ENGINEERING MATHEMATICS – III

CODE: 10 MAT 31 **IA Marks: 25**
Hrs/Week: 04 **Exam Hrs: 03**
Total Hrs: 52 **Exam Marks:100**

PART-A

Unit-I: FOURIER SERIES

Convergence and divergence of infinite series of positive terms, definition and illustrative examples*
Periodic functions, Dirichlet's conditions, Fourier series of periodic functions of period 2π and arbitrary period, half range Fourier series. Complex form of Fourier Series. Practical harmonic analysis. **[7 hours]**

Unit-II: FOURIER TRANSFORMS

Infinite Fourier transform, Fourier Sine and Cosine transforms, properties, Inverse transforms **[6 hours]**

Unit-III: APPLICATIONS OF PDE

Various possible solutions of one dimensional wave and heat equations, two dimensional Laplace's equation by the method of separation of variables, Solution of all these equations with specified boundary conditions. D'Alembert's solution of one dimensional wave equation.

[6 hours]

Unit-IV: CURVE FITTING AND OPTIMIZATION

Curve fitting by the method of least squares- Fitting of curves of the form $y = ax+b$, $y=a x^2 + b x+c$, $y = a e^{bx}$, $y = ax^b$

Optimization: Linear programming, mathematical formulation of linear programming problem (LPP), Graphical method and simplex method. **[7 hours]**

PART-B

Unit-V: NUMERICAL METHODS - 1

Numerical Solution of algebraic and transcendental equations: Regula-falsi method, Newton - Raphson method. Iterative methods of solution of a system of equations: Gauss-seidel and Relaxation methods. Largest eigen value and the corresponding eigen vector by Rayleigh's power method.

[6 hours]

Unit-VI: NUMERICAL METHODS – 2

Finite differences: Forward and backward differences, Newton's forward and backward interpolation formulae. Divided differences - Newton's divided difference formula, Lagrange's interpolation formula and inverse interpolation formula.

Numerical integration: Simpson's one-third, three-eighth and Weddle's rules (All formulae/rules without proof)

[7 hours]

Unit-VII: NUMERICAL METHODS – 3

Numerical solutions of PDE – finite difference approximation to derivatives, Numerical solution of two dimensional Laplace's equation, one dimensional heat and wave equations **[7 hours]**

Unit-VIII: DIFFERENCE EQUATIONS AND Z-TRANSFORMS

Difference equations: Basic definition; Z-transforms – definition, standard Z-transforms, damping rule, shifting rule, initial value and final value theorems. Inverse Z-transform. Application of Z-transforms to solve difference equations.

[6 hours]

Note: * In the case of illustrative examples, questions are not to be set.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

Reference Book:

1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd.Publishers

ANALOG ELECTRONIC CIRCUITS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES32**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Diode Circuits: Diode Resistance, Diode equivalent circuits, Transition and diffusion capacitance, Reverse recovery time, Load line analysis, Rectifiers, Clippers and clampers.

UNIT 2:
Transistor Biasing: Operating point, Fixed bias circuits, Emitter stabilized biased circuits, Voltage divider biased, DC bias with voltage feedback, Miscellaneous bias configurations, Design operations, Transistor switching networks, PNP transistors, Bias stabilization.

UNIT 3:
Transistor at Low Frequencies: BJT transistor modeling, Hybrid equivalent model, CE Fixed bias configuration, Voltage divider bias, Emitter follower,

CB configuration, Collector feedback configuration, Hybrid equivalent model.

UNIT 4:
Transistor Frequency Response: General frequency considerations, low frequency response, Miller effect capacitance, High frequency response, multistage frequency effects.

PART – B

UNIT 5:
(a) General Amplifiers: Cascade connections, Cascode connections, Darlington connections.
(b) Feedback Amplifier: Feedback concept, Feedback connections type, Practical feedback circuits.

UNIT 6:
Power Amplifiers: Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions.

UNIT 7:
Oscillators: Oscillator operation, Phase shift Oscillator, Wienbridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator. (BJT Version Only)

UNIT 8:
FET Amplifiers: FET small signal model, Biasing of FET, Common drain common gate configurations, MOSFETs, FET amplifier networks.

TEXT BOOK:
1. **"Electronic Devices and Circuit Theory",** Robert L. Boylestad and Louis Nashelsky, PHI/Pearson Eduication. 9TH Edition.

REFERENCE BOOKS:
1. **'Integrated Electronics',** Jacob Millman & Christos C. Halkias, Tata - McGraw Hill, 1991 Edition
2. **"Electronic Devices and Circuits",** David A. Bell, PHI, 4th Edition, 2004

3. "**Analog Circuits: A Fundamental Approach**", U B Mahadevaswamy, Pearson/Saguine, 2007

LOGIC DESIGN
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES33**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Principles of combinational logic-1: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables, Karnaugh maps-3, 4 and 5 variables, Incompletely specified functions (Don't Care terms), Simplifying Max term equations.

UNIT 2:
Principles of combinational Logic-2: Quine-McCluskey minimization technique- Quine-McCluskey using don't care terms, Reduced Prime Implicant Tables, Map entered variables.

UNIT 3:
Analysis and design of combinational logic - I: General approach, Decoders-BCD decoders, Encoders.

UNIT 4:
Analysis and design of combinational logic - II: Digital multiplexers-Using multiplexers as Boolean function generators. Adders and subtractors-Cascading full adders, Look ahead carry, Binary comparators.

PART – B

UNIT 5:
Sequential Circuits – 1: Basic Bistable Element, Latches, SR Latch, Application of SR Latch, A Switch Debouncer, The $\overline{S}\,\overline{R}$ Latch, The gated SR Latch, The gated D Latch, The Master-Slave Flip-Flops (Pulse-Triggered Flip-Flops): The Master-Slave SR Flip-Flops, The Master-Slave JK Flip-Flop, Edge Triggered Flip-Flop: The Positive Edge-Triggered D Flip-Flop, Negative-Edge Triggered D Flip-Flop.

UNIT 6:
Sequential Circuits – 2: Characteristic Equations, Registers, Counters - Binary Ripple Counters, Synchronous Binary counters, Counters based on Shift Registers, Design of a Synchronous counters, Design of a Synchronous Mod-6 Counter using clocked JK Flip-Flops Design of a Synchronous Mod-6 Counter using clocked D, T, or SR Flip-Flops

UNIT 7:
Sequential Design - I: Introduction, Mealy and Moore Models, State Machine Notation, Synchronous Sequential Circuit Analysis,

UNIT 8:
Sequential Design - II: Construction of state Diagrams, Counter Design

TEXT BOOKS:

1. **"Digital Logic Applications and Design"**, John M Yarbrough, Thomson Learning, 2001.
2. **"Digital Principles and Design ",** Donald D Givone, Tata McGraw Hill Edition, 2002.

REFERENCE BOOKS:

1. **"Fundamentals of logic design",** Charles H Roth, Jr; Thomson Learning, 2004.
2. **"Logic and computer design Fundamentals",** Mono and Kim, Pearson, Second edition, 2001.
3. **"Logic Design",** Sudhakar Samuel, Pearson/Saguine, 2007

NETWORK ANALYSIS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES34**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Basic Concepts: Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis With linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh.

UNIT 2:
Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, tie-set, tie-set and cut-set schedules, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of duality**.**

UNIT 3:
Network Theorems – 1: Superposition, Reciprocity and Millman's theorems.

UNIT 4:
Network Theorems - II:
Thevinin's and Norton's theorems; Maximum Power transfer theorem

PART – B

UNIT 5: Resonant Circuits: Series and parallel resonance, frequency-response of series and Parallel circuits, Q –factor, Bandwidth.

UNIT 6:
Transient behavior and initial conditions: Behavior of circuit elements under switching condition and their Representation, evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations.

UNIT 7:

Laplace Transformation & Applications : Solution of networks, step, ramp and impulse responses, waveform Synthesis

UNIT 8:

Two port network parameters: Definition of z, y, h and transmission parameters, modeling with these parameters, relationship between parameters sets.

TEXT BOOKS:

1. **"Network Analysis",** M. E. Van Valkenburg, PHI / Pearson Education, 3rd Edition. Reprint 2002.
2. **"Networks and systems",** Roy Choudhury, 2nd edition, 2006 re-print, New Age International Publications.

REFERENCE BOOKS:

1. **"Engineering Circuit Analysis",** Hayt, Kemmerly and DurbinTMH 6th Edition, 2002
2. **"Analysis of Linear Systems"**, David K. Cheng, Narosa Publishing House, 11th reprint, 2002

ELECTRONIC INSTRUMENTATION
(Common to EC/TC/IT/BM/ML)

Sub Code	**:**	**10IT35**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT – 1:

Introduction

(a) Measurement Errors: Gross errors and systematic errors, Absolute and relative errors, Accuracy, Precision, Resolution and Significant figures.

(b) Voltmeters and Multimeters Introduction, Multirange voltmeter, Extending voltmeter ranges, Loading, AC voltmeter using Rectifiers – Half wave and full wave, Peak responding and True RMS voltmeters.

UNIT – 2:

Digital Instruments

Digital Voltmeters – Introduction, DVM's based on V – T, V – F and Successive approximation principles, Resolution and sensitivity, General specifications, Digital Multi-meters, Digital frequency meters, Digital measurement of time.

UNIT – 3:

Oscilloscopes

Introduction, Basic principles, CRT features, Block diagram and working of each block, Typical CRT connections, Dual beam and dual trace CROs, Electronic switch.

UNIT – 4:

Special Oscilloscopes

Delayed time-base oscilloscopes, Analog storage, Sampling and Digital storage oscilloscopes.

PART – B

UNIT – 5:

Signal Generators

Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator, Sweep frequency generator, Frequency synthesizer.

UNIT – 6:

Measurement of resistance, inductance and capacitance

Whetstone's bridge, Kelvin Bridge; AC bridges, Capacitance Comparison Bridge, Maxwell's bridge, Wein's bridge, Wagner's earth connection

UNIT – 7:

Transducers - I

Introduction, Electrical transducers, Selecting a transducer, Resistive transducer, Resistive position transducer, Strain gauges, Resistance thermometer, Thermistor, Inductive transducer, Differential output transducers and LVDT.

UNIT – 8:

Miscellaneous Topics

(a) Transducers - II –Piezoelectric transducer, Photoelectric transducer, Photovoltaic transducer, Semiconductor photo devices, Temperature transducers-RTD, Thermocouple .

(b) Display devices: Digital display system, classification of display, Display devices, LEDs, LCD displays.

(c) Bolometer and RF power measurement using Bolometer

(d) Introduction to Signal conditioning.

TEXT BOOKS:

1. **"Electronic Instrumentation",** H. S. Kalsi, TMH, 2004
2. **"Electronic Instrumentation and Measurements",** David A Bell, PHI / Pearson Education, 2006.
3.

REFERENCE BOOKS:

1. **"Principles of measurement systems",** John P. Beately, 3rd Edition, Pearson Education, 2000
2. **"Modern electronic instrumentation and measuring techniques",** Cooper D & A D Helfrick, PHI, 1998.
3. **Electronics & electrical measurements,** A K Sawhney, , Dhanpat Rai & sons, 9th edition.

HUMAN ANATOMY & PHYSIOLOGY

Sub Code	**:**	**10BM36**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Introduction: Homeostasis, Tissue, Cartilage: The cell**,** The internal environment and homeostasis, movement of substances within the body, body fluids, action potential, propagation of action potential. Epithelial tissue- simple epithelium, stratified epithelium, connective tissue- cells of connective tissue, loose connective tissue, Adipose tissue, Dense connective

tissue, Lymphoid tissue, Cartilage- Hyaline cartilage, Fibrocartilage, Elastic cartilage.

6 Hours

UNIT 2:

Nervous System: Functional Components of nervous system**,** Neurons: Properties of neurons, Cell bodies, Axon and Dendrites, Types of nerves, Synapse and neurotransmitters, neuromuscular junction. Central nervous system: Meninges, ventricles of the brain and CSF. Brain: Cerebrum, functions of cerebrum, functional areas of the cerebrum, Brainstem, Cerebellum, Spinal cord- grey matter, white matter, spinal reflex, Cranial nerves-List & their functions, Autonomic nervous system (in brief)- functions and effects. **7 Hours**

UNIT 3:

Cardiovascular System: Introduction, Blood vessels- Arteries and Arterioles, Veins and Venules, capillaries, control of blood vessel diameter, blood supply- internal respiration, cell nutrition. Heart- position, structure- pericardium, myocardium, endocardium, interior of the heart, flow of blood through the heart, blood supply to heart, Conducting system of the heart, factors affecting heart rate, the Cardiac cycle, cardiac output, blood pressure, control of blood pressure, pulse and factors affecting the pulse rate. Circulation of the blood- pulmonary circulation, systemic circulation, aorta.

7 Hours

UNIT 4:

Digestive System: Introduction, Organs of the digestive system- mouth: tongue, teeth, salivary glands, pharynx, oesophagus, stomach, gastric juice and functions of stomach- small intestine: structure, chemical digestion in small intestine, large intestine: structure, functions of the large intestine, rectum and anal canal. Pancreas, Liver. **6 Hours**

PART – B

UNIT 5:

Respiratory System: Introduction, Nose and Nasal cavity- position, structure and functions, pharynx, position, structure, functions. Larynx: position, structure and functions. Trachea, bronchi, bronchioles and alveoli, lungs- position, associated structure, pleura and pleural cavity. Respiration-

muscles of respiration, cycle of respiration, variables affecting respiration, lung volumes and capacity. **6 Hours**

UNIT 6:

Skeletal System: Bone, Types of bone, structure, bone cells, functions of bone. Axial skeleton- skull, sinuses, Fontanelles, vertebral column- characteristics of typical vertebra, different parts of vertebral column (parts only), features of vertebral column, movements and functions of vertebral column, sternum, ribs, shoulder girdle and upper limb, pelvic girdle and lower limb. **6 Hours**

UNIT 7:

Muscles and Joints (Study of muscles along with joints): Muscle tissue: Skeletal muscle, Smooth muscle, Cardiac muscle, functions of muscle tissue, muscle tone and fatigue.

Types of joint- Fibrous, Cartilaginous, Synovial, characteristics of synovial joints, shoulder joint, elbow joint, radioulnar joint, wrist joint, Hip joint, Knee joint, ankle joint **7 Hours**

UNIT 8:

Endocrine, Urinary and Reproductive System: Pituitary gland, thyroid gland, parathyroid gland, adrenal gland. Parts of urinary system, kidneys- organs associated with the kidneys, gross and microscopic structure of the kidney, functions of the kidneys, ureter, urinary bladder, urethra, micturition. Reproductive system: Female- Uterus, Ovaries, Male- Scrotum, Testis.

7 Hours

TEXTBOOK:

1. **Ross & Wilson's Anatomy and Physiology in Health and Illness** – by Anne Waugh and Allison Grant, 9th Edition, Churchill Livingstone Publications.

REFERENCE BOOKS:

1. **Concise Medical Physiology**- by Sujit K. Chaudhuri, 5th Edition, New Central Book Agency Pvt. Ltd.
2. **Essentials of Medical Physiology** - by K. Sembulingam and Prema Sembulingam, 3rd Edition, Jaypee Publications.

Question Paper Pattern: Student should answer FIVE full questions out of 8 questions to be set each carrying 20 marks, **selecting at least TWO questions from each part**

ANALOG ELECTRONICS LAB
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ESL37**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**		**Exam Marks**	**:**	**50**

1. Wiring of RC coupled Single stage FET & BJT amplifier and determination of the gain-frequency response, input and output impedances.

2. Wiring of BJT Darlington Emitter follower with and without bootstrapping and determination of the gain, input and output impedances (Single circuit) (One Experiment)

3. Wiring of a two stage BJT Voltage series feed back amplifier and determination of the gain, Frequency response, input and output impedances with and without feedback (One Experiment)

4. Wiring and Testing for the performance of BJT-RC Phase shift Oscillator for $f_0 \leq 10$ KHz

5. Testing for the performance of BJT – Hartley & Colpitts Oscillators for RF range $f_0 \geq 100$KHz.

6. Testing for the performance of BJT -Crystal Oscillator for $f_0 > 100$ KHz
7 Testing of Diode clipping (Single/Double ended) circuits for peak clipping, peak detection

8. Testing of Clamping circuits: positive clamping /negative clamping.
9. Testing of a transformer less Class – B push pull power amplifier and determination of its conversion efficiency.

10. Testing of Half wave, Full wave and Bridge Rectifier circuits with and without Capacitor filter. Determination of ripple factor, regulation and efficiency

11. Verification of Thevinin's Theorem and Maximum Power Transfer theorem for DC Circuits.

12. Characteristics of Series and Parallel resonant circuits.

LOGIC DESIGN LAB
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ESL38**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**		**Exam Marks**	**:**	**50**

1. Simplification, realization of Boolean expressions using logic gates/Universal gates.
2. Realization of Half/Full adder and Half/Full Subtractors using logic gates.
3. (i) Realization of parallel adder/Subtractors using 7483 chip
   (ii) BCD to Excess-3 code conversion and vice versa.
4. Realization of Binary to Gray code conversion and vice versa
5. MUX/DEMUX – use of 74153, 74139 for arithmetic circuits and code converter.
6. Realization of One/Two bit comparator and study of 7485 magnitude comparator.
7. Use of a) Decoder chip to drive LED display and b) Priority encoder.
8. Truth table verification of Flip-Flops: (i) JK Master slave (ii) T type and (iii) D type.
9. Realization of 3 bit counters as a sequential circuit and MOD – N counter design (7476, 7490, 74192, 74193).
10. Shift left; Shift right, SIPO, SISO, PISO, PIPO operations using 74S95.
11. Wiring and testing Ring counter/Johnson counter.
12. Wiring and testing of Sequence generator.

ENGINEERING MATHEMATICS – IV

Sub Code	**:**	**10MAT41**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART-A

UNIT-1

Numerical Methods- 1

Numerical solution of ordinary differential equations of first order and first degree; Picard's method, Taylor's series method, modified Euler's method, Runge-kutta method of fourth-order. Milne's and Adams - Bashforth predictor and corrector methods (No derivations of formulae).

6 Hours

UNIT-2

Numerical Methods – 2

Numerical solution of simultaneous first order ordinary differential equations: Picard's method, Runge-Kutta method of fourth-order.

Numerical solution of second order ordinary differential equations: Picard's method, Runge-Kutta method and Milne's method.

6 Hours

UNIT-3

Complex variables – 1

Function of a complex variable, Analytic functions-Cauchy-Riemann equations in cartesian and polar forms. Properties of analytic functions.

Application to flow problems- complex potential, velocity potential, equipotential lines, stream functions, stream lines.

7 Hours

UNIT-4

Complex variables – 2

Conformal Transformations: Bilinear Transformations. Discussion of Transformations: $w = z^2$, $w = e^z$, $w = z + (a^2 / z)$. Complex line integrals- Cauchy's theorem and Cauchy's integral formula.

7 Hours

PART-B

UNIT-5

Special Functions

Solution of Laplace equation in cylindrical and spherical systems leading Bessel's and Legendre's differential equations, Series solution of Bessel's differential equation leading to Bessel function of first kind. Orthogonal property of Bessel functions. Series solution of Legendre's differential equation leading to Legendre polynomials, Rodrigue's formula.

7 Hours

UNIT-6

Probability Theory - 1

Probability of an event, empherical and axiomatic definition, probability associated with set theory, addition law, conditional probability, multiplication law, Baye's theorem.

6 Hours

UNIT-7

Probability Theory- 2

Random variables (discrete and continuous), probability density function, cumulative density function. Probability distributions – Binomial and Poisson distributions; Exponential and normal distributions.

7 Hours

UNIT-

Sampling Theory

Sampling, Sampling distributions, standard error, test of hypothesis for means, confidence limits for means, student's t-distribution. Chi -Square distribution as a test of goodness of fit

6 Hours

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

Reference Book:

1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd.Publishers.

MICROCONTROLLERS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES42**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Microprocessors and microcontroller. Introduction, Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, Computer software.

The 8051 Architecture: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, External Memory interfacing, Stacks.

UNIT 2:

Addressing Modes: Introduction, Instruction syntax, Data types, Subroutines, Addressing modes: Immediate addressing , Register addressing, Direct addressing, Indirect addressing, relative addressing, Absolute addressing,

Long addressing, Indexed addressing, Bit inherent addressing, bit direct addressing.
Instruction set: Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction.

UNIT 3:
8051 programming: Assembler directives, Assembly language programs and Time delay calculations.

UNIT 4:
8051 Interfacing and Applications: Basics of I/O concepts, I/O Port Operation, Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing and DC motor interfacing and programming

PART – B

UNIT 5:
8051 Interrupts and Timers/counters: Basics of interrupts, 8051 interrupt structure, Timers and Counters, 8051 timers/counters, programming 8051 timers in assembly and C.

UNIT 6:
8051 Serial Communication: Data communication, Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232, Serial communication Programming in assembly and C.
8255A Programmable Peripheral Interface:, Architecture of 8255A, I/O addressing,, I/O devices interfacing with 8051 using 8255A.

Course Aim – The MSP430 microcontroller is ideally suited for development of low-power embedded systems that must run on batteries for many years. There are also applications where MSP430 microcontroller must operate on energy harvested from the environment. This is possible due to the ultra-low power operation of MSP430 and the fact that it provides a complete system solution including a RISC CPU, flash memory, on-chip data converters and on-chip peripherals.

UNIT 7:
Motivation for MSP430microcontrollers – Low Power embedded systems, On-chip peripherals (analog and digital), low-power RF capabilities. Target

applications (Single-chip, low cost, low power, high performance system design).
MSP430 RISC CPU architecture, Compiler-friendly features, Instruction set, Clock system, Memory subsystem. Key differentiating factors between different MSP430 families.
Introduction to Code Composer Studio (CCS v4). Understanding how to use CCS for Assembly, C, Assembly+C projects for MSP430 microcontrollers. Interrupt programming.
Digital I/O – I/O ports programming using C and assembly, Understanding the muxing scheme of the MSP430 pins.

UNIT 8:
On-chip peripherals. Watchdog Timer, Comparator, Op-Amp, Basic Timer, Real Time Clock (RTC), ADC, DAC, SD16, LCD, DMA.
Using the Low-power features of MSP430. Clock system, low-power modes, Clock request feature, Low-power programming and Interrupt.
Interfacing LED, LCD, External memory. Seven segment LED modules interfacing. Example – Real-time clock.
Case Studies of applications of MSP430 - Data acquisition system, Wired Sensor network, Wireless sensor network with Chipcon RF interfaces.

TEXT BOOKS:

1. **"The 8051 Microcontroller and Embedded Systems – using assembly and C "-,** Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006
2. **"MSP430 Microcontroller Basics",** John Davies, Elsevier, 2008.

REFERENCE BOOKS:

1. **"The 8051 Microcontroller Architecture, Programming & Applications",** 2e Kenneth J. Ayala ;, Penram International, 1996 / Thomson Learning 2005.
2. "**The 8051 Microcontroller: Hardware, software and applications**", V.Udayashankara and MalikarjunaSwamy, TMH, 2009

3. **MSP430 Teaching CD-ROM,** Texas Instruments, 2008 (can be requested **http://www.uniti.in**)
4. **Microcontrollers: Architecture, Programming, Interfacing and System Design",**Raj Kamal, "Pearson Education, 2005

CONTROL SYSTEMS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ES43**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Modeling of Systems: Introduction to Control Systems, Types of Control Systems, Effect of Feedback Systems, Differential equation of Physical Systems -Mechanical systems, Friction, Translational systems (Mechanical accelerometer, systems excluded), Rotational systems, Gear trains, Electrical systems, Analogous systems

UNIT 2:
Block diagrams and signal flow graphs: Transfer functions, Block diagram algebra, Signal Flow graphs (State variable formulation excluded),

UNIT 3:
Time Response of feed back control systems: Standard test signals, Unit step response of First and second order systems, Time response specifications, Time response specifications of second order systems, steady – state errors and error constants. Introduction to PID Controllers(excluding design)

UNIT 4:
Stability analysis: Concepts of stability, Necessary conditions for Stability, Routh- stability criterion, Relative stability analysis; More on the Routh stability criterion.

PART – B

UNIT 5:
Root–Locus Techniques: Introduction, The root locus concepts, Construction of root loci.

UNIT 6:
Frequency domain analysis: Correlation between time and frequency response, Bode plots, Experimental determination of transfer functions, Assessment of relative stability using Bode Plots. Introduction to lead, lag and lead-lag compensating networks (excluding design).

UNIT 7:
Stability in the frequency domain: Introduction to Polar Plots, (Inverse Polar Plots excluded) Mathematical preliminaries, Nyquist Stability criterion, Assessment of relative stability using Nyquist criterion, (Systems with transportation lag excluded).

UNIT 8:
Introduction to State variable analysis: Concepts of state, state variable and state models for electrical systems, Solution of state equations.

TEXT BOOK :
1. J. Nagarath and M.Gopal, "Control Systems Engineering", New Age International (P) Limited, Publishers, Fourth edition – 2005

REFERENCE BOOKS:

1. **"Modern Control Engineering ",** K. Ogata, Pearson Education Asia/ PHI, 4th Edition, 2002.
2. **"Automatic Control Systems",** Benjamin C. Kuo and Farid Golnaagi, Wiley Studnt 8th Edition, 2009
3. **"Feedback and Control System",** Joseph J Distefano III et al., Schaum's Outlines, TMH, 2nd Edition 2007.

BIOMEDICAL TRANSDUCERS AND MEASUREMENTS

Sub Code	**:**	**10BM44**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART- A

UNIT - 1

FUNDAMENTAL CONCEPTS & BASIC TRANSDUCERS: Measurement, Signals and Noise in the measurement-Measurement, signals and noise, signal to noise ratio, different types of noise. Characteristics of Measurement system-Transducer and measurement system, static characteristics, dynamic characteristics, standard and calibration, accuracy and error. Basic medical instrumentation system, General constraints in design of medical instrumentation systems. **6 Hours**

UNIT - 2

BIOELECTRIC SIGNALS AND ELECTRODES: Electrocardiogram(ECG), Electroencephalogram (EEG), Electromyogram (EMG), Electrooculogram (EOG), Electroretinogram (ERG), Recording Electrodes – Electrode-tissue interface, polarization, skin contact impedance, motion artifacts, Silver-Silver Chloride electrodes, Electrodes for ECG, Electrodes for EEG, Electrodes of EMG, Electrical conductivity of electrode jellies and creams, microelectrodes. **6 Hours**

UNIT - 3

PRESSURE MEASUREMENT: Physiological pressure ranges and measurement sites, Direct pressure measurement-catheters for pressure measurement, diaphragm displacement transducers, catheter tip pressure transducers, implantable pressure transducers and pressure telemetering capsules. Indirect pressure measurement-Indirect measurement of systolic, diastolic, and mean blood pressure, Detection of Kortokoff sounds, Mean BP measurements by Oscillometric method, BP measurement by Doppler ultrasound. **7 Hours**

UNIT - 4

TEMPERATURE MEASUREMENT: Requirements for measurement ranges, Temperature transducers – Thermistors, thermocouples, wire and thin

film thermoresistive elements, P-N junction diodes and transistors, infrared radiation thermometers, infrared thermography. Clinical thermometer probes, tympanic thermometers, telemetering capsules, direct calorimetry.

7 Hours

PART- B

UNIT - 5 & 6

FLOW MEASUREMENT: Requirements for measurement ranges – blood flow in a single vessel, tissue blood flow, and respiratory gas flow. Electromagnetic flowmeters – principle, methods of magnetic field excitation, perivascular probes, intravascular probes. Ultrasonic blood flowmeters– propagation of ultrasound in the tissue, ultrasonic Doppler flowmeters, blood flow measurement through Doppler imaging. Indicator dilution method – principle and working, thermodilution method, Fick method, thermistor velocity probe, impedance cardiography, Laser Doppler flowmeters, NMR blood flowmeters. **13 Hours**

UNIT - 7 & 8

CHEMICAL MEASUREMENT AND BIOSENSORS: Objectives of chemical measurement, requirements and limitations in chemical measurement. Chemical Transducers – Electrochemical transducers, Electrode potential and reference electrodes, potentiometric sensors, amperometric sensors, electrochemical gas sensors, chemical transducers of acoustic and thermal principles. Biosensors – Enzyme based biosensors, immunosensors, and microbial sensors. Continuous measurement of chemical quantities – intravascular measurements, tissue measurements, measurement by blood drainage, measurement by microdialysis, measurement by effluent fluid analysis. Transcutaneous measurements - Transcutaneous measurement of pO2, Transcutaneous measurement of pCO2, Transcutaneous arterial oxygen saturation monitoring – the basic of oximetry, early oximeters, pulseoximeter, Electronic nose. **13 Hours**

TEXT BOOKS:

1. Biomedical Transducers and Instruments – by Tatsuo Togawa, Toshiyo Tamura and P. Ake Oberg, CRC Press, 1997.
2. Handbook of Biomedical Instrumentation – by R.S.Khandpur, 2nd Edition, Tata McGraw Hill, 2003

REFERENCE BOOK:

1. Biomedical Instrumentation and Measurement – by Leslie Cromwell, Fred J Weibell and Erich A. Pfeiffer, 2nd Edition, Prentice-Hall India Pvt. Ltd., 2004.
2. Transducers and Instrumentation by D. V. S. Murty Prentice Hall India Pvt ltd. 2nd Edition

Question Paper Pattern: Student should answer FIVE full questions out of 8 questions to be set each carrying 20 marks, **selecting at least TWO questions from each part**

FUNDAMENTALS OF HDL
(Common to EC/TC/IT/BM/ML)

Sub Code	**:**	**10EC45**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

Introduction: Why HDL? , A Brief History of HDL, Structure of HDL Module, Operators, Data types, Types of Descriptions, simulation and synthesis, Brief comparison of VHDL and Verilog

UNIT 2:

Data –Flow Descriptions: Highlights of Data-Flow Descriptions, Structure of Data-Flow Description, Data Type – Vectors.

UNIT 3:

Behavioral Descriptions: Behavioral Description highlights, structure of HDL behavioral Description, The VHDL variable –Assignment Statement, sequential statements.

UNIT 4:

.**Structural Descriptions**: Highlights of structural Description, Organization of the structural Descriptions, Binding, state Machines, Generate, Generic, and Parameter statements.

PART – B

UNIT 5:
Procedures, Tasks, and Functions: Highlights of Procedures, tasks, and Functions, Procedures and tasks, Functions.
Advanced HDL Descriptions: File Processing, Examples of File Processing

UNIT 6:
Mixed –Type Descriptions: Why Mixed-Type Description? VHDL User-Defined Types, VHDL Packages, Mixed-Type Description examples

UNIT 7:
Mixed –Language Descriptions: Highlights of Mixed-Language Description, How to invoke One language from the Other, Mixed-language Description Examples, Limitations of Mixed-Language Description.

UNIT 8:
Synthesis Basics: Highlights of Synthesis, Synthesis information from Entity and Module, Mapping Process and Always in the Hardware Domain.

TEXT BOOKS:
1. **HDL Programming (VHDL and Verilog**)- Nazeih M.Botros-Dreamtech Press, (Available through John Wiley – India and Thomson Learning) 2006 Edition

REFERENCE BOOKS:
1. **Verilog HDL** –Samir Palnitkar-Pearson Education
2. **VHDL** -Douglas perry-Tata McGraw-Hill
3. **A Verilog HDL Primer**- J.Bhaskar – BS Publications
4. **Circuit Design with VHDL**-Volnei A.Pedroni-PHI

LINEAR IC's & APPLICATIONS
(Common to EC/TC/IT/BM/ML)

Sub Code	**:**	**10EC46**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:
Operational Amplifier Fundamentals: Basic Op-Amp circuit, Op-Amp parameters – Input and output voltage, CMRR and PSRR, offset voltages and currents, Input and output impedances, Slew rate and Frequency limitations; Op-Amps as DC Amplifiers- Biasing Op-Amps, Direct coupled -Voltage Followers, Non-inverting Amplifiers, Inverting amplifiers, Summing amplifiers, Difference amplifier.

UNIT 2:
Op-Amps as AC Amplifiers: Capacitor coupled Voltage Follower, High input impedance - Capacitor coupled Voltage Follower, Capacitor coupled Non-inverting Amplifiers, High input impedance - Capacitor coupled Non-inverting Amplifiers, Capacitor coupled Inverting amplifiers, setting the upper cut-off frequency, Capacitor coupled Difference amplifier, Use of a single polarity power supply.

UNIT 3:
Op-Amps frequency response and compensation: Circuit stability, Frequency and phase response, Frequency compensating methods, Band width, Slew rate effects, Z_{in} Mod compensation, and circuit stability precautions.

UNIT 4:
OP-AMP Applications: Voltage sources, current sources and current sinks, Current amplifiers, instrumentation amplifier, precision rectifiers, Limiting circuits.

PART – B

UNIT 5:

More applications: Clamping circuits, Peak detectors, sample and hold circuits, V to I and I to V converters, Log and antilog amplifiers, Multiplier and divider, Triangular / rectangular wave generators, Wave form generator design, phase shift oscillator, Wein bridge oscillator.

UNIT 6:

Non-linear circuit applications: crossing detectors, inverting Schmitt trigger circuits, Monostable & Astable multivibrator, Active Filters –First and second order Low pass & High pass filters.

UNIT 7:

Voltage Regulators: Introduction, Series Op-Amp regulator, IC Voltage regulators, 723 general purpose regulator, Switching regulator.

UNIT 8:

Other Linear IC applications: 555 timer - Basic timer circuit, 555 timer used as astable and monostable multivibrator, Schmitt trigger; PLL-operating principles, Phase detector / comparator, VCO; D/A and A/ D converters – Basic DAC Techniques, AD converters.

TEXT BOOKS:

1. **"Operational Amplifiers and Linear IC's",** David A. Bell**,** 2nd edition, PHI/Pearson, 2004
2. **"Linear Integrated Circuits",** D. Roy Choudhury and Shail B. Jain**,** 2nd edition, Reprint 2006, New Age International

REFERENCE BOOKS:

1. **"Op - Amps and Linear Integrated Circuits",** Ramakant A. Gayakwad, 4th edition, PHI,
2. **"Operational Amplifiers and Linear Integrated Circuits",** Robert. F. Coughlin & Fred.F. Driscoll**,** PHI/Pearson, 2006
3. **"Op - Amps and Linear Integrated Circuits",** James M. Fiore**,** Thomson Learning, 2001
4. **"Design with Operational Amplifiers and Analog Integrated Circuits",** Sergio Franco**,** TMH, 3e, 2005

MICROCONTROLLERS LAB
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	**:**	**10ESL47**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).
5. Conditional CALL & RETURN.
6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX .
7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.

Note: Programming exercise is to be done on both 8051 & MSP430.

II. INTERFACING:

Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.

8. Simple Calculator using 6 digit seven segment display and Hex Keyboard interface to 8051.
9. Alphanumeric LCD panel and Hex keypad input interface to 8051.
10. External ADC and Temperature control interface to 8051.
11. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.
12. Stepper and DC motor control interface to 8051.
13.. Elevator interface to 8051.

HDL LAB
(Common to EC/TC/IT/BM/ML)

Sub Code	**:**	**10ECL48**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**03**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**42**	**Exam Marks**	**:**	**50**

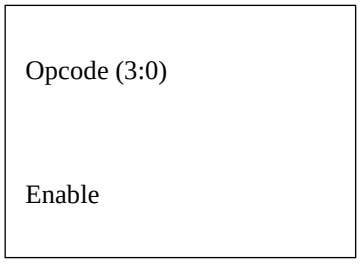
Note: Programming can be done using any compiler. Download the programs on a FPGA/CPLD boards such as Apex/Acex/Max/Spartan/Sinfi/TK Base or equivalent and performance testing may be done using 32 channel pattern generator and logic analyzer apart from verification by simulation with tools such as Altera/Modelsim or equivalent.

PROGRAMMING (using VHDL and Verilog)

1. Write HDL code to realize all the logic gates
2. Write a HDL program for the following combinational designs
   a. 2 to 4 decoder
   b. 8 to 3 (encoder without priority & with priority)
   c. 8 to 1 multiplexer
   d. 4 bit binary to gray converter
   e. Multiplexer, de-multiplexer, comparator.
2. Write a HDL code to describe the functions of a Full Adder Using three modeling styles.

3. Write a model for 32 bit ALU using the schematic diagram shown below

A (31:0) B (31:0)



- ALU should use combinational logic to calculate an output based on the four bit op-code input.
- ALU should pass the result to the out bus when enable line in high, and tri-state the out bus when the enable line is low.
- ALU should decode the 4 bit op-code according to the given in example below.

OPCODE	ALU OPERATION
1.	A + B
2.	A – B
3.	A Complement
4.	A * B
5.	A AND B
6.	A OR B
7.	A NAND B
8.	A XOR B

4. Develop the HDL code for the following flip-flops, SR, D, JK, T.
5. Design 4 bit binary, BCD counters (Synchronous reset and Asynchronous reset) and "any sequence" counters

INTERFACING (at least four of the following must be covered using VHDL/Verilog)

1. Write HDL code to display messages on the given seven segment display and LCD and accepting Hex key pad input data.

2. Write HDL code to control speed, direction of DC and Stepper motor.

3. Write HDL code to accept 8 channel Analog signal, Temperature sensors and display the data on LCD panel or Seven segment display.

4. Write HDL code to generate different waveforms (Sine, Square, Triangle, Ramp etc.,) using DAC change the frequency and amplitude.

5. Write HDL code to simulate Elevator operations
6. Write HDL code to control external lights using relays.

V SEMESTER
MANAGEMENT & ENTREPRENEURSHIP

Subject Code	:	**10AL51**	IA Marks	:	**25**
Hours/week	:	**04**	**Exam Hours**	:	**03**
Total no of Lecture Hrs	:	**52**	**Exam Marks**	:	**100**

PART – A
MANAGEMENT

UNIT 1

MANAGEMENT: Introduction: meaning-nature and characteristics of management, scope and functional areas of management-management as a science, art or profession-management and administration-Roles of management, Levels of management, Development of management Thought-early management approaches-Modern management approaches.

7 Hours

UNIT 2

PLANNING: Nature, importance and purpose of planning process-objectives-types of plans (meaning only)-design making-importance of planning-steps in planning and planning premises-hierarchy of plans.

6 Hours

UNIT 3

ORGANIZING AND STAFFING: Nature and purpose of organization-Principles of organization-Types of organization, departmentation, committees, Centralization Vs Decentralization of authority and responsibility-span and control-MBO and MBE (meaning) Nature and importance of staffing-process of selection and recruitment (in brief).

6 Hours

UNIT 4

DIRECTING AND CONTROLLING: Meaning and nature of directing-leadership styles, motivation theories, communication -meaning and importance-coordination, meaning and importance and techniques of Co-ordination. Meaning and steps in controlling-Essentials of sound control system-Methods of establishing control (in brief).

7 Hours

PART – B
ENTREPRENEURSHIP

UNIT 5

ENTREPRENEUR: Meaning of entrepreneur, Evolution of the concept, Functions of an entrepreneur, Types of Entrepreneur, Entrepreneur-an emerging class. Concept of Entrepreneurship-Evolution of Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship-its Barriers.

6 Hours

UNIT 6

SMALL-SCALE INDUSTRY: Definition: Characteristics; Need and rationale: Objectives; scope; role of SSI in Economic Development. Advantages of SSI, Steps to start an SSI-government policy towards SSI; Different policies of SSI; government support for SSI during 5years plans. Impact of Liberalization, Privatization, Globalization on SSI, Effect of WTO/GATT supporting agencies of Government for SSI, meaning; Nature of support; Objectives; Functions; Types of help; Ancillary Industry and Tiny Industry (Definition).

7 Hours

UNIT 7

INSTITUTIONAL SUPPORT: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC single window Agency: SISI; NSIC; SIDBI; KSFC.

6 Hours

UNIT 8:

PREPARATION OF PROJECT: Meaning of project: Project Identification; Project selection; project Report; Need and significance of Report; contents; formulation; Guidelines by planning Commission for project report; Network Analysis; Errors of Project Report; Project Appraisal. Identification of business opportunities. Market Feasibility Study; Technical feasibility study; Financial Feasibility Study and social Feasibility Study.

7 Hours

TEXT BOOKS:

1. **PRINCIPLES OF MANAGEMENT**- P.C.Tripathi, P.N.Reddy, Tata McGraw Hill.
2. **Dynamics of Entrepreneurial Development & Management**-Vasant Desai, Himalaya Publishing House.

3. **Entrepreneurship Development-Small Business Enterprises** - Poornima M Charantimath-Pearson Education-2006.

REFERENCE BOOKS:

1. **Manage Fundamentals-Concepts, Application, Skill Development** - Robert Lusier, Thomson.
2. **Entrepreneurship Development** - SS Khanka, S Chand &Co.
3. **Management** - Stephen Robbins, Pearson Education, PHI-17th Edition, 2003.

8086 MICROPROCESSOR & PERIPHERALS

Subject Code	:	**10BM52**	IA Marks	:	**25**
Hours/week	:	**04**	**Exam Hours**	:	**03**
Total no of Lecture Hrs	:	**52**	**Exam Marks**	:	**100**

PART- A

UNIT - 1

THE PROCESSORS: 8086 / 8088: Register Organization of 8086, Architecture, Signal Descriptions of 8086, Physical Memory Organization, General Bus Operation, I/O addressing Capability, Special Processors Activities, Minimum Mode 8086 System and Timings, Maximum Mode 8086 System and Timings, The Processors 8088. **7 Hours**

UNIT - 2 & 3

8086 / 8088 INSTRUCTION SET AND ASSEMBLER DIRECTIVES AND ASSEMBLY LANGUAGE PROGRAMMING: Machine Language Instruction Formats, Addressing Modes of 8086, Instruction Set of 8086, Assembler Directives and Operators, A Few Machine Level Programs, Programming with An Assembler, Assembly Language Example Programs.

12 Hours

UNIT - 4

SPECIAL ARCHITECTURAL FEATURES AND RELATED PROGRAMMING: Introduction to Stack, STACK Structure of 8086 / 8088, Interrupts and Interrupts Service Routines, Interrupt Cycle of 8086 /

8088, Non Mask able Interrupt, Mask able Interrupt (INTR), Interrupt Programming, MACROS and Timing and Delays. **7 Hours**

PART - B

UNIT - 5

PERIPHERALS AND THEIR INTERFACING WITH 8086 / 8088: Semiconductor Memory Interfacing, Dynamic RAM Interfacing, Interfacing I/O Ports, PIO 8255 [Programmable Input – Output Port], Modes of Operation of 8255, Interfacing Analog to Digital Data Converters, Interfacing Digital to Analog Data Converters, Stepper Motor Interfacing, Control of High Power Devices Using 8255. **7 Hours**

UNIT - 6 & 7

SPECIAL PURPOSE PROGRAMMABLE PERIPHERAL DEVICES AND THEIR INTERFACING: Programmable Interval Timer 8253, Programmable Interrupt Controller 8259A, The Keyboard / Display Controller 8279, Programmable Communication Interface 8251 USART, DMA Controller, DMA Transfer and Operations, Programmable DMA Interface. **13 Hours**

UNIT - 8

INTRODUCTION TO 80286 MICROPROCESSOR: Salient Features of 80286, internal architecture of 80286, Signal description of 80286, real addressing mode, protected virtual address mode. **6 Hours**

TEXTBOOK:

Advanced Microprocessors and Peripherals – A.K.Ray and K.M. Bhurchandi, Tata McGraw Hill, 3rd Reprint, 2007.

REFERENCE BOOK

Microprocessor and Interfacing - by Douglas V. Hall, 2nd Edn., Tata McGraw Hill, 21st Reprint, 2004.

SIGNALS & SYSTEMS

Subject Code	:	**10BM53**	IA Marks	:	**25**
Hours/week	:	**04**	**Exam Hours**	:	**03**
Total no of Lecture Hrs	:	**52**	**Exam Marks**	:	**100**

PART- A

UNIT 1:
Introduction: Definitions of a signal and a system, classification of signals, basic Operations on signals, elementary signals, Systems viewed as Interconnections of operations, properties of systems. **7 Hours**

UNIT 2:
Time-domain representations for LTI systems – 1: Convolution, impulse response representation, Convolution Sum, properties of impulse response representation. **6 Hours**

UNIT 3:
Time-domain representations for LTI systems – 2: Differential and difference equation Representations, Block diagram representations, autocorrelation and cross-correlation.

6 Hours

UNIT 4:
Fourier representation for signals : Introduction, continuous time and Discrete time Fourier series (properties are excluded), Continuous Fourier transforms (properties of transforms are excluded), Discrete Fourier transforms and their properties

7 Hours

PART – B

UNIT 5:
Applications of Fourier representations: Introduction, Frequency response of LTI systems, Fourier transform representation of periodic signals, Fourier transform representation of discrete time signals. **7 Hours**

UNIT 6:
Z-Transforms – 1: Introduction, Z – transform, properties of ROC,

properties of Z – transforms, inversion of Z – transforms. **7 Hours**

UNIT 7:

Z-transforms – 2: Transform analysis of LTI Systems, unilateral Z-Transform and its application to solve difference equations.

6 Hours

UNIT 8:

Realization of digital system**:** Basic Structures for IIR system : Direct forms (I & II), cascade and parallel realizations. Basic structures for FIR system - Direct & cascade form structure.

6 Hours

TEXTBOOK:

1."Signals and Systems", Simon Haykin and Barry Van Veen John Wiley & Sons, 2001.Reprint 2002.

2. Real Time Digital Signal Processing: Fundamentals, Algorithms and implementation using TMS Processor-V.Udayashankara, Prentice Hall of India, New Delhi, 2010

REFERENCE BOOKS:

1. "Signals and Systems" , Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab, Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002.
2. "Signals and Systems", Scham's outlines, H. P Hsu, R. Ranjan, TMH, 2006.
3. "Linear Systems and Signals", B. P. Lathi, Oxford University Press, 2005.
4. "Signals and Systems", Ganesh Rao and Satish Tunga, Sanguine Technical Publishers, 2004.

Question Paper Pattern: Student should answer FIVE full questions out of 8 questions to be set each carrying 20 marks, **selecting at least TWO questions from each part**

VLSI DESIGN

Subject Code	**: 10BM54**	IA Marks	**: 25**
Hours/week	**: 04**	**Exam Hours**	**: 03**
Total no of Lecture Hrs	**: 52**	**Exam Marks**	**: 100**

PART- A

UNIT 1

A REVIEW OF MICROELECTRONICS AN INTRODUCTION TO MOS TECHNOLOGY: Introduction to integrated circuit technology. The integrated circuit (IC) era, Metal-oxide-semiconductor (MOS) and related VLSI technology. Basic MOS transistors. Enhancement mode transistor action. Depletion mode transistor action, nMOS fabrication CMOS fabrication. Thermal aspects of processing. BICMOS technology.

7 Hours

UNIT 2 & 3

BASIC ELECTRICAL PROPERTIES OF MOS & BICMOS CIRCUITS: Drain-to-source current l_{ds} versus voltage V_{ds} relationships. Aspects of MOS transistor threshold voltage Vt. MOS transistor transconductance gm and output conductance gds. MOS transistor figure of merit ω0. The pass transistor. The nMOS inverter. Determination of pull-up to pull-down ratio (zp.u zp.d) for an nMOS inverter, driven by another nMOS inverter. Pull-up to pull-down ratio for an nMOS inverter driven through one or more pass transistors. Alternative forms of pull-up. The CMOS inverter MOS transistor circuit model, some characteristics of npn bipolar transistors, Latch-up in CMOS circuits. BICMOS latch-up susceptibility.

12 Hours

UNIT 4

MOS & BICMOS CIRCUIT DESIGN PROCESSES: MOS layers. Stick diagrams. Design rules and layout General observations on the design rules. 2µm double metal. double poly. CMOS BIC CMOS rules 1.2µm double metal. single poly. CMOS rules, layout diagrams - a brief introduction. Symbolic diagram translation to mask form.

7 Hours

PART-B

UNIT 5

BASIC CIRCUIT CONCEPTS: Sheet resistance Rs, sheet resistance concept applied to MOS transistors and inverters. Area capacitances of layers. Standard unit of capacitance ZCg some area capacitance calculation. The delay unit τ inverter delays. Driving large capacitive loads, propagation delays, wiring capacitance. Choice of layers.

7 Hours

UNIT 6

SCALING OF MOS CIRCUITS: Scaling models and scaling factors. Scaling factors for device parameters. Some discussion on and limitations of scaling.

SUBSYSTEM DESIGN & LAYOUT: Some architectural issues. Switch logic, Gate (restoring) logic, Examples of structured design (combinational logic).

6 Hours

UNIT 7

SUBSYSTEM DESIGN PROCESSES: Some general considerations. An illustration of design processes.

ILLUSTRATION OF THE DESIGN PROCESS COMPUTATIONAL ELEMENTS: Some observations on the design process, regularity, Design of an ALU subsystem.

7 Hours

UNIT 8

PRACTICAL ASPECTS & TEST ABILITY: Some thoughts on performance, further thoughts on floor plans / layout, input / output pads, further thoughts on system delays. Ground rules for successful design. CAD tools for design and simulation, aspects of design tools, test and testability.

6 Hours

TEXT BOOK:

1. **Basic VLSI Design-** Douglas A. Pucknell Kamran Eshraghian, 3rd Edition, 14th Indian Reprint, PHI.

REFERENCE BOOKS:

1. **Introduction to VLSI Systems**- Mead & Conway, Addison Wesley, 1980.
2. **VLSI Engineering** - Thomas Dillinger, 1st Edition, Prentice Hall, 1998.
3. **Principles of CMOS VLSI Design. A System Perspective** - N.Weste, K.Weste, K. Eshraghian, 2nd Edition, 4th Indian Reprint, Addison-Wesley Publishing Co., 2000.
4. **Modern VLSI Design – Systems on Silicon** - Wayne Wolf, 2nd Edition, Pearson Education Asia, 2003.

CLINICAL INSTRUMENTATION – I

Subject Code	:	**10BM55**	IA Marks	:	**25**
Hours/week	:	**04**	**Exam Hours**	:	**03**
Total no of Lecture Hrs	:	**52**	**Exam Marks**	:	**100**

PART- A
CARDIOLOGY

UNIT 1

ELECTROCARDIOGRAM: Review of Heart Structure & Function, Conduction System of the heart, Electrocardiogram (ECG), Characteristics of the normal ECG, Cardiac arrhythmias and their electrocardiographic interpretation- Abnormal sinus rhythms, Abnormal rhythms by impulse conduction blocks, Premature contractions, Ventricular & Atrial fibrillation, Cardiac arrest. **6 Hours**

UNIT 2

ELECTROCARDIOGRAPH: Electrocardiograph, Vectorcardiograph, Heart sounds, Abnormal heart sounds, Phonocardiograph, Stress test, & Holter monitor, cardiac cath lab. **7 Hours**

UNIT 3

CARDIAC PACEMAKERS: Need, Types, External, Implantable Pacemakers-Types, Ventricular synchronous demand pacemaker,

Programmable pacemaker, Rate-responsive pacemakers, Power sources, Leads & electrodes and their problems, Pacing system analyzers.
Defibrillators- Need, DC defibrillator, Electrodes, DC defibrillator with synchronizer, Automatic external defibrillator, Implantable defibrillator, Defibrillator analyzer. **7 Hours**

UNIT 4
Echocardiography, Intra-Aortic Balloon Pump, CVP & Swan Ganz catheter, Open Heart Surgery & Bypass Surgery, Angioplasty, Cardiac stents, Bedside patient monitoring system, Abdominal foetal electrocardiogram, Foetal phonocardiogram.

6 Hours

TEXT BOOKS:
1. **Textbook of Medical Physiology** - by Guyton & Hall, 10th Edition, Reed Elsvier Pvt., Ltd., 2006.
2. **Hand book of Biomedical Instrumentation -** by R. S. Khandpur, 2nd Edition, Tata McGraw Hill, 2003.

PART- B
OPHTHALMOLOGY & ENT

UNIT 5
EYE: Anatomy and physiology of human eye, Aqueous humor secretion & drainage, Anatomy of Normal Fundus, Study of Different Refractive Errors & their optical correction, Vision Testing Equipment - Snellen's Chart & ita applications, Keratometer- Principle, Types and procedure, Refractometer- Types & Procedure, Retinoscope- Principle, Procedure & Types. Ophthalmoscopy-Direct & Indirect.

7 Hours

UNIT 6
TECHNIQUES OF OCULAR EXAMINATION: Loupe & Lens Examination, Slit-Lamp Examination, Gonioscopy,
EQUIPMENT USED TO MEASURE IOP: Tonometry & its Different types, Fundus Fluorescein Angiography.
METHODS OF ESTIMATING VISUAL FIELDS: Peripheral Field Charting, Central Field Charting, Strabismus & Nystagmus. Examination

using various tests & Treatment: Cover – uncover test, Maddox rod test, Maddox wing test, Hess chart

6 Hours

UNIT 7

SPECIALIZED EQUIPMENT: Used in treatment: Lasers in Ophthalmology, Cryotherapy in Ophthalmology, Vitrectomy, Vitreous Liquefaction, Vitreous Opacities, Vitreous Haemorrhage, Vitrectomy – Open Sky, Pars Plana, Contact Lenses, Cataract & Surgical Techniques for Cataract Extraction, Glaucoma & Surgical Procedure for Glaucoma

6 Hours

UNIT 8

EAR: Anatomy & physiology of ear, mechanics of hearing & equilibrium/balance, Hearing Loss-types & causes, Audiometer-Principle Assessment of hearing, Types-pure tone audiometer, speech audiometer, impedance audiometer, Characteristics & use of hearing Aids, cochlear implants, electronystagmography.

7 Hours

TEXT BOOKS:

1. Ophthalmology - by A.K. Khurana, 3rd Edition, New Age International Pub.
2. Theory and Practice of Optics and Refraction by A.K. Khurana, 2nd Edition, Elsevier India, 2008.
3. Parson's Diseases of Eye- by Ramanjit Sihota & Radhika Tandon, 20th Edition, Elsevier India, 2007.
4. Handbook of Clinical Audiology - by Jack Katz, 4th Edition, Lippincott Wilkins Pub., 2002.
5. A short textbook on E.N.T. Diseases - by K.B.Bhargav, S.K.Bhargava & T.M.Shah, 6th Edition, Usha Publications, 2002.

REFERENCE BOOK:

1. **Hand book of Biomedical Instrumentation** - by R. S. Khandpur, 2nd Edition, Tata McGraw Hill, 2003.

BIOMEDICAL EQUIPMENTS

Subject Code	:	**10BM56**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

RESPIRATORY MONITORS & APNEA ALARMS: Disease states requiring artificial respiratory therapy, Respiratory impedance plethysmography, Pneumotachometers, Measurement of Volume, Pulmonary Function Analyzers, Respiratory Gas Analyzers, Alarm Circuits.

6 Hours

UNIT 2 & 3

PATIENT MONITORING SYSTEMS, ICU/CCU/LABOUR & NEONATAL ICU: Special care units, ICU/CCU Equipments, Bed side patient monitoring systems-multiparameters, Measurement of Heart rate & Pulse rate, Recording system, Oximeters: Principle, Intravascular Oximeter. Cardiotacograph, Methods of Monitoring Foetal Heart Rate, Monitoring Labour Activity, Baby Incubator.

ELECTRO SURGERY MACHINES: Principle of Surgical Diathermy, Surgical Diathermy Machine, Safety Aspects in Electro- Surgical Units, Surgical Diathermy Analyzers, RF Power Generators for Electro surgery, Measuring RF Power Output from the ESM, Testing Electro-surgery units (Dummy Loads).

14 Hours

UNIT 4

THERAPEUTIC EQUIPMENT: Lithotripsy- The Stone Disease Problem, First lithotripter machine, Modern lithotripter systems, Extra- corporeal Shock- wave Therapy, Radiotherapy equipment: use of HV X-Ray Machines, Development of betatron, Cobalt-60 machine, Medical Linear Accelerator machine.

6 Hours

PART- B

UNIT 5

PHYSIOTHERAPY & ELECTROTHERAPY EQUIPMENT: High Frequency Heat Therapy, Short Wave Diathermy, Microwave Diathermy,

Ultrasonic Therapy Unit, Electro diagnostic / therapeutic apparatus, pain relief through electrical stimulation, Bladder stimulators, neuro stimulators.

7 Hours

UNIT 6

BLOOD CELL COUNTERS: Types of blood cells, calculation of size of cells, Methods of cell counting, Coulter counters, Automatic recognition & differential counting of cells.

AUTOMATED DRUG DELIVERY SYSTEMS: Infusion pumps, Components of drug infusion pumps, Implantable infusion systems, Closed-loop control in infusion systems, Programmable controlled insulin-dosing device.

7 Hours

UNIT 7

ELECTROMAGNETIC INTERFERENCE TO MEDICAL ELECTRONIC EQUIPMENT: Types & Sources of EMI, EMI effects, dealing with signal overload problems, EMI to biomedical sensors, Internode Problems, Some Solutions, Dealing with TVI/ BCI, Medical Equipment & EMI.

6 Hours

UNIT 8

ELECTRICAL SAFETY: Physiological Effects of Electricity, Importance susceptibility parameters, Distribution of Electric power, Macro shock hazards, Microshock hazards, Electrical -Safety codes & standards, Basic approaches to protection against shock, Protection: Power distribution, Protection: Equipment design, Electrical-Safety Analyzers, Testing electric system, Tests of Electric Appliances, Problems.

6 Hours

TEXT BOOKS:

1. **Biomedical Equipment**- Use, Maintenance & Management - Joseph J. Carr, Prentice Hall, 1991.
2. **Introduction to Biomedical Equipment Technology**-J. J. Carr, 4th Edition, 7th Indian Reprint, Pearson Education, 2004.
3. **Medical Instrumentation Application & Design**- John G. Webster, 3rd Edition, John Wiley & Sons/Wiley Student Edition, 2001.

4. **Handbook of Biomedical Instrumentation**- R S Khandpur, 2nd edition, Tata McGraw Hill, 2003

8086 MICROPROCESSOR LAB

Subject Code	:	**10BML57**	**IA Marks**	:	25
No of Practical Hrs/week	:	03	Exam Hours	:	03
Total No of Practical Hrs	:	42	Exam Marks	:	50

PART - A

PROGRAMMING

1. ALP for addition of two BCD numbers(16 bit,32 bit)
2. ALP for subtraction of two BCD numbers(16 bit, 32 bit).
3. ALP for multiplication and division of two numbers (16 bit, 32 bit)
4. ALP to sort a set unsigned integer numbers in ascending/descending order using different algorithm.
5. ALP to find the G.C.D. & LCM of two unsigned integers.
6. ALP to find the sum & average of unsigned integers.
7. Develop and execute ALP that implements Binary search algorithm.
8. Develop and execute an ALP to compute factorial of a positive integer number using recursive procedure.
8. ALP for conversion of 16 bit

(i) BCD to HEX (ii) HEX to BCD numbers (iii) BCD number to 7- segment (iv) BCD to ASCII (v) ASCII to BCD (vi) HEX to ASCII (vii) ASCII to HEX

9. ALP to copy the string of successive memory locations from one memory to other with and without using string instructions.
10. ALP tp check whether the given string is palindrome or not
11. ALP to find the number of ones in a given block of data.
12. ALP to separate the odd and even numbers in a block of data.

PART B

INTERFACING

1. Generate a square wave on PC0 pin of 8255 in the add-on-card.
2. Generate different waveforms Sine, Square, Triangle, Ramp, etc using DAC interface.
3. Seven segment display interface.

4. Stepper motor interface
5. 8-bit ADC interface
6. Matrix keypad interface/ simulation of calculator.
7. Implement a programmable 4-bit binary/decade counter using the I/O lines in the Add-on-card
8. Using the 8255 in the Add-on-card realize an 8 to1 multiplexer.

CLINICAL INSTRUMENTATION LABORATORY – I

Subject Code	:	**10BML58**	**IA Marks**	:	25
No of Practical Hrs/week	:	03	Exam Hours	:	03
Total No of Practical Hrs	:	42	Exam Marks	:	50

1. Measurement of Op-amp parameters (I/P Offset current, I/P bias current, Slew rate, I/P offset Voltage, PSRR, CMRR & offset nulling.
2. Inverting amplifier & attenuator, non-inverting amplifier& voltage follower.
3. Adder, substractor, integrator, differentiator.
4. Half wave & full wave precision rectifiers, Schmitt trigger.
5. Design of Active band pass & notch filters.
6. Astable & Monostable Multivibrators using Op-amp.
7. Instrumentation amplifier- Design for Different gains.
8. Design of Astable and Monostable Multivibrator using 555 timer..
9. Plot the characteristics of following transducers
   (a) Thermistor (b) LVDT (c) LDR
10. Measurement of blood pressure using sphygmomanometer & stethoscope and digital BP meter.
11. Measurement of strain using strain gauge for (i) Quarter bridge (ii) Half bridge (iii) Full bridge
12. Measurement of body temperature using AD590 / LM34

VI SEMESTER

COMMUNICATION SYSTEMS

Subject Code	:	**10BM61**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

AMPLITUDE MODULATION: Introduction. Amplitude modulation: Time-Domain description, Frequency-Domain description, Generation of AM wave: square law modulator, switching modulator, Detection of AM waves: square law detector, envelope detector, Double side band suppressed carrier modulation (DSBSC): Time -Domain description, Frequency-Domain representation, Generation of DSBSC waves: balanced modulator, ring modulator, Coherent detection of DSBSC modulated waves, Costas loop, Quadrature carrier multiplexing.

6 Hours

UNIT 2

SINGLE SIDE BAND MODULATION: Frequency-Domain description of SSB modulated signals, Frequency discrimination method for generating an SSB modulated wave, Time-Domain description. Phase discrimination method for generating an SSB modulated wave. Demodulation of SSB wave. Vestigial side band modulation, Frequency-Domain description, Generation of VSB modulated wave, Time domain description, Envelop detection of VSB wave plus carrier, Comparison of amplitude modulation techniques, Frequency translation, Frequency division multiplexing.

7 Hours

UNIT 3

ANGLE MODULATION: Basic definitions, frequency modulation, narrow band frequency modulation, wide band frequency modulation, transmission band width of FM waves, generation of FM Waves: indirect FM and direct FM.

6 Hours

UNIT 4

DEMODULATION OF FM WAVES: FM stereo multiplexing, Phase-locked loop, Nonlinear model of phase-locked loop. Linear model of phase-locked loop. Nonlinear effects in FM systems. Pre-emphasis and De-emphasis.

7 Hours

PART- B

UNIT 5

DIGITAL COMMUNICATION: Introduction to Digital Communication, Sources and signals, basic signal processing operations in digital communication, channels for digital communication. PCM, DPCM, DM, Adaptive DPCM.

6 Hours

UNIT 6

SAMPLING PROCESS: Sampling Theorem, quadrature sampling of Band Pass signals, reconstruction of a message from its samples, practical aspects of sampling and signal recovery, PAM, TDM.

6 Hours

UNIT 7

METHODS OF DIGITAL DATA TRANSMISSION: Discrete PAM signals, correlative coding, eye pattern, base-band M-array, PAM systems, Digital Modulation Techniques.

7 Hours

UNIT 8

BIOMEDICAL TELEMETRY AND TELEMEDICINE: Single channel Telemetry systems, multichannel wireless Telemetry systems, Implantable Telemetry systems, Transmission of Analog Physiological signals over Telephone, Telemedicine.

7 Hours

TEXT BOOKS:

1. **An Introduction to Analog & Digital Communications** - Simon Haykin, John Wiley 2004.
2. **Digital Communications** – Simon Haykin, John Wiley, 2006.
3. **Handbook of Biomedical Instrumentation -** by R.S.Khandpur, 2nd Edition, Tata McGraw Hill, 2003.

REFERENCE BOOKS:

1. **Principles of communication systems** - Taub and Schilling, 2nd Edition, TMH.
2. **Digital Communications** – Proakis, 4th Edition, McGraw Hill.
3. **Electronic Communication Systems** – George Kennedy and Davis, 4th Edition, 28th Reprint, Tata McGraw Hill, 2005.

C++ AND DATA STRUCTURES

Subject Code	:	**10BM62**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART – A

UNIT 1

INTRODUCTION TO C++: A Review of Structures, Procedure-Oriented Programming Systems, Object-Oriented Programming Systems, Comparison of C++ with C, Console Input/Output in C++, Variables in C++, Reference Variables in C++, Function Prototyping, Function Overloading, Default Values for Formal Arguments of Functions, Inline Functions.

CLASS AND OBJECTS: Introduction to Classes and Objects, Member Functions and Member Data. **6 Hours**

UNIT 2

CLASS AND OBJECTS CONTD: Objects and Functions, Objects and Arrays, Namespaces, Nested Classes.

DYNAMIC MEMORY MANAGEMENT: Introduction, Dynamic Memory Allocation, Dynamic Memory Deallocation. **6 Hours**

UNIT 3

DYNAMIC MEMORY MANAGEMENT CONTD: The set_new_handler() function, **Constructors and Destructors:** Constructors, Destructors, The Philosophy of OOPS.

INHERITANCE: Introduction to Inheritance, Base Class and Derived Class Objects, Accessing Members of the Base Class in the Derived Class. The Protected Access Specifier, Deriving by Different Access Specifiers.

7 Hours

UNIT 4

OPERATOR OVERLOADING: Operator Overloading, Overloading the Various Operators – Overloading the Increment and the Decrement Operators (Prefix and Postfix), Overloading the Insertion and Extraction Operators, Overloading the new and the delete Operators.

TEMPLATES: Introduction, Function Templates, Class Templates, The Standard Template Library (STL)

EXCEPTION HANDLING: Introduction, C-Style Handling of Error generating Codes, C++ Style Solution – the try/throw/catch Construct, Limitation of Exception Handling. **7 Hours**

PART – B

UNIT 5

DATA REPRESENTATION: Introduction, Linear list, Formula based representation, Linked representation, Indirect Addressing, Simulating Pointers, Applications. **6 Hours**

UNIT 6

STACKS: The abstract data types, Derived Classes and inheritances, Formula based representation, Linked representation, Applications.

6 Hours

UNIT 7

QUEUES: The abstract data Types, Formula based Representation, Linked Representation, Priority Queues, Applications. **7 Hours**

UNIT 8

BINARY AND OTHER TREES: Trees, Binary Trees, Properties of binary Trees, Representation of Binary trees, Common binary tree operations Binary Tree traversal, The ADT Binary Tree, The Class Binary Tree, ADT and Class Extensions, Application

ARRAYS AND MATRICES: Arrays, Matrices, Special Matrices.

7 Hours

TEXT BOOKS:

1. Object-Oriented Programming with C++ - by Sourav Sahay, Oxford University Press, 2006.
2. Data Structure, Algorithms, and Applications in C++ - by Sartaj Sahani, McGraw-Hill, 2000.
3. C++ Programming Today – by Barbara Johnston, PHI, 2002.

REFERENCE BOOKS:
1. Object-Oriented Programming with C++ by E Balaguruswamy, 2nd Edition, Tata McGraw Hill, 2004.
2. The Waite Group's Object – Oriented Programming in C++ by Robert Lafore, 3rd Edition, Glagotia Pub.
3. Data Structures and Algorithms in C++ - by Adam Drozdek, Vikas Publishing House, 2004.
4. Data Structures and Algorithms in C++ - by Michael T. Goodrich, Roberto Tamassia, David M. Mount, Wiley Pub., 2007.
5. Introduction to Data structures and algorithm with C++ - by Glenn.W.Rowe, PHI, 2000.
6. Data structure and algorithm analysis in C++ - by Mark Allen Weiss, Addison Wesley.

DIGITAL SIGNAL PROCESSING & APPLICATIONS

Subject Code	:	**10BM63**	**IA Marks**	:	25
Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1 & 2

THE DISCRETE FOURIER TRANSFORM: IT'S PROPERTIES & APPLICATION: Review of Signals & systems, Frequency domain sampling: The DFT frequency-Domain Sampling & reconstruction of Discrete Time signals. The Discrete Fourier transform: The DFT as a linear transformation, Relationship of the DFT to other transforms. Properties of DFT: Periodicity, Linearity, & Symmetry properties. Multiplication of two DFTs & Circular convolution. Additional DFT properties. Frequency analysis of signals using DFT.

14 Hours

UNIT 3 & 4

EFFICIENT COMPUTATION OF DFT: FAST FOURIER TRANSFORM ALGORITHMS: Efficient Computation of the DFT: FFT Algorithms. Direct Computation of the DFT. Radix-2 FFT algorithms:

Decimation-in-time FFT algorithm and in-place computations: Decimation-in-frequency FFT algorithm and in-place computations.

12 Hours

PART- B

UNIT – 5

DESIGN FIR FILTERS: Symmetric & Anti Symmetric FIR Filters, Design of Linear phase FIR filter using windows(Rectangular, Hamming, Hanning & Kaiser). Design of Linear phase FIR filters by Frequency sampling techniques

7 Hours

UNIT – 6 &7

IIR FILTERS: Specification and design techniques, Impulse Invariant and Bilinear Transformation techniques. Design of digital Butterworth and Chebyshev low pass filters using Analog filter design techniques, Transform of Low pass to High pass, Band pass and Band rejection filters, Comparison of IIR and FIR filters

12 Hours

UNIT 8

ANALYSIS OF FINITE WORD LENGTH EFFECTS: Quantization process errors, Analysis of co-efficient quantization effects, Analysis of co-efficient of quantization effects in FIR filters, Analysis of Arithmetic round off errors, Reduction of product round off errors, round off errors in FFT Algorithm.

APPLICATIONS: Dual tone Multi frequency signal detection, Spectral analysis using DFT, Short time Fourier Transform, Musical Sound Processing, Digital FM Stereo generation.

7 Hours

TEXT BOOKS:

1. **Digital Signal Processing** - Principles algorithm and application (3^{rd} Edition) by John G. Proakis and D. Manolakis, Pearson Education, 2003.
2. **Digital Signal Processing: A computer based approach** - by S. K. Mitra, 4^{th} Edition, Tata McGraw Hill.

REFERENCE BOOKS:

1. **Real Time Digital Signal Processing: Fundamentals, Algorithms and implementation using TMS Processor**-V.Udayashankara, Prentice Hall of India, New Delhi, 2010
2. **Modern Digital Signal Processing** - Roberto Cristi, Thomson Learning, 2004.
3. **Discrete Time Signal Processing -** by Oppenheim and Schaffer, Pearson/PHI, 2003.
4. **Theory and Application of DSP** by Rabiner L. R and Gold B, PHI, 1999.

ANALYTICAL AND PHARMACEUTICAL INSTRUMENTATION

Subject Code	:	**10BM64**	IA Marks	:	**25**
Hours/week	:	**04**	**Exam Hours**	:	**03**
Total no of Lecture Hrs	:	**52**	**Exam Marks**	:	**100**

PART A

Unit 1

Visible Ultraviolet Spectrophotometers: Electromagnetic radiation, Beer Lambert law, absorption instruments, colorimeters, spectrophotometers: Single beam null type, direct reading, double beam, microprocessor based spectrophotometers, dual wavelength spectrophotometer, Sources of errors in spectrophotometric measurements. 7 **Hours**

Unit 2

Infrared Spectrophotometer: Infrared spectroscopy, Basic components of Infrared Spectrophotometer, Optical null Infrared Spectrophotometer

Flame Photometers: Principle of flame photometers constructional details of flame photometers, accessories of flame photometers, interference in flame photometry and determinations. **7 Hours**

Unit 3

Fluorimeters & Phosphorimeters: Principle of fluorescence, measurement of fluorescence, spectro fluorescence, microprocessor based spectro fluorescence, Measurement of Phosphorescence. Raman Spectrometer- Raman effect & Raman Spectrometer, **6 Hours**

Unit 4

Mass Spectrometer & NMR Spectrometer: Basic concept, types of mass spectrometer, components of mass spectrometer, resolution and applications. Principle of NMR, constructional details, sensitivity enhancement for analytical NMR spectroscopy. Use of computers with NMR spectrometers.

7 Hours

PART B

Unit 5

Automated Bio-chemical Analysis Systems: Basic concept, system details, system components, typical multiple analysis system, flow injection analysis

6 Hours

Unit 6

Chromatography: Gas chromatograph- basic concepts, parts of gas chromatograph. Method of peak areas, liquid chromatography- basic concepts, types of liquid chromatography, the liquid chromatograph.

7 Hours

Unit 7

Electrophoresis and Densitometers: Basic Electrophoresis, Electrophoresis techniques, paper Electrophoresis, Electrophoresis apparatus, spectrodensitometer, microprocessor based densitometer, microelectrophoresis, Conductivity meters.

7 Hours

Unit 8

Blood gas analyzer: Principle of pH measurement, electrode of pH measurement, Blood pH measurement, measurement of Blood pCO_2, measurement of Blood pO_2, complete Blood gas analyzer, commercially available Blood gas analyzers.

6 Hours

Text Book

1. Hand book of Analytical Instruments by R. S. Khandpur, TMH Publications 1st Ed 1989, New Delhi.

Reference Book

1. Instrumental Methods of Analysis by H. H. Willard, L. L. Merritt & J. A. Dean, CBS Publications 7th Ed 1988.
2. Principles of Instrumental analysis by S. J. Holler & T. A. Nilman Saunders college Publications 5st Ed 1998

CLINICAL INSTRUMENTATION – II

Subject Code	:	**10BM65**	IA Marks	:	**25**
Hours/week	:	**04**	**Exam Hours**	:	**03**
Total no of Lecture Hrs	:	**52**	**Exam Marks**	:	**100**

PART – A
NEUROLOGY & ORTHOPAEDICS

UNIT 1

Functional Topography of Brain, Higher Functions of Nervous System- Learning, Memory, Mechanism of speech & Language.

Neurologic Examination- Testing of higher cortical functions, cranial nerves, motor function, reflex function, sensory function, Gait and stance, Lumbar puncture & examination of CSF- Indications & Technique.

Radiological Examination of Skull & Spine (in brief applied to neurology) - Computed Tomography, MRI, Angiography, PET, SPECT, Ultrasound Scanning.

6 Hours

UNIT 2

Electroencephalography, EEG Electrodes and 10-20 System, EEG Amplitude and frequency bands, EEG diagnostic uses- Sleep patterns & abnormalities, Epilepsy, Multichannel EEG recording systems and typical external controls, EEG system, Preamplifiers and EEG system specifications, EEG telemetry system. Visual and auditory evoked potentials, Somatosensory evoked potentials, Motor paralysis- Definition, Patterns of paralysis & their diagnosis. Electromyography - EMG System, Studies of nerve conduction, Jolly test, Neuromuscular Stimulation (NMS).

7 Hours

UNIT 3

Pathology of Fractures and Fracture healing- Classification, Closed and open fractures, Patterns of fracture, Healing/repair of tubular bone, Rate of union, Fatigue or stress fractures, Pathological fractures (list only). Radiological features of fractures- Radiographic examination, Tests of union.

Principles of Fracture treatment- Reduction, Methods of reduction, Immobilization, Methods of immobilization, External fixation- Indications, Types. Internal Fixation- Indications, Types. Bone grafting for delayed union and non-union, Electromagnetic stimulation.

7 Hours

UNIT 4

SYNOVIAL FLUID & MEMBRANE: Synovial fluid composition, Basic functions of synovial fluid, Synovial joint lubrication- Fluid film, boundary, weeping & boosted lubrication. Arthritis- Types, Rheumatoid arthritis, Osteoarthritis. Joint replacement- Procedure & components of Hip & Knee replacement.

HUMAN GAIT: Definition, Divisions of gait cycle, Functional tasks in gait, Phases of gait, Temporal parameters, Abnormal gaits-Cerebellar gait, Hemiplegic & Paraplegic gaits, Gaits of the mentally retarded.

Spinal deformities- Scoliosis, types, diagnosis, Spinal deformity correction.

6 Hours

TEXT BOOKS:

PART -A

1. **Adams & Victor's Principles of Neurology** - by Allan H. Ropper and Robert H. Brown, 8th Edition, McGraw Hill, 2005.
2. **Concise Medical Physiology**- by Sujit K. Chaudhuri, 5th Edition, New Central Book Agency Pvt. Ltd, 2004.
3. **Ross & Wilson's Anatomy and Physiology in Health and Illness** – by Anne Waugh and Allison Grant, 9th Edition, Churchill Livingstone, Publications, 2003.
4. **Introduction to Biomedical Equipment Technology** - by Joesh J Carr and John M. Brown, 4th Edition, PHI / Pearson Education Asia, 2001.
5. **Outline of Fractures -** by John Crawford Adams & David Hamblen, 11th Edition, Churchill Livingstone, 1999.

6. **Outline of Orthopaedics -** by John Crawford Adams & David Hamblen, 13th Edition, Churchill Livingstone
7. **Physical Rehabilitation** - by Susan B O'Sullivan, Thomas J Schmitz. 5th Edition, Jaypee Pub., 2007.

PART – B
ANESTHESIA

UNIT 5:

PHYSICAL PRINCIPLES, MEASUREMENT OF GAS FLOW AND VOLUME: Introduction & Gas Laws, Differential Pressure Flowmeters, Variable-Area Flowmeters, Anemometry, Spirometers.

VAPORIZERS & HUMIDIFIERS: Introduction, Vaporizing Systems (Draw-Over Systems), Other Factors Affecting Vapour Concentration, Summary of Vaporizer Performance, Calibration of Vaporizers, Examples of Vaporizers: Boyle's Vapourisers & its use. Definitions of Humidifiers, Importance of Humidification, Examples of Humidification Equipment.

7 Hours

UNIT 6

THE SUPPLY OF ANAESTHETIC GASES: Cylinders, Oxygen Concentrators, Bulk Store: Oxygen, Emergency supply manifold, liquid oxygen plant, Nitrous oxide, Medical compressed air, piped medical vaccum, Introduction to continuous flow anaesthetic machine (*introduction only*), **Safety Features**: Non-return valve, emergency oxygen, oxygen failure warning devices.

6 Hours

UNIT 7

ELECTRONICS IN THE ANESTHETIC MACHINE: Introduction, Ergonomics, Control Engineering, New Components, An Electronically Controlled Anesthetic Machine, Servo-controlled Anesthesia.

BREATHING SYSTEMS & NONBREATHING SYSTEMS: Definitions, Classification of Breathing Systems, Classification of Systems with Potential for Rebreathing- Mapleson A breathing system, Mapleson A & controlled ventilation. Mapleson D system with spontaneous respiration, Mapleson D system with controlled ventilation, Non-Rebreathing Systems- Anesthetic non Rebreathing system which include CO_2 absorption.

7 Hours

UNIT 8

MONITORING OF GASES: Introduction, Inspired Oxygen Concentration (working principle of Galvanic Oxygen fuel cell, Servomex paramagnetic oxygen analyzer, Nitrous Oxide and the Volatile Agents: The Riken gas indicator, Bruel & Kjaer Anesthetic gas monitor, Raman anesthetic gas monitor, Hewlett- Packard main stream carbon dioxide gas analyzer.

Anesthetic Room: Introduction, Layout of the Anesthetic Room, Contents of the Anesthetic Room.

6 Hours

TEXT BOOK:

1. Ward's Anaesthetic Equipment - by Andrew Davey, John T. B. Moyle & Crispian S. Ward, 3rd Edition, W.B. Saunders Company Ltd.

REFERENCE BOOKS:

1. Principles of Measurement & monitoring in Anaesthesia & intensive care - by M. K. Sykes, M.D. Vickers, C. J. Hull, 3rd Edition, Blackwell Scientific Pub.
2. A Text book of Anaesthesia - by R. D. Miller, 5th Edition, Vol-2, Churchill Livingston, 2000.
3. Introduction to Biomedical Equipment Technology - by J. J. Carr J.M.Brown, 4th Edition, Pearson Education.

OPERATING SYSTEMS WITH LINUX

Subject Code	:	**10BM661**	IA Marks	:	**25**
Hours/week	:	**04**	**Exam Hours**	:	**03**
Total no of Lecture Hrs	:	**52**	**Exam Marks**	:	**100**

PART - A

UNIT - 1

INTRODUCTION TO OPERATING SYSTEMS & THEIR CLASSIFICATION: What is an operating system, Mainframe systems, Desktop systems, Multiprocessor system, Distributed system, Clustered system, Real time system, Handheld system, Feature migration, Computing environments.

OPERATING SYSTEM STRUCTURES: System components, OS Services, System calls, System programs, System structure, Virtual machines.

7 Hours

UNIT - 2

PROCESS, INTER PROCESS COMMUNICATION, THREADS & CPU SCHEDULING: Process concept, Process scheduling, Operation on processes, Cooperating processes, Inter process communication. **Threads –** Overview, Multithreading models, Threading issues, Pthreads, Java threads.

CPU SCHEDULING: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Real time scheduling.

7 Hours

UNIT - 3

PROCESS SYNCHRONIZATION: The Critical section problem, Synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, monitors.

6 Hours

UNIT - 4

DEADLOCKS: Deadlock – System model, Deadlock characterization, Methods for handling deadlocks – Deadlock prevention, deadlock avoidance, Deadlock detection and recovery from deadlock.

6 Hours

PART - B

UNIT – 5 & 6

MEMORY MANAGEMENT: Background, Swapping, Contiguous allocation, Paging, Segmentation.

VIRTUAL MEMORY: Background, Demand paging, Process creation, Page replacement algorithms

FILE SYSTEM INTERFACE: File concept, Access methods, Directory structure, File system mounting, File system implementation, Directory implementation, Allocation methods.

13 Hours

UNIT – 7 & 8

LINUX OPERATING SYSTEM: Design principles, Kernel modules, Process management, Scheduling, Memory management, File systems, Input and output, Interprocess communication.

Basic File Attributes, The vi Editor, The Shell

13 Hours

TEXT BOOK:

1. Operating System Concepts by Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 6th Edition, John Wiley & Sons, 2003.

2. "UNIX – Concepts and Applications", Sumitabha Das, 4th Edition, Tata McGraw Hill, 2006.

REFERENCE BOOKS:

1. Operating system concepts and design - by Milan Milankovic 2nd Edition, Pearson Education, 1996.
2. An Introduction to Operating Systems - by Harvey M Deital, 2nd Edition, Pearson Education,1990.
3. Operating Systems - A concept based Approach, D.M Dhamdhere Tata McGraw-Hill, 2002.

BIOINFORMATICS

Subject Code	:	**10BM662**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

OVERVIEW, INTRODUCTION & INFORMATION NETWORKS: Information networks, protein & genome information resources, DNA sequence analysis, pairwise alignment techniques, multiple sequence alignment, secondary database searching, building a sequence search protocol, analysis packages.

Introduction, dawn sequencing, bioinformatics, biological sequence, genome projects, human genome project, importance of bioinformatics, pattern recognition & prediction, folding problem, role of chaperones, sequence analysis, homology & analogy. Introduction, internet, computer network, facilities in internet, world wide web, web browser, HTTP, HTML, & URL, EMBnet, NCBI, virtual tourism.

7 Hours

UNIT 2

PROTEIN & GENOME INFORMATION RESOURCES: Introduction, biological databases, primary sequence databases, composite protein sequence databases, secondary databases, structure classification databases.

Introduction to genome information resources, DNA sequence databases, specialized genomic resources.

7 Hours

UNIT 3

DNA SEQUENCE ANALYSIS: Introduction, why to analyze DNA, gene structure and DNA sequences, features of DNA sequence analysis, issues in the interpretation of EST searches, two approaches to gene hunting, expression profile of a cell, cDNA libraries and ESTs, different approaches to EST analysis, effects of EST data on DNA databases, a practical example of EST analysis.

6 Hours

UNIT 4

PAIRWISE ALIGNMENT TECHNIQUES: Introduction, database searching, alphabets and complexity, algorithms and programs, comparing two sequences-a simple case, sub-sequences, identity and similarity, Dotplot, local and global similarity, global alignment-Needleman & Wunsch algorithm, local alignment-Smith-Waterman algorithm, dynamic programming, pairwise database searching.

6 Hours

PART- B

UNIT 5

MULTIPLE SEQUENCE ALIGNMENT & SECONDARY DATABASE SEARCHING: Introduction, goal of multiple sequence alignment & definition, consequences, computational complexity, manual methods, simultaneous methods, progressive methods, databases of multiple alignments & searching. Introduction to secondary database searching, why secondary databases & its contents.

6 Hours

UNIT 6

BUILDING A SEQUENCE SEARCH PROTOCOL & ANALYSIS PACKAGES: Introduction, practical approach, when believe the result, structural and functional interpretation. Introduction & what is an analysis package, commercial databases & software, comprehensive packages, packages for DNA analysis, intranet & internet packages

6 Hours

UNIT 7

GENOMICS AND GENE RECOGNITION: Prokaryotic genomes & gene structure, GC content in prokaryotic genomes, prokaryotic gene density, Eukaryotic genomes & gene structure, open reading frames, GC content in

eukaryotic genomes, gene expression, transposition, repetitive elements, eukaryotic gene density. **7 Hours**

UNIT 8

PROTEOMICS: Brief review on protein structure, from genomes to proteomes, protein classification, experimental techniques, inhibitors and drug design, ligand screening, x-ray crystal structures, NMR structures, empirical methods and prediction techniques, post-transnational modification prediction.

7 Hours

TEXT BOOKS:

1. **Introduction to Bioinformatics** - by T. K. Attwood & D.J.Parry-Smith, Pearson Education Low Price Edition, 2004
2. **Fundamental Concepts** - of Bioinformatics by Dan E. Krane & Michael L. Raymer, Pearson Education Low Price Edition, 2004

REFERENCE BOOKS:

1. **Bioinformatics** - Concepts, Skills & Applications by S.C.Rastogi, Namita Mendiratta & Parag Rastogi, CBS Publications, 2004.
2. **Bioinformatics** - by Andreas D. Boxevanies, Wiley Interscience, 1998.
3. **Bioinformatics** - Sequence and Genome Analysis by David W. Mount, Cold Spring Harbor, 2001.
4.

BIOMATERIALS & ARTIFICIAL ORGANS

Subject Code	:	**10BM663**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART -A
BIOMATERIALS

UNIT 1

Introduction to biomaterials, uses of biomaterials, biomaterials in organs & body systems, materials for use in the body, performance of biomaterials

METALLIC BIOMATERIALS: Introduction, Stainless steel, Cobalt-Chromium alloy, Titanium alloys, Titanium-Nickel alloys, Dental metals, Corrosion of metallic implants, Manufacturing of implants,

6 Hours

UNIT 2

CERAMIC BIOMATERIALS: Introduction, nonabsorbable/relatively bioinert bioceramics, biodegradable/resorbable ceramics, bioreactive ceramics, deterioration of ceramics, bioceramic manufacturing techniques

POLYMERIC BIOMATERIALS: Introduction, polymerization and basic structure, polymers used as biomaterials, sterilization, surface modifications to for improving biocompatibility.

6 Hours

UNIT 3

COMPOSITE BIOMATERIALS: Structure, bounds on properties, anisotropy of composites, particulate composites, fibrous composites, porous materials, biocompatibility.

BIODEGRADABLE POLYMERIC BIOMATERIALS: Introduction, Glycolide based biodegradable homopolymers polyesters, non-glycolide linear aliphatic polyesters, aliphatic and aromatic polycarbonates, biodegradation properties of synthetic biodegradable polymers.

TISSUE DERIVED BIOMATERIALS: Structure and properties of collagen and collagen-rich tissues, biotechnology of collagen, design of resorbable collagen-based medical implants.

7 Hours

UNIT 4

HARD TISSUE REPLACEMENTS: Bone repair and joint implants-long bone repair and joint replacements, dental implants- effects of material selection, effects of surface properties, surface chemistry.

PRESERVATION TECHNIQUES FOR BIOMATERIALS: Phase behavior, nonfreezing storage-hypothermic, freeze-thaw technology, freeze-drying, vitrification.

7 Hours

PART-B
ARTIFICIAL ORGANS

UNIT 5

INTRODUCTION: Substitutive medicine, outlook for organ replacement, design consideration, evaluation process.

ARTIFICIAL HEART AND CIRCULATORY ASSIST DEVICES: Engineering design, Engg design of artificial heart and circulatory assist devices, blood interfacing implants – introduction, total artificial hearts & ventricular assist devices, vascular prostheses, Non-blood interfacing implants for soft tissues- sutures and allied augmentation devices, percutaneous and skin implants, maxillofacial implants, eye and ear implants.

7 Hours

UNIT 6

CARDIAC VALVE PROSTHESES: Mechanical valves, tissue valves, current types of prostheses, tissue versus mechanical, engineering concerns and hemodynamic assessment of prosthetic heart valves, implications for thrombus deposition, durability, current trends in valve design, vascular grafts-history, synthetic grafts, regional patency, thrombosis, neointimal hyperplasia, graft infections.

6 Hours

UNIT 7

ARTIFICIAL KIDNEY: Functions of the kidneys, kidney disease, renal failure, renal transplantation, artificial kidney, dialyzers, membranes for haemodialysis, haemodialysis machine, peritoneal dialysis equipment-therapy format, fluid and solute removal.

ARTIFICIAL BLOOD: Artificial oxygen carriers, flurocarbons, hemoglobin for oxygen carrying plasma expanders, hemoglobin based artificial blood.

6 Hours

UNIT 8

ARTIFICIAL LUNGS: Gas exchange systems, Cardiopulmonary bypass (heart-lung machine)-principle, block diagram and working, artificial lung versus natural lung. Liver functions, hepatic failure, liver support systems, general replacement of liver functions.

ARTIFICIAL PANCREAS: Structure and functions of pancreas, endocrine pancreas and insulin secretion, diabetes, insulin, insulin therapy, insulin administration systems.

Tracheal replacement devices, laryngeal replacement devices, Artificial esophagus

Artificial Skin: Vital functions of skin, current treatment of massive skin loss, design principles for permanent skin replacement.

7 Hours

TEXT BOOKS:

1. **Biomedical Engineering Handbook-Volume 1, 2nd Edition** - by J.D.Bronzino, CRC Press / IEEE Press, 2000.
2. **Biomedical Engineering Handbook-Volume 2 (2nd Edition)** - by J.D.Bronzino, CRC Press / IEEE Press, 2000.
3. **Handbook of Biomedical Instrumentation -** by R.S.Khandpur, 2nd Edition, Tata McGraw Hill, 2003.

COMPUTER ORGANIZATION

Subject Code	:	**10BM664**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

COMPUTING AND COMPUTERS: **The nature of computing, Evolution of Computers- Mechanical era, electronic computers, later generations, VLSI Era- Integrated circuits, Processor architecture, system architecture.**

6 Hours

UNIT 2

DESIGN METHODOLOGY: **System design, The Register Level – registers level components, programmable logic devices, register level design, The processor level – Processor level components, processor level design.**

7 Hours

UNIT 3

PROCESSOR BASICS: **CPU organization, Data Representation- Basic formats, Fixed-point numbers, floating point numbers, Instruction sets- Instruction formats, instruction types, programming considerations.**

6 Hours

UNIT 4

DATAPATH DESIGN: **Fixes-point arithmetic- addition, subtraction, multiplication and division, Arithmetic logic units- combinational ALU, sequential ALU, Floating-point arithmetic, pipeline processing.**

7 Hours

PART- B

UNIT 5 & 6

CONTROL DESIGN: **Introduction, Hardwired control, Microprogrammed control- concepts, Multiplier control unit, CPU Control unit, Pipeline Control – Instruction pipelines, performance, superscalar processing.**

12 Hours

UNIT 7

MEMORY ORGANIZATION: **Memory technology, Memory systems- Multilevel memories, address translation, memory allocation, Caches- main features, address mapping.**

7 Hours

UNIT 8

SYSTEM ORGANIZATION: **Communication methods, IO and System control-programmed IO, DMA and interrupts, IO processors, operating systems, Parallel processing-processor level parallelism, multiprocessors, fault tolerance.**

7 Hours

TEXT BOOK:

1. Computer Architecture and organization - **by John P. Hayes 3rd Edition, McGraw Hill, 1998.**

REFERENCE BOOKS:

1. **Computer Organization** - by Carl Hamacher Z Vranesic & S Zaky, 5th Edition, McGraw Hill, 2002.
2. **Computer system Architecture** - by Morris Mano , 2nd Edition, Pearson Education, 2003.
3. **Computer system design & Architecture** - by V Heuring & H Jordan, 2nd Edition, Pearson Education, 2004.

HOSPITAL DESIGN, PLANNING & MANAGEMENT

Subject Code	:	**10BM665**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1 & 2

PLANNING & BUILDING A NEW HOSPITAL: Role of Hospital in Health Care, Hospital Planning & Design, Guiding principle in Hospital facilities & services, Functional Plans for Hospital construction, Design items, Functional program & design stage, Planning the Hospital building.

EFFECTIVE HOSPITAL MANAGEMENT: Planning, Organization, Directing & Leading, Controlling, Financial Management

12 Hours

UNIT 3

ADMINISTRATIVE SERVICE: Medical Record, Hospital Infection, Hospital Utilization Statistics, Material Management, Evaluation of Hospital services.

7 Hours

UNIT 4

PLANNING & DESIGNING MEDICAL SERVICES: Out Patient service, Emergency service, Clinical laboratories, Radiology services, Radiation Therapy Department, Surgical Department, Nursing Department, Operation Theater, CSSD Nursing services.

7 Hours

PART- B

UNIT 5 & 6

PLANNING & DESIGNING ENGINEERING SERVICES: Engineering Department, Maintenance management, Clinical [Bio-medical] Engineering, Electrical System, Air Condition System, Water supply & sanitary system, Centralized Medical Gas System, Telecommunication System, Environmental Control, Safety & Security System, Fire Safety & Bomb threat alarm system, Disposal of Hospital Wastes.

13 Hours

UNIT 7 & 8

PLANNING & DESIGN OF SUPPORTIVE SERVICES: Admitting Department, Medical Record Department, Centralized Sterilization & Supply department, Pharmacy Material Management, Food service Department, Laundry & Linen Services, House Keeping & Val entry Department.

13 Hours

TEXT BOOKS:

1. **Principles of Hospital Administration & Planning** - by B. M. Sakharkar, Jaypee Publications, 1998.
2. **Hospital Facilities, Planning & Management** - by G. D. Kunders, Tata McGraw Hill, 2004.

REFERENCE BOOKS:

1. **Hospital Administration & Management** - by S. L. Goel & R. Kumar Deep & Deep Publications
2. **Applied Clinical Engineering** - by Barry N. Feinberg, Prentice Hall, 1984.
3. **Clinical Engineering Principle & Practices** - By John G. Webster & Albert M. Cook, Prentice Hall.

REHABILITATION ENGINEERING

Subject Code	:	**10BM666**	IA Marks	:	**25**
Hours/week	:	**04**	**Exam Hours**	:	**03**
Total no of Lecture Hrs	:	**52**	**Exam Marks**	:	**100**

PART- A

UNIT 1

INTRODUCTION TO REHABILITATION & REHABILITATION TEAM: What is Rehabilitation, Epidemiology of Rehabilitation, Health, Levels of Prevention, Preventive Rehabilitation, Diagnosis of Disability, Functional Diagnosis, Importance of Physiatry in Functional diagnosis,

Impairment disability handicap, Primary & secondary Disabilities, Effects of prolonged inactivity & Bed rest on body system.

6 Hours

UNIT 2

REHABILITATION TEAM: Classification of members, The Role of Physiatrist, Occupational therapist, Physical therapist, Recreation therapist, Prosthetist-Orthotist, Speech pathologist, Rehabilitation nurse, Social worker, Corrective therapist, Psychologist, Music therapist, Dance therapist & Biomedical engineer.

6 Hours

UNIT 3

THERAPEUTIC EXERCISE TECHNIQUE: Coordination exercises, Frenkels exercises, Gait analyses-Pathological Gaits, Gait Training, Relaxation exercises-Methods for training Relaxation, Strengthening exercises-Strength training, Types of Contraction, Mobilisation exercises, Endurance exercises.

7 Hours

UNIT 4

PRINCIPLES IN MANAGEMENT OF COMMUNICATION: Impairment-introduction to communication, Aphasia, Types of aphasia, Treatment of aphasic patient, Augmentative communication-general form of communication, types of visual aids, Hearing aids, Types of conventional hearing aid, Writing aids.

7 Hours

PART- B

UNIT 5

ORTHOTIC DEVICES IN REHABILITATION ENGINEERING: General orthotics, Classification of orthotics-functional & regional, General principles of Orthosis, Biomechanics of orthoses, merits & demerits of orthotics, Material design consideration in orthotics, Calipers-FO, AFO, KAFO, HKAFO. Spinal Orthosis, Cervical, Head cervical thoracic orthosis, Thoraco lumbar sacral orthosis, Lumbo sacro orthosis, Splints-its functions & types.

7 Hours

UNIT 6

AMPUTATION LEVELS OF AMPUTATION – Surgical process, Expected Outcomes, Post operative dressings – Rigid dressings, Semi rigid

dressings, Soft dressings, Examination- Range of Motion, Muscle Strength, Status of Residual Limb, Status of the un involved limb, Functional status, emotional status.

6 Hours

UNIT 7

PROSTHETIC DEVICES

INTRODUCTION, PARTIAL FOOT PROSTHESES- Foot-ankle assembly, Trans femoral Prostheses – Knee unit, Axis system, Friction Mechanisms, Extension aid, Stabilizers, Socket. Disarticulation Prostheses- Knee Disarticulation Prostheses, Hip Disarticulation Prostheses.

7 Hours

UNIT 8

MOBILITY AIDS: Walking frames, Parallel bars, Rollators, Quadripods, Tripods & walking sticks, Crutches, Wheel chairs.

6 Hours

TEXT BOOKS:

1. **Rehabilitation Medicine** - By Dr. S. Sunder, 2nd Edition, Jaypee Medical Publications, Reprint 2004.
2. **Physical Rehabilitation** - by Susan B O'Sullivan, Thomas J Schmitz. 5th Edition, Jaypee Pub.,2007.

C++ AND DATA STRUCTURES LABORATORY

Subject Code	:	**10BML67**	IA Marks	:	**25**
Hours/week	:	**03**	**Exam Hours**	:	**03**
Total No of Practical Hrs	:	**42**	**Exam Marks**	:	**50**

1. Define a STUDENT class with USN, Name, and Marks in 3 tests of a subject. Declare an array of 10 STUDENT objects. Using appropriate functions, find the average of the two better marks for each student. Print the USN, Name and the average marks of all the students
1. Write a C++ program to create a class called COMPLEX and implement the following overloading functions ADD that return a complex

number:(i) ADD(a, s2) – where ‘a’ is an integer (real part) and s2 is a complex number. ii) ADD(s1, s2) – where s1 and s2 are complex numbers)

2. Write a C++ program to demonstrate the initialization of structure Variables and to demonstrate the use of pointer to and address of operator.
3. Write a C++ Program to create a file with at least five records, each record with following fields.
   University Seat Number : Non Zero Positive Integer
   Name : Twenty-Five Characters
   Marks1, Marks2, Marks3 : Positive Integer
4. Write a C++ Program to demonstrate working of stack of size N using an array. The elements on stack can be integer or real. The operation should be PUSH and POP.
5. Write a C++ Program to demonstrate the working of Queue using arrays.
6. Write a C++ Program to implement circular Queue using arrays.
7. Write a C++ Program to implement priority.
8. Write a C++ Program to construct the singly linked list and to do the following operations
   a) Insertion – at front, at end and at any position in the list
   b) Deleting a note based on given field
   c) Searching a note based on given field
   d) Displaying the list
9. Write a C++ Program Implement stack using dynamic variables
10. Write a C++ Program to implement Queue using dynamic variables.
11. Write a C++ Program to do the following operations on doubly linked list.
    a) Add at the front
    b) Insert at the left
    c) Delete the node with given data
    d) Display
12. Write a C++ Program to create a binary search tree.
    a) Add a node
    b) Insert at the node
    c) Delete the node with given data
    d) Display the tree

CLINICAL INSTRUMENTATION LABORATORY - II

Subject Code	:	**10BML68**	**IA Marks**	:	25
No of Practical Hours/week	:	03	Exam Hours	:	03
Total no of Practical Hrs	:	42	Exam Marks	:	50

1. Sample & Hold Circuit
2. ASK & FSK: Generation and Detection.
3. Experiment using 8 bit monolithic ADC & DAC to determine linearity error & resolution.
4. Pulse amplitude modulation and Pulse width modulation.
5. Study Experiments: DC defibrillator, baby incubator, ventilator, heart-lung machine, pacemaker, Snell's chart, ophthalmoscope, Recording of pulse & oxygen saturation using pulse oximeter.
6. Recording & Display of ECG / EMG / EEG / PCG.
7. Measurement of hearing loss & threshold using audiometer and plot the characteristics.
8. Measurement & recording of lung parameters using spirometer/pulmonary function equipment.
9. Calibration & testing of syringe infusion pump.
10. Measurement of refractive index using keratometer.
11. Measurement of unknown concentration of given solution using Spectrophotometer and Colorimeter.
12. (a) Measurement of pH of a given solution using pH meter. (b) Determination of Conductivity of a given unknown solution using conductivity meter

VII SEMESTER

COMPUTER COMMUNICATION & HEALTH CARE NETWORKS

Subject Code	:	**10BM71**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1 & 2

COMPUTER NETWORKS IN HEALTH CARE: Introduction, history, impact of clinical data, information types, platforms, current technologies, identifier standards, communication (message format) standards.

INTRODUCTION TO COMPUTER NETWORKS: Uses of Computer Networks: Business Applications, Home Applications, Mobile Users. Network Hardware: Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Wireless Networks. Network Software: Design Issues for the Layers, Connection – Oriented and Connectionless Services, Service primitives. The Relationship of Services to Protocols. Reference Models: The OSI Reference3 Model, The TCP/IP Reference Model, A Comparison of the OSI and TCP/IP Reference Models. Example Networks: Internet Usage, Architecture of the Internet, Connection– Oriented Networks: X.25, Frame Relay, and ATM.

12 Hours

UNIT 3

THE PHYSICAL LAYER: The Theoretical Basis For Data communication: Bandwidth Limited Signals, The Maximum Data Rate of a Channel. Guided Transmission Media: Magnetic Media, Twisted Pair, Coaxial Cable, Fiber Optics. Wireless Transmission: The Electromagnetic Spectrum, Radio Transmission, Microwave Transmission, Infrared and Millimeter Waves, Light wave Transmission. The Public Switched Telephone Network: Structure of the Telephone System. Trunks and Multiplexing: FDM, WDM & TDM, Switching, Internet over Cable.

7 Hours

UNIT 4

THE DATA LINK LAYER: Data Link Layer Design Issues: Services Provided to the Network Layer, Framing, Error Control, Flow Control. Elementary Data Link Protocols: A Simplex Stop–and–Wait Protocol. Sliding Window Protocols: A One – Bit Sliding Window Protocol, A Protocol Using Go Back N, A Protocol Using Selective Repeat, HDLC – High – Level Data Link Control, The Data Link Layer in the Internet.

7 Hours

PART- B

UNIT 5

THE MEDIUM ACCESS CONTROL SUBLAYER: Multiple Access Protocols: ALOHA, Carrier Sense Multiple Access Protocols, Wireless LAN Protocols. Ethernet: Ethernet Cabling, Manchester Encoding, The Ethernet MAC Sublayer Protocol, The Binary Exponential Backoff Algorithm, Ethernet Performance. Wireless Lans: The 802.11 Protocol Stack, The 802.11 Physical Layer, The 802.11 MAC Sublayer Protocol, The 802.11 Frame Structure, Services.

7 Hours

UNIT 6 & 7

BLUE TOOTH: Blue tooth Architecture, Bluetooth Applications. Data Link Layer

SWITCHING: Local Internet Working, Repeaters, Hubs, Bridges, Switches, Routers, and Gateways, Virtual LANs.

THE NETWORK LAYER: Network Layer Design Issues: Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection – Oriented Service. Routing Algorithms: The Optimality Principle, Shortest Path Routing, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, CONGESTION control Algorithms: General Principles of Congestion Control. Quality of Service: Requirements, Techniques for Achieving Good Quality of Service-leaky bucket algorithm, token bucket algorithm. Internetworking: How Networks Differ, How Networks Can Be Connected. The Network layer In The Internet: The IP Protocol, IP Address Formats, IPV6 Header Format.

12 Hours

UNIT 8

THE TRANSPORT LAYER: The Transport Service: Services Provided to the Upper Layers, Transport Service Primitives. Elements of Transport Protocols: Addressing. Flow Control and Buffering, Multiplexing, Crash Recovery. The Internet Transport Protocols – UDP: Header Format. The Internet Transport Protocols – TCP: Introduction to TCP, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release.

THE APPLICATION LAYER: DNS – The Domain Name System: The DNS Name Space, Name Servers. Electronic Mail: Architecture and Services, The User Agent, message Transfer, SMTP. The World Wide Web: Architectural Overview, Client Side, Server Side.

7 Hours

TEXTBOOKS:

1. **The Biomedical Engineering Handbook-Volume II (2nd Edition) -** by Joseph D. Bronzino, CRC/IEEE Press, 2000.
2. **Computer Networks** – Andrew S. Tanenbaum, 4e, Pearson Education / PHI, 2004.

REFERENCE BOOKS:

1. **Data and Computer Communication** – William Stallings, 7th Edition, Pearson Education, 2004.
2. **Data Communications and Networking** – Behrouz A Forouzan, 4th Edition, Tata McGraw Hill, 2006.
3. **Computer Networking –** Kurose and Ross, Pearson Education, 2004.

BIOMEDICAL DIGITAL SIGNAL PROCESSING

Subject Code	:	**10BM72**	IA Marks	:	**25**
Hours/week	:	**04**	**Exam Hours**	:	**03**
Total no of Lecture Hrs	:	**52**	**Exam Marks**	:	**100**

PART – A

UNIT 1 & 2: Introduction to Bio-Medical Signals

The nature of Bio-Medical Signals, objectives of Bio-Medical signal analysis, artifacts encountered and difficulties in Bio-Medical signal analysis, computer aided diagnosis.

Neurological Signal Processing
EEG signal and its characteristics, linear prediction theory, autoregressive method, Recursive estimation of AR parameters, Spectral error measure, adaptive segmentation, transient detection and elimination – a case of epileptic patients. Markov model, marko chain, dynamics of sleep wave transitions, hipnogram model parameters. **13 Hours**

UNIT 3: Cardiological Signal Processing
ECG parameters and its estimation, the review of Wiener filtering problem, principle of adaptive filter, adaptive noise canceller, cancellation of 60Hz interference in ECG, cancellation of ECG signal from the EMG of chest muscle, cancellation of maternal ECG in fetal ECG, cancellation of high frequency noise in electro surgery. **7 Hours**

UNIT 4: Data Reduction Techniques
Need for data reduction, turning point algorithm, AZTEC algorithm, CORTES algorithm, FAN algorithm, Huffman coding technique and data compression techniques comparison. **6 Hours**

PART-B

Unit 5: Introduction to MATLAB
Installation, Location and starting MATLAB, MATLAB windows, interrupting calculations, MATLAB Basics: Input Outputs, arithmetic Algebra, Managing Variables- Variables and assignments, vectors and matrices, functions, built in functions, user define functions and graphics. **7 Hours**

UNIT 6 – MATLAB INTERFACING
The MATLAB interface, M files, loops, presenting results, data classes, functions and expressions, problems on matrices and mathematical applications. **6 Hours**

UNIT 7: MATLAB GRAPHICS
Two dimensional expressions, three dimensional plots, special effects and applications in Bio-Medical signal processing. **6 Hours**

UNIT 8 MATLAB Programming

Branching, looping, programming commands and interacting operating systems, filter design and applications in Bio-Medical signal processing.

7 Hours

Text Books:

1. Biomedical Signal Processing principles and techniques – D C Reddy, TMH Publication 2005
2. Biomedical signal analysis – A case study approach by Rangraj M Rangayyan, John Wiley publications
3. A guide to MAT LAB – Ronald Lipsman, Brain Hunt, Jonnathan Rosen Berg, Cambridge University Press 2005

REFERENCE BOOKS:

1. Biomedical Digital Signal Processing – Willis J Tomkins, The PHI Publications
2. Handbook of Biomedical Instrumentation – R S Khandpur, TMH Publications, 2nd Edition.
3. MATLAB Primer – Marcel CRC Press

EMBEDDED SYSTEM DESIGN AND PROGRAMMING

Subject Code	:	**10BM73**	IA Marks	:	**25**
Hours/week	:	**04**	**Exam Hours**	:	**03**
Total no of Lecture Hrs	:	**52**	**Exam Marks**	:	**100**

PART - A

UNIT – 1

INTRODUCTION AND GENERAL-PURPOSE PROCESSORS: SOFTWARE: Embedded Systems Overview, Design Challenge, Processor Technology, IC Technology, Design Technology, Introduction, Basic Architecture, Operation, Programmer's View, Development Environment, Application-Specific Instruction-Set Processors, Selecting a Microprocessor, General-Purpose Processor Design

7 Hours

UNIT – 2

CUSTOM SINGLE-PURPOSE PROCESSORS: HARDWARE: Introduction, Combinational Logic, Sequential Logic, Custom Single-Purpose Processor Design, RT-Level Custom Single-Purpose Processor Design, Optimizing Custom Single-Purpose Processors

7 Hours

UNIT – 3 & 4

STANDARD SINGLE-PURPOSE PROCESSORS: PERIPHERALS AND MEMORY: Introduction, Timers, Counters, and Watchdog Timers, UART, Pulse Width Modulators, LCD Controllers, Keypad Controllers, Stepper Motor Controllers, Analog-to-Digital Converters, Real-Time Clocks, Introduction, Memory writes ability and storage performance, Common memory types, Composing Memory, Memory Hierarchy and Cache, Advanced RAM

12 Hours

PART - B

UNIT - 5

DATA REPRESENTATION and GETTING THE MOST OUT OF C: fixed precision binary numbers, binary representations of integers, and Binary representation of real numbers, Integer data types, mixing data types, typedefs and defines, manipulating bits in memory, manipulating bits in I/O ports, accessing memory-mapped I/O devices, structures, variant access.

6 Hours

UNIT - 6

A PROGRAMMER'S VIEW OF COMPUTER ORGANIZATION and MIXING C AND ASSEMBLY: Memory, CPU, I/O, introduction to Intel architecture, operand and address-size override prefixes, Intel data manipulation instructions, Programming in assembly, register usage conventions, typical use of addressing options, instruction sequencing, procedure call and return, parameter passing, retrieving parameters, temporary variables.

7 Hours

UNIT - 7

INPUT/OUTPUT PROGRAMMING and CONCURRENT SOFTWARE AND SCHEDULING: Intel I/O instructions, synchronization, transfer rate and latency, Foreground/Background systems, multithreaded programming, shared resources and critical sections, thread states, pending threads, context

switching, round robin scheduling, priority based scheduling, assigning priorities, deadlock, WDT.

7 Hours

UNIT - 8

MEMORY MANAGEMENT AND SHARED MEMORY: Objects in C, scope, automatic allocation, static allocation, programs to distinguish static from automatic, dynamic allocation, automatic allocation with variable size, recursive functions and memory allocations, recognizing shared objects, reentrant functions, read-only data, coding practices to avoid, accessing shared memory.

6 Hours

TEXT BOOKS:

1. Embedded system Design by, Frank Vahid & Tony Givargis, John Wiley, 2003.
2. Fundamentals of Embedded Software, where C and assembly meet - by Daniel. W. Lewis, Pearson Education, 2009

REFERENCE BOOKS:

1. Embedded System Design by Peter Marwedel, New Age International
2. Embedded Linux Primer: A Practical, Real-World Approach by Christopher Hallinan, PHI, 2006

MEDICAL IMAGE PROCESSING

Subject Code	:	**10BM74**	**IA Marks**	:	25
Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

INTRODUCTION: Origin of DIP, examples of fields that use DIP, fundamentals of DIP, components of a DIP system.

DIGITAL IMAGE FUNDAMENTALS: Elements of visual perception, light and EM spectrum, a simple image formation model, image sampling and quantization, some basic relationships between pixels.

7 Hours

UNIT 2

IMAGE ENHANCEMENT IN SPATIAL DOMAIN: Background, some basic gray level transformations, Histogram processing, enhancement using arithmetic and logic operations.

6 Hours

UNIT 3 & 4

IMAGE ENHANCEMENT IN SPATIAL DOMAIN (**CONT…):** Basic of spatial filtering. Smoothing spatial filters, sharpening spatial filters

IMAGE ENHANCEMENT IN THE FREQUENCY DOMAIN: Background, introduction to FT and frequency domain, smoothing frequency domain filters, sharpening frequency domain filters, homographic filtering, additional properties of the 2-D FT, convolution and correlation theorems.

13 Hours

PART- B

UNIT 5

IMAGE COMPRESSION: Fundamentals, image compression models, elements of information theory, error free compression, run length coding, loss less predictive coding, lossy predictive coding, image compression standards, JPEG, video compression standards

7 Hours

UNIT 6

IMAGE SEGMENTATION: Detection of discontinuities, point detection, line detection, edge detection, gradient operators, Laplacian, edge linking and boundary detection, thresholding, region based segmentation

7 Hours

UNIT 7 & 8

COLOR IMAGE PROCESSING: Color Fundamentals, Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing & Sharpening, Color Segmentation, Noise in Color Images, Color Image Compression

IMAGE RECONSTRUCTION: Introduction, Fourier slice theorem, filtered back projection algorithm for parallel projection data, algebraic reconstruction technique.

12 Hours

TEXTBOOKS:

1. **Fundamentals of Digital Image Processing** - by Rafael. C. Gonzalez and Richard. E. Woods, 3 Edn, Pearson Education, 2002.

2. Digital Image Processing by Anil K. Jain, 5th Indian Print, PHI, 2002.

REFERENCE BOOKS:

1. **Digital Image Processing** –by William K. Pratt, 3rd Edition, John Wiley and Sons Inc.
2. **Image Processing Analysis and Machine Vision** – by Milan Sonka, Vadan Hlavac and Roger Boyle. 2nd Edition, Brooks/Cole Publishing Company / Thompson Learning, 1999.

BIOMECHANICS AND BIODYNAMICS

Subject Code	:	**10BM751**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

BIOMECHANICS APPLICATIONS TO JOINT STRUCTURE AND FUNCTION: Introduction to Kinematics; Displacement in space; Force vectors and gravity; Linear forces and concurrent forces; Kinetics of rotary and translatory forces; Classes of levers; Close chain force analysis.

7 Hours

UNIT 2

CONSTITUTIVE EQUATIONS: Equations for Stress and Strain; Non-viscous fluids; Newtonian viscous fluids; Elastic solids; Visco-elasticity and its applications in biology.

7 Hours

UNIT 3

JOINT STRUCTURE AND FUNCTION: Properties of connective tissues; Human Joint design; Joint Function and changes in disease.

6 Hours

UNIT 4

INTEGRATED FUNCTIONS: Kinetics and Kinematics of Postures; Static and Dynamic Postures; Analysis of Standing, Sitting and Lying Postures.

6 Hours

PART- B

UNIT 5

GAIT ANALYSIS: Gait cycle and joint motion; Ground reaction forces; Trunk and upper extremity motion; internal and external forces, moments and conventions; Gait measurements and analysis.

7 Hours

UNIT 6

FORCE PLATFORM AND KINEMATIC ANALYSIS: Design of force platforms, Integrating force and Kinematic data; linked segment, free-body analysis.

6 Hours

UNIT 7

BIOVISCOELASTIC FLUID: Viscoelasticity, Viscoelastic Models: Maxwell, Voigt and Kelvin Models Response to harmonic variation. Use of viscoelastic models. Bio-Viscoelastic fluids : Protoplasm. mucus, saliva, semen, synovial fluids.

7 Hours

UNIT 8

RHEOLOGY OF BLOOD IN MICROVESSELS: Fahreus·Lindqulst effect and inverse effect, hematocrit in very narrow tube.

FINITE ELEMENT ANALYSIS IN BIOMECHANICS: Model creation, Solution, Validation of results and applications of FEA.

6 Hours

TEXTBOOKS:

1. **Biomechanics**: Mechanical Properties of living tissues by Y. C. Fung, 2nd Edition, Springer Verlag, 1993.
2. **Joint Structure and Function, A Comprehensive Analysis** - by Pamela K. Levangie and Cynthia C. Norkin, Jaypee Publications, 4th Edition, 2006.
3. **Biomechanics of Human Motion** - by T. McClurg Anderson, Sports Pub., 2007.
4. **Biomechanics, Structures and Systems** - by A. A. Biewener, Sports Publication.

GENETIC ENGINEERING

Subject Code	:	**10BM752**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1 & 2

INTRODUCTION & BASIC MOLECULAR BIOLOGY: Definition of genetic engineering, foundations, first steps & overview.

Basic Molecular Biology: The flow of genetic information, the structure of DNA & RNA, gene organization, gene expression.

WORKING WITH NUCLEIC ACIDS & TOOLS OF THE TRADE: Isolation of DNA & RNA, handling and quantification of nucleic acids, radiolabeling of nucleic acids, nucleic acid hybridization, gel electrophoresis, DNA sequencing, Restriction enzymes-cutting DNA, DNA modifying enzymes, DNA ligase-joining DNA molecules.

12 Hours

UNIT 3

THE BIOLOGY OF GENETIC ENGINEERING: Host cell types, plasmid vectors for use in E.Coli, bacteriophage vectors for use in E.Coli, other vectors, getting DNA into cells

7 Hours

UNIT 4

CLONING STRATEGIES: The approach, cloning from mRNA, cloning from genomic DNA, advanced cloning strategies.

7 Hours

PART- B

UNIT 5

SELECTION, SCREENING & ANALYSIS OF RECOMBINANTS: Genetic selection and screening methods, screening using nucleic acid hybridization, immunological screening of expressed genes, analysis of cloned genes

7 Hours

UNIT 6

GENETIC ENGINEERING IN ACTION: Analysis of gene structure and function, making proteins, transgenic plants, transgenic animals, spin-off technologies.

7 Hours

UNIT 7 & 8

GENE THERAPY: Gene therapy-in somatic and germ line, gene therapy in immuno-deficiency diseases, and cancer, use of genetically modified and humanized antibodies, against cell surface antigens tom prevent the spread of breast cancer, targeting and destroying artificial clotting (thrombosis) by using Plasminogen, activating factor conjugated to humanized antibody against fibrin. Curing Severe-Combined-Immono-Deficiency (SCID) in human beings by using Adenosine Deaminase (ADA) gene, Prevention of tissue and organ graft rejection.

12 Hours

TEXTBOOKS:

1. **An Introduction to Genetic Engineering** - by Desmond Nicholl, Cambridge Low Price Edition, 1996.
2. **From Genetics to Gene Therapy** - The molecular pathology of human disease by David S. Latchman, BIOS Scientific Publications, 1994.
3. **Principles of Gene Manipulation** - An Introduction to Genetic Engineering by Old R.W. and Primrose S.B, Blackwell Scientific Publications, 1993.

REFERENCE BOOKS:

1. **Genes VIII by Benjamin Lewis** - Oxford University/ Pearson Education, 2004.
2. **Recombinant DNA** - Jan Witkowski, M. Zoller, J.P. Watson and M. Gilman, Freeman Company, 1982.

Subject Code	:	**10BM753**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

MEDICAL INFORMATICS: Aim and scope, salient feature, Introduction, history, definition of medical informatics, bio-informatics, online learning, introduction to health informatics, prospectus of medical informatics.

7 Hours

UNIT 2

HOSPITAL MANAGEMENT AND INFORMATION SCIENCE: Introduction**,** HMIS: need, Benefits, capabilities, development, functional areas. Modules forming HMIS, HMIS and Internet, Pre-requisites for HMIS, PACS, why HMIS fails, health information system, disaster management plans, advantages of HMIS.

7 Hours

UNIT 3 & 4

HOSPITAL MANAGEMENT AND INFORMATION SYSTEMS: Central Registration Module, OPD / Consultant Clinic / Policlinic Module, Indoor Ward Module, Patient Care Module, Procedure Module, Diet Planning Module, MLC Register Module, Pathology Laboratory Module, Blood Bank Module, Operation Theatre Module, Medical Stores Module, Pharmacy Module, Inventory Module, Radiology Module, Medical Records Index Module, Administration Module, Personal Registration Module, Employee Information Module, Financial modules, Health & Family Welfare, Medical Examination, Account Billing, Medical Research, Communication, General Information.

12 Hours

PART- B

UNIT 5

KNOWLEDGE BASED AND EXPERT SYSTEMS & PATIENT RECORDS: AI, expert systems, materials and methods, applications of ES, Introduction to computer based patient record, development tools, intranet,

CPR in radiology, legal security and private issues, application service providers.

7 Hours

UNIT 6

COMPUTER ASSISTED MEDICAL EDUCATION & SURGERY: CAME, Education software, Tele-education, Tele-mentoring, CAPE, patient counseling software. Limitation of conventional surgery, computer assisted surgery (CAS), 3D navigation system, intra-operative imaging for 3D navigation system, merits and demerits of CAS.

7 Hours

UNIT 7

SURGICAL SIMULATION AND VIRTUAL ENVIRONMENT: Need, technology, volume image data file, human resources, interface and applications. Virtual environment (VE), technology, applications of VE, advantages of simulators and after effects of VE participation.

6 Hours

UNIT 8

TELECOMMUNICATION BASED SYSTEMS: Telemedicine, need of telemedicine, technology materials and methods, internet, applications of telemedicine, reliability and cost analysis, tele-surgery, robotic surgery, needs for tele-surgery, advantages and disadvantages, technology materials and methods, applications.

6 Hours

TEXTBOOK:

1. **Medical Informatics: A Primer** - by Mohan Bansal, 1st Print, Tata McGraw Hill, Publications, 2003.

REFERENCE BOOKS:

1. **Medical Informatics**: Computer applications in health care and biomedicine by E.H.Shortliffe, G. Wiederhold, L.E.Perreault and L.M.Fagan, 2nd Edition, Springer Verlag, 2000
2. **Handbook of Medical Informatics** by J.H.Van Bemmel, Stanford University Press/ Springer, 2000.

DSP ARCHITECTURE

Subject Code	:	**10BM754**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION TO DIGITAL SIGNAL PROCESSING: Introduction, A digital signal processing system, the sampling process, discrete time sequences, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), linear time invariant systems, Digital filters, Decimation and Interpolation, Analysis and Design tool for DSP systems.

7 Hours

UNIT – 2

COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATION: Introduction, Number formats for signals and coefficients in DSP systems, Dynamic range and precision, Sources of error in DSP implementations, A/D conversion error, DSP computational error and D/A Conversion error.

7Hours

UNIT - 3

Digital Signal Processing Devices: Introduction, Basic architectural features, DSP computational building blocks, Bus architecture and memory, Data addressing capabilities, Address generation unit, Programmability and Program execution, Speed issues.

6 Hours

UNIT - 4

PROGRAMMABLE DIGITAL SIGNAL PROCESSORS: Introduction, Architecture of TMS320C54xx digital signal processors: Bus structure, Central processing unit, internal memory and memory mapped registers, Data addressing modes of TMS320C54xx processors, Memory space of TMS320C54xx processors.

6 Hours

PART – B

UNIT - 5

TMS320C54xx Instructions and programming, On-chip peripherals, Interrupts of TMS320C54xx processors, Pipeline operation of TMS320C54xx processors.

7 Hours

UNIT - 6

IMPLEMENTATION OF BASIC DSP ALGORITHMS: Introduction, The Q-notation, Linear Convolution, Circular Convolution, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, Adaptive Filters, butterfly computation and FFT implementation on the TMS320C54xx

7 Hours

UNIT - 7

INTERFACING MEMORY AND PARALLEL I/O PERIPHERALS TO PROGRAMMABLE DSP DEVICES: Introduction, Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). Interfacing Serial Converters to a Programmable DSP device: Introduction, Synchronous Serial Interface (SSI), A multi channel buffered serial port (McBSP).

6 Hours

UNIT - 8

A CODEC INTERFACE CIRCUIT: CODEC-DSP interface circuit. Applications of programmable DSP devices**:** Introduction, A DSP system, DSP-based Biotelemetry receiver, A speech processing system, An image processing system.

6 Hours

TEXT BOOK:

1. **Digital Signal Processing**-Avtar Singh and S. Srinivasan, Thomson Publishing, 2004, Singapore.
2. **Real Time Digital Signal Processing: Fundamentals, Algorithms and implementation using TMS Processor**-V.Udayashankara, Prentice Hall of India, New Delhi, 2010

REFERENCE BOOKS:

1. **Digital Signal Processing-** A Practical Approach, Emmanuel C Ifeachor and B W Jervis, Pearson Education, New Delhi.

2. **Digital Signal Processors**- B Venkataramani and M Bhaskar, Tata-McGraw Hill, New Delhi, 2002.

LOW POWER VLSI DESIGN

Subject Code	:	**10BM755**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1 & 2

Need for low power VLSI chips, Sources of power dissipation on Digital Integrated circuits. Emerging Low power approaches, Physics of power dissipation in CMOS devices.

DEVICE & TECHNOLOGY IMPACT ON LOW POWER: Dynamic dissipation in CMOS, Transistor sizing & gate oxide thickness, Impact of technology Scaling, Technology & Device innovation.

12 Hours

UNIT 3 & 4

POWER ESTIMATION, SIMULATION POWER ANALYSIS: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, static state power, gate level capacitance estimation, architecture level analysis, data correlation analysis in DSP systems, Monte Carlo simulation.

PROBABILISTIC POWER ANALYSIS: Random logic signals, probability & frequency, probabilistic power analysis techniques, signal entropy.

14 Hours

PART- B

UNIT 5

CIRCUIT LEVEL: Power consumption in circuits. Flip Flops & Latches design, high capacitance nodes, low power digital cells library.

LOGIC LEVEL: Gate reorganization, signal gating, logic encoding, state machine encoding, pre-computation logic

7 Hours

UNIT 6

LOW POWER ARCHITECTURE & SYSTEMS: Power & performance management, switching activity reduction, parallel architecture with voltage

reduction, flow graph transformation, low power arithmetic components, low power memory design.

7 Hours

UNIT 7

LOW POWER CLOCK DISTRIBUTION: Power dissipation in clock distribution, single driver Vs distributed buffers, Zero skew Vs tolerable skew, chip & package co design of clock network

6 Hours

UNIT 8

ALGORITHM & ARCHITECTURAL LEVEL METHODOLOGIES: Introduction, design flow, Algorithmic level analysis & optimization, Architectural level estimation & synthesis.

6 Hours

TEXTBOOKS:

1. **Practical Low Power Digital VLSI Design** - Gary K. Yeap, Practical **Low Power Digital VLSI Design**, KAP, 2002
2. **Low power design methodologies** - Rabaey, Pedram, Kluwer Academic, 1997
3. **Low-Power CMOS VLSI Circuit Design** - Kaushik Roy, Sharat Prasad, Wiley, 2000

SPEECH SIGNAL PROCESSING

Subject Code	:	**10BM756**	IA Marks	:	**25**
Hours/week	:	**04**	**Exam Hours**	:	**03**
Total no of Lecture Hrs	:	**52**	**Exam Marks**	:	**100**

PART - A

UNIT - 1

DIGITAL MODELS FOR SPEECH SIGNALS: Process of Speech Production, Acoustic phonetics, Digital models for Speech signals.

6 Hours

UNIT - 2

TIME DOMAIN MODELS FOR SPEECH PROCESSING: Time dependent processing of speech, Short time Energy and average magnitude,

Short time average zero crossing rate, Speech Vs silence discrimination using energy and zero crossing. Pitch period estimation, Short time autocorrelation function, Short time average magnitude difference function, Pitch period estimation using autocorrelation function. **7 Hours**

UNIT – 3

SHORT TIME FOURIER ANALYSIS: Linear filtering interpretation, Filter bank summation method, Design of digital filter banks, Spectrographic displays, Cepstrum analysis. **7 Hours**

UNIT - 4

DIGITAL REPRESENTATIONS OF THE SPEECH WAVEFORM: Sampling speech signals, Review of the statistical model for speech, Instantaneous quantization, Adaptive Quantization, General theory of differential quantization, Delta modulation. **6 Hours**

PART - B

UNIT - 5

LINEAR PREDICTIVE CODING OF SPEECH: Basic principles of linear predictive analysis, Solution of LPC equations, Prediction error signal, Frequency domain interpretation, Applications of LPC parameters**.**

7 Hours

UNIT - 6

SPEECH SYNTHESIS: Principles of Speech synthesis, Synthesis based on waveform coding, analysis synthesis method, speech production mechanism, Synthesis by rule, Text to speech conversion.

6 Hours

UNIT – 7

SPEECH RECOGNITION: Principles of Speech recognition, Speech period detection, Spectral distance measures, Structure of word recognition systems, Dynamic time warping (DTW), Word recognition using phoneme units, HMM.

7 Hours

UNIT – 8

SPEAKER RECOGNITION: Principles of Speaker recognition, Speaker recognition methods, examples of speaker recognition system.

6 Hours

TEXTBOOKS:

1. **Digital Processing of Speech Signals** - L R Rabiner and R W Schafer, Pearson Education 2004

2. **Digital Speech Processing** - Synthesis and Recognition, Sadoaki Furui, Second Edition, Mercel Dekker 2002.

REFERENCE BOOKS:

1. **Introduction to Data Compression** - by Khalid Sayood, 3rd Edition, Elsivier Pub.
2. **Digital Speech** - by A M Kondoz, 2nd Edition, Wiley Publications

BIOSTATISTICS

Subject Code	:	**10BM761**	IA Marks	:	**25**
Hours/week	:	**04**	**Exam Hours**	:	**03**
Total no of Lecture Hrs	:	**52**	**Exam Marks**	:	**100**

PART- A

UNIT 1

INTRODUCTION TO BIOSTATISTICS: Introduction, Some basic concepts, Measurement and Measurement Scales, Simple random sample, Computers and biostatistical analysis.

DESCRIPTIVE STATISTICS: Introduction, ordered array, grouped data-frequency distribution, descriptive statistics – measure of central tendency, measure of dispersion, measure of central tendency computed from grouped data, variance and standard deviation-grouped data.

6 Hours

UNIT 2

BASIC PROBABILITY CONCEPTS: Introduction, two views of probability – objective and subjective, elementary properties of probability, calculating the probability of an event.

PROBABILITY DISTRIBUTIONS: Introduction, probability distribution of discrete variables, binomial distribution, Poisson distribution, continuous probability distributions, normal distribution and applications.

7 Hours

UNIT 3

SAMPLING DISTRIBUTION: Introduction, sampling distribution, distribution of the sample mean, distribution of the difference between two

samples means, distribution of the sample proportion, distribution of the difference between two sample proportions.

6 Hours

UNIT 4

ESTIMATION: Introduction, confidence interval for population mean, t-distribution, confidence interval for difference between two population means, population proportion and difference between two population proportions, determination of sample size for estimating means, estimating proportions, confidence interval for the variance of normally distributed population and ratio of the variances of two normally distributed populations.

7 Hours

PART- B

UNIT 5

HYPOTHESIS TESTING: Introduction, hypothesis testing – single population mean, difference between two population means, paired comparisons, hypothesis testing-single population proportion, difference between two population proportions, single population variance, ratio of two population variances.

7 Hours

UNIT 6

ANALYSIS OF VARIANCE (ANOVA): Introduction, completely randomized design, randomized complete block design, factorial experiment.

6 Hours

UNIT 7

LINEAR REGRESSION AND CORRELATION: Introduction, regression model, sample regression equation, evaluating the regression equation, using the regression equation, correlation model, correlation coefficient.

6 Hours

UNIT 8

MULTIPLE REGRESSION AND CHI-SQUARE DISTRIBUTION: Multiple linear regression model, obtaining multiple regression equation, evaluating multiple regression equation, using the multiple regression equation, multiple correlation model, mathematical properties of Chi-square distribution, tests of goodness of fit, tests of independence, tests of homogeneity.

7 Hours

TEXTBOOK:

1. **Biostatistics-A Foundation for Analysis in the Health Sciences** - by Wayne W. Daniel, John Wiley & Sons Publication, 6th Edition, 1995.

REFERENCE BOOKS:

1. **Principles of Biostatistics** - by Marcello Pagano and Kimberlee Gauvreu, Thomson Learning Publication, Indian Edition, 2007.
2. **Biostatistics** - by Ronald N Forthofer, Eun Sul Lee and M. Hernandez, Academic Press, 2007.
3. **Basic Biostatistics and its Applications** - by Animesh K. Dutta, 2006.

TISSUE ENGINEERING

Subject Code	:	**10BM762**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

TISSUE ENGINEERING: Introduction, basic principles and considerations, reconstruction of connective tissue, reconstruction of epithelial or endothelial tissue, bioreactor design in tissue engineering

BIOMATERIALS: Protein surface interactions: Introduction, fundamentals of protein adsorption, calculation and applications of protein adsorption.

ENGINEERING BIOMATERIALS FOR TISSUE ENGINEERING: Introduction, fundamentals, applications,

6 Hours

UNIT 2

REGENERATION TEMPLATES: Problem of missing organ, search principles for identification of regeneration templates, structural specificity of dermis regeneration template (DRT), in-situ synthesis of skin with DRT, advantages and disadvantages of clinical treatment of skin loss with DRT, bilayered skin-equivalent graft, structural specificity of nerve regeneration template (NRT), meniscus regeneration template (MRT).

FLUID SHEAR STRESS EFFECTS ON CELLULAR FUNCTION: Introduction, devices and methodologies for in-vitro experiments, shear

stress-mediated cell-endothelium interactions, shear stress effects on gene regulation, mechanism of shear stress-induced gene regulation, gene therapy and tissue engineering in vascular biology.

7 Hours

UNIT 3

BIOLOGY OF STEM CELLS: Introduction, embryonic stem cells, control of stem cell development, adult stem cells, aging of stem cells, other types of stem cells.

CELL MOTILITY AND TISSUE ARCHITECTURE: Introduction, directed motile responses in-vivo, engineering directed motile response in-vitro. Importance of Stromal Cells: Tissue composition and stromal cells, stromal cells as feeder layers, support of cultured cells using cell lines, stereotypic culture vs. monolayer culture

7 Hours

UNIT 4

TISSUE ENGINEERING OF BONE MARROW: Biology of hematopoiesis, applications of reconstituted ex-vivo hematopoiesis, history of hematopoietic cell culture development, challenges for scale-up, recapitulations.

TISSUE ENGINEERING OF LIVER: Background, hepatocyte transplantation systems, conclusions.

6 Hours

PART- B

UNIT 5

TISSUE ENGINEERING IN NERVOUS SYSTEM: Delivery of neuroactive molecules to the nervous system, tissue reconstruction-nerve regeneration, in-vitro neural circuits and biosensors, conclusions.

TISSUE ENGINEERING OF SKELETAL MUSCLE: Introduction, skeletal muscle structure, skeletal muscle function, injury and repair of skeletal muscle, reconstructive surgery of skeletal muscle, myoblast transfer and gene therapy.

7 Hours

UNIT 6

TISSUE ENGINEERING OF CARTILAGE: Scope, cell-based approaches to cartilage tissue engineering, cell-polymer bioreactor system, summary and future directions.

6 Hours

UNIT 7

TISSUE ENGINEERING OF KIDNEY: Introduction, fundamentals of kidney functions, tissue engineering formulation based upon fundamentals, clinical and economical implications.

6 Hours

UNIT 8

BIOMECHANICAL ASPECTS OF GROWTH AND TISSUE ENGINEERING: Introduction, Wolff's law and Roux's functional adaptation concept, bioelectric effect on the growth of whole organ, remodeling of soft tissues in response to stress changes, stress field created by fibroblast cells and collagen synthesis, growth factors, significance of zero-stress state, engineering of blood vessels, tissue engineering of skin.

7 Hours

TEXTBOOKS:

1. **The Biomedical Engineering Handbook-Volume II (2nd Edition)** - by Joseph D. Bronzino, CRC/IEEE Press, 2000.
2. **Biomechanics: Motion, Flow, Stress and Growth** - by Y. C. Fung, Springer, Publications, 1990.

ERGONOMICS

Subject Code	:	**10BM763**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

Muscular Work, Nervous Control of Movements, Improving Work Efficiency, Problems of Body Size.

6 Hours

UNIT 2

Methods for Static Anthropometric Measurements, Anthropometry of Special Regions of the Body.

7 Hours

UNIT 3

The Design of Work Stations, Heavy Work, Handling Loads, Skilled Work.

7 Hours

UNIT 4

Man-Machine Systems, Mental Activity, Fatigue, Occupational Stress.

6 Hours

PART- B

UNIT 5

Boredom, Job Design in Monotonous Tasks, Working Hours and Eating Habits, Night Work and Shift Work.

7 Hours

UNIT 6

Vision, Ergonomic Principles of Lighting, Noise and Vibration.

6 Hours

UNIT 7

Indoor Climate, Daylight Colours and Music for a Pleasant Work Environment

7 Hours

UNIT 8

Ergonomics for Electronic Equipment Design.

6 Hours

TEXTBOOK:

1. **Fitting the Task to the Human -** A Text Book of Occupational Ergonomics by H. E. Kroemer and Etienne Grandjean, 5th Edition, Taylor & Francis.

REFERENCE BOOKS:

1. **The Human Body in Equipment Design** - by A. Damon et.al., Harverd University Press, 1966.
2. **Human Factors in Engineering and Design** - by Mark S. Sanders and Ernest J. Mc Cormick, 1993.

ARM PROCESSORS & PROGRAMMING

Subject Code	:	**10BM764**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART - A

UNIT-1

An overview of computing system: Introduction, History of RISC, The Computing Device, Number systems, Representation of numbers and characters, Translating bits to commands, the tools, exercises.

The ARM7TDMI processor core and programmer's model:

ARM7TDMI, Introduction, data types, processors modes, registers, Program status registers, the vector table, exercises. (Text 2-Chapter 1, Text 1-Chapter 9.1, Text 2-Chapter 2) **7 Hours**

UNIT–2 & 3

ARM Assembly language programming: Load, store and addressing, Constants and literal pools, Logic and arithmetic, Loops and branches, Tables, exercises.(Text 2-Chapter 5, 6, 7, 8, 9) **12 Hours**

UNIT-4

Subroutine and Stack: Introduction, The stack, subroutines, Passing parameters to subroutines, The ARM APCS, exercises.

Exception Handling: Introduction, Interrupts, Error conditions, Processor exception sequence, the vector table, Exception handlers, Exception priorities, Procedure for handling exceptions, exercises. (Text 2-Chapter 10, 11) **7 Hours**

PART - B

UNIT-5

Assembler Rules and Directives: Introduction, Structure of assembly language modules, Predefined register names, frequently used directives, Macros, Miscellaneous assembler features, exercises.

Mixing C and Assembly: Introduction, Inline assembler, embedded assembler, calling between C and assembly, exercises. (Text 2-Chapter 4, 14) **6 Hours**

UNIT-6 & 7

Memory mapped peripherals: Introduction, The LPC2104, The LPC2132, exercises.

Architectural support for System Development: The ARM memory interface, The Advanced Microcontroller Bus Architecture (AMBA), The ARM reference peripheral specification, Hardware system prototyping tools, The ARMulator, The JTAG boundary scan test architecture, The ARM debug architecture, Embedded Trace, Signal processing support, Example and exercises. (Text 1-Chapter 8, Text 2-Chapter 12) **14 Hours**

UNIT-8

Architectural support for operating system: An introduction to operating systems, The ARM system control coprocessor, CP15 protection unit registers, ARM protection unit, CP15 MMU registers, ARM MMU architecture, Synchronization, Context switching, Input/Output, Example and exercises. (Text 1-Chapter 11) **6 Hours**

TEXTBOOK:

1. **ARM-System-On-Chip- Architecture** - by Steve Furber, 2nd Edition, Pearson Education, 2000.

2. **ARM Assembly language Fundamentals and Techniques**- by William Hohl, CRC press.

WAVELET TRANSFORMS

Subject Code	:	**10BM765**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

MATHEMATICAL PRELIMINARIES: Linear spaces, Vector and vector spaces, basic functions, matrix algebra & linear transformations, Fourier series, properties And examples of Fourier transforms

6 Hours

UNIT 2

TIME FREQUENCY ANALYSIS: Window function, STFT, Discrete STFT, discrete Gabor representation, Continuous wavelet transform, discrete wavelet transform, wavelet series, WVD and its properties.

6 Hours

UNIT 3

CONTINUOUS WAVELET TRANSFORMS: Continuous time wavelets, CWT as correlation, filter and time resolution operation. Inverse CWT T

7 Hours

UNIT 4

DISCRETE WAVELET TRANSFORM: Introduction, vector approximations in nested linear vector subspaces, multi resolution analysis.

7 Hours

PART- B

UNIT 5

MRA, ORTHONORMAL WAVELETS: Introduction, Definition of MRA, Construction of orthonormal MRA, wavelet basics for MRA, digital filter interpretation, examples of orthogonal basics generating wavelets, MRA interpretation for discrete time signals.

6 Hours

UNIT 6

WAVELET APPLICATIONS: Data compression; introduction, transform coding, DTWT for image compression, Audio compression.

7 Hours

UNIT 7

WAVELET DENOISING - speckle removal, edge detection & object isolation, image fusion

6 Hours

UNIT 8

WAVELET PACKETS - Wavelet packet algorithms, Thresholding, 2D wavelets, wavelet packet algorithms for 2d signals, 3D medical image visualization. **7 Hours**

TEXTBOOKS:

1. **Fundamentals of Wavelets** - theory, algorithms & applications – Goswami and Chan, John Wiley & sons ,1999.
2. **Wavelet transforms** - introduction to theory and applications – Raghuveer M Rao, Ajit S Bopardikar, Pearson LPE, 2006

REFERENCE BOOKS:

1. **Introduction to wavelets and wavelet transforms** - A Primer – C Sidney Burrus, Ramesh A Gopinath, Guo, Prentice Hall Inc, 1998.
2. **Wavelet Theory and its applications** - Randy K Young, Kluwer publications, 1963

SOFTWARE ENGINEERING

Subject Code	:	**10BM766**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

OVERVIEW & INTRODUCTION: FAQ's about software engineering, Professional and ethical responsibility.

SOFTWARE PROCESSES: Software Process Models, Process iteration, Software specification, Software design and implementation, Software validation, Software evolution, Automated Process support.

7 Hours

UNIT 2 & 3

REQUIREMENTS ENGINEERING:

SOFTWARE REQUIREMENTS: Functional and Non – functional requirements, User requirements, System requirements, software requirements document.

REQUIREMENTS ENGINEERING PROCESSES: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

SYSTEM MODELS: Context models, Behavioral models, Data models, Object models, CASE workbenches.

SOFTWARE PROTOTYPING: Prototyping in software process, Rapid prototyping techniques, User interface prototyping.

12 Hours

UNIT 4

SOFTWARE DESIGN

ARCHITECTURAL DESIGN: System structuring, Control models, Modular decomposition, Domain specific architectures.

OBJECT – ORIENTED DESIGN: Objects and Object Classes, An Object Oriented design process, Design evolution.

7 Hours

PART- B

UNIT 5 & 6

USER INTERFACE DESIGN: User interface design principles, User interaction, Information presentation, User support, Interface Evaluation.

VERIFICATION AND VALIDATION: Verification and validation planning, Software inspections, Automated static analysis, Clean room software development.

SOFTWARE TESTING: Defect testing, Integration testing, Object oriented testing, Testing Workbenches.

CRITICAL SYSTEMS: Critical system, Availability and reliability, Safety and Security.

CRITICAL SYSTEM SPECIFICATION: Software reliability specification, safety specification.

14 Hours

UNIT 7 & 8

SOFTWARE MANAGEMENT:

PROJECT MANAGEMENT: Management activities, Project planning, Project Scheduling, Risk management.

SOFTWARE COST ESTIMATION: Productivity, Estimation techniques, Algorithm cost modeling, Project duration and staffing.

QUALITY MANAGEMENT: Quality assurance and standards, Quality Planning, Quality Control, Software measurements and metrics.

SOFTWARE EVOLUTION

LEGACY SYSTEMS: Legacy system structures, Legacy system design and assessment.

SOFTWARE REENGINEERING: Source code translation, Reverse engineering, Program structure improvement, Program modularization, Data reengineering.

12 Hours

TEXTBOOK:

1. **Software Engineering** - by Ian Sommerville, 6th Edition, Pearson Education Ltd., 2001.

REFERENCE BOOKS:

1. **Software Engineering** – A Practitioners approach by Roger. S. Pressman, Tata – McGraw Hill, 6th Edition, 2005.
2. **An Integrated Approach to Software Engineering** - by Pankaj Jalote, Narosa Publications, 1997.
3. **Object Oriented & Classical Software Engineering -** by Stepen R. Schach, 5th Edition, Tata McGraw Hill, 2002.

BIOMEDICAL DIGITAL SIGNAL PROCESSING LAB

Subject Code	:	**10BML77**	**IA Marks**	:	25
No of Practical Hrs/week	:	03	Exam Hours	:	03
Total No of Practical Hrs	:	42	Exam Marks	:	50

1. Display of static and moving ECG.
2. Down sampling & up-sampling of ECG signal.
3. Detection of QRS complex and heart rate measurement.
4. Auto-correlation and cross correlation of ECG signals.
5. DCT & IDCT of ECG signal
6. Computation of Convolution and Correlation Sequences.
7. Signal Averaging to Improve the SNR
8. PSD estimation for ECG, EEG, and EMG.
9. Design of 50 Hz notch filter for ECG signal and display PSD.
10. Design of IIR filters for ECG (LPF, HPF, BP)
11. Design of FIR Filter for ECG. (LPF, HPF, BP)
12. Data Compression Techniques: AZTEC, TP, FAN algorithmes
13. Frequency response and phase response of FIR filter using KAISER window.
14. MATLAB experiments based on convolution

MEDICAL IMAGE PROCESSING LAB

Subject Code	:	**10BML78**	**IA Marks**	:	25
No of Practical Hours/week	:	03	Exam Hours	:	03
Total No of Practical Hrs	:	42	Exam Marks	:	50

1. Display of an image, negative of an image.
2. Contrast stretching of a low contrast image.
3. Display of a histogram, and histogram equalization.
4. Bit plane slicing of an image.
5. Image enhancement by Gray level slicing.
6. Implementation of FT for an image.
7. Implementation of High pass, Low pass.
8. Mean and Median filtering of an image.
9. Implementation of image sharpening filters and edge detection using gradient filters.
10. Image Rotation (Clockwise and anticlockwise) and Flipping(Horizontal and Vertical)
11. Canny edge detection.
12. Image compression by DCT.
13. Implementation of image segmentation techniques.

VIII SEMESTER

DATABASE MANAGEMENT SYSTEM IN HEALTHCARE

Subject Code	:	**10BM81**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

DATABASE SYSTEMS: Introduction, Characteristics of database systems, Advantages of database, DB languages & interfaces data model, schemas and instances, classification of DBMS.

PATIENT DATABASE: Patient Database strategies for HIS, data acquisition, patient admission, transfer, discharge, evaluation & management. Computer based patient record, clinical decision support systems.

MANAGING DATA: A Historical Perspective: File Systems versus a DBMS; Describing and Storing Data in a DBMS, Queries in a DBMS, Transaction Management; Structure of a DBMS,

7 Hours

UNIT 2

ENTITY – RELATIONSHIP MODEL: Using High – Level Conceptual Data Models for Database Design, An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design for the COMPANY Database; ER Diagrams, Naming Conventions and Design Issues.

6 Hours

UNIT 3

RELATIONAL MODEL AND RELATIONAL ALGEBRA: Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations and Dealing with Constraints Violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN and DIVISION; Additional Relational Operations; Examples of Queries in

Relational Algebra; Relational Database Design Using ER-to-Relational Mapping.

7 Hours

UNIT 4

SQL – THE RELATIONAL DATABASE STANDARD: SQL Data Definition and Data Types, Specifying Basic Constraints in SQL, Schema Change Statements in SQL; Basic Queries in SQL; More Complex SQL Queries; Insert, Delete and Update Statements in SQL; Additional Features of SQL; Specifying General Constraints as Assertion; Views (Virtual Tables) in SQL; Database Programming: Issues and Techniques; Embedded SQL, Dynamic SQL.

6 Hours

PART- B

UNIT 5 & 6

DATABASE DESIGN: Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form; Properties of Relational Decompositions; Algorithms for Relational Database Schema Design; Multivalued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form; Inclusion Dependencies; Other Dependencies and Normal Forms.

DATABASE SECURITY: Introduction to Database Security; Access Control; Discretionary Access Control; Mandatory Access Control.

13 Hours

UNIT 7 & 8

TRANSACTION MANAGEMENT: The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock-Based Concurrency Control; Performance of Locking; Transaction Support in SQL; Introduction to Crash Recovery; 2PL, Serializability and Recoverability; Introduction to Lock Management; Lock Conversions; Dealing with Deadlocks; Specialized Locking Techniques; Concurrency Control without Locking; Introduction to ARIES: The Log; Other Recovery- Related Data Structures; The Write-Ahead Log Protocol; Check-pointing; Recovering from a System Crash; Media Recovery.

SEARCHING THE MEDICAL LITERATURE: Introduction, How the Computer Assists in Searching Medical Literature. Sources of Medical Literature Searches, Internet Grateful Med (IGM), Pubmed, Indian Meddler

Centre, CD -Rom Databases, Other Internet Resources, Practicing Evidence-Based Medicine, Tips for Improving Search Techniques, Conclusion.

13 Hours

TEXT BOOKS:

1. **The Biomedical Engineering Handbook-Volume II (2nd Edition)** - by Joseph D. Bronzino, CRC/IEEE Press, 2000.
2. **Database Management Systems -** by Raghu Ramakrishna and Johannes Gehrke, (3rd Edition), McGraw Hill, 2003
3. **Fundamentals of Database Systems** - by Elmasri and Navathe (4th Edition), Pearson Education, 2003
4. **Medical Informatics: A Primer** - by Mohan Bansal, Tata McGraw Hill Pub, 2003.
   Section VI, Chapter 16: Searching the Medical Literature.

REFERENCE BOOK:

1. **Data base System Concepts** - by Silberschatz, Korth and Sudharshan:, (4th Edition), McGraw Hill, 2002.

MEDICAL IMAGING SYSTEMS

Subject Code	:	**10BM82**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

X-RAY IMAGING: Fundamentals of X-ray – Electromagnetic radiation, Interactions between X-rays and matter, Intensity of X-ray beam, Attenuation, Generation and Detection of X-rays – X-ray generation, X-ray generators, Filters, Beam restrictors and grids, Intensifying screens, fluorescent screens, and image intensifiers, X-ray detectors, X-ray image characteristics – Spatial resolution, Image noise, Image contrast, Receiver operating curve (ROC), Biological effects of ionizing radiation, Film processors-wet & dry.

6 Hours

UNIT 2

X-RAY DIAGNOSTIC METHODS: Conventional X-ray radiography, Fluoroscopy, Angiography, Mammography and Xeroradiography, Image subtraction.

COMPUTED TOMOGRAPHY: Conventional tomography, Computed tomography – Projection function, Algorithms for image reconstruction, CT number, Image artifacts, Spiral CT. Recent developments – Digital radiography, Digital subtraction angiography (DSA), 3D reconstruction, Dynamic spatial reconstructor (DSR),

7 Hours

UNIT 3

ULTRASOUND IMAGING: Fundamentals of acoustic propagation - Stress strain relationship, Characteristic impedance, Intensity, Reflection and refraction, Attenuation, absorption & scattering, Doppler effect, Generation and detection of Ultrasound-Piezoelectric effect, Ultrasonic transducers, Transducer beam characteristics-Huygens's principle, Beam profiles, Pulsed ultrasonic field, Axial and Lateral resolution, Focusing, Arrays.

7 Hours

UNIT 4

ULTRASONIC DIAGNOSTIC METHODS: Pulse echo systems-Amplitude mode (A-mode), Brightness mode (B-mode), Motion mode (M-mode), Constant depth mode (C-mode), Doppler methods, Duplex imaging, Tissue characterization, Colour Doppler flow imaging, Power Doppler Imaging, Image characteristics – Ultrasonic texture or speckle, Speckle reduction, Compensation of phase aberration, Biological effects of ultrasound, video printers.

6 Hours

PART- B

UNIT 5

RADIONUCLIDE IMAGING: Introduction, Fundamentals of Radioactivity – Nuclear particles, Nuclear activity and half-life, Units of measuring nuclear activity, Specific activity, Interaction of nuclear particles and matter, Attenuation of Gamma radiation, Radionuclides, Generation & Detection of Nuclear Emission – Radionuclide generators, nuclear radiation detectors, Collimators, Diagnostic methods using radiation detector probes – Thyroid function test, Renal function test, Blood volume measurement,

Radionuclide imaging systems- Rectilinear scanner, Scintillation camera, SPECT, PET.

7 Hours

UNIT 6

BASICS OF MAGNETIC RESONANCE IMAGING: Fundamentals of nuclear magnetic resonance- Angular momentum, magnetic dipole moment, magnetization, Larmor frequency, Rotating frame of reference and RF magnetic field, Free induction decay (FID), Fourier spectrum of the NMR signal, Spin density, Relaxation times, Pulse sequences.

6 Hours

UNIT 7

MRI SYSTEM & IMAGING METHODS: Introduction, Magnet, Room temperature and magnetic field gradients, NMR Coil/Probe, Transmitter, Receiver, Data acquisition. Imaging Methods- Introduction, slice selection, frequency encoding, phase encoding, Spin-Echo imaging- Gradient echo imaging, Blood flow imaging, Characteristics of MRI images- Spatial resolution, image contrast. Biological effects of magnetic fields- Static magnetic fields, Radio-frequency fields, Gradient magnetic fields, Imaging safety, Functional MRI.

7 Hours

UNIT 8

THERMAL IMAGING & ADVANCES IN MEDICAL IMAGING: Medical thermography, Physics of thermography, Infrared detectors, Thermographic equipment, Quantitative medical thermography, Pyroelectric vidicon camera.

Image guided intervention- Introduction, Stereotactic neurosurgery, Stereotactic neurosurgery based on digital image volumes- image acquisition, planning and transfer, Intraoperative Imaging- Intraoperative diagnostic imaging, transfer by matching preoperative with intraoperative images, augmented reality.

6 Hours

TEXTBOOKS:

1. **Principles of Medical Imaging -** by Kirk Shung, Michael B. Smith and Banjamin Tsui, Academic Press, 1992.
2. **Handbook of Biomedical Instrumentation** – by R.S.Khandpur, 2nd Edition, Tata McGraw Hill, 2003.
3. **Fundamentals of Medical Imaging -** by Paul Suetens, Cambridge University Press, 2002.

LASERS AND OPTICAL FIBERS IN MEDICINE

Subject Code	:	**10BM831**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

INTRODUCTION: Historical background

MEDICAL LASERS: Introduction, Laser physics-fundamentals, principles, advances, Medical Lasers-fundamentals, principles, advances. Medical Laser Systems-fundamentals, principles. Laser safety-fundamentals,

7 Hours

UNIT 2 & 3

APPLICATIONS OF LASERS IN THERAPY & DIAGNOSIS: Introduction, laser assisted diagnosis and therapy-fundamentals, interaction of laser beams and materials-principles (except 3.3.4), laser interaction with tissue-principles, laser assisted diagnostics-principles, applications of lasers in diagnosis and imaging-advances, laser surgery and therapy-principles-photothermal & photomechanical mechanisms, thermal interaction between laser and tissue-advances.

12 Hours

UNIT 4

SINGLE OPTICAL FIBERS: Introduction, historical background, optical fibers-fundamentals, light transmission in optical fibers-principles, optical properties of optical fibers-advances, fabrication of optical fibers-principles, optical fibers for UV, visible, IR light-principles, power transmission through optical fibers-principles, modified fiber ends and tips-principles, fiber lasers-advances. **7 Hours**

PART- B

UNIT 5

OPTICAL FIBER BUNDLES: Introduction, nonordered fiberoptic bundles for light guides-fundamentals & principles, ordered fiberoptic bundles for

imaging devices-fundamentals & principles, fiberscopes and endoscopes-fundamentals, fiber optic imaging systems-advances. **7 Hours**

UNIT 6

ENDOSCOPY: Introduction, endoscopic imaging systems-fundamentals, principles, advances, endoscopic diagnostics-advances, endoscopic therapy-fundamentals, endoscopic ultrasound imaging-principles. **7 Hours**

UNIT 7 & 8

CLINICAL APPLICATIONS OF FIBER OPTIC LASER SYSTEMS: Introduction, fiberoptic laser systems in cardiovascular disease (except 9.2.6), gastroenterology, gynecology, neurosurgery, oncology, ophthalmology, orthopaedics, otolaryngology (ENT), urology, flow diagram for laser angioplasty & photodynamic therapy.

12 Hours

TEXT BOOK:

1. **Lasers and Optical Fibers in Medicine -** by Abraham Katzir, Academic Press, 1998.

REFERENCE BOOK:

1. **Lasers in Medicine** - by Ronal W. Waynant, CRC Press, 2002.

BIOSENSORS AND SMART SENSORS

Subject Code	:	**10BM832**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART-A
BIOSENSORS

UNIT 1

INTRODUCTION: What is a biosensor, the first biosensors, urea biosensors, bananatrode, biosensors under different headings, scope and applications.

BIOLOGICAL ELEMENTS: Introduction, enzymes, examples of enzyme biosensors, antibodies, nucleic acids, receptors.

6 Hours

UNIT 2

IMMOBILIZATION OF BIOLOGICAL COMPONENTS: Introduction, adsorption, microencapsulation, entrapment, cross-linking, covalent bonding.

TRANSDUCERS I-ELECTROCHEMISTRY: Potentiometry: Cells and electrodes, reference electrodes, practical aspects of ion-selective electrodes, measurement and calibration, examples of ion-selective electrodes. Voltammetry: Linear sweep voltammetry, cyclic voltammetry, amperometry, kinetic and catalytic effects. Conductivity, Field effect transistors, applications of FET sensors,

7 Hours

UNIT 3

AMPEROMETRIC BIOSENSORS: Enzyme electrode, membrane limiting diffusion, glucose assay, electrochemically deposited immobilization matrix, signal enhancement, enzyme labeled linked assays, amperometric determination of bioaffinity reactions, amplification and miniaturization.

6 Hours

UNIT 4

PHOTOMETRIC ASSAY TECHNIQUES: Fluorescence and phosphorescence, indicator linked bioassay, irrational spectroscopy, the optical transducer, P^H optical probes.

OPTICAL BIOSENSORS & OTHER TECHNIQUES: Indicator labeled bioassay, chemiluminescence, bioluminescence, surface plasma resonance, piezoelectric based sensors and surface acoustic waves.

7 Hours

PART-B
SMART SENSORS

UNIT 1

BASICS OF SMART SENSORS & MICROMACHINING: Introduction, Mechanical-Electronic transitions in sensing, nature of sensors, overview of smart sensing and control systems, integration of micromachining and microelectronics, Introduction to micromachining, bulk micromachining, wafer bonding, surface micromachining.

7 Hours

UNIT 2

SENSOR INFORMATION TO MCU: Introduction, amplification and signal conditioning, separate versus integrated signal conditioning, digital conversion

6 Hours

UNIT 3

MCUS AND DSPS TO INCREASE SENSOR IQ: Introduction, MCU control, MCUs for sensor interface, DSP control, Software, tools and support, sensor integration,

6 Hours

UNIT 4

COMMUNICATIONS FOR SMART SENSORS: Introduction, definitions and background, sources and standards, automotive protocols, industrial networks, office & building automation, home automation, other aspects of network communications

CONTROL TECHNIQUES: Introduction, state machines, fuzzy logic, neural networks, combined fuzzy logic and neural networks, adaptive control, other control areas.

7 Hours

TEXT BOOKS:

1. **Biosensors: An Introduction** - by Brain R. Eggins, John Wiley Pub., 1996.
2. **Biosensors -** by Elizabeth A. H Hall - Open University press, Milton Keynes.
3. **Understanding Smart Sensors -** by Randy Frank, 2nd Edition, Artech House Publications, 2000.

REFERENCE BOOKS:

1. **Biosensors** - by A.E.G Gass, IRL Press, 1990.
2. **Smart Sensors -** by Paul W. Chapman, ISA Press.

NANOTECHNOLOGY

Subject Code	:	**10BM833**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

INTRODUCTION: Physics of solid state-structure, energy bands, localized particles

Methods of Measuring Properties: Structure, microscopy, spectroscopy,

7 Hours

UNIT 2

PROPERTIES OF INDIVIDUAL NANOPARTICLES: Metal nanoclusters, semiconducting, nanoparticles, rare gas and molecular clusters, methods of synthesis

6 Hours

UNIT 3

CARBON NANOSTRUCTURES: Carbon molecules, carbon clusters, carbon nanotubes, applications of carbon nanotubes.

7 Hours

UNIT 4

BULK NANOSTRUCTURE MATERIALS: Solid disordered nanostructures, nanostructures crystals.

6 Hours

PART- B

UNIT 5

NANOSTRUCTURED FERROMAGNETISM: Basics of ferromagnetism, effect of bulk nanostructuring of magnetic properties, dynamics of nanomagnets, nanopore containment of magnetic particles, nanocarbon, ferromagnets, giant and colossal magnetoresistance, ferro fluids.

7 Hours

UNIT 6 & 7

OPTICAL AND VIBRATIONAL SPECTROSCOPY: Infrared frequency range, luminescence, nanostructures of Zolite cages.

Quantum Wells, Wires and Dots: Preparation of quantum nanostructures, size and dimensionality effects, excitons, single-electron tunneling, applications, superconductivity.

12 Hours

UNIT 8

BIOLOGICAL MATERIALS: Biological building blocks, nucleic acids, biological nanostructures.

Nanomachines and Nanodevices: NEMS, Molecular and supramolecular switches.

7 Hours

TEXT BOOK:

1. **Introduction to Nanotechnology** - by Charles P. Poole Jr and Frank J. Owens, John Wiley, 2003.

REFERENCE BOOKS:

1. **Nanotechnology** - by Mark Ratner and Daniel Ratner, Pearson Pub, 2003.
2. **Nanotechnology** - by Gregory Timp, Springer, 1999.
3. **Bionanotechnology -** by David S. Goodsell, John Wiley & Sons, 2004.

NEURAL NETWORKS & AI IN BIOMEDICAL ENGINEERING

Subject Code	:	**10BM834**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

OVERVIEW: Early biomedical systems, medical and biological data

FOUNDATIONS OF NEURAL NETWORKS: Objectives of neural networks, biological foundations of neural networks, early neural models, precursor to current models-pattern classification, basic concepts.

6 Hours

UNIT 2

CLASSES OF NEURAL NETWORKS: Basic network properties, classification models, association models, optimization models, self organization models, radial basis functions.

CLASSIFICATION OF NETWORKS AND LEARNING: Network structure, feature selection, types of learning, interpretation of output.

6 Hours

UNIT 3

SUPERVISED LEARNING: Decision surfaces, two category separation-linearly separable sets, nonlinearly separable sets, multiple category classification problems, relationship to neural network models, comparison of methods, applications.

UNSUPERVISED LEARNING: Background, clustering, Kohonen networks & competitive learning, adaptive resonance theory, applications.

7 Hours

UNIT 4

DESIGN ISSUES: Introduction, input data types, structure of networks, implications of network structures, choice of learning algorithm.

COMPARATIVE ANALYSIS: Introduction, input data considerations, supervised learning, algorithms, unsupervised learning, network structures, interpretation of results.

VALIDATION & EVALUATION: Introduction, data checking, validation of learning algorithm, evaluation of performance.

7 Hours

PART- B

UNIT 5 & 6

FOUNDATIONS OF COMPUTER ASSISTED DECISION MAKING: Motivation, databases and medical records, mathematical modeling and simulation, pattern recognition, Bayesian analysis, decision theory, symbolic reasoning techniques,

KNOWLEDGE REPRESENTATION: Production rules, frames, databases, predicate calculus and semantic nets, temporal data representations.

KNOWLEDGE ACQUISITION: Introduction, expert input, learned knowledge, meta-knowledge, knowledge base maintenance.

14 Hours

UNIT 7 & 8

REASONING METHODOLOGIES: Introduction, problem representation, blind searching, ordered search, AND/OR trees, searching game trees, searching graphs, rule base searching, higher-level reasoning methodologies.

VALIDATION AND EVALUATION: Introduction, algorithm evaluation, knowledge base evaluation, system evaluation.

12 Hours

TEXT BOOK:

1. **Neural Networks and Artificial Intelligence for Biomedical Engineering by** - Donna L. Hudson and Maurice E. Cohen, IEEE Press, 2000.

REFERENCE BOOKS:

1. **Artificial Neural Networks -** Robert J. Schalkoff, Tata McGraw Hill, 1997.
2. **Introduction Artificial Neural System** - By Jacek M. Zurada, Jaico Pub. House, 2004.
3. **Artificial Neural Networks** - B. Yegnanarayan –PHI 1999.
4. **Neural Networks a comprehensive foundation -** Simon Haykin –, McMillan College Public Company, New York 1994

HARDWARE SOFTWARE CO-DESIGN

Subject Code	:	**10BM835**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART - A

Unit-I

Introduction

Motivation hardware & software co-design, system design consideration, research scope & overviews

Hardware Software back ground

Embedded systems, models of design representation, the virtual machine hierarchy, the performance modeling, Hardware Software development.

(6 Hrs)

Unit-II

Hardware Software Co-Design Research

An informal view of co-design, Hardware Software tradeoffs, crosses fertilization, typical co-design process, co-design environments, limitation of existing approaches, ADEPT modeling environment. **(6 Hrs)**

Unit-III

Co-design Concepts

Functions, functional decomposition, virtual machines, Hardware Software partitioning, Hardware Software partitions, Hardware Software alterations, Hardware Software trade offs, co-design. **(7 Hrs)**

Unit-IV

Methodology for Co-Design

Amount of unification, general consideration & basic philosophies, a framework for co-design, an example.**(7 Hrs)**

PART - B

Unit-V

Unified Representation for Hardware & Software

Benefits of unified representation, modeling concepts, a unified representation. **(6 Hrs)**

Unit-VI

An Abstract Hardware & Software Model

Requirement & applications of the models, models of Hardware Software system, an abstract Hardware Software models, generality of the model.

(7 Hrs)

Unit-VII

Performance Evaluation

Application of t he abstract Hardware & Software model, examples of performance evaluation. **(7 Hrs)**

Unit-VIII

Object Oriented Techniques in Hardware Design

Motivation for object oriented technique, data types, modeling hardware components as classes, designing specialized components, data decomposition, Processor example. **(6 Hrs)**

Text Book:

. Sanjaya Kumar, James H. Ayler "The Co-design of Embedded Systems: A Unified Hardware Software Representation", Kluwer Academic Publisher, 2002 .

REFERENCE BOOKS:

1. Peter Mwrwedel, "Embedded System Design", by Springer P.O. Box 17, 3300 AA Dordrecht, The Netherlands
2. R. Gupta, "Co-synthesis of Hardware and Software for Embedded Systems", Kluwer 1995.
3. S. Allworth, "Introduction to Real-time Software Design",Springer-Verlag, 1984.
4. C. M. Krishna, K. Shin, "Real-time Systems", Mc-Graw Hill, 1997
5. Peter Marwedel, G. Goosens, "Code Generation for Embedded Processors", Kluwer Academic Publishers, 1995.

DISTRIBUTED SENSOR NETWORKS

Subject Code	:	**10BM836**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

INTRODUCTION: Challenges, Sensor Network Architectures, Sensor Node Deployment, Energy-Efficient Information Processing, Data Dissemination, Self-Configuration Methods.

6 Hours

UNIT 2

SENSOR NODE DEPLOYMENT: Sensor Node Detection Models, Virtual Force Algorithm, Virtual Forces, Overlapped Sensor Detection Areas, Energy Constraint on the VFA Algorithm, Procedural Description VFA Simulation

Results Case Studies Uncertainty Modeling, Modeling of Non-Deterministic Placement Uncertainty-Aware Placement Algorithms Procedural Description Simulation Results, Case Study.

7 Hours

UNIT 3

ENERGY-AWARE TARGET LOCALIZATION: Detection Probability Table Score-Based Ranking Selection of Sensors to Query 3Energy Evaluation Model Primitive Energy Evaluation Model Refined Energy Evaluation Model Procedural Description Simulation Results, Case Study.

6 Hours

UNIT 4

ENERGY-EFFICIENT SELF-ORGANIZATION: Introduction Relevant Prior Outline of SCARE Basic Scheme Network Partitioning Problem Details of SCARE. Time Relationships Ensuring Network Connectivity Message Complexity Optimal Centralized Algorithm overage Comparisons Performance Evaluation Simulation Methodology Simulation Results Effect of Location Estimation Error Conclusion.

7 Hours

PART- B

UNIT 5

ENERGY-AWARE INFORMATION DISSEMINATION: Introduction Related Prior Work Location-Aided Flooding Modified Flooding Location Information Virtual Grids Packet Header Format LAF Node Types Information Dissemination using LAF Resource Management in LAF Completeness of the Data Dissemination Procedure Analysis Errors in Location Estimates Performance Evaluation Energy Model Simulation Model Conclusion.

7 Hours

UNIT 6 & 7

OPTIMAL ENERGY EQUIVALENCE ROUTING IN WIRELESS SENSOR NETWORKS: Related Work Networking Characteristics of WSNWSN Protocol Stack Classification of Energy Equivalence Routing Energy Saving Routing Protocols Comparison to Flooding Family Comparison to Sensor-Centric Paradigm Data-Centric Routing and Directed Diffusion Energy Equivalence Approach Basics Neighbor Switching Path Rerouting EER Algorithms Assumptions Procedures and Functions Formats of Packets EER Common Entry Algorithm Common Neighbor Switching EER Algorithm (CNS) Shortest Rerouting EER Algorithm (EERS) Longest

Rerouting EER Algorithm (EERL) Simulation Analysis Basic Procedure Lifetime and End Condition Density of Network Conclusion.

12 Hours

UNIT 8

TIME SYNCHRONIZATION IN WIRELESS SENSOR NETWORKS: Introduction Synchronized Time in a WSN Traditional Network Time Synchronization Energy Awareness Infrastructure Supported Vs. Ad Hoc Static Topology vs. Dynamics Connected vs. Disconnected Design Principles for WSN Time Synchronization Computer Clocks Clock Synchronization in DSN Synchronization Algorithm The Idea Time Transformation Message Delay Time Stamp Calculation Improvements.

07 Hours

TEXT BOOK:

1. **Scalable Infrastructure for Distributed Sensor Networks** - by Krishnendu Chakrabarty and S. S. Iyengar, Springer-Verlag London Limited, 2005.

REFERENCE BOOK:

1. **Distributed Sensor Networks** - A multi-agent perspective by Victor L, Charles Oitiz and Tambe, Kluwer Academic Pub, 2003.

BIO-MEMS

Subject Code	:	**10BM841**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

OVERVIEW OF MEMS AND MICROSYSTEMS: MEMS and Microsystems, Typical MEMS and Microsystems products, Evolution of Micro fabrications, Microsystems and Microelectronics, The Multidisciplinary Nature of Microsystems Design and Manufacture, Microsystems and Miniaturization, Applications of Microsystems in health care industry, BioMEMS, Fabrication, Structure, Driving force behind

biomedical applications- Diagnostics, Drug delivery systems, Tissue engineering, Minimally invasive procedures, Biocompatibility.

06 Hours

UNIT 2

WORKING PRINCIPLES OF MICROSYSTEMS: Introduction, Micro-sensors, Microactuation, MEMS with Microactuators, Microaccelerometers, Microfluidics.

07 Hours

UNIT 3

ENGG SCIENCE FOR MICROSYSTEM DESIGN & FABRICATION: Introduction, Atomic Structure of Matter *(Review only)* , Ions and Ionization, Molecular Theory of Matter and Intermolecular forces, Doping of Semiconductors *(Review only)*, The Diffusion Process, Plasma Physics, Electrochemistry, Quantum Physics.

DETECTION & MEASUREMENT SCHEMES: Electrochemical (EC) detection, Chemiluminescence & Bioluminescence, Fluorescence, Confocal laser microscopy, Interferometry, Raman Microscopy & Surface-enhanced resonance Raman scattering, TEM & SEM.

07 Hours

UNIT 4

ENGINEERING MECHANICS FOR MICRO-SYSTEMS DESIGN: Introduction, Static Bending of thin plates- Bending of circular plates & square plates with all edges fixed, Mechanical vibration- General formulation, Resonant vibration, Microaccelerometers, Design theory of microaccelerometers, Thermo mechanics- Thermal effects on mechanical strength of materials, Creep deformation, Thermal stresses *(excluding thermal stresses in thin plates and beams)*, Thin-Film Mechanics, Overview of Finite Element Stress Analysis.

06 Hours

PART- B

UNIT 5

SCALING LAWS IN MINIATURIZATION: Introduction to Scaling, Scaling in Geometry, Scaling in Rigid Body Dynamics, Scaling In Electrostatic Forces, Scaling in Electromagnetic Forces, Scaling in Electricity, Scaling in Fluid Mechanics, Scaling in Heat Transfer.

06 Hours

UNIT 6

MATERIALS FOR MEMS AND MICROSYSTEMS: Introduction, Substrates and Wafers, Active Substrate Materials, Silicon as a Substrate Material- The ideal substrate for MEMS, single-crystal silicon & wafers, crystal structure, mechanical properties, Silicon Compounds- Silicon dioxide, silicon carbide, silicon nitride, polycrystalline silicon, Silicon Piezoresistors, Gallium Arsenide, Quartz, Piezoelectric Crystals, Polymers, Packaging Materials.

07 Hours

UNIT 7

MICROSYSTEMS FABRICATION & DESIGN: Introduction, Photolithography, Ion implantation, Diffusion, Oxidation- Thermal oxidation, Silicon dioxide, Chemical vapor deposition- Working principle, Chemical reactions in CVD, Enhanced CVD, Etching- Chemical & Plasma etching.

The LIGA Process- General description of the LIGA process, Microsystem Design- Design considerations

07 Hours

UNIT 8

EMERGING BIOMEMS TECHNOLOGY: Introduction, Minimally invasive surgery, Point-of-care Clinical Diagnosis, Syncope assessment, Continuous glucose monitoring, Micordroplet analysis, Endoscopy- Introduction, Micro-optical scanner, Neurosciences- Introduction, Micro-probes, Ophthalmology- Introduction, Retinal implants, Tissue Engineering- Introduction, Cell patterning & bioreactors, Cell based biosensors, Homeland security.

06 Hours

TEXT BOOKS:

1. **MEMS & Microsystems: Design and Manufacture -** by Tai-Ran Hsu, Tata McGraw Hill, 2002.
2. **Fundamentals of BioMEMS and Medical Micro devices -** by Steven S. Saliterman, Wiley-Interscience, 2006.

BIOLOGICAL CONTROL SYSTEMS AND MODELLING

Subject Code	:	**10BM842**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

AN INTRODUCTION TO PHYSIOLOGICAL CONTROL SYSTEM: Differences between the technological and Physiological control system, Regulation of electrolyte concentrations, Regulation of Electrolyte concentrations, Regulation of Acid-Base Balance, Regulation of Red blood cell Production, Regulation of Arterial Pressure, Regulation of blood volume, regulation of Respiration, reflex functions of the nervous system, regulation of body temperature, regulation of blood glucose.

07 Hours

UNIT 2

STATIC CHARACTERISTICS OF TECHNOLOGICAL AND PHYSIOLOGICAL CONTROL SYSTEMS: Introduction, Determination of open-loop gain. Method 1, Application of Method 1 to a physiological system, Determination of open loop gain Method 2, Application of Method 2 to a physiological system, determination of open loop gain Method 3, Application of method 3 to a Physiological system.

07 Hours

UNIT 3 & 4

THE APPLICATION OF FREQUENCY RESPONSE ANALYSIS TO PHYSIOLOGICAL SYSTEM: Frequency analysis of the cerebral Ischemic pressure response, The papillary Light reflex.

DYNAMIC SYSTEMS AND THEIR CONTROL: A Qualitative Introduction: Introduction, some systems definition , man machine example ,the pupil control systems the generic structure of control systems ,open and closed loop systems –closed loop instability , automatic aperture control in cameras – an engineering analog of the pupil control system.

12 Hours

PART- B

UNIT 5

MODELS OF NEURONS: Basic biophysics tools, equilibrium in one ion system, Donan equilibrium, space charge neutrality, voltage across membrane with non-zero permeability for all ions, Goldman equation, ion pumps, membrane potentials for biological membranes, Hodgin-Huxley model, iron-wire model.

7 Hours

UNIT 6

MODEL FOR NEUROMUSCULAR SYSTEM: Stretch reflex, antagonist muscle, two control mechanics, golgi tendon organs, experimental validation of the model, Parkinson's syndrome

7 Hours

UNIT 7

MODEL OF THERMOREGULATION SYSTEM: Model of the plant, controlled model, model validation & variation.

6 Hours

UNIT 8

CARDIOPULMONARY SYSTEM MODEL: Myocardial model, distributed parameter model, model performance, respiratory system model.

6 Hours

TEXT BOOKS:

1. **The Application of control theory to Physiological systems** - by Howard T. Milhorn, Jr.
2. **Biological control systems analysis** - by Jhon H. Milsum, Mc Graw Hill Book company.
3. **Bioengineering** - by A. Terry Bahill, Prentice Hall
4. **Handbook of Biomedical Engineering** - by Jacob Kline, Academic Press, 1988.

PICTURE ARCHIVING & COMMUNICATION SYSTEMS

Subject Code	:	**10BM843**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

INTRODUCTION TO PACS: Interpretation Workstations, Strategic Plan, PACS Impact Analysis, Financial Analysis, Technical Requirements, Project Planning and Evaluation, Contract Negotiations, DICOM Standard, Queuing Perspective, Quality Assurance, HL7, IHE.

7 Hours

UNIT 2

COMPUTER FUNDAMENTALS: Digital Imaging Fundamentals, Image Acquisition, Image Processing Algorithms, Quality Assurance , Future trends, Image Compression , Compression Applications to medical imaging.

7 Hours

UNIT 3

PACS ARCHITECTURE: Centralized model, Medical-legal Archive, Networking Fundamentals, Factors to consider in building a network**.**

6 Hours

UNIT 4

SERVERS AND OPERATING SYSTEMS: Disaster recovery, Storage and enterprise archiving, RAID, Direct attached storage, Storage area network, Hierarchical storage.

6 Hours

PART- B

UNIT 5

IMAGE DISPLAYS: Digital Mammography, Web distribution.

7 Hours

UNIT 6

PACS WORKSTATION SOFTWARE: Role of Workstation, User Interface, Future of Workstations, Breast Imaging, Cad, CASS.

6 Hours

UNIT 7

3 DIMENSIONAL IMAGING IN RADIOLOGY: Voice recognition, Order entry in Radiology.

6 Hours

UNIT 8

TELE RADIOLOGY: Image Acquisition and Image Digitization, Image Transmission, Applications of Tele Radiology, Legal and Socioeconomic issues ACR Standards.

7 Hours

TEXT BOOK:

1. **PACS – A guide to the Digital Revolution**- Keith Dreyer – Springer, 2006

REFERENCE BOOK:

1. **PACS in Medicine** by H.K.Huang, Wiley-IEEE, 2004

PATTERN RECOGNITION IN MEDICINE

Subject Code	:	**10BM844**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1 & 2

INTRODUCTION: Machine perception, an example, pattern recognition system, the design cycle, Introduction, Bayes decision theory-continues

features, Minimum error rate classification, Classifiers, Discriminants and decision surfaces, Normal density, Discriminant functions for the normal density, Base decision theory discrete features, compound Bayes Decision Theory and context.

12 Hours

UNIT 3

PARAMETER ESTIMATION AND SUPERVISED LEARNING: Introduction, Maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation, sufficient statistics and exponential family, problem of dimensionality.

7 Hours

UNIT 4

NON-PARAMETRIC TECHNIQUES: Introduction, density estimation, Parzen windows, nearest neighbor estimation, the nearest neighbor rule, Matrix and nearest neighbor classification,

7 Hours

PART- B

UNIT 5 & 6

NON-PARAMETRIC TECHNIQUES: Fuzzy classifications, relaxation methods, approximation by series expansion.

LINEAR DISCRIMINANT FUNCTIONS: Introduction, linear Discriminant functions and decision surfaces, Generalized linear discriminant functions, the two category linearly separable case, minimizing the perceptron criterion function, relaxation procedures, non-separable behavior, minimum squared error procedures.

14 Hours

UNIT 7 & 8

UNSUPERVISED LEARNING AND CLUSTERING: Introduction, Mixture densities and identifiability, maximum likelihood estimates, application to normal mixtures, unsupervised Bayesian learning, data description and clustering, criterion functions for clustering, iterative optimization, hierarchical clustering, The problem of validity, On line clustering, graph theoretic methods, Component analysis low dimensional representations and multidimensional scaling.

12 Hours

TEXT BOOK:

1. **Pattern Classification** - by Richard. O. Duda, Peter E. Hart and David G. Stork, 2nd Edition, John Wiley Interscience.

DIGITAL SYSTEMS USING VERILOG

Subject Code	:	**10BM845**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

INTRODUCTION TO LOGIC CIRCUITS: Variables and functions, Inversions, truth tables, logic gates and networks, Boolean algebra, synthesis using AND, OR, and NOT gates, NAND and NOR logic Networks, Design Examples.

7 Hours

UNIT 2 & 3

INTRODUCTION TO CAD TOOLS, INTRODUCTION TO VERILOG IMPLEMENTATION TECHNOLOGY: Transistor switches, NMOS logic gates, CMOS logic gates, Negative logic system, standard chips, and programmable logic devices: PAL, PLA, voltage levels in logic gates, noise margin, fan-in and fan-out in logic gates, transmission gates, implementation details for SPLDs, CPLDs and FPGAs.

12 Hours

UNIT 4

IMPLEMENTATION OF LOGIC FUNCTIONS AND ARITHMETIC CIRCUITS: K-map, minimization of POS forms, multiple-output circuits, multilevel synthesis, analysis of multilevel circuits, CAD tools, positional number representation, addition of unsigned numbers, signed numbers, fast adders.

7 Hours

PART- B

UNIT 5

COMBINATIONAL CIRCUIT BUILDING BLOCKS: Multiplexers, decoders, encoders, code converters, arithmetic comparison circuits, Verilog for combinational circuits.

6 Hours

UNIT 6 & 7

FLIP-FLOPS, REGISTERS, COUNTERS AND A SIMPLE PROCESSOR: Basic latch, Gated SR latch, Gated D latch, master-slave and edge triggered d flip-flops, T flip-flops, JK flip-flops, registers, counters; reset synchronization, different counters, using storage elements with CAD tools, using registers and counters with CAD tools, design examples.

SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS: Basic design steps, mealy state model, design of finite machines using CAD tools, serial adder, state minimization,

13 Hours

UNIT 8

SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS: Design of a counter using the sequential circuit approach, FSM as an Arbiter Circuit, analysis of synchronous sequential circuits, asynchronous behavior, analysis and synthesis of asynchronous circuits, state reduction, state assignment, vending machine controller.

7 Hours

TEXT BOOKS:

1. **Fundamentals of Digital Logic with Verilog Design -** by, Stephen Brown & Zvonko Vranesic, 4th Reprint, Tata McGraw Hill, 2004.

REAL TIME SYSTEMS

Subject Code	:	**10BM846**	**IA Marks**	:	25
No of Lecture Hours/week	:	04	Exam Hours	:	03
Total no of Lecture Hrs	:	52	Exam Marks	:	100

PART- A

UNIT 1

BASIC REAL TIME CONCEPTS: Basic computer architecture , Real Time definitions, Synchronous and Asynchronous Events, Real time Design Issues, CPU, Memories , Input and Output , Other Devices

6 Hours

UNIT 2

LANGUAGE ISSUES – SOFTWARE LIFE CYCLES: Language features, Basic, Fortran, C,C++ , Pascal, Modula2,Ada, Assembly languages, Code Generation, Scheduling Analysis , Phases of software cycle, Spiral Model, Standards DOD-STD-2167A,ISO 9000,IEEE 830.

7 Hours

UNIT 3

REAL TIME SPECIFICATIONS AND DESIGN TECHNIQUES: Natural Languages, Flow charts ,Structure Charts, Data Flow diagrams, Petri Nets, State Charts, Polled Loop Systems , Phase. State Driven Codes, Interrupt Driven Systems, Fore ground Background systems , Full features Real Time System

7 Hours

UNIT 4

INTER STACK COMMUNICATION – REAL TIME MEMORY MANAGEMENT: Buffering data, Mail boxes , Critical Regions, Semaphores, Event Flags and Signals, Deadlock, Process Stack Management, Dynamic Allocation, Static Schemes.

6 Hours

PART- B

UNIT 5

SYSTEM PERFORMANCE ANALYSIS AND OPTIMIZATION: Response Time Calculations, Interrupt Latency, Time Loading and its Measurement, Reducing Response Time and Time Loading, Analysis of Memory Requirements, Reducing Memory Loading , I/O Performance

6 Hours

UNIT 6

QUEUING MODELS: Probability Functions, Continuous, Discrete, Basic Buffer Size Calculation, Classical Queuing theory, Little's Law, Erlang's formula.

6 Hours

UNIT 7

RELIABILITY TESTING- MULTIPROCESSING SYSTEMS: Faults, Failures, Bugs, Reliability , Testing , Fault Tolerance, Classification of Architecture, Distributed Systems, Non- Von Neuman Architecture

7 Hours

UNIT 8

HARDWARE / SOFTWARE INTEGRATION- REAL TIME APPLICATIONS: Goals of Real Time System Integration, Tools, Methodology, Uncertainty principle, Real Time systems as Complex Systems, Real Time Databases, Real Time Image Processing, Real Time Unix

7 Hours

TEXT BOOK:

Real-Time Systems Design & Analysis - by Philip A. Laplante, PHI.

REFERENCE BOOK:

Real-Time Systems – Krishna and Lin, TMH.

7.