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

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 SR 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.

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.

FIELD THEORY
(Common to EC/TC/ML/EE)

Sub Code	**:**	**10ES36**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total Hrs.	**:**	**52**	**Exam Marks**	**:**	**100**

PART – A

UNIT 1:

a. Coulomb's Law and electric field intensity: Experimental law of Coulomb, Electric field intensity, Field due to continuous volume charge distribution, Field of a line charge.

b. **Electric flux density, Gauss' law and divergence:** Electric flux density, Gauss' law, Divergence, Maxwell's First equation(Electrostatics), vector operator □ and divergence theorem.

UNIT 2:

a. **Energy and potential :** Energy expended in moving a point charge in an electric field, The line integral, Definition of potential difference and Potential, The potential field of a point charge and system of charges, Potential gradient , Energy density in an electrostatic field.

b. Conductors, dielectrics and capacitance: Current and current density, Continuity of current, metallic conductors, Conductor properties and boundary conditions, boundary conditions for perfect Dielectrics, capacitance and examples.

UNIT 3:

Poisson's and Laplace's equations: Derivations of Poisson's and Laplace's Equations, Uniqueness theorem, Examples of the solutions of Laplace's and Poisson's equations.

UNIT 4:

The steady magnetic field: Biot-Savart law, Ampere's circuital law, Curl, Stokes' theorem, magnetic flux and flux density, scalar and Vector magnetic potentials.

PART – B

UNIT 5:

a. Magnetic forces: Force on a moving charge and differential current element, Force between differential current elements, Force and torque on a closed circuit.

b. Magnetic materials and inductance: Magnetization and permeability, Magnetic boundary conditions, Magnetic circuit, Potential energy and forces on magnetic materials, Inductance and Mutual Inductance.

UNIT 6:

Time varying fields and Maxwell's equations: Faraday's law, displacement current, Maxwell's equation in point and Integral form, retarded potentials.

UNIT 7:

Uniform plane wave: Wave propagation in free space and dielectrics, Poynting's theorem and wave power, propagation in good conductors – (skin effect).

UNIT 8:

Plane waves at boundaries and in dispersive media: Reflection of uniform plane waves at normal incidence, SWR, Plane wave propagation in general directions.

TEXT BOOK:

1. "Engineering Electromagnetics", William H Hayt Jr. and John A Buck**,** Tata McGraw-Hill, 7th edition, 2006

REFERENCE BOOKS:

1. **"Electromagnetics with Applications",** John Krauss and Daniel A Fleisch, McGraw-Hill, 5th edition, 1999
2. **"Electromagnetic Waves And Radiating Systems,"** Edward C. Jordan and Keith G Balmain, Prentice – Hall of India / Pearson Education, 2nd edition, 1968.Reprint 2002
3. **"Field and Wave Electromagnetics",** David K Cheng, Pearson

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

CODE: 10 MAT 41 **IA Marks: 25**
Hrs/Week: 04 **Exam Hrs: 03**
Total Hrs: 52 **Exam**
Marks:100

PART-A

Unit-I: 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-II: 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-III: 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-IV: 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-V: 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-VI: 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-VII: 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-VIII: 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 feedback 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.

SIGNALS & SYSTEMS
(Common to EC/TC/IT/ML)

Sub Code	**:**	**10EC44**	**IA Marks**	**:**	**25**
Hrs/ Week	**:**	**04**	**Exam Hours**	**:**	**03**
Total 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.

UNIT 2:

Time-domain representations for LTI systems – 1: Convolution, impulse response representation, Convolution Sum and Convolution Integral.

UNIT 3:

Time-domain representations for LTI systems – 2: properties of impulse

response representation, Differential and difference equation Representations, Block diagram representations.

UNIT 4:
Fourier representation for signals – 1: Introduction, Discrete time and continuous time Fourier series (derivation of series excluded) and their properties .

PART – B

UNIT 5:
Fourier representation for signals – 2: Discrete and continuous Fourier transforms(derivations of transforms are excluded) and their properties.

UNIT 6:
Applications of Fourier representations: Introduction, Frequency response of LTI systems, Fourier transform representation of periodic signals, Fourier transform representation of discrete time signals

UNIT 7:
Z-Transforms – 1: Introduction, Z – transform, properties of ROC, properties of Z – transforms, inversion of Z – transforms.

UNIT 8:
Z-transforms – 2: Transform analysis of LTI Systems, unilateral Z- Transform and its application to solve difference equations.

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

REFERENCE BOOKS:

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

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**

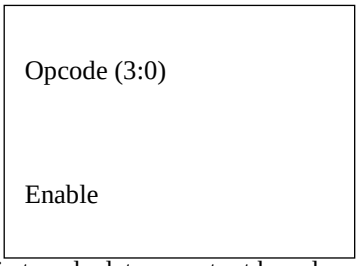
Note: Programming can be done using any compiler. Download the programs on a FPGA/CPLD boards such as Apex/Acex/Max/Spartan/Sinfi/TK Base or equivalent and performance testing may be done using 32 channel pattern generator and logic analyzer apart from verification by simulation with tools such as Altera/Modelsim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

Subject Code	:	**10AL51**	**IA Marks**	:	25
No. of Lecture Hrs./ 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 of profession – Management & 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) – Decision making – Importance of planning – steps in planning & 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 of control – MBO and MBE (Meaning Only) Nature and importance of staffing–Process of Selection & Recruitment (in brief).

6 Hours

UNIT - 4

DIRECTING & 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 a 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, Intrapreneur - 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 INDUSTRIES: Definition; Characteristics; Need and rationale; Objectives; Scope; role of SSI in Economic Development. Advantages of SSI Steps to start and SSI – Government policy towards SSI; Different Policies of SSI; Government Support for SSI during 5 year 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 Only)

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 & 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** – Poornima.M.Charantimath – Small Business Enterprises – Pearson Education – 2006 (2 & 4).

REFERENCE BOOKS:

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

COMMUNICATION SYSTEMS

Subject Code	:	**10ML52**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNITS - 1 & 2

AMPLITUDE MODULATION: Time-Domain Description, Frequency domain description, Generation of AM waves, Detection of AM waves, AM/DSB, Time-Domain Description, Frequency domain description, Generation of DSBSC waves, Coherent Detection of DSBSC Modulated waves. Costas loop, Quadrature Carrier multiplexing, AM-SSB/SC generation, Frequency-Domain Description, Frequency discrimination method for generation an SSB Modulated wave, time domain description, phase discrimination method for generating an SSB modulated wave, Demodulation of SSB waves, Comparison of amplitude modulation techniques, frequency translation, FDM.

12 Hours

UNIT - 3

ANGLE MODULATION: Basic Concepts, Frequency Modulation, Spectrum Analysis Of sinusoidal FM wave, NBFM, WBFM, Constant Average power, Transmission bandwidth of FM waves, Generation of FM waves, Direct FM, demodulation of FM waves, frequency discriminator, ZCD, phase locked loop (1^{st} order) of AM and FM.

7 Hours

UNIT - 4

NOISE IN ANALOG MODULATION: Signal to noise Ratios, AM Receiver Model, Signal to noise ratios for Coherent Reception, DSBSC Receiver, SSB Receiver, Noise in AM Receivers using envelope Detection, Threshold effect, FM Receiver Model, Noise in FM Reception, FM Threshold effect, Pre-Emphasis and De-Emphasis in FM.

7 Hours

PART - B

UNITS - 5 & 6

PULSE MODULATION: Sampling theorem for low pass and band pass signal, statement and proof, PAM, Channel bandwidth for a PAM signal, Natural Sampling, Flat-Top sampling, Signal recovery though Holding, Quantization of Signals, Quantization error, PCM, Electrical representations of Binary digits, The PCM Systems, DPCM, Delta Modulation, ADM.

12 Hours

UNITS - 7 & 8

DIGITAL MODULATION: Introduction, Binary Shift Keying, BFSK, Spectrum, Receiver for BFSK, Geometrical Representation of Orthogonal BFSK, DPSK, QPSK, Type D flip-flop, QPSK Transmitter, Non-offset QPSK, The QPSK receiver, Signal space representation, line codes, TDM.

14 Hours

TEXT BOOKS:

1. **Analog and Digital communication-**Simon Haykin, John Willey.
2. **Principles of communication systems 3rd edition**- Taub and Schilling, TMH.

REFERENCE BOOKS:

1. **Electronic Communication Systems**-2nd Edition, Blake, Thomson
2. **Communication Systems**- Sam Shanmugam, Jhon wiley
3. **Contemporary Communication Systems using Matlab,** 2nd edition Cengage Learning-Proakis.
4. **Electronic Communication Systems**- George Kennedy

MEDICAL SCIENCE

Subject Code	:	**10ML53**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: HOMEOSTASIS, TISSUE, CARTILAGE: 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: Neurons: Properties of neurons, Cell bodies, Axon and Dendrites, Types of nerves, Synapse and neurotransmitters, neuromuscular junction. Central nervous system: neuroglia, 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, motor nerve tracts, spinal nerves: nerve roots, plexuses, cranial nerves. Autonomic nervous system (in brief)- functions and effects.

7 Hours

UNIT - 3

CARDIOVASCULAR SYSTEM: Introduction, Blood vessels- Arteries and Arterioles, Veins and Venules, capillaries and sinusoids, 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, circulation of blood to head and neck, circulation of blood to upper limb, portal circulation.

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, joints of hands and fingers, Hip joint, Knee joint, ankle joint, joints of foot and toes.

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

TEXT BOOK:

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.
3. **Human Physiology**- **From Cells to Systems** - by Lauralee Sherwood, 6th Edition, Brooks Cole Publication.

BIOMEDICAL INSTRUMENTATION

Subject Code	:	**10ML54**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

FUNDAMENTAL CONCEPTS: Sources of biomedical signals, Basic medical instrumentation system, performance requirements of medical instrumentation systems, PC based medical instruments, General constraints in design of medical instrumentation systems. 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.

7 Hours

UNIT - 2

PHYSIOLOGICAL TRANSDUCERS: Classification of transducers, performance characteristics of transducers, displacement, positioning and motion transducers, pressure transducers, transducers for body temperature

measurement, photoelectric transducers, optical fiber sensor, biosensor and smart sensor.

6 Hours

UNIT - 3

BIOMEDICAL RECORDERS: Electrocardiograph, vectorcardiograph, phonocardiograph, Electroencephalograph, Electromyograph, other biomedical recorders and biofeedback instruments.

6 Hours

UNIT - 4

PATIENT MONITORING SYSTEMS: System concepts, cardiac monitor, central monitor, measurement of heart rate, measurement of pulse rate, blood pressure measurement, measurement of temperature, measurement of respiratory rate, catheterization, laboratory instrumentation.

7 Hours

PART - B

UNIT - 5 & 6

OXIMETERS: Oximetry, ear oximeter, pulse oximeter, skin reflectance oximeter and intravascular oximeter. Blood Flow Meters & Cardiac Output Measurement. Electromagnetic blood flow meters, Ultrasonic blood flow meters, NMR blood flow meters, Laser Doppler blood flow meters. Indicator dilution method, Dye dilution method, Thermal dilution techniques, Measurement of continuous cardiac output derived from the aortic pressure waveform, Impedance technique. Pulmonary Function Analyzer: Pulmonary function measurement, Spirometry, Pneumotachometer, Measurement of volume by Nitrogen washout technique.

14 Hours

UNIT - 7

CARDIAC PACEMAKERS AND DEFIBRILLATORS: Need for cardiac pacemaker, External pacemaker, Implantable pacemaker, Types of Implantable pacemakers, Programmable pacemaker, Rate-responsive pacemakers.

6 Hours

UNIT - 8

PATIENT SAFETY: Electric shock hazards, Leakage currents, safety codes and analyzer. Biomedical Telemetry & Telemedicine: Wireless telemetry, single channel telemetry, multi-patient telemetry, implantable telemetry and telemedicine.

6 Hours

TEXT BOOK:

1. **Handbook of Biomedical Instrumentation**– by R.S.Khandpur, 2nd Edition, Tata McGraw Hill, 2003

REFERENCE BOOK:

1. **BIOMEDICAL TRANSDUCERS AND INSTRUMENTS**– by Tatsuo Togawa, Toshiyo Tamura and P. Ake Oberg, CRC Press, 1997.
2. **Biomedical Instrumentation and Measurement** – by Leslie Cromwell, Fred J Weibell and Erich A. Pfeiffer, Prentice-Hall India Pvt. Ltd.

PHYSIOLOGICAL CONTROL SYSTEMS

Subject Code	:	**10ML55**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART A

Unit 1

INTRODUCTION TO PHYSIOLOGICAL CONTROL SYSTEMS

Preliminary considerations, Historical Background, System analysis, Physiological systems-A simple example, Differences between engineering & physiological control systems, The science of modeling, problems

6 hours

Unit 2

MATHEMATICAL MODELING

Generalized system properties, Models with combination of system elements, Linear models of Physiological systems, Distributed Vs Lumped parameter models, Linear systems & superposition principle, Laplace transforms & transfer functions, Impulse response & linear convolution, state space analysis, Computer analysis & simulation – Matlab & Simulink, Problems

6 hours

Unit 3

STATIC ANALYSIS OF PHYSIOLOGICAL SYSTEMS

introduction, open loop Vs closed loop, determination of steady state operating point, steady state analysis using simulink, regulation of cardiac output, regulation of glucose, chemical regulation of ventilation, problems

7 hours

Unit 4

TIME DOMAIN ANALYSIS OF LINEAR CONTROL SYSTEMS

Linearized respiratory mechanics, open & closed loop transient responses for 1^{st} & 2^{nd} order models, Impulse & step response descriptors, transient response analysis using matlab, SIMULINK applications, Problems

7 hours

PART B

Unit 5

FREQUENCY DOMAIN ANALYSIS OF LINEAR CONTROL SYSTEMS

Steady state responses to sinusoidal inputs, Graphical representation of frequency response, Frequency response analysis using matlab, frequency response model of a circulatory control, frequency response of glucose-insulin regulation, problems

6 hours

Unit 6

STABILITY ANALYSIS – LINEAR APPROACHES

stability & transient responses, root locus plots, routh-hurwitz stability criterion, nyquist stability for stability, relative stability, stability analysis of pupillary light reflexes, model of chyne-stokes breathing, problems

6 hours

Unit 7

IDENTIFICATION OF PHYSIOLOGICAL CONTROL SYSTEMS

basic problems in physiological system analysis, non-parametric & parametric identification methods, Problems in parameter estimation, Identification of closed loop systems, identification under closed-loop conditions, problems

7 hours

Unit 8

OPTIMIZATION IN PHYSIOLOGICAL CONTROL

optimization in systems with negative feedback, single parameter optimization-Control of respiratory frequency, Constrained optimization-airflow pattern regulation, control of aortic pulse, Adaptive control of physiological variables, problems 7 hours

Text Books

'Physiological Control Systems – Analysis, Simulation & Estimation', by Michael C Khoo, Wiley IEEE press

DIGITAL SIGNAL PROCESSING

Subject Code	:	**10ML56**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

Review of discrete signal and systems, DFT, IDFT, Properties of DFT

7 Hours

UNIT - 2

COMPUTATION OF FFT: Radix-2 Decimation in Time FFT, Radix-2 Decimation in Frequency FFT, Inverse FFT Algorithm.

6 Hours

UNIT – 3

DIGITAL FILTER STRUCTURES: Basic IIR Filter Structures: Direct forms (I & II), cascade and parallel realizations, Basic FIR filter structures-Direct & cascade form structure. **6 Hours**

UNIT – 4

FIR FILTERS: Properties, Filter Design using Windows (Rectangular, Hamming, Hanning and Kaiser Window), Filter design using Frequency sampling technique.

7 Hours

PART - B

UNIT – 5 &6

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

14 Hours

UNIT – 7

MULTIRATE DIGITAL SIGNAL PROCESSING: Introduction, Decimation by a factor D, Interpolation by a factor I, Applications of multirate signal processing: Interfacing of digital systems with different sampling rate, Implementation of Digital filter banks, DFT filter banks, Quadrature Mirror filter banks.

6 Hours

UNIT- 8

ADAPTIVE FILTERS: Adaptive filters, LMS adaptive algorithms, Recursive least square algorithms, Applications of Adaptive filters.

6Hours

TEXT BOOKS:

1.Digital Signal Processing- PROAKIS and MANOLAKIS, 3rd Edition, Prentice Hall of India / Pearson.

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-** S K MITRA, 4th Edition, Mc Graw-Hill.
2. **Theory and Application of DSP-** RABINAR L R and GOLD B, Prentice Hall of India, 1999.
3. **Introduction to digital signal processing-** JOHNSON, Prentice Hall of India 1999.
4. **Digital Signal Processing-**ALAN V OPPENHEIM, Prentice Hall of India.
5. **DSP using Matlab-** Prokis & Ingle 1st edition, Cengage Learning

ANALOG IC'S AND COMMUNICATION LAB

Subject Code	:	**10MLL57**	**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, Adder, substractor, integrator, differentiator.
3. Design of Astable and Monostable Multivibrator using 555 timer for pacemaker circuit.
4. Amplitude Modulation: a) Collector modulation b) Base Modulation c) Emitter Modulation.
5. Frequency Modulation- Using IC 8038.
6. Demodulation of AM & FM.
7. Mixers.
8. Analog Multiplexer a) FDM b) TDM.
9. Digital Modulation- Generation & Recovery of ASK, FSK, BPSK.
10. Digital Modulation- Generation & Recovery of PCM, PPM, PWM.
11. Frequency Demodulator &Frequency Multipliers-Using Phase Locked Loop IC.
12. Study of active second order -- LP, HP, BP & BE Filters.
13. Study of optic fibers, Study of transmission of Analog & Digital signals through optic fiber

DIGITAL SIGNAL PROCESSING LAB

Subject Code	:	**10MLL58**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Representation and display of basic sequences.
2. Determine linear convolution, Circular convolution and Correlation of two given sequences. Verify the result using theoretical computations.
3. Determine the linear convolution of two given point sequences using FFT algorithm.
4. Determine the correlation using FFT algorithm.

5. Display of original sequence along with operation on sequence like shifting, folding, time scaling and multiplication.
6. Display of DTFS of a sequence
7. Display of DFTF of a sequence.
8. Computation and verification FFT of a sequence.
9. Design and test FIR filter using Windowing method (Hamming window and Kaiser window) for the given order and cut-off frequency for (a) LP (b) HP (c) BP (d) Notch filter.
10. Realization of design of IIR filter for a given specification and verification.

VI SEMESTER

DATA COMMUNICATION

Subject Code	:	**10ML61**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

DIGITAL TRANSMISSION FUNDAMENTALS: Definition of information. Digital Representation of Information, Block-Oriented information, Stream information. Why digital communication, comparison of Analog and digital transmission, Basic Properties of Digital transmission Systems; Digital Representation of Analog Signals: Bandwidth of Analog Signals, sampling of an Analog signal, digital Transmission of Analog Signals. Characteristics of communications channels: frequency domain characterization. Time Domain characterization. Fundamental limits in digital Transmission, The Nyquist signaling rate, The Shannon channel capacity.

7 Hours

UNIT - 2

LINE CODING MODEMS AND DIGITAL MODULATION: binary phase Modulation QAM and Signal constellations, telephone modem standards, properties of media and Digital transmission systems: twisted pair, coaxial cable, optical fiber, radio transmission, Infrared light. Error detection and correction: Error Detection, Two-dimensional parity Checks, Internet checksum, polynomial codes, Standardized polynomial codes, Error detecting capability of a polynomial code.

7 Hours

UNIT - 3

CIRCUIT SWITCHING NETWORKS: Multiplexing: FDM, TDM, WDM, SONET, SONET multiplexing, SONET frame structure. Transport networks: SONET networks, optical Transport networks, circuit switches,

space division switches, Time division switches, the telephone network, transmission facilities, end to end digital services.

6 Hours

UNIT - 4

COMMUNICATION NETWORKS AND SERVICES: Evolution of Network architecture and Services: Telegraph Networks and Message Switching, Telephone Networks and Circuit Switching, The Internet, Computer Networks and Packet Switching.

6 Hours

PART - B

UNIT - 5

APPLICATIONS AND LAYERED ARCHITECTURES: Examples of Protocols, Services and Layering: HTTP, DNS and SMTP. TCP and UDP Transport Layer Services, The OSI Reference Model: The seven layer OSI Reference Model, Unified View of Layers, Protocols and Services. Overview of TCP/IP Architecture: TCP/IP Architecture, TCP/IP Protocol: How the layers work together. Protocol Overview, Application layer protocols and TCP/IP Utilities.

7 Hours

UNIT - 6

DATA LINK LAYER: PEER-TO-PEER PROTOCOLS: Peer-to-Peer Protocols and Service Models; ARQ Protocols and Reliable Data Transfer Service: Stop-and-Wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ, Other Peer-to-Peer Protocols.

6 Hours

UNIT - 7

DATA LINK CONTROLS: Framing, Point to point Protocol, HDLC Data link Control, Link Sharing using Packet Multiplexers: Statistical Multiplexing, Speech Interpolation and the Multiplexing of pocketsize Speech.

6 Hours

UNIT - 8

MEDIUM ACCESS CONTROL PROTOCOLS AND LAN: The Medium Access Control Protocols, Multiple Access Communications, Random Access: ALOHA, Slotted ALOHA, CSMA, CAMA-CD, Scheduling Approaches to Medium Access Control: Reservation Systems, Polling, Token-Passing Rings; Channelization, FDMA, TDMA, CDMA. High speed

Digital Access & connecting Devices. DSL: DSL Technology, cable modems, connecting devices: Repeaters, Hubs, Bridges, Two-layer switch, router and three layer switches

7 Hours

TEXT BOOKS:

1. **Communication Networks-** Alberto Leon- Garcia and India Widjaja Fundamental Concepts and Key Architectures, Tata McGraw-Hill 2nd edition.
2. **Data Communications and Networking**- Behrouz A. ForouzaTata McGraw-Hill, 3rd Edition.

REFERENCE BOOKS:

1. **Data and Computer Communication**- William Stallings, Fifth Edition, Pearson Education/ Prentice Hall India.
2. **Understanding Data Communications and Networks**- William A. Shay, 2nd Edition, Thomson.
3. **Data Communications and Networks**- by author Codbole Tata McGraw-Hill 2002.
4. **Computer Communications and Networking Technologies**- Micael A Gallo & William M. Handcock 2003 Edition, Thomson.

MEDICAL PHYSICS

Subject Code	:	**10ML62**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART A

UNIT - 1

Heat and cold in medicine: Introduction, Physical basis of heat and temperature Thermography and temperature scales, mapping of body's temperature, heat therapy, Use of cold in medicine, Cryosurgery and safety aspects

7 Hours

UNIT - 2

Energy, work, power and pressure: Conservation of energy in the body, energy changes in the body, work and power, heat losses from the body, measurement of pressure in the body, pressure inside skull, eye, digestive system , skeleton & urinary bladder, Hyper baric Oxygen Therapy

6 Hours

UNIT - 3

Physics of lung and breathing: **Introduction, the air ways, blood & lung interaction, measurement of lung volumes, pressure-air flow-volume relationship of the lungs,**

Physics of alveoli, breathing mechanism, air-way resistance, work of breathing, physics of some common lung diseases

6 Hours

UNIT - 4

Physics of cardiovascular system: Introduction to cardiovascular system, major components of cardiovascular system, oxygen and carbon dioxide exchange in the capillary system, work done by the heart, blood pressure and its measurements, transmural pressure, Bernoulli's principle applied to cardiovascular system, Blood flow-laminar & turbulent, heart sounds, physics of some cardiovascular diseases

7 Hours

PART - B

UNITS - 5

Electricity within the body: **The nervous system & neurons. electrical potential of nerves, electromyogram, electrocardiogram, electroencephalogram, electroretinogram,electrooculogram,**
magneto cardiogram & magneto encephalogram
Electric shock, high frequency and low frequency electricity in medicine, magnetism in medicine

12 Hours

UNIT 6

Sound in medicine: **General properties of sound, body as a drum, the stethoscope, Ultrasound picture of the body, Ultrasound to measure motion, physiological effects of ultrasound in therapy, the production of speech**

7 Hours

UNIT - 7

Physics of ear and hearing: **The outer ear, the middle ear and the inner ear, Sensitivity of ears, testing hearing, Deafness & hearing aids**
Light in medicine: **Measurement of light & its units, applications of visible light in medicine**
Applications of UV & IR in medicine, LASERs in medicine, applications of microscopes in medicine

7 Hours

UNIT - 8

Physics of eyes and vision: **Focusing elements of the eye, the retina, diffraction effects of the eye, optical illusion, defective vision & correction,, colour vision & chromatic aberration,**
Instrument used in ophthalmology

TEXT BOOK:

1. **Medical Physics**-John R. Cameron, James G. Skofronick, 1978.

REFERENCE BOOK:

1. **Physics of the Human Body**- Herman I.P., Springer

BIOMEDICAL EQUIPMENTS

Subject Code	:	**10ML63**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

CLINICAL LABORATORY INSTRUMENTS: Medical diagnosis with clinical tests, spectrophotometry & instruments, automated biochemical analysis system, clinical flame photometer, ion-selective electrode based analyzers.

6 Hours

UNIT - 2

BLOOD GAS ANALYZERS: Acid-base balance, blood pH measurement, measurement of blood pCO2, intra-arterial blood gas monitoring, complete blood gas analyzer, Blood cell counters: Types of blood cells, methods of cell counting, Coulter counter, automatic recognition and differential counting of cells.

7 Hours

UNIT - 3

AUDIOMETER AND HEARING AIDS: Mechanism of hearing, measurement of sound, basic audiometer, pure-tone audiometer, speech

audiometer, audiometer system, Bekesy evoked response audiometer system, calibration of audiometer and hearing aids.

6 Hours

UNIT - 4

INSTRUMENTS OF SURGERY: Principles of surgical diathermy, surgical diathermy machine, safety aspects in electro- surgical units, surgical diathermy analyzer.

7 Hours

PART - B

UNIT - 5

PHYSIOTHERAPY AND ELECTROTHERAPY EQUIPMENTS: High frequency heat therapy, short-wave diathermy, microwave diathermy, ultrasound therapy unit, electrodiagnostic therapeutic apparatus, pain relief through electrical stimulation, bladder and cerebral stimulators.

6 Hours

UNIT - 6

HAEMODIALYSIS MACHINE: Function of kidney, artificial kidney, dialyzer, membranes for haemodialysis, portable kidney machine.

6 Hours

UNIT - 7

LITHOTRIPSY: Stone disease problems, lithotriptor machine, extra-corporeal shock wave therapy. Anesthesia Machine**:** Need for anesthesia, anesthesia machine, electronics in the anesthetic machine

7 Hours

UNIT - 8

VENTILATORS: Mechanics of respiration, artificial ventilation, ventilators, types of ventilators, ventilator terms, classification of ventilators, pressure volume flow diagrams, modern ventilators, high frequency ventilators, humidifiers, nebulizers and aspirators. Automated Drug Delivery Systems: Infusion pumps, components of drug infusion systems and implantable infusion systems, closed loop control in infusion systems and examples.

7 Hours

TEXT BOOK:

1. **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, Prentice-Hall India Pvt. Ltd.

LASERS AND FIBER OPTICS IN MEDICINE

Subject Code	:	**10ML64**	**IA Marks**	:	25
No. of Lecture Hrs./ 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.

6 Hours

UNIT - 2

APPLICATIONS OF LASERS IN THERAPY & DIAGNOSIS: Introduction, laser assisted diagnosis and therapy-fundamentals, interaction of laser beams and materials-principles (except 3.3.4).

7 Hours

UNIT - 3

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.

6 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, non-ordered fiber optic 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

UNITS - 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, and 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 BOOKS:

1. **Therapeutic Lasers – Theory and practice** by G.David Baxter, Churchill Livingstone Publications.
2. **Medical Lasers and their safe use-**David H Shiney, Stephen and L.Trokel, Springer, Springer Verlag publications
3. **Elements of fiber optics**- S.L.Wymer, Regents PHI
4. **Biomedical Electronics and Instrumentation**- S.K.Venkata Ram Galgotia publications.

C++ AND DATA STRUCTURES

Subject Code	:	**10ML65**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

C++ PROGRAMMING BASICS: Need of object oriented programming, procedural languages, characteristics of OOP, preprocessor directives, data types, manipulators.

6 Hours

UNIT - 2

STRUCTURES: Structures, enumerated data types, Boolean type, Functions: passing arguments, returning values, reference arguments, overloaded functions, inline functions, variable and storage classes.

7 Hours

UNIT - 3

OBJECTS AND CLASSES: objects as data types, constructors, destructors, overloaded constructors. Arrays: Arrays as class member data types, passing arrays, arrays as objects, strings, arrays of strings.

7 Hours

UNIT - 4

OPERATOR OVERLOADING: over loading of unary operators, binary operators, data conversion. **6 Hours**

PART - B

UNIT - 5

INHERITANCE: Inheritance, derived class and base class, overriding member functions, scope resolution, levels of inheritance, multiple inheritances.

7 Hours

UNIT - 6

Pointers, pointers to objects, linked list, virtual functions, static functions, files and streams, input/output operations.

7 Hours

UNITS - 7& 8

DATA STRUCTURES: data representation, matrices, stacks, Queues, skip lists and Hashing, binary trees.

12 Hours

TEXT BOOKS:

1. **Object oriented programming in TURBO C++**-Robert Lafore, Galgotia Publications.2002.
2. **Data Structures, Algorithms and Applications in C++-** Sartaj Sahni, Tata McGrawHill Publications.

REFERENCE BOOKS:

1. **Object Oriented Programming with C++**-E Balaguruswamy, Third edition, TMH2006
2. **C++ the complete reference**-Herbert Schildt, Fourth edition, TMH, 2003
3. **Data Structures using C++-** D.S.Malik, Thomson, 2003.

ELECTIVE-I (GROUP A)
VLSI DESIGN

Subject Code	:	**10ML661**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

A review of Microelectronics and an introduction to MOS Technology. Introduction to IC technology, the IC era, metal oxide semi conductor (MOS) and related VLSI technology. Basic MOS transistors, MOS characterization, enhancement mode transistor action, depletion mode action, MOS

fabrication. CMOS fabrication, thermal aspects of processing Bi CMOS technology

7 Hours

UNIT - 2

Basic electrical properties of MOS and BiCMOS circuits, Drain to source current I_{DS} verses voltage V_{DS} relationship, aspects of MOS transistor threshold voltage Vt, MOS transistor transconductance Gm and output conductance Gds.

6 Hours

UNIT - 3

The pass transistor, the nMOS inverter, determination of pull up to down ratio (Zpu / Z pd) for an nMOS inverter driven by another nMOS inverter, alternative forms of pull up. The CMOS inverter, MOS transistor circuit model, some characteristics or NPN bipolar transistor, latch up in CMOS circuits, BiCMOS latch up susceptibility.

7 Hours

UNIT - 4

MOS AND BICMOS CIRCUIT DESIGN PROCESS: MOS layers, stick diagram, design rules and layout, general observations on the design rules. 2.5μm double metal double poly CMOS rules, 1.2μm double metal single poly CMOS rules, layout diagrams, a brief introduction to symbolic diagrams, translation to mask form.

6 Hours

PART - B

UNIT - 5

BASIC CIRCUIT CONCEPTS: sheer resistance R, sheet resistance concept applied to MOS transistor and inverter, area capacitances of layers, standard unit of capacitance Cg, some area capacitance calculation, the delay unit τ, inverter delays, driving large capacitance loads, propagation delays, wiring capacitance, choice of layers.

7 Hours

UNIT - 6

SCALING OF MOS CIRCUITS: Scaling models and scaling factors for device parameters, some discussions on scaling and limitations of scaling, subsystem design and layout. Some architectural issues, switch logic gate restoring logic. Examples of structured design

6 Hours

UNIT - 7

SUBSYSTEM DESIGN PROCESS: Some general considerations. An illustration of design processes, computational elements. Some observations on the design process, regularity, design of an ALU subsystem.

7 Hours

UNIT - 8

PRACTICAL ASPECTS AND TESTABILITY: Some thought on the performance, further thoughts on floor plans/layout, input /output pads, thoughts of system delay, ground rules for successful design, CAD tools for design and simulation, aspects of design tools, test and testability.

6 Hours

TEXT BOOKS:

1. **Basic VLSI design-** Dougles A Pucknell, 3rd edition, PHI
2. **Principles of C MOS VLSI design-**Neil West and Eshranghian, 2nd edition, Addison Wesley, 2002.

REFERENCE BOOKS:

1. **Introduction to VLSI system** – Mead & Conway, Addison Wesley, 1980
2. **CMOS circuit design layout and simulation**-Jacob Baker, Li & Boyce, PHI 1999.
3. **Modern VLSI design**- Warne Wolf, Pearson Education, 2000.
4. **VLSI design technologies for Analog & Digital circuits**- Gieger Allen Strader, McGraw Hill.

DSP ARCHITECTURE

Subject Code	:	**10ML662**	**IA Marks**	:	25
No. of Lecture Hrs./ 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.

7 Hours

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, 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, first edition , Cengage Learning.
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.

BIOMECHANICS

Subject Code	:	**10ML663**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

BASIC CONCEPTS, STATICS & JOINT MECHANICS : Introduction, Force Types, Resolution and composition of forces, Resultant of force and couple, vector method for resultant force determination, Parallel forces in space, Equilibrium of coplanar forces, Human joint forces, Mechanics of the elbow, Shoulder, Hip, Knee, Ankle Joint, Problems & Examples.

7 Hours

UNIT - 2

DYNAMICS: Introduction, Human body links and data, linear motion, Angular motion, Newtons law of motion, Impulse & momentum, Work and energy, Problem and examples.

6 Hours

UNIT - 3

MECHANICS OF SOLIDS: Introduction, Stress, Axial load and normal stress, Stress-strain, Torsion, , Moment of inertia , Geomatrical properties of human bone, problems and examples.

7 Hours

UNIT - 4

TISSUE MECHANICS: Introduction, Mechanical properties, Biological properties, Bone as composite material , Properties, Viscoelestaicity, soft tissue mechanics, Testing of soft tissues.

6 Hours

PART - B

UNIT - 5

BIOFLUID MECHANICS: introduction, Viscosity and viscometry, Capillary viscometry, Blood, Models of Peripheral circulation, coagulation, Blood rheology, synovial fluid.

7 Hours

UNIT - 6

CARDIOVACULAR MECHANICS: Introduction, Heart, Conduction system, Heart sounds, Heart rate, cardiac cycle, ECG, Cardiac output, Diseases of the cardiovascular system, Artficial Heart valve, Design of valves,

6 Hours

UNIT - 7

RESPIRATORY MECHANICS: Lung RC, Static lung mechanics, mechanics of breathing, Flow volume curves, Characteristics of respiration, Lung compliance, Surface tension, Elastic properties of lung, Distribution of ventillation in upright lung, effects of forced or gentle expiration to RV

6 Hours

UNIT - 8

HUMAN LOCOMOTION : Introduction, Gait analysis, Motion analysis, Energy consideration, Muscle function, Force data, Measurement devices, Kinematics, Other methods of Analysis, EMG data transmission, Quantification of EMG, Applications,

7 Hours

TEXT BOOKS:

1. **Text Book of Biomechanics –**Subrata Pal, Viva Books, 2009.

REFERENCES :

1. **The biomedical Hand book**-Joseph.D.Bronzino CRC Press, 2nd Edition2, 2000.
2. **Introduction to biomechanics of joints & joint replacement mechanical Engg-**D.Dowson, V Wright 1987 publication.

APPLIED NUMERICAL METHODS

Subject Code	:	**10ML664**	IA Marks	:	25

No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

Part - A

UNIT - 1

NUMERICAL COMPUTATION: Motivation and objectives / Number Representation/ Machine Precision/ / Round off Error /Truncation Error / Random Number Generation.

6 Hours

UNITS - 2 & 3

LINEAR ALGEBRAIC SYSTEMS: Motivation and objectives / Gauss-Jordan Elimination/ Gaussian Elimination/LU Decomposition/ III-Conditioned systems/ Iterative Methods.

13 Hours

UNIT - 4

EIGENVALUES AND EIGENVECTORS: Motivation and objectives/ The Characteristic polynomial/ Power methods/ Jacobs's method/ householder transformation/ QR method/ Danilevskys Method/ Polynomial Roots.

7 Hours

PART - B

UNIT - 5

CURVE FITTING: Motivation and objectives/ Interpolation/ Newtons Difference Formula/ Cubic Splines/ Least square/ Two- Dimensional Interpolation.

7 Hours

UNIT - 6 & 7

ROOT FINDING: Motivation and objectives/ Bracketing methods/ contraction mapping method/ secant Method/ Mullers Method/ Newton's Method/ polynomial roots/ Nonlinear systems of equations.

12 Hours

UNIT - 8

OPTIMIZATION: motivation and objectives/ Local and Global minima/ Line searches/ steepest Descent method/ Conjugate- Gradient Method/ quasi-Newton Methods/ Penalty Functions / Simulated Annealing

7 Hours

TEXT BOOK:

1. **Applied Numerical Methods for Engineers using MATLAB and C-**ROBERT J.SCHILING & SANDRA HARRIS, Cengage Learning.

REFERENCE BOOKS:

1. Applied Numerical methiods with Matlab for Engineers and Scientist, Selvan .C. Chopra, second edition, Tata McGraw Hill.
2. **Applied Numerical Analysis-** GERALD AND WHETELY, Pearson Education, New Delhi, 2002.
3. **Numerical Receipies in C-** WILLIM PRESS ET.AL, Cambridge publishers, New Delhi.

MEDICAL ELECTRONICS LAB

Subject Code	:	**10MLL67**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Plotting the characteristics & Determination of parameters of: Resistive strain gage (b) Photoelectric transducer (c) Temperature transducers: RTD / thermocouple / thermistor
2. Determination of characteristics of: (a) Polarized electrode; (b) Non-polarized electrode (c) Multipoint electrode
3. Design & Testing of: (a) DC amplifier (b) Isolation amplifier
4. Design & Testing of: (a) Instrumentation amplifier; (b) Transducer bridge with amplifier
5. Design & Testing of Electronic Thermometer
6. Recording of ECG: (a) Determination of time & amplitude of QRS complex, (b) Calculation of Heart Rate, (c) Determination of Cardiac Vector
7. Recording of (a) EEG (b) EMG (c) EOG
8. Measurement of Hearing threshold using Audiometer and plot its characteristics
9. Measurement of pH of a given solution using pH meter
10. Determination of solution concentration using Colorimeter/Spectrophotometer
11. Measurement of Blood Pressure using Sphygmomanometer & Digital meter
12. Recording of Pulse Rate using Photoelectric transducer and Respiratory Rate using Strain gage/ Thermistor
13. Plot the signals using: (a) Strip chart recorder (b) X-Y recorder
14. Study of (a) Ultrasound transducers & Ultrasonic blood flow meters, (b) Nerve stimulator, (c) Bladder stimulator.

C++ AND DATA STRUCTURES LAB

Subject Code	:	**10MLL68**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Write a C++ program to demonstrate the initialization of structure variables.
2. Write a C++ program 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.
    e) Add at the front
    f) Insert at the left
    g) Delete the node with given data
    h) Display
12. Write a C++ Program to create a binary search tree.
    i) Add a node
    j) Insert at the node

k) Delete the node with given data
l) Display the tree

VII SEMESTER

BIOMEDICAL DIGITAL SIGNAL PROCESSING

Subject Code	:	**10ML71**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION TO BIOMEDICAL SIGNALS: The nature of biomedical signals, the action potential, objectives of biomedical signal analysis, Difficulties in biomedical signal analysis, computer aided diagnosis. Neurological signal processing: The brain and its potentials, The electrophysiological origin of brain waves, The EEG signal and its characteristics, EEG analysis.

7 Hours

UNIT - 2

Linear prediction theory, The Autoregressive (AR) method, Recursive estimation of AR parameters, Spectral error measure, Adaptive segmentation, Transient detection and elimination- the case of epileptic patients, overall performance.

6 Hours

UNIT - 3

SLEEP EEG: **Data acquisition and classification of sleep stages, The Markov model and Markov chains, Dynamics of sleep-wake transitions, Hypnogram model parameters, Event history analysis for modeling sleep.**

6 Hours

UNIT - 4

ADAPTIVE FILTERS: Principle of an adaptive filter, the steepest descent algorithm, adaptive noise canceller, cancellation of 60 Hz interference in electrocardiography, applications of adaptive filters. Canceling donor-heart interference in heart-transplant electrocardiography, Cancellation of ECG signal from the electrical activity of the chest muscles, canceling of maternal ECG in fetal ECG, Cancellation of High frequency noise in Electro-surgery.

7 Hours

PART - B

UNIT - 5

SIGNAL AVERAGING: Basics of signal averaging, a typical signal averager, signal averaging as a digital filter, Removal of artifacts by averaging. Filtering for removal of artifacts**:** Introduction, Random noise, structured noise and physiological interference, stationary versus non stationary process, high frequency noise in ECG, motion artifact in ECG, power line interference in ECG signals, Maternal interference in Fetal ECG, muscle contraction interference in VAG signals.

7 Hours

UNIT - 6

DATA COMPRESSION TECHNIQUES: Lossy and Lossless data reduction Algorithms. ECG data Compression using Turning point, AZTEC, FAN, and Hoffman coding technique.

6 Hours

UNIT - 7

CARDIOLOGICAL SIGNAL PROCESSING : Pre-processing. ECG QRS Detection techniques. Rhythm analysis. Arrhythmia detection Algorithms. Automated ECG Analysis. ECG Pattern Recognition. Heart rate variability analysis, ST–segment analyzer, portable, arrhythmia monitor.

7 Hours

UNIT - 8

Introduction to continuous and discrete wavelet transforms. Applications of wavelets in medicine.

6 Hours

TEXT BOOKS:

1. **Biomedical Digital Signal Processing**-Willis J.Tompkins, PHI,
2. **Biomedical Signal Processing- principles and techniques**, Tata McGraw-Hill, D.C.Reddy, 2005
3. **Biomedical Signal Analysis**. IEEE Press, 2001. Rangaraj M. Rangayyan
4. Wavelet Transforms by Raghuveer M. Rao and Ajit S. Bopardikar, Pearson, 1998.

REFERENCE BOOKS:

1. **Biomedical Signal Processing** -Akay M, , Academic: Press 1994
2. **Biomedical Signal Processing** -Cohen.A, -Vol. I Time & Frequency Analysis, CRC Press, 1986.

MEDICAL IMAGING SYSTEMS

Subject Code	:	**10ML72**	**IA Marks**	:	25
No. of Lecture Hrs./ 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-Huygen'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.

06 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

TEXT BOOKS:

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.

BIOMATERIALS & ARTIFICIAL ORGANS

Subject Code	:	**10ML73**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

BIOMATERIALS: 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, and 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 implant.

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, and vitrification.

7 Hours

PART - B

UNIT - 5

ARTIFICIAL ORGANS: 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 BOOK:

1. **Biomedical Engineering Handbook**-Volume1 (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** (2nd Edition) by R.S.Khandpur (Tata McGraw Hill, 2003)

DIGITAL IMAGE PROCESSING

Subject Code	:	**10ML74**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART A

Unit – 1

INTRODUCTION

Background, digital image representation, examples of field that use DIP, fundamental steps in digital image processing, elements of digital image processing system 6 hours

Unit – 2

DIGITAL IMAGE FUNDAMENTALS

Simple image model, Sampling and quantization, some basic relationships between pixels, some basic transformations 6 Hours

Unit 3

IMAGE TRANSFORMS

Introduction to Fourier transform, The Discrete Fourier transform, Some Properties of the 2-dimensional Fourier transform, The Fast Fourier Transform, other separable image transforms, The Hotelling transform 7 Hours

Unit – 4

IMAGE ENHANCEMENT IN FREQUENCY DOMAIN

Background, introduction to the frequency domain, smoothing and sharpening frequency domain filters, homomorphic filtering, implementation, generation of spatial masks from frequency domain specifications, color image processing

7 Hours

PART B

Unit – 5 & 6

IMAGE ENHANCEMENT IN SPATIAL DOMAIN

Background, Basic gray level transformations, histogram processing, enhancement using arithmetic/logic operations, basics of spatial filtering, smoothing and sharpening spatial filters, combining spatial enhancement methods 12 Hours

Unit – 7 & 8

IMAGE RESTORATION

Degradation model, Noise models, restoration in the presence of noise only (Spatial and frequency domain filters), Diagonalisation of circulant and block circulant matrices, algebraic approach to restoration, Inverse filtering, LMS filtering, constrained least square restoration, interactive restoration, restoration in the spatial domain 14 Hours

Text Books:

12. Digital Image Processing by R C Gonzalez & R E Woods, 2e, Pearson Education.
13. Digital Image Processing and Computer Vision by Milan Sonka, First edition, Cengage learning.

Reference Books:

1 Digital Image Processing by S.Jayaraman, S.Esakkirajan, T.Veerakumar, Tata Mcgraw hill, 2009.

Fundamentals of Digital Image processing by A K Jain ,PHI / Pearson Education, 1989

Digital Image Processing by Sid Ahmed, McGraw Hill

ELECTIVE-II (GROUP B)
SPEECH PROCESSING

Subject Code	:	**10ML751**	**IA Marks**	:	25

No. of Lecture Hrs./ 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

TEXT BOOKS:

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**-Khalid Sayood, Third Edition, Elsivier Publications.
2. **Digital Speech**- A M Kondoz, Second Edition, Wiley Publications

ELECTRO-OPTICAL DEVICES

Subject Code	:	**10ML752**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

Part A

UNIT-1

Introduction to Opto-electronic devices: Classification of optical fiber, Principle of light transmission through fiber, Loss and band width limiting mechanism, Light sources for fiber optics, Source coupling. **7 Hours.**

UNIT-2

Fundamentals of Optics: Introduction to optics, Polarization, Diffraction, Interference, Dispersion, Holograms, Dispersion holograms. **6 Hours.**

UNIT-3

Optical Sources: Light Emitting Diodes (LEDs), Structure, Materials, Characteristics, Efficiency, Liquid Crystal Display (LCD). **6 Hours.**

UNIT-4

Photo Detectors: Thermal detectors, Photo detectors, Vacuum photo diode, Photo multiplier tube, Photo multiplier tube, Photo conductive detector, LDR, PIN diode. **7 Hours.**

Part B

UNIT-5

Optical Instruments: Optical pyrometer: Infrared thermometer, Polarimeter, Light intensity meter, Spectro photo meter, X-ray fluoroscopic instruments, Optical filters. **7 Hours.**

UNIT-6

Fundamentals of Lasers: Principle of lasers, Fundamentals of laser emission, Different types of lasers, Gas laser, Liquid lasers, Semiconductor lasers. **7 Hours.**

UNIT-7

Use of lasers: Measurement of distance, measurement of velocity, measurement of acceleration, measurement of length. **6Hours.**

UNIT-8

Applications of lasers in medicine: Laser assisted diagnosis, and therapy fundamentals, Laser surgery, thermal interaction between laser and tissue advances, Laser safety fundamentals. **6 Hours.**

Text Books:

1. Optical fiber Communication by Gerd Keiser, Mc Graw Hill International Editions
2. Optical Communications – Components and Systems by JH Franz and VK Jain -N
3. Lasers and Optical Fibers in Medicine by Abrahm Katizer, Academic press.

References:

1. Optical fiber Communication and its Applications by S C Gupta, Prentice
2. Optical fiber Communication by John M Senior, Prentice Hall of India, New Delhi

LINEAR ALGEBRA

Subject Code	:	**10ML753**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

LINEAR EQUATIONS: Fields; system of linear equations, and its solution sets; elementary row operations and echelon forms.

6 Hours

UNIT - 2

Matrix operations; invertible matrices, LU-factorization.

6 Hours

UNIT - 3

VECTOR SPACES: Vector spaces; subspaces; bases and dimension; coordinates; summary of row-equivalence; computations concerning subspaces.

7 Hours

UNIT - 4

LINEAR TRANSFORMATIONS: Linear transformations; algebra of linear transformations; isomorphism; representation of transformations by matrices; transpose of a linear transformation.

7 Hours

PART - B

UNIT - 5

CANONICAL FORMS: Characteristic values; invariant subspaces; direct-sum decompositions; invariant direct sums; primary decomposition theorem; cyclic bases; Jordan canonical form

7 Hours

UNIT - 6

INNER PRODUCT SPACES: Inner products; inner product spaces; orthogonal sets and projections.

6 Hours

UNIT - 7

Gram-Schmidt process; QR-factorization; least-squares problems; unitary operators.

6 Hours

UNIT - 8

SYMMETRIC MATRICES AND QUADRATIC FORMS: Digitalization; quadratic forms; constrained optimization; singular value decomposition.

7 Hours

TEXT BOOKS:

1. **Linear Algebra and its Applications**-4th edition Gilbert Strang, Cengage Learning.
2. **Linear Algebra and its Applications-** David C. Lay3rd Edition, Pearson Education (Asia) Pvt. Ltd, 2005.

3. **Introductory Linear Algebra with Applications**-.Bernard Kolman and David R. Hill, Pearson Education (Asia) Pvt. Ltd, 7th edition, 2003.

OPERATING SYSTEMS

Subject Code	:	**10ML754**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

UNIT - 1

INTRODUCTION TO OPERATING SYSTEMS AND CLASSIFICATION: What is an operating system, Mainframe systems, Desktop systems, multiprocessor system, Distributed system, Clustered system, Real time system, Handled 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, Co-operating processes, Inter process communication. Threads – overview, Multithreading models, Threading issues, P threads, Java threads. CPU scheduling – Basic concepts, Scheduling criteria, Scheduling algorithms, multiple processors scheduling, real time scheduling.

7 Hours

UNIT - 3

PROCESS SYNCHRONIZATION AND HANDLING DEADLOCKS: The critical section problem, Synchronization hardware, Semaphores, Classical problems of synchronization, critical regions, monitors.

6 Hours

UNIT - 4

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

STORAGE MANAGEMENT: Main memory management – Background, Swapping, Contiguous, allocation, Paging, Segmentation, Segmentation with paging Virtual memory – Background, Demand paging, Process creation, Page replacement algorithms, Allocation of frames, Thrashing

7 Hours

UNIT - 6

FILE SYSTEM INTERFACE – File concept, Access methods, Directory structure, File system mounting, File system implementation, Directory implementation, Allocation methods, free space management. Mass storage structures – Disk structure, Disk scheduling methods, Disk management, Swap space management.

7 Hours

UNITS - 7 & 8

PROTECTION AND SECURITY: Goals of protection, domain of protection, access matrix, implementation of access matrix, Revocation of access rights, The security problem, Authentication, Program threats, System threats, Security systems and facilities, Intrusion detection, introduction to cryptography, basics of Linux operating system.

12 Hours

TEXT BOOK:

1. **Operating System Concepts**-by Abraham silberschatz, Peter Baer Galvin, Greg Gagne, 6th edition, John wiley & sons 2003.

REFERENCE BOOKS:

1. **Operating system concepts and design**- Milan Milankovic 2nd Edition, McGraw Hill 1992.
2. **Operating systems-** Harvey M Deital Addison Wesley 1990

3. **Operating Systems concepts based approach**, D.M Dhamdhere, Tata Mc Graw Hill 2002.

ELECTIVE-III (GROUP C)
PATTERN RECOGNITION IN MEDICINE

Subject Code	:	**10ML761**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION : Pattern Recognition (PR) overview , pattern recognition typical system, classification, patterns & features extraction with examples, Design cycles, Training , learning and adaptation , Pattern recognition approaches. Statistical decision theory. Probability: Introduction, probability of events, random variables, joint distributions and densities, moments of random variables, estimation of parameters from samples, minimizing risk estimators.

7 Hours

UNIT - 2

Statistical decision making: Introduction, byes theorem, multiple feature, conditionally independent feature, decision boundaries, unequal costs of error, estimation of error rates the leaving one out technique, characteristic curves, estimating the composition of populations.

6 Hours

UNIT - 3

Nonparametric decision making: introduction, histograms kernel & window estimators nearest neighbour classification techniques, adaptive decision boundaries. **7 Hours**

UNIT - 4

Clustering: Introduction, hierarchil clustering, partitional clustering. Formulations of unsupervised learning problems, Clustering for Unsupervised Learning and classification.

6 Hours

PART - B

UNITS - 5

SYNTACTIC PATTERN RECOGNITION: Overview, quantifying structure in pattern description and recognition, grammar based approach, elements of formal grammar.

Structural Recognition via Parsing and other grammars; Graphical approaches to syntPR. Learning Via Grammatical inference.

7 Hours

UNIT - 7

Neural Pattern Recognition: Introduction to neural networks, Neural network for PR applications, Physical neural networks, Artificial neural network model. Introduction to neural pattern associators and matrix approaches and examples.

7 Hours

UNIT – 7 & 8

Feedforward networks and training by backpropagation: Introduction, Multilayer, Feedforward structure, Training the feedforward netwoek, Examples, Unsupervised Learning in NeurPR: Hopefield approach to neural computing, Examples, **12 Hours**

TEXT BOOKS:

1. Pattern Recognition and image analysis – Earl Gose, PHI, 2002
2. Robert Schalkoff, Pattern Recognition : Statistical, **structural and Neural Approaches**, John Wiley and Sons, Inc. 1992.

Reference :

1. Pattern Classification- Richard O. Duda, peter E. Hart and David G Stork John Wiley and Sons, Inc 2nd Ed. 2001.

BIOSTATISTICS

Subject Code	:	**10ML762**	**IA Marks**	:	25
No. of Lecture Hrs./ 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.

7 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.

6 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**

TEXT BOOK:

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

REFERENCE BOOKS:

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

ADAPTIVE SIGNAL PROCESSING

Subject Code	:	**10ML763**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

ADAPTIVE SYSTEMS: Definition and characteristics, Areas of application, general properties, open and close loop adaptation, Application closed loop adaptation, examples of adaptive systems. The adaptive linear combiner: General description, input signal and weight vectors, desired response and error, the performance function gradient and minimum mean square error. Example of a performance surface, alternative expression of the gradient, De correlation of error and input components.

7 Hours

UNIT - 2

PROPERTIES OF QUADRATIC PERFORMANCE SURFACE: Normal form of input correlation Matrix, Eigen and eigen vectors of the input correlation matrix. An example with two weights, geometrical significance of Eigen vectors and Eigen values.

7 Hours

UNIT - 3

SEARCHING THE PERFORMANCE SURFACE: Methods of searching the performance surface. Basic idea of gradient search methods, A simple gradient search algorithm and its solution.

6 Hours

UNIT - 4

Stability and rate of convergence, the learning curve, Gradient search by newtons method in multi dimensional space, gradient search by the method of steepest descent, comparison of learning curves.

6 Hours

PART - B

UNIT - 5

GRADIENT ESTIMATION AND EFFECTS ON ADAPTATION: Gradient component estimation by derivatives measurements, the performance penalty, derivative measurement and performance penalties with multipleweights.

6 Hours

UNIT - 6

Variance of the gradients estimate, effects on the weight vector solution, excess mean square error and time constants. Miss adjustment, comparative performance of Newton's steepest descent methods, total miss adjustment and other practical considerations.

6 Hours

UNIT - 7

THE LMS ALGORITHM: Derivation of LMS algorithm, convergence of the weight vectors, an example of convergence, learning curve, noise in the weight vector solution, miss adjustment, performance.

7 Hours

UNIT - 8

ADAPTIVE MODELING SYSTEM IDENTIFICATION: General description, adaptive modeling of multi path communication channel, Adaptive modeling in geo physical exploration, adaptive modeling in FIR digital filters synthesis. Introduction to adaptive arrays and adaptive beam forming: Side lobe cancellation, beam forming with pilot signaling, spatial configuration, adaptive algorithms, narrow band experiments and broad band experiments.

7 Hours

TEXT BOOK:

1. **Adaptive signal Processing**- B. Widrow & S D Streans, Pearson Education 1985.

REFERENCE BOOK:

1. **Adaptive filters**-C F N Cowan & P M Grant, Prentice Hall, 1985.

Subject Code	:	**10MS769**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION TO MICRO AND SMART SYSTEMS

a) What are smart-material systems? Evolution of smart materials, structures and systems. Components of a smart system. Application areas. Commercial products.

b) What are microsystems? Feynman's vision. Micromachined transducers. Evolution of micro-manufacturing. Multi-disciplinary aspects. Applications areas. Commercial products.

6 Hours

UNIT - 2

MICRO AND SMART DEVICES AND SYSTEMS: PRINCIPLES AND MATERIALS

a) Definitions and salient features of sensors, actuators, and systems.

b) **SENSORS**: silicon capacitive accelerometer, piezo-resistive pressure sensor, blood analyzer, conductometric gas sensor, fiber-optic gyroscope and surface-acoustic-wave based wireless strain sensor.

c) **ACTUATORS**: silicon micro-mirror arrays, piezo-electric based inkjet print-head, electrostatic comb-drive and micromotor, magnetic micro relay, shape-memory-alloy based actuator, electro-thermal actuator

d) **SYSTEMS**: micro gas turbine, portable clinical analyzer, active noise control in a helicopter cabin

7 Hours

UNIT - 3

MICROMANUFACTURING AND MATERIAL PROCESSING:

a) Silicon wafer processing, lithography, thin-film deposition, etching (wet and dry), wafer bonding, and metallization.

b) Silicon micromachining: surface, bulk, moulding, bonding based process flows.

c) Thick-film processing:

d) Smart material processing:

e) Processing of other materials: ceramics, polymers and metals
f) Emerging trends

7 Hours

UNIT - 4
MODELLING:

a) Scaling issues.
b) Elastic deformation and stress analysis of beams and plates. Residual stresses and stress gradients. Thermal loading. Heat transfer issues. Basic fluids issues.
c) Electrostatics. Coupled electromechanics. Electromagnetic actuation. Capillary electro-phoresis. Piezoresistive modeling. Piezoelectric modeling. Magnetostrictive actuators.

6 Hours

PART - B

UNIT - 5
COMPUTER-AIDED SIMULATION AND DESIGN: Background to the finite element element method. Coupled-domain simulations using Matlab. Commercial software.

6 Hours

UNIT - 6
ELECTRONICS CIRCUITS AND CONTROL: Carrier concentrations, semiconductor diodes, transistors, MOSFET amplifiers, operational amplifiers. Basic Op-Amp circuits. Charge-measuring circuits. Examples from microsystems. Transfer function, state-space modeling, stability, PID controllers, and model order reduction. Examples from smart systems and micromachined accelerometer or a thermal cycler.

7 Hours

UNIT - 7

INTEGRATION AND PACKAGING OF MICRO ELECTRO-MECHANICAL SYSTEMS: Integration of microelectronics and micro devices at wafer and chip levels. Microelectronic packaging: wire and ball bonding, flip-chip. Low-temperature-cofired-ceramic (LTCC) multi-chip-module technology. Microsystem packaging examples.

7 Hours

UNIT - 8

CASE STUDIES: BEL pressure sensor, thermal cycler for DNA amplification, and active vibration control of a beam.

6 Hours

PART - C

UNIT - 9

MINI-PROJECTS AND CLASS-DEMONSTRATIONS (Not For Examination)

a) CAD lab (coupled field simulation of electrostatic-elastic actuation with fluid effect)
b) BEL pressure sensor
c) Thermal-cycler for PCR
d) Active control of a cantilever beam

TEXT BOOK:

1. **MEMS & Microsystems: Design and Manufacture-** Tai-Ran Tsu, Tata Mc-Graw-Hill.
2. **"Micro and Smart Systems"** by Dr. A.K.Aatre, Prof. Ananth Suresh, Prof.K.J.Vinoy, Prof. S. Gopalakrishna,, Prof. K.N.Bhat.,John Wiley Publications
3.

REFERENCE BOOKS:

1. **Animations of working principles, process flows and processing techniques**- A CD-supplement with Matlab codes, photographs and movie clips of processing machinery and working devices.
2. **Laboratory hardware kits for-** (i) BEL pressure sensor, (ii) thermal-cycler and (iii) active control of a cantilever beam.

3. **Microsystems Design-** S. D. Senturia, 2001, Kluwer Academic Publishers, Boston, USA. ISBN 0-7923-7246-8.
4. **Analysis and Design Principles of MEMS Devices-**Minhang Bao, Elsevier, Amsterdam, The Netherlands, ISBN 0-444-51616-6.
5. **Design and Development Methodologies**-Smart Material Systems and MEMS: V. Varadan, K. J. Vinoy, S. Gopalakrishnan, Wiley.
6. **MEMS-** Nitaigour Premchand Mahalik, Tata McGraw Hill 2007.

BIOMEDICAL DIGITAL SIGNAL PROCESSING LAB

Subject Code	:	**10MLL77**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Computation of Convolution and Correlation Sequences.
2. Signal Averaging to Improve the SNR
3. Read and plotting of ECG data, spectrum of ECG with 50 HZ noise.
4. Realization of IIR filters for ECG analysis
5. Design of FIR Filter for ECG.
6. Integer filters for ECG
7. PSD estimation for ECG, EEG, and EMG
8. QRS detection and Heart rate determination.
9. Correlation and Template matching.
10. Realization of Notch filter for removal of line interference
11. Data Compression Techniques: AZTEC, TP algorithms.
12. Data Compression Techniques:FAN, CORTES algorithmes.

DIGITAL IMAGE PROCESSING LAB

Subject Code	:	**10MLL78**	**IA Marks**	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Simulation and display of an image, negative of an image (Binary & Gray Scale)
2. Implementation of relationships between pixels
3. Implementation of transformations of an image
4. Contrast stretching of a low contrast image, histogram, and histogram equalization
5. Display of bit planes of an image
6. Display of FFT (1-D & 2-D) of an image
7. Computation of mean, standard deviation and correlation co-efficient of the given images
8. Implementation of image smoothening filters (Mean and Median filtering of an image)
9. Implementation of image sharpening filters and edge detection using gradient filters
10. Image compression by DCT, DPCM, HUFFMAN coding
11. Implementation of image restoring techniques
12. Implementation of image intensity slicing technique for image enhancement
13. Canny edge detection algorithm.

VIII SEMESTER
EMBEDDED SYSTEMS DESIGN

Subject Code	:	**10ML81**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

Introduction. Embedded system overview, design challenge-optimizing design matrix, common design matrix, time to market design matrix, the NRE and unit cost design matrix, the performance design matrix, processor technology, software and hardware, IC technology, Design technology.

7 Hours

UNIT - 2

CUSTOM SINGLE PURPOSE PROCESSORS: Hardware Introduction, combinational logics, sequential logics, custom single processor design, RT level custom single purpose processor design, optimizing custom single purpose processors.

6 Hours

UNIT - 3

GENERAL-PURPOSE PROCESSORS SOFTWARE: Introduction, basic architecture, operations, programmers view, development environment, Application-specific instruction-set processors, selecting a microprocessor, General-purpose processor design.

7 Hours

UNIT - 4

STANDARD SINGLE PURPOSE PROCESSOR: peripherals: Introduction, Timers, counter and watch dog Timers, UART.

6 Hours

PART - B

UNIT - 5

PulseWidth Modulator, LCD controllers, Key pad Controllers, Stepper motor Controllers, Analog to Digital converters, Real time clocks.

6 Hours

UNIT - 6

MEMORY: Introduction, Memory writes ability and storage performance, Common memory types, Composing Memory, Memory Hierarchy and Cache, Advanced RAM.

7 Hours

UNIT - 7

INTERFACING: Introduction, communication basics, Microprocessor Interfacing: I/O addressing, Microprocessor Interfacing: Interrupts, Microprocessor Interfacing: Direct Memory Access

6 Hours

UNIT - 8

Arbitration, Multilevel Bus Architecture, Advanced Communication Principles, Serial Protocols, Parallel Protocols, Wireless Protocols. Digital Camera Example. Introduction, to a simple Digital Camera, Requirement Specification, Design.

7 Hours

TEXT BOOK:

1. **Embedded system Design**-By Frank Vahid & Tony Givargis, John Wiley, 2003

REFERENCE BOOK:

1. **Embedded systems** By Raj Kamal, TMH, 2003

NEURAL NETWORKS

Subject Code	:	**10ML82**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

Part - A

UNIT - 1

INTRODUCTION TO BIOLOGICAL NEURAL NETWORK: Classic neuron, Bioelectric potential, Electrochemical mechanism of action potential, Nernst equation-electrochemistry give rise to electrical events, Membrane potential distributed model, Synaptic electrical events, slow potential theory of neurons.

7 Hours

UNIT - 2

ARTIFICIAL NEURAL NETWORK: What is an artificial neural network, Benefits, model of a neuron, Types of activation function, neural networks viewed as directed graphs, architectural graph of a neuron with feedback, Network Architectures, Artificial intelligence and Neural Networks.

7 Hours

UNIT - 3

Learning Processes: Learning in context to neural Networks, learning paradigms, supervised & unsupervised learning, Five basic learning rules-Error correction Learning, Memory based learning.

6 Hours

UNIT - 4

Hebbian learning, Competitive and Boltzmann learning, learning tasks, Memory, adaptation, Statistical nature of learning processes, Statistical learning theory. **6 Hours**

PART - B

UNIT - 5

SINGLE LAYER PERCEPTION: Introduction, Adaptive filtering problem, Unconstrained optimization techniques, Newton's method, Gauss-Newton method, Linear least square filter, Least mean square algorithm, Learning curves, Learning Rate, Annealing techniques, Perceptron, convergence theorem

7 Hours

UNIT - 6

MULTILAYER PERCETRON: Introduction, Some Preliminaries, Back propagation algorithm, XOR Problem, Heuristics for making the back

propagation algorithm perform better, Feature detection, Hessian matrix, generalization, Cross validation, Virtues and limitations of back propagation algorithm.

7 Hours

UNIT - 7

RADIAL BASIS FUNCTION NETWORKS: Architecture, learning algorithms, Applications.

6 Hours

UNIT - 8

HOPFIELD NETWORKS – Architecture, Capacity of Hopfield models, Energy analysis of Hopfield networks.

6 Hours

TEXT BOOKS:

1. **An Introduction To Neural Networks**-James A. Anderson 2e, PHI, 1995
2. **Neural Networks**- Simon Haykin Pearson Education/PHI, 2001.
3. **Neural Networks** by Satish Kumar, Tata Mcgraw-hill 2009

REFERENCE BOOKS:-

1. **Introduction To Artificial Neural Systems**- Jacck M Zurada, Jaico publishing
2. **Artificial Neural Networks**- B Yegnanarayana, PHI, 2001
3. **Fundamentals of Artificial Neural Networks**- Mohammad Hassan, PHI, 1999
4. **Neural network design**- Martin T.Hagan, Cengage Learning

ELECTIVE-IV (GROUP D)
ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

Subject Code	:	**10ML831**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNITS - 1 & 2

INTRODUCTION TO ARTIFICIAL INTELLIGENCE: Scope, history and applications: predicate calculus inference rules. Logic based financial advisor, structures and strategies for state space search graph theory, strategies for space search, using state space to represent reasoning with predicate calculus.

12 Hours

UNIT - 3

HEURISTIC SEARCH: An algorithm for heuristic search, admissibility monotonic and informed ness heuristics in games, complexity issues, control and implementation of state space search recursion based search, pattern directed search. Production systems, predicate calculus and planning the black board architecture for problems solving.

7 Hours

UNIT - 4

LISP AND PROLOG: Knowledge representation languages issues in knowledge representation. Network representation language, structured representations, introduction to LISP, search in LISP: a functional approach to the farmer, Wolf, Goat and cabbage problem, higher order functions and procedural abstraction, search strategies in LIPS.

7 Hours

PART - B

UNITS - 5& 6

EXPERT SYSTEMS: Introduction, History basic concepts, structure of expert systems, the human element in ES and how ES works, problem areas addressed by ES, ES success factors, types of expert systems, ES and the internet interacts web, knowledge engineering, scope of knowledge, difficulties in knowledge acquisition methods of knowledge acquisition, machine learning, intelligent agents, selecting appropriate knowledge acquisition method, knowledge acquisition form multiple experts validation and verification of the knowledge base, analyzing coding, documenting and diagramming .

13 Hours

UNITS - 7 & 8

EXPERT SYSTEMS-II, SOCIAL IMPACTS REASONING IN ARTIFICIAL INTELLIGENCE, INFERENCE WITH RULES, WITH FRAMES: model based reasoning, case based reasoning explanation and meta knowledge inference with uncertainty representing uncertainty probabilities and related approaches, theory of certainty (certainty factors) qualitative reasoning, the development Life cycle, phases I, II, III, IV, V, VI the future of expert system development process social impacts.

13 Hours

TEXT BOOKS:

1. **Decision support systems and Intelligent Systems**- Efrain Turban and Jay E Aranson. 5e, Pearson Education, 1998.
2. **A Guide to expert Systems**- Donald A Waterman**,** Pearson Education, 1995.

REFERENCE BOOK:

1. **Artificial intelligence structures and Strategies for complex problem solving**- G.F. Luger & W.A Stubble Field 3e, Pearson Education, 1998.

FUZZY LOGIC AND APPLICATIONS

Subject Code	:	**10ML832**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

CRISP SETS AND FUZZY SETS: Introduction, crisp sets, the notion of fuzzy sets, Basic concepts of fuzzy sets, classical logic, fuzzy logic.

7 Hours

UNIT - 2

OPERATIONS ON FUZZY SETS: General discussion, fuzzy complement, fuzzy union, fuzzy intersection, and combinations of operations

7 Hours

UNITS - 3 & 4

FUZZY RELATIONS: Crisp and fuzzy relations, Binary relation, Binary relations on a single set, equivalence and similarity relations, compatibility or tolerance relations, ordering morphism, fuzzy relations equations.

12 Hours

PART - B

UNITS - 5 & 6

FUZZY MEASURES: General discussion, Belief and plausibility measures, probability measures, possibility and necessity measures, relationship among classes of fuzzy measures.

14 Hours

UNITS - 7 & 8

APPLICATIONS: General discussion, natural life and social sciences, engineering, medicine, management and decision-making, computer science and systems science

12 Hours

TEXT BOOK:

1. **Fuzzy sets, Uncertainty and information**-Klein and Folger, Prentice Hall, 1987.

REFERENCE BOOK:

1. **Fuzzy logic with engineering applications-** Timothy. J. Ross, McGraw Hill International edition, 1997.

BIOSENSORS AND SMART SENSORS

Subject Code	:	**10ML833**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: What are Biosensors? Advantages and limitations, various components of biosensors, the growing of biosensor. The biosensor family, the biomolecule ingredients, proteins, enzymes complexes, enzymes kinetics, the proteins of the immune systems.

6 Hours

UNIT - 2

TRANSDUCERS IN BIOSENSORS: Various types of transducers; principles and applications - Calorimetric, optical, potentiometric / amperometric conductrometric/resistormetric, piezoelectric, semiconductor, impedimetric, mechanical and molecular electronics based transducers. Chemiluminescences - based biosensors.

7 Hours

UNIT - 3

APPLICATION AND USES OF BIOSENSORS: Biosensors in clinical chemistry, medicine and health care, biosensors for veterinary, agriculture and food. Biosensors for personal diabetes management, application of biosensors to environmental samples. Biochips and their application to genomics.

6 Hours

UNIT - 4

SEMICONDUCTOR ELECTRODES: Measurement of H +**,** Ion selective interfaces, Ion selective electrodes, semiconductor electrodes, MIS structures, semiconductor solution interface, FET, chemical sensitive FETA (CHEMFETA), suspended gate field effect transistor, selectivity via pattern recognition, Ion selective FET (ISFET), reference FET, CHEMFET, assessment of CHEMFETS.

7 Hours

PART - B

UNITS - 5 & 6

AMPEROMETRIC ASSAY TECHNIQUES: Analysis of charge transfer, volumetric techniques, potential step techniques, non steady state measurement, and applications of charge transfer measurement of the oxygen electrode.

SOURCE OF ERROR – Depletion of sample, non-Faradic current error, selectivity interference from other electro active species, Amperometric electrodes for estimation of Ion concentration, macromolecules system, Redox enzymes, modified electrodes, mediated electron transfer, microelectrode fabrication and application.

12 Hours

UNIT - 7

PHOTOMETRIC ASSAY TECHNIQUES: Energy transition, ultraviolet and visible absorption spectra, fluorescence and phosphorescence, infra Red transitions, light scattering, Raman scattering, applications of ultraviolet visible spectra, indicator linked bioassay, irrational spectroscopy, the optical transducer, wave guides in sensors, device construction, P^H optical probes, light scattering analysis.

7 Hours

UNIT - 8

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

7 Hours

TEXT BOOKS:

1. **Biosensors**- by Elizabeth A. H Hall - Open University press, Milton Keynes.
2. **Commercial Biosensors-** by Graham Ramsay, John Wiley and son, INC. (1998).

REFERENCE BOOKS:

1. **Biosensors-** by Eggins
2. **Biosensors** edited by AEG CASS – OIRL press, Oxford University.
3. **Transducers and Instrumentation**-by Murthy D V S. Prentice Hall, 1995

LOW POWER VLSI DESIGN

Subject Code	:	**10ML834**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: 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.

6 Hours

UNIT - 2

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

7 Hours

UNIT - 3

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.

7 Hours

UNIT - 4

PROBABILISTIC POWER ANALYSIS: Random logic signals, probability & frequency, probabilistic power analysis techniques, signal entropy. Circuit level: Power consumption in circuits. Flip Flops & Latches design, high capacitance nodes, low power digital cells library.

6 Hours

PART - B

UNIT - 5

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

6 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

7 Hours

UNIT - 8

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

6 Hours

TEXT BOOKS:

1. **Practical Low Power Digital VLSI Design**-Gary K. Yeap, KAP, 2002
2. **Low power design methodologies Rabaey, Pedram**-Kluwer Academic, 1997.

REFERENCE BOOK:

1. **Low-Power CMOS VLSI Circuit Design**-Kaushik Roy, Sharat Prasad, Wiley, 2000.

ELECTIVE-V (GROUP E)

BIO-MEMS

Subject Code	:	**10ML841**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

Part A

UNIT-1

Introduction to BioMEMS: What are BIOMEMS, The driving force behind biomedical applications, biocompatiability, Silicon fabrication: Hard fabrication considerations, lithography, etching techniques, Thin film deposition process, ion implantation, substrate bonding **7 Hours.**

UNIT-2

Soft fabrications & Polymer Materials: Introduction, Biomaterials, soft lithography, micromolding, smart polymers & hydrogels, nanomedicine, thick film technologies, polymers, physical properties, copolymers **6 Hours.**

UNIT-3

Microfluidic Principles & Sensors: Introduction, transport process, electrokinetic phenomena, microvalves, micromixers, micropumps **6 Hours.**

UNIT-4

Sensor principles & microsensors: Introduction, fabrication, basic sensors, optical fibres, piezoelectricity, SAW devices, electrochemical detection, applications to medicine. **7 Hours.**

Part B

UNIT-5

Microactuators & drug delivery: Introduction, activation methods, microactuators for microfluids, equivalent circuit representation, drug delivery **7 Hours.**

UNIT-6

Clinical laboratory medicine: introduction, chemistry, hematology, immunology, urine analysis **7 Hours.**

UNIT-7

Micro-Total-Analysis Systems: Lab-On_A-Chip, capillary electrophoresis arrays, cell, molecule & particle handling, surface modification, Microspheres **6Hours**

UNIT-8

Emerging BioMEMS technology: introduction, Minimal invasive surgery, cardiovascular, neurosciences, diabetics, point-of-care diagnosis, cell-based biosensors, oncology **6 Hours.**

Text Books:

1. Fundamentals of BioMEMS & Medical Microdevices, Steven Salitreman, Cengage Learning India, 2006

2. Lab-On-A-Chip: Miniaturized systems for chemical analysis & synthesis, Edwin ooterrbroek, Alert Berg, Elsevier, 2003

ADVANCED DIGITAL IMAGE PROCESSING

Subject Code	:	**10ML842**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART A

Unit 1

COLOR IMAGE PROCESSING

Color Fundamentals, Pseudo-color Image processing, Color transformations, Smoothing & sharping, Color Segmentation, Noise in color images, Color Image compression 6 hours

Unit 2

IMAGE COMPRESSION

Fundamentals, image compression models, elements of information theory, error-free compression, lossy compression, image compression standards 7 hours

Unit 3

MORPHOLOGICAL IMAGE PROCESSING

preliminaries, dilation and erosion, opening and closing, the Hit-or-miss transformation, some basic morphological algorithms, extensions to gray scale images 7 hours

Unit 4

IMAGE SEGMENTATION

Detection of discontinuities, edge linking and boundary detection, Thresholding, region oriented segmentation, segmentation of morphological watersheds, the use of motion in segmentation 6 hours

PART B

Unit 5

REPRESENTATION & DESCRIPTION

Representation, boundary descriptors, regional descriptors, use of principal components for description, relational descriptors 6 hours

Unit 6

OBJECT RECOGNITION

Patterns and pattern classes, recognition based on decision-theoretic methods, structural methods, 6 hours

Unit 7 & 8

WAVELET & MULTIRESOLUTION PROCESSING

Background, Multiresolution expansions, wavelet transforms in one dimension, fast wavelet transforms, wavelet transforms in two dimensions, wavelet packets 14 hours

Text Books:

1. Digital Image Processing by R C Gonzalez & R E Woods, 2e, Pearson Education.

References:

1. Fundamentals of Digital Image processing by A K Jain ,PHI / Pearson Education, 1989
2. Digital Image Processing by Sid Ahmed, McGraw Hill

REHABILITATION ENGINEERING

Subject Code	:	**10ML843**	**IA Marks**	:	25
No. of Lecture Hrs./ 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 : Co-ordination 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**-Dr. S. Sunder, Jaypee Medical Publications, New Delhi.
2. **Physical Rehabilitation**-Susan B O'Sullivan, Thomas J Schmitz. 5th edition

ARM PROCESSOR

Subject Code	:	**10ML844**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

Unit 1 and 2

Introduction to embedded systems, ARM embedded system, ARM processor fundamentals: Registers, Current program status register, pipeline, exceptions, Interrupts, the Vector table, Core extensions, ARM processor families 14 Hours

Unit 3

Introduction to ARM instruction set: Data processing instructions, Branch instructions, load-store instructions, software interrupt instructions, program status register instructions, Coprocessor instructions. 6 Hours

Unit4

Introduction to thumb instruction set: Thumb programmers model, Thumb branch instructions, data processing instructions, Single register load-store Instructions, Multiple-Register load-store instruction, Stack instruction, Software interrupt instruction. 6 Hours

PART - B

Unit 5

ARM assembly language Programming 7 Hours

Unit 6

Architectural Support for High-Level languages: Data types, Floating-point data types, The ARM floating point architecture, Expressions, Conditional statements, Loops, functions and procedures.

6 Hours

Unit 7

Introduction to DSP on the ARM, FIR filters, IIR filters, DFT 7 Hours

Unit8

Embedded operating systems 6 Hours

TEXT BOOKS:

1. **ARM system developers guide**, Andrew N Sloss, Dominic Symes and Chris wright, Elsevier, Morgan Kaufman publishers, 2008.
2. **Arm-System-On-Chip- Architecture**: By Steve Furber-Pearson.

REFERENCE BOOKS:

1. **"Embedded system design"**, Frank vahid/Tony givargis, John wiley &sons, 2003.
2. **"Embedded/Real time systems, Real-Time systems"**, Dr.K.V.K.K Prasad, Dreamtech press, 2004.

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