COURSE CATALOG FOR 2010 SCHEME

ACHARYA INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MECHATROINICS ENGINEERING

III SEMESTER

Sl. No.	Sub code	Subjects
1	10MAT31	ENGG-MATHEMATICS III
2	10MT32	MATERIAL SCIENCE AND METALLURGY
3	10MT33	MECHANICS OF MATERIALS
4	10MT34	FLUID MECHANICS
5	10MT35	ANALOG AND DIGITAL ELECTRONICS
6	10MT36	SIGNALS & SYSTEMS
7	10MT37	MATERIALS TESTING & METALLURGY LAB
8	10MT38	ANALOG AND DIGITAL ELECTRONICS LAB

IV SEMESTER

Sl. No.	Sub code	Subjects
1	10MAT41	ENGG MATHEMATICS IV
2	10MT42	MANUFACTURING TECHNOLOGY
3	10MT43	KINEMATICS OF MACHINERY
4	10MT44	POWER ELECTRONICS
5	10MT45	INSTRUMENTATION & MEASUREMENTS
6	10MT46	ELECTRICAL MACHINES AND DRIVES
7	10MT47	POWER ELECTRONICS LAB
8	10MT48	ELECTRICAL MACHINES LAB DRIVES LAB

V SEMESTER

Sl. No.	Sub code	Subjects
1	10MT51	METROLOGY AND MEASUREMENTS
2	10MT52	COMPUTER GRAPHICS
3	10MT53	HYDRAULICS AND PNEUMATICS
4	10MT54	MICROCONTROLLER
5	10MT55	AUTOMOTIVE ELECTRONICS
6	10MT56	SENSORS AND NETWORKS
7	10MT57	METROLOGY AND MEASUREMENTS LAB
8	10MT58	MICROCONTROLLER & PLC LAB

VI SEMESTER

Sl. No.	Sub code	Subjects
1	10AL61	MANAGEMENTS & ENTREPRENEURSHIP
2	10MT62	MODELING & SIMULATION
3	06MT63	MICRO AND SMART SYSTEMS TECHNOLOGY
4	10MT64	EMBEDDED SYSTEMS
5	10MT65	ADVANCED COMPUTER PROGRAMMING
6	10MT66X	ELECTIVE I
7	10MT67	MICRO AND SMART SYSTEMS TECHNOLOGY LAB
8	10MTL68	ADVANCED COMPUTER PROGRAMMING LAB

ELECTIVE I:
10MT661 – COMPUTER VISION
10MT662 – OPERATING SYSTEMS
10MT663 – ELECTRICCAL/HYBRID VEHICLES
10MT664 - PLC
10MT665 – COMMUNICATION SYSTEM

VII SEMSTER

Sl. No.	Sub code	Subjects
1	10MT71	THERMODYNAMICS & HEAT TRANSFER
2	10MT72	ROBOTICS AND MACHINE VISION SYSTEMS
3	10MT73	WIRELESS NETWORKS
4	10MT74	DIGITAL SIGNAL PROCESSING
5	10MT75X	ELECTIVE I
6	10MT76X	ELECTIVE II
7	10MT77	ROBOTICS LAB
8	10MT78	DSP (HW + MAT LAB)

ELECTIVE II:

10MT751 – SMART MATERIALS
10MT752 –MIS
10MT753 – ARTIFICIAL INTELLIGENCE
10MT754 –MECHANICAL VIBRATIONS
10MT755 –OPERATION RESEARCH

ELECTIVE III:

10MT761 – REAL TIME SYSTEMS
10MT762 – IMAGE PROCESSING
10MT763 – DISPLAY SYSTEMS
10MT764 – SOFT COMPUTING
106MT765 –SAFETY AND SECURITY OF MECHATRONICS SYSTEMS

VIII SEMESTER

Sl. No.	Sub code	Subjects
1	10MT81	RAPID PROTOTYPING
2	10MT82	RELIABILITY & FAULT TOLERANCE
3	10MT83X	ELECTIVE IV
4	10MT84X	ELECTIVE V
5	10MT85	PROJECT WORK
6	10MT86	SEMINAR ON CURRENT TOPICS

ELECTIVE IV:
10MT831 – NANO TECHNOLOGY
10MT832 - DBMS
10MT833 – DESIGN OF EXPERIENCE
10MT834 - FINITE ELEMENT ANALYSIS
10MT835 – INDUSTRIAL ENGINEERING & ERGONOMICS
10MT836 – OPTIMUM DESIGN

ELECTIVE V:
10MT841 – WIRELESS COMMUNICATION
10MT842 – AUDIO & VIDEO PROCESSING
10MT843 – VIRTUAL INSTRUMENTATION
10MT844 – DSP ARCHITECTURES & ALGORITHMS
10MT845 – LOW POWER RF

ENGINEERING MATHEMATICS – III

Sub Code : 10MAT31 **IA Marks : 25**
Hrs/ Week : 04 **Exam Hrs : 03**
Total Hrs. : 52 **Exam Marks : 100**

PART-A

UNIT-1

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 and arbitrary period, half range Fourier series. Complex form of Fourier Series. Practical harmonic analysis. **7 Hrs**

UNIT-2

Fourier Transforms Infinite Fourier transform, Fourier Sine and Cosine transforms, properties, Inverse transforms **6 Hrs**

UNIT-3

Application 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 Hrs**

UNIT-4

Curve Fitting and Optimisation Curve fitting by the method of least squares- Fitting of curves of the form $y= ax+b$, $y= ax^2 + bx + c$, $y=ae^{bx}$, $y=ax$, bx , y b y a e ax Optimization: Linear programming, mathematical formulation of linear programming problem (LPP), Graphical method and simplex method. **7 Hrs**

PART-B

UNIT-5

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 Hrs**

UNIT-6

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 Hrs**

UNIT-7

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 Hrs**

UNIT-8

Difference Equations and Z-Transforms Difference equations: Basic definition; Z-transforms – definition, standard Ztransforms, damping rule, shifting rule, initial value and final value theorems. Inverse Z-transform. Application of Z-transforms to solve difference equations. **6 Hrs**

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 BOOKS:

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

MATERIAL SCIENCE AND METALLURGY

Subject Code : 10MT32, **IA Marks : 25**
Hrs/Week : 04, **Exam Hrs : 03**
Total Hrs : 52, **Exam Marks : 100**

PART – A

UNIT – 1 Crystal Structure: BCC, FCC and HCP Structures, coordination number and atomic packing factors, crystal imperfections -point line and surface imperfections. Atomic Diffusion: Phenomenon, Ficks laws of diffusion, factors affecting diffusion. **06 Hrs**

UNIT – 2 Mechanical Behaviour: Stress-strain diagram showing ductile and brittle behaviour of materials, linear and non linear elastic behaviour and properties, mechanical properties in plastic range, yield strength offset yield strength, ductility, ultimate tensile strength, toughness. Plastic deformation of single crystal by slip and twinning. **06 Hrs**

UNIT – 3 Fracture: Type I, Type II and Type III.
Creep: Description of the phenomenon with examples. three stages of creep, creep properties, stress relaxation.
Fatigue: Types of fatigue loading with examples, Mechanism of fatigue, fatigue properties, fatigue testing and S-N diagram. **07 Hrs**

UNIT – 4 Solidification: Mechanism of solidification, Homogenous and Heterogeneous nucleation, crystal growth, cast metal structures. Phase Diagram I: Solid solutions Hume Rothary rule substitutional, and interstitial solid solutions, intermediate phases, Gibbs phase rule. **07 Hrs**

PART – B

UNIT – 5 Phase Diagram II: Construction of equilibrium diagrams involving complete and partial solubility, lever rule. Iron carbon equilibrium diagram description of phases, solidification of steels and cast irons, invariant reactions. 6**Hrs**

UNIT – 6 Heat treating of metals: TTT curves, continuous cooling curves, annealing and its types. normalizing, hardening, tempering, martempering, austempering, hardenability, surface hardening methods like carburizing, cyaniding, nitriding, flame hardening and induction hardening, age hardening of aluminium-copper alloys. **07 Hrs**

UNIT – 7 Ferrous and non ferrous materials: Properties, Composition and uses of
- Grey cast iron, malleable iron, SG iron and steel.
- Copper alloys-brasses and bronzes. Aluminium alloys-Al-Cu,Al-Si,Al-Zn alloys. **06 Hrs**

UNIT – 8 Composite Materials: Definition, classification, types of matrix materials & reinforcements, fundamentals of production of FRP's and MMC's advantages and application of composites. **07 Hrs**

TEXT BOOKS:

1. **Foundations of Materials Science and Engineering,** Smith, 4th Edition McGraw Hill, 2009
2. **Materials Science, Shackleford., & M. K. Muralidhara,** Pearson Publication – 2007.

REFERENCE BOOKS:

1. **An Introduction to Metallurgy; Alan Cottrell**, Universities Press India Oriental Longman Pvt. Ltd., 1974.
2. **Engineering Materials Science**, W.C.Richards, PHI, 1965
3. **Physical Metallurgy**; Lakhtin, Mir Publications
4. **Materials Science and Engineering,** V.Raghavan , PHI, 2002
5. **Elements of Materials Science and Engineering,** H. VanVlack, Addison- Wesley Edn., 1998
6. **Materials Science and Engineering,**William D. Callister Jr., John Wiley & Sons. Inc, 5th Edition, 2001.
7. **The Science and Engineering of Materials,** Donald R. Askland and Pradeep.P. Phule, Cengage Learning, 4th Ed., 2003.

MECHANICS OF MATERIALS

Subject Code : 10MT33 **IA Marks : 25**
Hrs/Week : 04 **Exam Hrs : 03**
Total Hrs : 52 **Exam Marks : 100**

PART-A

UNIT 1: Simple Stress and Strain: Introduction, Stress, strain, mechanical properties of materials, Linear elasticity, Hooke's Law and Poisson's ratio, Stress-Strain relation - behavior in tension for Mild steel, cast iron and non ferrous metals. Extension / Shortening of a bar, bars with cross sections varying in steps, bars with continuously varying cross sections (circular and rectangular), Elongation due to self weight, Principle of super position. **07 Hrs**

UNIT 2: Stress in Composite Section: Volumetric strain, expression for volumetric strain, elastic constants, simple shear stress, shear strain, temperature stresses (including compound bars). **06 Hrs**

UNIT 3: Compound Stresses: Introduction, Plane stress, stresses on inclined sections, principal stresses and maximum shear stresses, Mohr's circle forplane stress. **07 Hrs**

UNIT 4: Energy Methods: Work and strain energy, Strain energy in bar/beams, Castiglinios theorem, Energy methods.**Thick and Thin Cylinder** Stresses in thin cylinders, changes in dimensions of cylinder (diameter, length and volume). Thick cylinders Lame's equation (compound cylinders not included). **06 Hrs**

PART-B

UNIT 5: **Bending Moment and Shear Force in Beams**: Introduction, Types of beams, loads and reactions, shear forces and bending moments, rate of loading, sign conventions, relationship between shear force and bending moments. Shear force and bending moment diagrams for different beams subjected to concentrated loads, uniformly distributed load, (UDL) uniformly varying load (UVL) and couple for different types of beams. **07 Hrs**

UNIT 6:Bending and Shear Stresses in Beams: Introduction, Theory of simple bending, assumptions in simple bending. Bending stress equation, relationship between bending stress, radius of curvature, relationship between bending moment and radius of curvature. Moment carrying capacity of a section. Shearing stresses in beams, shear stress across rectangular, circular, symmetrical I and T sections. (composite / notched beams not included).**07 Hrs**

UNIT 7:Deflection of Beams: Introduction, Differential equation for deflection. Equations for deflection, slope and bending moment. Double integration method for cantilever and simply supported beams for point load, UDL, UVL and Couple. Macaulay's method. **06 Hrs**

UNIT 8:Torsion of Circular Shafts and Elastic Stability of Columns: Introduction. Pure torsion, assumptions, derivation of torsional equations, polar modulus, torsional rigidity / stiffness of shafts. Power transmitted by solid and hollow circular shafts
Columns: Euler's theory for axially loaded elastic long columns. Derivation of Euler's load for various end conditions, limitations of Euler's theory, Rankine's formula. **06 Hrs**

TEXT BOOKS:
1. **"Mechanics of Materials",** by R.C.Hibbeler, Prentice Hall. Pearson Edu., 2005
2. **"Mechanics of materials",** James.M.Gere, Thomson, Fifth edition2004.
3. **"Mechanics of materials",** in SI Units, Ferdinand Beer & Russell Johston, 5th Ed., TATA McGraw Hill- 2003.

REFERENCE BOOKS:
1. **"Strength of Materials",** S.S. Rattan, Tata McGraw Hill, 2009
2. **"Strength of Materials",** S.S.Bhavikatti, Vikas publications House -1 Pvt. Ltd., 2nd Ed., 2006.
3. **"Mechanics of Materials",** K.V. Rao, G.C. Raju, First Edition, 2007
4. **"Engineering Mechanics of Solids**", Egor.P. Popov, Pearson Edu. India, 2nd, Edition, 1998.
5. **"Strength of Materials",** W.A. Nash, 5th Ed., Schaum's Outline Series, Fourth Edition-2007.

FLUID MECHANICS

Subject Code: 10MT34 **IA Marks: 25**
Hrs/Week: 04 **Exam Hrs: 03**
Total Hrs: 52 **Exam Marks : 100**

PART – A

UNIT-1: Properties of Fluids: Introduction, Types of fluid, Properties of fluids, viscosity, thermodynamic properties, surface tension, capillarity, vapour pressure and cavitation **06 Hrs**

UNIT-2: Fluid Statistics: Fluid pressure at a point, Pascal's law, pressure variation in a static fluid, absolute, gauge, atmospheric and vacuum pressures, simple manometers and differential manometers. Total pressure and center of pressure on submerged plane surfaces; horizontal, vertical and inclined plane surfaces, curved surface submerged in liquid. **07 Hrs**

UNIT-3: Buoyancy and Fluid Kinematics: Buoyancy, center of buoyancy, metacentre and metacentric height, conditions of equilibrium of floating and submerged bodies, determination of Metacentric height experimentally and theoretically. Kinematics: Types of fluid flow, continuity equation in 2D and 3D (Cartesian Co-ordinates only), velocity and acceleration, velocity potential function and stream function. **07 Hrs**

UNIT-4: Fluid Dynamics: Introduction equation of motion, Euler's equation of motion, Bernoulli's equation from first principles and also from Euler's equation, limitations of Bernoulli's equation. **06 Hrs**

PART-B

UNIT-5: Fluid Flow Measurements: Venturimeter, orificemeter, pitot-tube, vertical orifice, V-Notch and rectangular notches. Dimensional Analysis: Introduction, derived quantities, dimensions of physical quantities, dimensional homogeneity, Rayleigh's method, Buckingham theorem, dimensionless numbers, similitude, types of similitudes. **07 Hrs**

UNIT-6: Flow through pipes: Minor losses through pipes. Darey's and Chezy's equation for loss of head due to friction in pipes. HGL and TEL. **06 Hrs**

UNIT-7:Laminar flow and viscous effects : Reyonold's number, critical Reynold's number, laminar flow through circular pipe-Hagen Poiseille's equation, laminar flow between parallel and stationary plates. **06 Hrs**

UNIT-8: Flow past immersed bodies : Drag, Lift, expression for lift and drag, boundary layer concept, displacement, momentum and energy thickness. Introduction to compressible flow : Velocity of sound in a fluid, Mach number, Mach cone, propagation of pressure waves in a compressible fluid. **07 Hrs**

TEXT BOOKS:

1. **Fluid Mechanics,** Oijush.K.Kundu, IRAM COCHEN, ELSEVIER, 3rd Ed. 2005.
2. **Fluid Mechanics**, Dr. Bansal, R.K.Lakshmi Publications, 2004.

REFERENCE BOOKS:

1. **Fluid Mechanics and hydraulics,** Dr.Jagadishlal: MetropolitanBook Co-Ltd., 1997.
2. **Fluid Mechanics (SI Units),** Yunus A. Cengel John M.Oimbala, 2nd Ed., Tata McGraw Hill, 2006.
3. **Fluid Mechanics,** John F.Douglas, Janul and M.Gasiosek and john A.Swaffield, Pearson Education Asia, 5th ed., 2006
4. **Fluid Mechanics and Fluid Power Engineering**, Kumar.D.S,Kataria and Sons., 2004
5. **Fluid Mechanics** -. Merle C. Potter, Elaine P.Scott. Cengage learning.

ANALOG AND DIGITAL ELECTRONICS

Sub Code : 10MT35 **IA Marks : 25**
Hrs/Week :04 **Exam Hrs :03**
Total Lecture Hrs : 52 **Exam Marks :100**

PART – A

UNIT 1:Diode Applications : PN junction Diode, VI-Characteristics, Junction diode Models, Junction Diode as a switch, Diode specifications, Circuit applications of diodes, Smoothing circuits, Zener diode voltage Regulators. **7 Hrs**

UNIT: 2 Bipolar Junction Transistor: Small signal model, DC biasing of BJT amplifiers, BJT amplifiers, BJT as a switch, feedback amplifier concept, Frequency response. **6 Hrs**

UNIT : 3 Op-Amp active filter and oscillators : Active filters, I & II order low pass filter, I and II order high filters, wide Band pass and Band reject filter, phase shift oscillator, wein bridge oscillator. **7 Hrs**

UNIT: 4 Comparators and 555 timer: Basic compartors, zero crossing detector, schimitt trigger, the 555 timer, monostable multivibrator, astable multivibrator, applications of astable multivibrator. **6 Hrs**

PART-B

UNIT: 5 Logic families: Digital circuits, basic logic operations, the NOR & NAND logic gates, other IC logic gates, logic gates characteristics, the TTL logic, CMOS logic family, emitter coupled logic. **7 Hrs**

UNIT: 6 Sequential circuits: RS latch, Flip flops, JK flip flop, digital registers, binary and decade counters, read and write memories. **6 Hrs**

UNIT: 7 Combinational circuits: multiplexers, demultiplixers, encoders, decoders, adders **6 Hrs**

UNIT: 8 Analog – Digital Converters: Quantization of analog signals, DAC, ADC, digital instrumentation system. **7 Hrs**

TEXT BOOKS:

1. **"Electronic Circuits and systems- analog and digital", Y.N** Bapat 1992 edition, Tata Mc GrawHill.
2. **"Opamp and Linear Integrated Circuits",** Ramakant A Gayakwad 3rd edition, PHI.
3. **"Digital Logic and Computer Design",** M Morris Mano, 2001 ledition, PHI.

REFFERENCE BOOKS:

1. **"Digital Electronics: Principles and Integrated circuits",** Anil K Maini, 2008, wiley India.
2. **"Linear Integrated Circuits",** D. Roy Choudhury and Shail B Jain, 2nd edition, Reprint 2006, New Age International.
3. **"Digital Principles and applications",** Malvino & Leach, Tata Mc. Graw Hill.

Coverage in the Text books:
Unit 1: (Text 1: Chapter 2-2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8,)
Unit 2: (Text 1: Chapters – 3.4, 3.5, 3.6, 5.1, 5.2, 7.1, 7.2,)
Unit 3: (Text 2: Chapters 8.2, 8.3, 8.4, 8.5, 8.6, 8.8.1, 8.9.2, 8.12, 8.13)
Unit 4: (Text 2: Chapters9.2, 9.3, 9.4, 10.4.1, 10.4.2, 10.4.3, 10.4.4)
Unit 5: (Text 1: Chapt9 – 9.1 To 9.7),
Unit 6: (Text 1: Chapter 11- 11. 1, 11.2, 11.3, 11.4, 11.5,)
Unit 7: (Text 3:Chapter 5 -5.1,5.2,5.3,5.5,5.6)
Unit 8 :(Text 1: Chapter 14-14.1, 14.2, 14.3, 14.4).

SIGNALS & SYSTEMS

Sub code : 10MT36 **IA MARKS: 25**
Hrs/Week: 4 **Total Marks: 100**
Exam Hrs: 03 **Total Hrs: 52**

PART – A

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

UNIT 2: Time-domain representations for LTI systems – 1: Convolution, impulse response representation, Convolution Sum and Convolution Integral. **6 Hrs**

UNIT 3: Time-domain representations for LTI systems – 2: properties of impulse response representation, Differential and difference equation Representations, Block diagram representations. **7 Hrs**

UNIT 4: Fourier representation for signals – 1: Introduction, Discrete time and continuous time Fourier series (derivation of series excluded) and their properties. **6 Hrs**

PART – B

UNIT 5: Fourier representation for signals – 2: Discrete and continuous Fourier Transforms (derivations of transforms are excluded) and their properties. **6 Hrs**

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. **7 Hrs**

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

UNIT 8: Z-transforms – 2: Transform analysis of LTI Systems, unilateral Z- Transform and its application to solve difference equations. **06 Hrs**

TEXT BOOK:Simon Haykin and Barry Van Veen "Signals and Systems", John Wiley & Sons,2001.
UNIT 1: 1.1, 1.2, 1.4 to 1.8
UNIT 2: 2.1, 2.2
UNIT 3: 2.3**,** 2.4, 2.5
UNIT 4: 3.1, 3.2, 3.3, 3.6
UNIT 5: 3.4, 3.5, 3.6
UNIT 6: 4.1, 4.2, 4.3, 4.5, 4.6.
UNIT 7: 7.1, 7.2, 7.3, 7.4, 7.5
UNIT 8: 7.6 (Excluding 'relating the transfer function and the State-Variable description,
Determining the frequency response from poles and zeros) and 7.8

MATERIAL TESTING AND METALLOGRAPHY LABORATORY

Sub Code: 10MTL37 **IA Marks : 25**
Hrs/week: 0 **Exam Hrs: 03**
Total Lecture Hrs: 42 **Exam Marks: 50**

PART – A

1. Preparation of specimen for Metallographic examination of different engineering materials. Identification of microstructures of plain carbon steel, tool steel, gray C.I, SG iron, Brass, Bronze & composites.

2. Heat treatment: Annealing, normalizing, hardening and tempering of steel. Hardness studies of heat-treated samples.

3. To study the wear characteristics of ferrous, non-ferrous and composite materials for different parameters.
4. Non-destructive test experiment likes,
   (a) Ultrasonic flaw detection.
   (b) Magnetic crack detection.
   (c) Dye penetration testing. To study the defects of Cast and Welded specimens.

PART-B

1. Tensile, shear and compression tests of metallic and non metallic specimens using Universal Testing machine.
2. Torsion Test.
3. Bending Test on metallic and non metallic specimens.
4. Izod and Charpy tests on M.S.C.I Specimen.
5. Brinell, rockwelll and Vickers"s hardness test.
6. Fatigue Test

Scheme of Examination:
One Question From Part – A : 20 marks
One Question From Part - B : 20 Marks
Viva- Voice : 10 Marks
Total : 50 Marks

ANALOG AND DIGITAL ELECTRONICS LAB

Sub Code: 10MTL38 **IA Marks: 25**
Hrs/ Week: 03 **Exam Hrs: 03**
Total Hrs: 42 **Exam Marks: 50**

1. Clipper circuits and Clamper circuits using diodes.
2. Single stage RC coupled amplifier using BJT and its frequency respons.
3. Invering Amplifier, Non inverting Amplifier, voltage Follower using Opamp.
4. Astable and Monostable multivibrator using timer 555.
5. RC phase shift Oscillator using BJT.
6. Simplification and realization of Boolean expression using logic gates/ universal gates.
7. Half adder/ Full Adder using logic gates.
8. Decoder/Encoders
9. Multiplexers/demultiplexers.
10. Realization of counters.

SCHEME OF EXAMINATION :

Experiment : **40 Marks**
Viva- voice : **10 Marks**
Total : 50 Marks

IV SEMESTER

MANUFACTURING TECHNOLOGY

Sub Code: 10MT42 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

PART – A

UNIT 1: Theory of Metal Cutting: Single point cutting tool nomenclature, geometry. Mechanics of Chip Formation, Types of Chips. Merchants circle diagram and analysis, Ernst Merchant's solution, shear an angle relationship, problems of Merchants' analysis. Tool Wear and Tool failure, tool life. Effects of cutting parameters on tool life. Tool Failure Criteria, Taylor's Tool equation. Problems on tool life evaluation. **7 Hrs**

UNIT 2: Cutting Tool Materials: Desired properties and types of cutting tool materials – HSS, carbides coated carbides, ceramics, cutting Fluids. Desired properties, types and selection. Heat generation in metal cutting, factors affecting heat generation. Heat distribution in tool and work piece and chip. Measurement of tool tip temperature. **6 Hrs**

UNIT 3: Turning (Lathe), Shaping and Planning Machines: Classification, constructional features of Turret and Capstan Lathe. Tool Layout, shaping Machine, Planning Machine, Driving mechanisms of lathe, shaping and planning machines, Different operations on lathe, shaping machine and planning machine. Simple problems on machinery time calculations. **7 Hrs**

UNIT 4: Drilling Machines: Classification, constructional features, drilling & related operations. Types of drill & drill bit nomenclature, drill materials. **6 Hrs**

Milling Machines: Classification, constructional feature, milling cutters nomenclature, milling operations, up milling and down milling concepts. Various milling operations.
Indexing: Simple, compound, differential and angular indexing calculations. Simple problems on simple and compound indexing. **6 Hrs**

PART – B

UNIT: 5: NC, CNC, DNC, Technology: NC, CNC, DNC, models, NC elements, advantages and limitations of NC, CNC. Introduction to NC machines- Principles of operation. Axes of NC machine-Coordinate systems. **6 Hrs**

UNIT 6: Introducing to CNC machines: Basics of Turning tool Geometry, ATC, Programming methods. – Manual part programming, Milling, Turning, (Simple Programs), Computer Aided part programming (Simple problems) **6 Hrs**

UNIT 7: DNC, Types, Applications, Types of CNC Programming Software's, Over view CNC machining centers, Turning centre. **6 Hrs**

UNIT 8: Non-traditional Machining Processes: Need for non-traditional machining, Principle, equipment & operation of Laser Beam, Plasma Arc Machining, Electro Chemical Machining, Ultrasonic Machining, Abrasive Jet Machining, Water Jet Machining, Electron Beam Machining, Electron Discharge Machining and Plasma Arc Machining. **8 Hrs**

Text Books:

1. NC Machine Programming and Software Design, ChnoHwachang**,** Michel. A. Melkanoff, Prentice Hall, 1989
2. Manufacturing Technology, Serope Kalpakjain, Steuen.R.Sechmid, Pearson Education Asia, 5th Ed. 2006.

Reference Books:

1. **Process and Materials of Manufacturing,** Roy A Lindberg, 4th Ed. Pearson Ed. 2006.
2. **Workshop technology,** Hazara Choudhry, Vol-II, Media Promoters & Publishers Pvt Ltd. 2004.
3. **Automation Production system and Computer Integrated Manufacturing** Mikell. O. Grover, PHI, New Delhi, 2002.
4. **Production technology,** HMT, Tata McGraw Hill, 2001.
5. **Manufacturing Science,** Amitable Ghosh and Mallik, affiliated East West press, 2003.

6. **Fundamentals of metal Machining and machine Tools,** G. Boothroyd, McGraw Hill. 2000.

KINEMATICS OF MACHINES

Sub Code: 10MT43 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

Part – A

Unit 1: Introduction: Definitions Link of element, kinematic pairs, Degrees of freedom, Grubler's criterion (without derivation), Kinematic chain, Mechanism, Structure, Mobility of Mechanisms, Inversion, Machine.
Kinematic Chains and Inversions: Inversions of Four bar chain; Single slider crank chain and Double slider crank chain. **07 Hrs**

Unit 2: Mechanisms: Quick return motion mechanisms-Drag link mechanism, Whitworth mechanism and Crank and slotted lever Mechanisms. Straight line motion mechanisms Peaucellier's mechanism and Robert's mechanisms. Intermittent Motion mechanisms –Geneva wheel mechanism and Ratchet and Pawl mechanism. Toggle mechanism, Pantograph, Ackerman steering gear mechanism. **06 Hrs**

Unit 3: Velocity and Acceleration Analysis of Mechanisms (analytical Methods): Analysis of four bar chain and slider crank chain using analytical expressions. (Use of complex algebra and vector algebra) **06 Hrs**

Unit 4: Cams: Types of cams, Types of followers. Displacement, Velocity and, Acceleration time curve for cam profiles. Disc cam with reciprocating fllower having knife-edge, roller and flat-face follower, Disc cam with oscillating roller follower. Follower motions including SHM, Uniform acceleration and retardation and Cycloidal motion. **07 Hrs**

Part – B

Unit 5: Friction and Belt Drivers: Definitions: Types of Friction: Laws of friction, Friction in Pivot and Collar Bearings. Belt Drives: Flat Belt Drives, Ratio of Belt Tensions, Centrifugal Tension, power Transmitted. **06 Hrs**

Unit 6: Gyroscope: Vectorial Representation of Angular Motion, Gyroscopic Couple. Effect of Gyroscopic Couple on Ship, Plane Disc, Aero plane, Stability of Two Wheelers and Four Wheelers. **06 Hrs**

Unit 7: Spur Gears: Gear terminology, law of gearing, characteristics of involve action, Path of contact Arc of contact, Contact ratio of spur, helical, bevel and worm gears, Interference in involute gears. Method of avoiding interference, Back lash. Comparison of involute and cycloidal teeth. Profile Modification. **07 Hrs**

Unit 8: Gear Trains: Simple gear trains, Compound gear trains for large speed. Reduction, Epicyclic gear trains. Algebraic and tabular methods of finding velocity ratio of epicyclic gear trains. Tooth load and torque calculations in epicyclic gear trains. **07 Hrs**

Text Books:

1. **Theory of Machines:** Sadhu Singh, Pearson Education, 2nd edition, 2007.
2. **Theory of Machines:** Rattan S.S Tata McGraw Hill Publishing Company Ltd., New Delhi, 2nd Edition, 2006.

Reference Books:

1. **Theory of Machines,** Thomas Bevan, CBS Publication 1984.
2. **Design of Machinery,** Robert L, Nortion, McGraw Hill, 2001.
3. **Mechanisms and Dynamics of Machinery,** J Srinivas, Scitech Publications, Chennai, 2002.

POWER ELECTRONICS

Sub Code: 10MT44 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

PART – A

Unit 1: Introduction, Power semiconductor Devices: Applications of Power Electronics, Power semiconductor devices, Control Characteristics. Types of power electronics circuits. Peripheral effects. **06 Hrs**

Unit 2: Power Transistors: Power BJt's – switching characteristics, switching limits, bas drive Control. Power Mosfet's – switching characteristics, gate drivel. IGBT's, di/dt and dv/dt limitations. Isolation of gate and base drives. Simple design of gate and base drives. **06 Hrs**

Unit 3: Thyristors: Introduction, characteristics. Two Transistor Model. Turn-on and turn-off. di/dt and dv/dt protection. Thyristor types. Series and parallel operation of Thyristors. Thyristors firing circuits. Simple design of firing circuits using UJT, op-amps, and digital IC's. **07 Hrs**

Unit 4: Commutation Techniques: Introduction. Natural Communication, Forced commutation: self commutation, impulse commutation, resonant pulse commutation and complementary commutations. **07 Hrs**

PART – B

Unit 5: AC Voltage Controllers: Introduction. Principle of ON-OFF and phase control. Single-phase bidirectional controllers with resistive and inductive loads. **06 Hrs**

Unit 6: Controlled Rectifiers: Introduction. Principle of phase controlled converter operation. Single phase semi-converters. Full converters./ Three-phase half-wave converters. Three-phase full-wave converters. **06 Hrs**

Unit 7: DC Choppers: Introduction. Principle of step-down and step-up chopper with R-L load. Performance parameters. Choppers classification. Analysis of impulse commutated thyristor chopper (only qualitative analysis) **07 Hrs**

Unit 8: Inverters: Introduction, Principle of operation. Performance parameters. Single-phase bridge inverters. Three phase inverters. Voltage control of single-phase nverters single pulse width, multiple pulse width, and sinusoidal pulse width modulation. Current source inverters. Variable D.C link inverter. **07 Hrs**

Text Book:

1. **"Power Electronics"**, M H. Rashid 2nd Edition, P. H.I/Pearson, New Delhi, 2002.

References

1. "Power Electronics – converters, Application and Design", Net Mohan, Tore M. Undeland, and William P. Robins, Third Edition, John Wiley and Sons.
2. "Thyristorised Power Controllers", G. K. Dubey, S. R. Doradla, A. Joshi and R M K. Sinha, New Age International Publishers.
3. "Power Electronics", M. D. Singh and Khanchandani K.B. T.M.H., 2001.
4. "Power Electronics", Cyril Lander, 3rd Edition, McGraw-Hill.
5. "Power Electronics: Principles and Applicsations", J.M. Jacob, Thomson-Vikas Publicaions.
6. "Power Electronics : A Simplefied Approach", R.S. Ananda Murthy and V. Nattarasu, Sanguine Technical Publishers.

INSTRUMENTATION AND MEASUREMENTS

Sub Code : 10MT45 IA Marks : 25
Hrs/week : 04 Exam Hrs : 03
Total Lecture 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, lading AC voltmeter using Rectifiers - |Half wave and full wave, Peak responding and True RMS voltmeters. **07 Hrs**

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. **07 Hrs**

Unit 3: Oscilloscopes: Introduction, Basic principles, CRT features, Block diagram and working of each block. Typical CRT connections. Dual beam and dual trace CROs, Electronics switch.

Unit 4: Special Oscilloscopes: delayed time-base oscilloscopes, Analog storage, Sampling and Digital storage oscilloscopes. **06 Hrs**

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. **06 Hrs**

Unit 6: Measurement of resistance, induction and capacitance: Whetstone's bridge, Kelvin Bridge; AC bridges, Capacitance Comparison Bridge, Maxwell's bridge, wein's bridge, Wagners's earth connection. **07 Hrs**

Unit 7: Transducers – I: Introduction, Electrical transducers, Selecting a transducer, Resistive transducers, Resistive position transducer, Strain gauges, Resistance thermometer, Thermistor, Inductive transducer, Differential output transducers and LVDT. **07 Hrs**

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 divices, LEDs, LCd displays (c) **06 Hrs**

TEXT BOOKS:

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

Reference Books:

1. "Principles of measurements systems", John P. Bearly, 3rd Edition, Pearson Education, 2000.
2. "Modern electronic instrumentation and measuring techniques", Cooper D & A D Heltrick, PHI, 1998.
3. "Electronic and Electrical measurements and Instrumentation", J. B. Gupta, S.K. Kataria & Sons, Delhi.
4. Electronics & Electrical measurements, A K Sawhney. . Dhanpal Rai & Sons, 9th edition.

Coverage in the Texts:
Unit 1: (a) Text 2: 2.1 to 2.3(b) Text 1: 4.1, 4.4 to 4.6, 4.12 to 4.14, 4.17, 4.18.

ELECTRICAL MACHINES AND DRIVES

Sub Code: 10MT46 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

Unit 1: Transformers: Construction and principle of operation, types of transformers, emf equation, operation of transformer on no load and on load condition, losses, efficiency and regulation, O. C. and S.C tests, simple problems. **4 Hrs**

Unit 2: D. C. Motors: Constructional details, principle of operation, Back emf and torque equation. Types of D.C motors, characteristics and applications. Testing of D.C shunt Motors. Necessity of a starter, 3 point starter, simple problems. **8 Hrs**

Unit 3: Three Phase Induction motor and Synchronous Motor: Construction and types of induction motor, principles of operation, slip, production of torque, torque-slip characteristic, power stages and applications, principle and construction of synchronous motor, V and inverted V-Curves, starting methods of synchronous motors and applications. **8 Hrs**

Unit 4: Fractional kilo-watt motors: Constructional details, principle of operation, performance characteristics and applicable of single – phase induction motor, universal motor, stepper motor and reluctance motor. **6 Hrs**

PART – B

Unit 5: Speed control of A.C and D.C Motors: Speed control of D.C motors: Armature control, Flux control methods, Ward-Leonard method of speed control, simple problems. Speed control of induction motor, voltage control, frequency control, pole changing and rotor resistance control. **8 Hrs**

Unit 6: Breaking of D.C and A.C motors: Plugging, Dynamic breaking and regenerative braking as applied to D.C motors and induction motors. Temperature rise in electrical machines, duty cycles, rating of machines, simple problems. **6 Hrs**

Unit 7: Solid State Drives – introduction, solid state power converters, thyristor motor control, D.C motor control through chopper, A.C motor control, Vector control of induction motor. **6 Hrs**

Unit 8: industrial applications: Drives for steel mill, paper industry, cement industry, textile industry and electric traction. **6 Hrs**

Text Books:

1. **"Electrical Machines",** I. J Nagrath, T.P Kothari, McGraw-Hill, Fourth Edition
2. **"Fundamentals of electrical drives", Gopal K. Dubey, second edition 2002, Narosa publications, second edition, 2002**
3. **"A first course in electrical drives", Pillai S. K Wilay Eastern Ltd. New Delhi, 2007.**

Reference Books:

1. **"Electrical drives"m, N. K De P. K Sen First Edition 1999.**
2. **"A Course in electrical power", Soni Gupta & Bhatnagar, Dhanpatrai.**
3. **"A Text book of electrical technology", B. L. Theraja, Vol. 2. S,. chand**

POWER ELECTRONICS LAB

Sub Code: 10MTL47 **IA Marks: 25**
Hrs/Week: 03 **Exam Hrs: 03**
Total Lecture Hrs: 42 **Exam Marks: 50**

1. Static characteristics of SCR.
2. Static characteristics of MOSFET and IGBT.
3. SCR turn-on circuit using synchronized UJT relaxation oscillator.
4. SCR Digital triggering circuit for a single-phase controlled rectifier OR A.C. voltage Controller.
5. Single-phase full-wave rectifier with R and R-L loads.
6. A.C. voltage controller using TRIAC and diac combination connected to R and R-L loads.
7. Speed control of a separately excited D.C motor using an IGBT or MOSFET chopper.
8. Speed control of a stepper motr.
9. Speed control of a universal motor and a single-phase induction motor using A.C. Voltage controller.
10. MOSFET OR IGBT based single-phase full-bridge inverter connected to R load.

Scheme of Examination:

Experiment : 40 Marks
Viva – Voice : 10 Marks
Total : 50 Marks

ELECTRICAL MACHINES AND DRIVES LAB

Sub Code: 10MTL48 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

1. Load test on D.C. Shunt motor.
2. Speed control of D.C. Shunt motor.
3. Swinburne's test.
4. Load test on three phase induction motor.
5. Load test on single phase induction motor.
6. V and Invested curves of synchronous motor.
7. Performance characteristics of single phase transformer.
8. Single phase Rectifier control of DC motor.
9. Control of DC motor using Choppers.
10. Load test on Universal motor.

V SEMESTER

METROLOGY MECHANICAL MEASUREMENTS

Subject Code : 10MT51 **IA Marks : 25**
Hrs/Week : 04 **Exam Hrs : 03**
Total Hrs : 52 **Exam Marks : 100**

PART- A

UNIT-1: Standards of measurement: Definition and Objectives of metrology, Standards of length-International prototype meter, Imperial standard yard, Wave length standard, subdivision of standards, line and end standard, calibration of end bars (Numerical), Slip gauges, Wringingphenomena, Indian Standards (M-81, M12),Numerical problems onbuilding of slip gauges. **06 Hrs**

UNIT-2: System of Limits, Fits, Tolerance and Gauging: Definition of tolerance, Specification in assembly, Principle of interchangeability and selective assembly limits of size, Indian standards, concept of limits of size and tolerances, compound tolerances, accumulation of tolerances, definition offits, types of fits and their designation (IS 919-1963), geometrical tolerance, positional-tolerances, hole basis system, shaft basis system, classification of gauges, brief concept of design of gauges (Taylor's principles), Wear allowance on gauges, Types of gauges-plain plug gauge, ring gauge, snapgauge, limit gauge and gauge materials. **07 Hrs**

UNIT-3 : Comparators and Angular measurement: Introduction to comparators, characteristics, classification of comparators, mechanical comparators-Johnson Mikrokator, sigma comparators, dial indicator, optical comparatorsprinciples, Zeiss ultra optimeter, electric and electronic comparatorsprinciples, LVDT, pneumatic comparators, back pressure gauges, solexcomparators. Angular measurements, bevel protractor, sine principle and use of sine bars, sine centre, use of angle gauges (numericals on building of angles), clinometers. **07 Hrs**

UNIT-4: Interferometer and screw thread, gear measurement: Interferometer, interferometry, autocollimator. Optical flats. Terminology of screw threads, measurement of major diameter, minor diameter, pitch, angle and effective diameter of screw threads by 2-wire and 3-wire methods, best size wire. Tool maker's microscope, gear tooth terminology, use of gear tooth vernier caliper and micrometer. **06 Hrs**

PART – B

UNIT 5: Measurements and Measurement systems: Definition, Significance of measurement, generalized measurement system, definitions and concept of accuracy, precision, calibration, threshold, sensitivity, hystersis, repeatability, linearity, loading effect, system response-times delay. Errors in Measurements, Classification of Errors.Transducers, Transfer efficiency, Primary and Secondary transducers, electrical, Mechanical, electronic transducers, advantages of each type transducers. **07 Hrs**

UNIT 6: Intermediate modifying and terminating devices: Mechanical systems, inherent problems, Electrical intermediate modifying devices, input circuitry, ballast, ballast circuit, electronic amplifiers and telemetry. Terminating devices, Mechanical, Cathode Ray Oscilloscope, Oscillographs, X-Y Plotters. **06 Hrs**

UNIT 7: Measurement of Force and Torque, pressure: Principle, analytical balance, platform balance, proving ring, Torque measurement, Prony brake, hydraulic dynamometer. Pressure Measurements, Principle, use of elastic members, Bridgeman gauge, Mcloed gauge, Pirani Gauge. **06 Hrs**

UNIT-8: Temperature and strain measurement: Resistance thermometers, thermocouple, law of thermo couple, materials used for construction, pyrometer, optical pyrometer. Strain measurements, strain gauge, preparation and mounting of strain gauges, gauge factor, methods of strain measurement. **07 Hrs**

TEXT BOOKS:

1. Mechanical Measurements, Beckwith Marangoni and Lienhard, Pearson Education, 6th Ed., 2006.
2. Engineering Metrology, R.K. Jain, Khanna Publishers, 1994.

Reference Books:

1. Engineering Metrology: I.C. Gupta, Dhapat Rai Publications. Delhi.
2. Mechanical Measuremetns: R.K. Jain.
3. Industrial Instrumentation: Alsutko, Jerry. D. Faulk. Thompson Asia Pvt Ltd. 2002.
4. Measurement Systems Applications and Design: Earnest O. Doblin, McGraw Hill Book Co.

COMPUTER GRAPHICS

Sub code : 10MT52 **IA Marks :25**
Hrs/week : 04 **Exam Hrs : 03**
Total Leccture Hrs : 52 **Exam Marks :100**

PART – A

UNIT 1: Scan Conversion and Cmlipping Representation of points, lines, Line Drawing Algorithms: DDA algorithi m, Bresenham's integer line algorithim, Bresenham's circle algorithim, mid point line and circle, Polygon filing algorithims: scan conversion, seed fillinge, scan line algorithim. Viewing transformation, Clipping – points, lines, text, olygon, Cohen-Sutherland line clipping, Sutherland-Hodgmen algorithim. **7 Hrs**

UNIT 2:Two Dimensional Transformations Representation of points, Transformations: Rotation, Reflection, Scaling, combined Transformations, Translations and Homogeneous Coordinates, A geometric interpretation of homogeneous coordinates, Over all scaling, Points at infinity, rotation about an arbitrary point, Reflection through an arbitrary line. **6 Hrs**

UNIT 3: Three Dimensional Transformations and Projections 3D Transformation matrix : General matrix, Translation, scaling, Shearing, Rotation, Relection, Multiple transformations, Rotation about an axis paralle to coordinate axis, Rotation about an arbitrary axis in space, Reflection through an arbitrary plane, Orthographic, Parallel projection Transformtions, one, Perspective projections – one point, two point and three point. **6 Hrs**

UNIT 4: Plane and Space Curves Curve : representation, Nonparametric curves, parametric curves, parametric representation and generation of line, circle, ellipse, hyperbola, generation of circle, ellipse, parabola, hyperbola, Cubic spline, normalized cubic splines, Bezier curves: blending function, properties, generation, B-spline curves- Cox-deBoor recursive formul, properties, open uniform basis functions, Non-uniform basis functions, periodic B-spline curve. **7 Hrs**

PART- B

UNIT 5:Types and Mathematical representation of solids, Solid Models, Solid entities, Solid representation, Solid modeling- set theory, regularized set operatorions, set membership classifications, Half spaces, Half space of plane, Cylinder, sphere, conical half-space, Boundary representation, Constructive Solid Geometry-basic elements, Building operations. **7 Hrs**

UNIT 6:Visual Realism – 1 Introduction, hidden line removal- visibility of object views, Visibility techniques ; minimax test, containment test, surface test, Silhouttes, Homogeneity test, Sorting, Coherence, Hidden line priority algorithm, Hidden surface removal- -buffer algorithm, Warnock's algorithm, Hidden solid removal- ray tracing algorithm. **6 Hrs**

UNIT 7 :Visual realism-II :
Shading, shading models- diffuse reflection, specular reflection, ambient light, Shading surfaces- constant shading, gourmand shading, Phong shading, Shading enhancements, Shading Solids- Ray tracing for CSG, Z- buffer algorithm for B-rep and CSG, octree encoded objects, Colouring-RGB, CMY, HSV, HSL colour models. **7 Hrs**

UNIT 8 :Computer Animation :
Introduction, Conventional animation-key frame, inbetweening, Line testing, Painting, Filming, Computer animation-entertainment and engineering animation, Animation system hardware, software architecture, Animation types- frame buffer, colour table, zoom-pan-scroll, cross bar, real time play back, Animation techniques-key frame, skelton. Path of motion and p-curves. **6 Hrs**

Text Books:
1.**CAD/CAM**-Theory and Practice, ibraham Zeid, McGraw Hill, 2006
2. Mathematical Elements for Computer Graphics, Rogoer's Adams, McGraw Hill. 1990.

Rererence Books:
1. **Computer Graphics,** Xiang z, Plastock, R.A.,, Schaums outlines, McGraw Hill. 2007
2. Computer Graphics, Principles and Practice, Foley, Van, Damn, Finner and Hughes, Addison Wesley. 2000
3. Computer Graphics, Sinha A. N., Udai A. D., Tata McGraw Hill, 2008.
4. Computer Graphics, C Version-Doneld Heran, M. Pauline Bakers, 2nd Edition, Pearson,

HYDRAULICS AND PNEUMATICS

Subject Code : 10MT 53 **IA Marks : 25**
Hrs/Week : 04 **Exam Hrs : 03**
Total Hrs : 52 **Exam Marks : 100**

PART – A

UNIT -1:Introduction to Hydraulic Power: Definition of hydraulic system, advantages, limitations, applications, Pascal's law, structure of hydraulic control system, problems on Pascal's law.**The source of Hydraulic Power: Pumps** Classification of pumps, Pumping theory of positive displacement pumps, construction and working of Gear pumps, Vane pumps, Piston pumps, fixed and variable displacement pumps, Pump performance characteristics, pump Selection factors, problems on pumps. **07 Hrs**

UNIT -2:Hydraulic Actuators and Motors: Classification cylinder and hydraulic motors, Linear Hydraulic Actuators [cylinders], single and double acting cylinder, Mechanics of Hydraulic Cylinder Loading, mounting arrangements,cushioning, special types of cylinders, problems on cylinders, construction and working of rotary actuators such as gear, vane, piston motors, Hydraulic Motor Theoretical Torque, Power and Flow Rate, Hydraulic MotorPerformance, problems, symbolic representation of hydraulic actuators (cylinders and motors). **06 Hrs**

UNIT – 3:Control Components in Hydraulic Systems: Classification of control valves, Directional Control Valves- Symbolic representation, constructional features of poppet, sliding spool, rotary type valves solenoid and pilot operated DCV, shuttle valve, check valves, Pressure control valves - types, direct operated types and pilot operated types. Flow Control Valves -compensated and non-compensated FCV, needle valve, temperature compensated, pressure compensated, pressure and temperature compensated FCV, symbolic representation. **07 Hrs**

UNIT – 4:Hydraulic Circuit Design And Analysis: Control of Single and Double -Acting Hydraulic Cylinder, Regenerative circuit, Pump Unloading Circuit, Double Pump Hydraulic System, Counter balance Valve Application,Hydraulic Cylinder Sequencing Circuits, Automatic cylinder reciprocating system, Locked Cylinder using Pilot check Valve, Cylinder synchronizing circuit using different methods, factors affecting synchronization, Hydraulic circuit for force multiplication, Speed Control of Hydraulic Cylinder, Speed Control of Hydraulic Motors, Safety circuit, Accumulators, types, construction and applications with circuits. **06 Hrs**

PART – B

UNIT – 5:Maintenance of Hydraulic System: Hydraulic Oils - Desirable properties, general type of Fluids, Sealing Devices, Reservoir System, Filters and Strainers, wear of Moving Parts due to solid -particle Contamination, temperature control (heat exchangers), Pressure switches, trouble shooting. **06 Hrs**

UNIT – 6:Introduction to Pneumatic Control: Definition of pneumatic system, advantages, limitations, applications, Choice of working medium. Characteristic of compressed air. Structure of Pneumatic control System, fluid conditioners and FRL unit. **Pneumatic Actuators:** Linear cylinder - Types, Conventional type of cylinder- working, End position cushioning, seals, mounting arrangements- Applications. Rod - Less cylinders types, working, advantages, Rotary cylinders- types construction and application, symbols. **07 Hrs**

UNIT-7:Pneumatic Control Valves: DCV such as poppet, spool, suspended seat type slide valve, pressure control valves, flow control valves, types and construction, use of memory valve, Quick exhaust valve, time delay valve, shuttle valve, twin pressure valve, symbols. Simple Pneumatic Control: Direct and indirect actuation pneumatic cylinders, speed control of cylinders - supply air throttling and Exhaust air throttling and Exhaust air throttling.**Signal Processing Elements:** Use of Logic gates - OR and AND gates in pneumatic applications. Practical Examples involving the use of logic gates, Pressure dependant controls- types - construction - practical applications,Time dependent controls principle. Construction, practical applications. **07 Hrs**

UNIT-8:Multi- Cylinder Application: Coordinated and sequential motion control, Motion and control diagrams. Signal elimination methods, Cascading method- principle, Practical application examples (up to two cylinders) using cascading method (using reversing valves).**Electro- Pneumatic Control:** Principles - signal input and out put, pilot assisted solenoid control of directional control valves, Use of relay and contactors. Control circuitry for simple signal cylinder application.**Compressed Air:** Production of compressed air- Compressors Preparation of compressed air-Driers, Filters, Regulators, Lubricators, Distribution of compressed air Piping layout. **06 Hrs**

TEXT BOOKS:

1. **"Fluid Power with Applications",** Anthony Esposito**,** Sixth edition, Pearson Education, Inc, 2000.
2. **'Pneumatics and Hydraulics',** Andrew Parr, Jaico Publishing Co

REFERENCE BOOKS:

1. **'Oil Hydraulic systems', Principles and Maintenance** S. R. Majurr, Tata McGraw Hill Publishing Company Ltd. - 2001
2. **'Industrial Hydraulics', Pippenger, Hicks"** McGraw Hill, New York
3. **'Hydraulic & Pneumatic Power for Production'**, Harry L. Stewart
4. **'Pneumatic Systems',** S. R. Majumdar, Tata McGraw Hill Publish 1995

5. **Power Hydraulics'** Michael J Pinches & John G Ashby, Prentice Hall

MICROCONTROLLER

Sub code: 10MT54 **IA Marks: 25**
Hrs/Week: 4 **Exam Hrs: 3**
Total Hrs: 52 **Exam Marks: 100**

PART – A

UNIT 1:Microprocessors and microcontroller. Introduction, Microprocessors and Microcontrollers, A Microprocessors survey. RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture. The 8051 Architecture: Introduction, 8051 Microcontroller Hardware, Input / Output Pins, Ports and Circuits External Memory, Counter and Timers, Serial Data Input / Output, Interrupts. **7 Hrs**

UNIT 2:Addressing Modes and Operations: Introduction, Addressing modes, External data Moves, Code Memory, Read Only Data Moves / Indexed Addressing mode, PUSH and POP Opcodes, Data exchanges, Example Programs; Byte level logical Operations, Bit level Logical Operations, Rotate and Swap Operations, Example Programs. Arithmetic Operations: Flags, Incrementing and Decrementing, Addition, Subtraction, Multiplication and Division, Decimal Arithmetic, Example Programs**.** **7 Hrs**

UNIT 3:Jump and Call Instructions: The JUMP and CALL Program range, Jumps, calls and Subroutines, Interrupts and Returns, More Detail on Interrupts, Example Problems. **6 Hrs**

UNIT 4:8051 programming in C: Data types and time delays in 8051C, I/O programming, logic operations, data conversion programs, accessing code ROM space, data serialization. **6 Hrs**

PART – B

UNIT 5:Timer / Counter Programming in 8051: Programming 8051 Timers, Counter Programming, programming timers 0 and 1 in 8051 C. **6 Hrs**

UNIT 6:8051 Serial Communication: Basics of Serial Communication, 8051 connections to RS-232, 8051 Serial communication Programming, Programming the second serial port, Serial port programming in C. **7 Hrs**

UNIT 7:Interrupts Programming: 8051 Interrupts, Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Interrupt Priority in the 8051/52, Interrupt programming in C **6 Hrs**

UNIT 8: 8051 Interfacing and Applications: Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing, DC motor interfacing and PWM. **7 Hrs**

Text Books:

1. "The 8051 Microcontroller Architecture, Programming & Applications", 2e Kenneth J. Ayala ;, Penram International, 1996 / Thomson Learning 2005
2. "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

Reference Books:

1. "Programming and Customizing the 8051 Microcontroller" Predko ;–, TMH
2. Microcontrollers: Architecture, Programming, Interfacing and System Design",Raj Kamal, "Pearson Education, 2005
3. "Microcontrollers- Theory and Applications", Ajay V.Deshmukh; TMH,2005
4. "Microcontroller and its applications", Dr.Ramani Kalpathi and Ganesh Raja; Sanguine Technical publishers,Bangalore-2005.

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

Coverage in the Text books:

UNIT 1:Text 1 – Chapter 1(excluding 1.2 and 1.4) and chapter 3, R1 - chapter 1
UNIT 2:Text 1-chapters 5, 6 & 7UNIT 3: Text 1 - chapter 8 UNIT 4:Text 2 – chapter 7 UNIT 5: Text 2 – chapter 9
UNIT 6: Text 2 – chapter 10 UNIT 7: Text 2 – chapter 11
UNIT 8: Text 2 – chapter 12, chapter 13(13.1&13.2), chapter 17 (except 17.1)

AUTOMOTIVE ELECTRONICS

Sub code: 10MT55 **IA Marks: 25**
Hrs/Week: 4 **Exam Hrs: 3**
Total Hrs: 52 **Exam Marks: 100**

PART – A

UNIT : 1 Automotive Fundamentals Overview : Four Stroke Cycle, Engine Control, Ignition System, Spark plug, Spark pulse generation, Ignition Timing, Drive Train, Transmission, Brakes, Steering System, Battery, Starting System. **6 Hrs**

UNIT : 2 Air/Fuel Systems Fuel Handling, Air Intake System, Air/ Fuel Management.
Sensors – Oxygen (02/EGO) Sensors, Throttle Position Sensor (TPS), Engine Crankshaft Angular Position (CKP) Sensors, Hall effect Position Sensor, Shielded Field Sensor, Optical Crankshaft Position Sensor, Manifold Absolute Pressure (MAP) Sensor – Strain gauge and Capacitor capsule, Engine Coolant Temperature (ECT) Sensor, Intake Air Temperature (IAT) Sensor, Knock Sensor, Airflow rate sensor, Throttle angle Sensor. **10 Hrs**

UNIT : 3 Actuators : Fuel Metering Actuator, Fuel Injector, Ignition Actuator. **Exhaust After-Treatment Systems** – AIR, Catalytic Converter, Exhaust Gas Recirculation (EGR), Evaporative Emission Systems. **6 Hrs**

UNIT : 4 Electronic Engine Control : Engine parameters, variables, Engine Performance terms, Electronic Fuel Control System, Electronic Ignition control, Idle sped control, EGR Control. **5 Hrs**

PART – B

UNIT : 5 Communication : Serial Data, Communication Systems, Protection, Body and Chassis is Electrical Systems, Remote Keyless Entry, GPS. **4 Hrs**

UNIT : 6 Vehicle Motion Control : Cruise control, Chassis, Power Brakes, Antilock Brake System (ABS), Electronic Steering Control, Power Steering, Traction Control, Electronically controlled suspension. **6 Hrs**

UNIT : 7 Automotive Instrumentation : Sampling, Measurement & Signal Conversion of various parameters. **Integrated Body –** Climate Control Systems, Electronic HVAC Systems. Safety Systems – SIR, Interior Safety, Lighting, Entertainment Systems. **8 Hrs**

UNIT : 8 Automotive Diagnostics –Timing Light, Engine Analyzer, On-board diagnostics, Off-board diagnostics, Expert Systems.**Future Automotive Electronics Systems :** Alternative Fuel Engines, Collision Avoidance Radar warning Systems, Low tire pressure warning system, Radio navigation, Advance Driver Information System. **6 Hrs**

References:
1) Willliam B. Ribbens: Understanding Automotive Electronics, 6th Edition, SAMS/Elsevier Publishing
2) Robert Bosch GmbH: Automotive Electronics Systems and Components 5th Edition, John Wiley & Sons Ltd., 2007

SENSORS AND NETWORKS

Sub Code : 10MT56 **IA Marks : 25**
Hrs/week : 04 **Exam Hrs : 03**
Total Lecture Hrs : 52 **Exam Marks : 100**

PART-A

UNIT: 1 INTRODUCTION: Sensors Fundamentals, Basic sensor technology, Sensor Systems, Sensor Characteristics, System Characteristics, Instrument Selection, Data acquisition, Installation. process of developing sensors, sensor arrays smart sensors, Industrial sensor networking basic Elements. **8 Hrs**

UNIT: 2 TYPES OF SENSORS AND APPLICATIONS, OVER VIEW: Process of developing sensors, trends in sensor Technology and IC Sensors, sensor array's and multi sensor systems, smart sensors, sensor networks in R & D, sensors and networks, industrial network and automation. **6 Hrs**

UNIT: 3 WIRELESS SENSOR NODES: Motivation for a N/W of wireless sensor nodes, Sensing and Sensor challenges and constraints, wireless sensor architecture and network design, architecture of wireless sensor network, network design, energy issues in sensor networks , wireless integrated network sensors, self management, De-centralized Management, wireless networking. **6 Hrs**

UNIT: 4 NODE ARCHITECTURE: The Sensing Subsystem, (Analog to Digital Converter) Processor Subsystem, Communication Interface, Prototypes. Network topologies, Various topologies for inter connection of Networks **6 Hrs**

PART – B

UNIT: 5 NETWORK PROTOCOLS AND STANDARDS Routing Technique, Data dissemination and Gathering Network, Internet working, Internet and Intranet, Protocols, OSI model, Structure of OSI Model, IEEE 802 Network Model. **6 Hrs**

UNIT: 6 BROADCAST, MULTCAST and GEOCAST. Concepts and major challenges, design guidelines, Broad casting mechanism, Blind broad cast, probability based broadcast, counter based broad cast, energy Efficient broadcast, Multicasting mechanisms: Distance Vector, Centralised and Localized Multicast, Geocasting mechanisms: Direct Flooding Based geocast 8 **Hrs**

UNIT:7 TRANSPORT CONTROL PROTOCOL FOR WSN: Principles of Traditional Protocols, Transmission protocol Design for Sensor Network,Disadvantages of Traditional TCP,,Transport protocol Design for Sensor Network,Congestion Control,Congestion Detection,Congestion notification and Congestion Avoidance,, Packet loss recovery. **6 Hrs.**

UNIT: 8 SENSOR NETWORK STANDARDS: Introduction, IEEE 802.15.4 Standard, Wireless Ethernet Concepts,IEEE 802.16 Wireless MAN,CDMA based Standards,TDMA based Standards,GSM and GPRS Standards,Otherv wireless network Standards,Standards for smart sensor Interface. **6 Hrs.**

TEXT BOOKS :

1) WIRELESS SENSOR NETWORK:A NETWORKING PERSPECTIVE – By JUN ABAS JAMALIPUR.
John wiley 2009
2)FUNDAMENTALS OF WIRELESS SENSOR NETWORKS – THEORY & PRACTICE
- WALTENEGUS DARGIE
- CHRISTIAN POEU ABAUER.
3)WIRELESS SENSOR AND INSTRUMENTS:Networks,Design and Applications: CRC Taylor & Francis

REFERENCES:-

1} **Sensor Technology Hand Book** – By Jon's Wilson.
2} **Sensor Networks and Configuration, Fundamentals, Standards, Plat form** –
By _ Nitaigour Premchand Mahalik Springer 2007.
3} **Fundamentals of Wireless Sensor Networks – Theory & Practice** – Waltenegus Dargie / Christian Poeu Abauer.
4} **Wireless Sensors & Instruments – Networks, Designs and Applications**
By HalitEren, CRC Taylor & Francis Group, 2006.
5} **Handbook of sensor networks:** Ivan stojmenovic – 2005.

METROLOGY AND MEASUREMENTS LABORATORY

Sub Code : 10MT57 **IA Marks : 25**
Hrs/week : 03 **Exam Hrs : 03**
Total Hrs : 42 **Exam Marks : 50**

PART – A : METROLOGY

1. Measurements using Optical Projector / Toolmaker Microscope.
2. Measurement of angle using Sine Centre / Sine bar / bevel protractor.
3. Measurement of cutting tool forces using,
a) Lathe tool Dynamometer
b) Drill tool Dynamometer.
5. Measurement of Screw threads Parameters using two wire or Three-wire methods.
6. Measurement of Surface roughness, using Tally Surf/Mechanical Comparator
7. Measurement of gear tooth profile using gear tooth vernier/Geaar tooth micrometer.
8. Calibration of Micrometer using slip gauges.
9. Measurement using Optical Flats

PART-B: MEASUREMENTS

1. Calibration of Pressure Gauge
2. Calibration of Thermocouple.
3. Calibration of LVDT.
4. Calibration of Load cell.
5. Determination of modulus of elasticity of a mild steel specimen using strain gauges.

Scheme of Examination:

ONE question from METROLOGY (part-a) **: 20** Marks
ONE question from MEASUREMENTS (part-b) : **20** marks.
Viva-Voice **: 10** Marks
Total: **50 Marks**

MICROCONTROLLER & PLC LAB

Sub code No: 10MT58 **IA MARKS: 25**
Hrs/Week: 04 **Exam Marks: 50**
Exam Hrs: 03 **Total Hrs: 42**

PART – A

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.

II. INTERFACING:

1. Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.
2. Simple Calculator using 6 digit seven segment display and Hex Keyboard interface to 8051.
3. Alphanumeric LCD panel and Hex keypad input interface to 8051.
4. External ADC and Temperature control interface to 8051.
5. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.
6. Stepper and DC motor control interface to 8051.
7. Elevator interface to 8051.

Scheme of Examinations:

One Question from Part A **: 20 Marks**
One Question from Part B **: 20 Marks**
Viva- voice **: 10 Marks**
Total : 50 Marks

VI SEMESTER

MANAGEMENT & ENTREPRENEURSHIP

Sub code: 10AL61 **IA Marks : 25**
Hrs/week : 04 **Exam Hrs : 03**
Total Lecture Hrs ; 52 **Exam Marks: 100**
PART – A

UNIT 1: Management: Introduction – Meaning – nature and characteristics of Management, scope and Functional areas of management – Management as a science, are of profession – Management & Administration – Roles of Management, Levels of Management, Development of Management Thought-early management approaches – Modern management approaches. **7 Hrs**

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 Hrs**

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 Hrs**

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 Hrs**

PART – B
ENTREPRENEURSHIP

UNIT 5: Entrepreneur: Meaning of Entrepreneur: Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneur, Entrepreneur – an emerging Class, Concepts 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 Hrs**

UNIT 6: Small Scale Industries: Definition; Characteristics; need and rationale; objectives; Scope; role of SSI; Different policies of SSI; Government support for SSI during 5 year plans. Impact of Liberalization, Privatizations, 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 Hrs**

UNIT 7: Institutional Support: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC Single window Agency; SISI; NSIC; SIDBI; KSFC. **6 Hrs**

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; Networks Analysis; Errors of Project Report; Project appraisal.
Identification of Business Opportunities: Market Feasibility Study, Technical feasibility Study; Financial Feasibility Study & Social Feasibility Study. **7 Hrs**

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, Roboers Lusier Thomson.
2. **Entrepreneurship development,** S. S. Khanka. S. Chand & Co.
3. **Management,** Steps Robbins, Pearson Education/PHI, 17th Edition, 2003.

MODELLING & SIMULATION

Sub code: 10MT62 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

UNIT 1: System and system environment: Component of a system – Continuous and discrete systems – Types of model; Steps in Simulation study; simulation of an event occurrence using random number table – Single server queue- two server queue- inventory systems. **7 Hrs**

UNIT 2: Discrets Event Simulation: Concepts in discreet event simulation, manual simulation using event scheduling, single channel queue, two server queue, and simulation of inventory problem. **6 Hrs**

UNIT 3: Random number generations: Properties of random numbers – Generation of Pseudo – Random numbers – techniques of generating pseudo random numbers; Test for random number; the Chisquare test-the kolmogrov smimov test – Runs test – Gap test – poker test. **7 hrs.**

UNIT 4: Random – Viriate Generation: Inverse transform technique for Exponential, Uniform. Triangular, weibull, empirical, uniform and discrete distribution. Acceptance rejection method for Poisson and gamma distribution; Direct Transformation for normal distribution. **6 Hrs**

PART – B

UNIT 5: Empirical discrete distribution: Discrete uniform – distribution Poisson distribution – geometric distribution – acceptance – rejection technique for Poisson distribution gamma distribution. **6 Hrs**

UNIT 6: Design and evaluation of Simulation Experiments. Variance reduction techniques – antithetic variables, variables-verification and validation of simulation models. **7 Hrs**

UNIT 7; Analysis of simulated Data: Data collection, identifying the distribution, parameter estimations, and goodness of fit tests, verification and validation of simulation models. **6 Hrs**

UNIT 8: Comparison and selection of GPSS, SIMSCRIPT, SLAM: Arena simulation languages: development of simulation models using arena simulation package for queuing system, Productions systems, maintenance system.

Text Book:

1. **Discrete, Event system Simulation,** Banks J., Carson J.S. and Nelson B.L., 3rd Edition, Pearson education, Inc 2004 (ISBN 81-7808-505-4).
2. **System Simulation,** Geoffrey Gorden, Prentice Hall of India, 2003.

References:

1. **System Simulations,** Geoffery Gorden, Prentice Hall of India, 2003.
2. **System Simulations and Modeling,**. Narsingh deo., Prentice Hall of India 2003.
3. **Computer simulations and Modeling,** Francis Neelamkovil, , john Wiley & Sons, 1987
4. **Simulation Modeling with Pascal,** Rath M.Davis & Robert M O Keefe, Prentice Hall Inc. 1989.

MICRO & SMART SYTEMS TECHNOLOGY

Sub code: 10MT63 **IA Marks: 25**
Hrs/week : 04 **Exam Hrs : 03**
Total 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 micro systems? Feynman's vision. Micro machined transducers. Evolution of micro manufacturing. Multi-disciplinary aspects. Applications areas. Commercial products. **5 Hrs.**

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, conduct metric 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 micro motor, 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. **8 Hrs.**

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 materials processing;
e. Processing of other materials: ceramics, polymers and metals
f. Emerging trends. **7 Hrs**

Unit 4: Modeling:

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 elctromechanics. Electromagnetic actuation. Capillary electro-phoresis. Piezoresistive modeling. Magnetostrictive actuators. **6 Hrs**

PART – B

Unit 5: Computer-Aided Simulation and design: Background to the finite element method. Coupled-domain simulations using Mat lab. Commercial software. **8 Hrs**

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 form smart systems and micromachined accelerometer or a thermal cycler. **8 Hrs**

Unit 7: Integration and Packaging of Microelectro Mechanical Systems: Integration of microelectronics and micro devices at wafer and chip levels. Microelectronics packaging: wire and ball bonding, flip-chip. Low temperature – cofired-ceramic (LTCC) multi-chip-module technology. Micro system packaging examples. **6 Hrs**

Unit 8: Case Studies: BEL pressure sensor, thermal cycler for DNA amplification, and active vibration control of a beam. **6 Hrs**

Text Books and A CD-Supplement:

1. A course-pack with matter taken from the following books including some newly written material. (This is until the textbook is ready. Chapter-wise resource materials is indicated below).
2. **MEMS & Microsystems: Design and Manufacture,** Tai-Ran Tsu, Tata Mc-Graw-Hill.

Reference Books:

1. Animation 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. Microsystesm design, S. D. Senturia, 2001. Kluwer academic Publishers, Boston, USA. ISBN O- 7923-7246-8.
3. Analysis and design Principles of MEMS Devices, Minhang Bao, Elsevier, Amsterdam. The Netherlands, ISBN 0-444-51616-6.
4. Design and Development Methodogies, Smart Material Systems and MEMS: V. Varadan, K. J. Vinoy, S. Goplakrishnan, Wiley.
5. MEMS- Nitaigour Premchand Mahalik, TMH 2007.

Embedded System Design

Subject Code: 10MT64 **IA Marks: 25**
No.of Lect Hrs:/week: 4 **Exam Hrs: 03**
Toral Lect. Hrs: 52 **Exam Marks: 100**

PART A

UNIT 1:Introduction to Embedded System: Introducing Embedded Systems, Philosophy, Embedded Systems, Embedded Design and Development Process. **6 Hrs**

UNIT 2:The Hardware Side: An Introduction, The Core Level, Representing Information, Understanding Numbers, Addresses, Instructions, Registers-A First Look, Embedded Systems-An Instruction Set View, Embedded Systems-A Register View, Register View of a Microprocessor. The Hardware Side: Storage Elements and Finite-State Machines. The concepts of State and Time, The State Diagram, Finite State Machines- A Theoretical Model. **10 Hrs**

UNIT 3:**Memories and the Memory Subsystem**: Classifying Memory, A General Memory Interface, ROM Overview, Static RAM Overview, Dynamic RAM Overview, Chip Organization, Terminology, A Memory Interface in Detail, SRAM Design, DRAM Design, DRAM Memory Interface, The Memory Map, Memory Subsystem Architecture, Basic Concepts of Caching, Designing a Cache System, Dynamic Memory Allocation. **7 Hrs**

UNIT 4:Embedded Systems Design and Development : System Design and Development, Life-cycle Models, Problem Solving-Five Steps to Design, The Design Process, Identifying the Requirements, Formulating the Requirements Specification, The System Design Specification, System Specifications versus System Requirements, Partitioning and Decomposing a System, Functional Design, Architectural Design, Functional Model versus Architectural Model, Prototyping, Other Considerations, Archiving the Project. **7 Hrs**

UNIT 5 & 6:Real-Time Kernels and Operating Systems: Tasks and Things, Programs and Processes, The CPU is a resource, Threads – Lightweight and heavyweight, Sharing Resources, Foreground/Background Systems, The operating System, The real time operating system (RTOS), OS architecture, Tasks and Task control blocks, memory management revisited. **10 Hrs**

UNIT 7 & 8:Performance Analysis and Optimization: Performance or Efficiency Measures, Complexity Analysis, The methodology, Analyzing code, Instructions in Detail, Time, etc. – A more detailed look, Response Time, Time Loading, Memory Loading, Evaluating Performance, Thoughts on Performance Optimization, Performance Optimization, Tricks of the Trade, Hardware Accelerators, Caches and Performance. **12 Hrs**

Text Book:

1. **Embedded Systems – A contemporary Design Tool,** James K. Peckol**,** John Weily India Pvt. Ltd, 2008

Advanced COMPUTER PROGRAMMING

SUBJECT CODE: 06MT65 **IA MARKS: 25**
No. of lect /week: 04 **EXAM Hrs: 03**
Total lect. Hrs: 52 **EXAM Marks: 100**

PART A

Unit – 1: Introduction: Functions and parameters, Dynamic memory allocation classis, Testing and debugging. Data Representation, Introduction, Linear lists, Formula-based representation linked representation, Indirect addressing simulating pointers. 7 **Hrs**

Unit – 2: Arrays And Matrics: Arrays, Matrices, Special matrices spare matrices. **6 Hrs**

Unit – 3: Stacks: The abstract data types, Derived classed and inheritance, Formula-based representation, Linked representation, Applications. **6 Hrs**

Unit – 4: Queues: The abstract data types, Derived classes and inheritance, Formula-based representation, Linked representation, Applications. **7 Hrs**

PART B

Unit – 5: Skip Lists And Hashing: Dictionaries, Linear representation, Skip list presentation, Hash table representation. **7 Hrs**

Unit – 6: Binary And Other Trees: Trees, Binary trees, Properties and representation of binary trees, Common binary tree operations, Binary tree traversal the ADT binary tree, ADT and class extensions. **7 Hrs**

Unit – 7: Pririty Queues: Linear lists, Heaps, Leftist trees. **6 Hrs**

Unit-8: Search Trees: Binary search trees, B-trees, Applications. **6 Hrs**

Text Book:

8. **Data structures, Algorithms, and applications in C++ -** Sartaj Sahni, McGraw Hill.2000.

Reference Books:

2. **Object Oriented Programming in C++** - Balaguruswamy. TMH, 1995.
3. **Programming in C++** - Balaguruswamy. TMH, 4th, 2010.

OPERATING SYSTEMS

Sub Code No: 10MT662 **IA Marks: 50**
No. of Lect. Hrs: 04 **Exams: 03**
Total Hrs: 52 **Exam Marks: 100**

PART A

Unit – 1: Introduction And Overview Of Operating Systems: Operating system, Goals of an O.S, Operation of an O.S, Resource allocation and related functions, User interface related functions, Classes of operating systems, O.S and the computer system, Batch processing system, Multi programming systems, Time sharing systems, Real time operating systems, distributed operating systems. **7 Hrs**

Unit – 2: Structure of the Operating Systems: Operation of an O.S, Structure of the supervisor, Configuring and installing of the supervisor, Operating system with monolithic structure, layered design, Virtual machine operating systems, Kernel based operating systems, and Microkernel based operating systems. **7 Hrs**

Unit – 3: Process Management: Process concept, Programmer view of processes, OS view of processes, Interacting processes, Threads, Processes in UNIX, Threads in Solaris**.** **6 Hrs**

Unit – 4: Memory Management: Memory allocation to programs, Memory allocation preliminaries, Contiguous and noncontiguous allocation to programs, Memory allocation for program controlled data, kernel memory allocation**. 6 Hrs**

PART B

Unit – 5: Virtual Memory: Virtual memory basics, Virtual memory using paging, Demand paging, Page replacement, Page replacement policies, Memory allocation to programs, Page sharing, UNIX virtual memory. **7 HRS**

Unit – 6: File Systems: File system and IOCS, Files and directories, Overview of I/O organization, Fundamental file organizations, Interface between file system and IOCS, Allocation of disk space, Implementing file access, UNIX file system. **6 Hrs**

Unit – 7: Scheduling: Fundamentals of scheduling, Long-term scheduling, Medium and short term scheduling, Real time scheduling, Process scheduling in UNIX. **6 Hrs**

Unit – 8: Message Passing: Implementing message passing, Mailboxes, Inter process communication in UNIX. **7 Hrs**

Text book:

1. "Operating Systems - A Concept based Approach", D. M. Dhamdhare, TMH, 3rd Ed, 2010.

Reference book:

1. Operating Systems Concepts, Silberschatz and Galvin, John Wiley India Pvt. Ltd, 5th Edition, 2001.
2. Operating System – Internals and Design Systems, Willaim Stalling, Pearson Education, 4th Ed, 2006.
3. Design of Operating Systems, Tennambhaum, TMH, 2001.

ELECTRIC HYBRID VEHICLES

Sub code: 10MT663 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

PART – A

Unit 1: Introduction to Alternative Vehicles: Electric Vehicle, Hybrid Electric vehicle, Electric Hybrid Vehicle, Vehicle components, Electric and Hybrid history EV/CEV Comparison**.** **7Hrs**

Unit 2: Vehicle Mechanics: Roadway Fundamentals, Laws of motion, Vehicle Kinetics, Dynamics of Vehicle Motion, Propulsion power, Velocity & acceleration, Tire-Road Force, Mechanics. **7 Hrs**

Unit 3: Alternative Vehicle Architecture: Electric Vehicles, Hybrid Electric Vehicles, Plug-in Hybrid Electric Vehicles, Power Train component Sizing, Mass Analysis & Packaging, Vehicle Simulation. **6 Hrs**

Unit 4: Battery Energy: Batteries in Electric & Hybrid Vehicles, Battery basis, Battery parameters, Electromechanical Cell Fundamentals, Battery Modeling, Traction Batteries, Battery Pack Management**.** **6 Hrs**

PART – B

Unit 5: Alternative Energy Strategies: Fuel Cells, Ultra capacitors, Compressed Air storage, Fly wheels. **6 Hrs**

Unit 6: Electric machine: Simple Electric Machine, DC Machine, Induction Machine, Permanent magnet machines, Switched Reluctance Machine**. 6 Hrs**

Unit 7: Power Electronics Converters: Power Electronics Converters, DC/DC Converters, Cell Balancing Converters **6 Hrs**

Unit 8: Electric Motor Drives: Electric Drive Components, DC Drives, Operating Point, Analysis of SRM Drives. **8 Hrs**

Text Book:

1. **Iqbal Husain "Electric and Hybrid Vehicles: Design fundamentals". CRC Press, 2011.**

Reference Books:

1. **James Laminie and John Lowry. "Electric Vehicle Technology – Explained', CRC Press 2010.**
2. **Society of Automobile Engineers, "Hybrid Electric vehicles", CRC Press, 2011.**

Programmable Logic Controllers (PLCs)

Subject Code: 10MT73 **IA Marks: 28**
No. of Hrs.week: 04 **Exam Marks: 100**
Total no Lecture Hrs: 52 **Exam Hrs: 03**
PART – A

Unit 1: Introduction: what is A PLC, Technical Definition of PLC, What are its advantages, characteristics functions of A PLC, Chronoligical Evolution of PLC, Types of PLC, Unitary PLC, Modular PLC, Small PLC, Medium PLC, Large PLC, Block Diagram of PLC: Input/output (I / O) section, Processor Section, Power supply, Memory central Processing Unit: Processor Software / Executive Software, Multi asking, Languages, Ladder Language. **8 Hrs**

Unit 2: Bit Logic Instructions: introduction: Input and Output contact program symbols, Numbering system of inputs and outputs, Program format, introduction to logic: Equivalent Ladder diagram of AND gate, Equivalent ladder diagram of or Gate, equivalents Ladder Diagram of NOT gate, equivalent ladder diagram of XOR gate, equivalent ladder diagram of NAND gate, equivalent ladder diagram of NOR gate, equivalent ladder diagram to demonstrate De Morgan theorem. Ladder design**.** **6 Hrs**

Unit 3: PLC Timers and Counters: Timer and its Classification: Characteristics of PLC timer, functions in timer, Re-setting retentive and Non-retentive, Classification of PLC timer. On Delay and OFF delay timers, Timer-on Delay, Timer off delay, Retentive and non-retentive timers. Format of a timer instruction. PLC Counter: Operation of PLC Counter, Counter Parameters, Counters Instructions Overview Count up (CTU) Count Down (CTD) **6Hrs**

Unit 4: Advanced instructions: Introduction: Comparison instructions, discussions on comparison instructions, "EQUAL" or "EQU" instruction, "NOT EQUAL" or "NEQ" instruction, "LESS THAN" or "LESS" instruction, "LESS THANOR EQUAL' or "LEQ" instruction, GREATER THAN" OR "GRT" instruction, "GREATER THAN OR EQUAL TO" or "GRO" instruction, "MASKED COMPARISON FOR EQUAL" or "MEQ" instruction, "LIMIT TEST" or "LIM" instruction. Addressing data files: Format of Logical address, Addressing format for micrologic system different addressing types. Data movement instructions, Logical instructions, Mathematical instructions. Special mathematical instructions, data handling instructions. Program flow control instructions, proportional integrate derivative (PID) instruction. **8 Hrs**

PART – B

Unit 5: PLC input output (I/O) modules and power supply: Introduction: Classification of I/O, I/O system overview, practical I/O system and its mapping addressing local and expansion I/O, input-output systems, direct I/O, parallel I/O systems serial I/O systems. Sinking and sourcing. Discrete input module. Rectifier with filter, threshold detection, Isolation, logic section, specifications of discrete input module, types of analog input module, special input modules, analog output module, I/O modules in hazaradous locations power supply requirements, power supply configuration, filters. **8 Hrs**

Unit 6 & 7: Industrial communication and networks: Introduction: Evolution of industrial control process. Types of communication interface. Types of networking channels, parallel communication interface, IEEE-488 bus, devices useable with IEEE-488, handshaking process, interface management lines, serial communication interface. Communication mode. Synchronization and training in communication, synchronous an asynchronous transmissions compared, different recommended standards compared. Software protocol, industrial network, network topology, media access methods, open system interconnection (OSI) network model, network components, advantage of standardized industrial network, industrial network, controller area network (CAN), AS-I interface, FOUNDATION FIELDBUS, physical Layer (Layers), communication stack (layer 2 and 7), user layer (layer 8). **10 Hrs**

Unit 8: Industrial automation: Introduction: Utility of automation, general structure of an automated process, examples of some simple automated systems, selection of PLC**.** **6Hrs**

Text Books:

1. **"PLC and Industrial application", Madhuchhandan Gupts and Samarjit Sen Gupta, pernram international pub. (Indian) Pvt. Ltd., 2011.**

Reference Books;

1. **Cite Address: www.equinoxac.co.uk**
2. **'basic PLC Course (programmable Logic Controller)', Mohd Shafiex Yaacob, Pearson, 2006.**
3. **Cite address: PLC's Elostz.com**

Communication system

Sub Code : 10MT665 **IA Marks : 25**
Hrs/Week :04 **Exam Hrs :03**
Total Lecture Hrs : 52 **PART – A** **Exam Marks :100**

Unit – 1:Introduction to communication systems: COMMUNICATION SYSTEMS**:** Information, Transmitter, chanel-noise, Receiver, modulation, need for modulation, band width requirements, sine wave and Fourier series review, frequency spectra of non sinusoidal waves. **7 Hrs**

Unit -2:noise: External noise, Internal Noise, noise calculations and noise figure. Noise Temperature **7 Hrs**

unit-3:Amplitude Modulation: Introduction AM: Time-Domain description, Frequency – Domain description. Generation of AM wave: square law modulator, switching modulator. Detection of AM waves: square law detector, envelop detector. Double side band suppressed carrier modulation (DSBSC): Time-Domain description, Frequency-Domain representation, Generation of DSBSC waves: balanced modulator, ring modulator. Coherent detection of DSBSC modulated waves. Costas loop. **7 Hrs**

UNIT-4:Angle Modulation (FM)-I: Basic definitions, FM, narrow band FM, wide band FM, transmission bandwidth of FM waves, generation of FM waves: indirect FM and direct FM. **6 Hrs**

Unit – 5:Angle Modulation (FM)-II: Demodulation of FM waves, FM stereo multiplexing, Phase-locked loop, Nonlinear model of the phase – locked loop, Linear model of the phase – locked loop, Nonlinear effects in FM systems. **6 Hrs**

UNIT – 6:Waveform coding techniques: PAM, TDM. Waveform Coding Techniques, PCM, Quantization noise and SNR, robust quantization. **6 Hrs**

UNIT -7:Digital Modulation Techniques: Digital Modulation formats, Coherent binary modulation techniques, Coherent quadrature modulation techniques. Non-coherent binary modulation techniques. **7 Hrs**

UNIT -8:Applications: Radar And Tv Fundamentals, **6 Hrs**

Text books:

Communication Systems, Simon Haykins, 3rd Edition, John Willey, 1996.
An Introduction to Analog and Digital Communication, Simon Haykins, John Wiley, 2003
Digital communications, Simon Haykin, John Wiley, 2003.

Reference books:

Modern digital and analog Communication systems B. P. Lathi, 3rd ed 2005 Oxford University press.
Communication Systems, Harold P.E, Stern Samy and A Mahmond, Pearson Edn, 2004.
Communication Systems: Singh and Sapre: Analog and
Digital and analog communication systems & An introduction to Analog and Digital Communication, K. Sam Shanmugam, John Wiley, 1996. 2.Simon Haykin, John Wiley, 2005
Embedded Systems: Architecture and Programming, Raj Kamal, TMH. 2008

MICRO & SMART SYSTEMS TECHNOLOGY LABORATORY

Sub Code: 10MTL67 **IA Marks: 25**
Hrs/week: 03 **Exam Hrs: 03**
Total Lecture Hrs: 42 **Exam Marks: 50**

PART – A

CAD lab (coupled field simulation of electrostatic-elastic actuation with fluid effect)

PART – B

1) BEL pressure sensor
2) Thermal-Cycle for PCR
3) Active control of a cantilever beam.

Scheme of Examinations:

One Question from Part A : **20 Marks**
One Question from Part B : **20 Marks**
Viva-Voice : **10 Marks**
TOTAL : 50 Marks

ADVANCED PROGRAMMING LAB

IA MARKS: 25 **Hrs/Week: 04**
Exam Marks: 50 **Exam Hrs: 03**
Sub code No: 06MT68 **Total Hrs: 42**

PROGRAMMING

1Write a Program to perform Matrix Multiplication in C/C++.

2Write a Program to perform Ascending / Descending order of Numbers or Names.

3Write a program to implement of the operation of Queue, Tree, and Stack.

4Write a program to implement the linear search & binary search algorithm.

5Write a program to implement the shortest minimum path algorithm.

6Write a program to perform the operation of the palindrome.

7Write a program to perform the inverse matrix operation.

8Write a program to perform the operation of a power function (x ** y).

9Write a program to perform the operation of recursion.

10Write a program to perform the operation of a fork operation.

Scheme of Examinations:

Progrram	:	**40 Marks**
Viva-Voice	:	**10 Marks**
TOTAL	**:**	**50 Marks**

VII SEMESTER

THERMODYNAMICS & HEAT TRANSFER

Sub Code: 10MT71 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

PART – A

THERMODYNAMICS

Unit 1: Fundamental Concepts & Definitions: Thermodynamics: definition and scope, Microscopic and Macroscopic approaches. Engineering thermodynamics: definition, some practical applications of engineering thermodynamic. System (Closed system) and Control Volume (open system): Characteristics of system boundary and control surface, examples. Thermodynamic properties; definition and units, intensive and extensive properties. Thermodynamic state, state point, state diagram, path and process, quasi-static process, cyclic and non-cyclic presses; Thermodynamic equilibrium; definition, mechanical equilibrium; diathemic wall, thermal equilibrium, chemical equilibrium. Zeroth law of thermodynamics, temperature; concepts, scales, measurement, internal fixed points. **7 Hrs**

Unit 2: Work and Heat: Mechanics, definition of work and its limitations, thermodynamic definition of work; examples, sign convention. Displacement work; at part of a system boundary, at whole of a system boundary, expressions for displacement work in various process through p-v diagrams. Shaft work; Electrical work. Other types of work, Heat; definition, units and sign convention, what heat is not. **6 Hrs**

Unit 3: First Law of Thermodynamics: Joules experiments, equivalence of heat and work, Statement of the First law of thermodynamics, extension of the First law to non-cyclic process, energy, energy as a property, modes of energy, pure substance; definition, two-property rule, Specific heat at constant volume, enthalpy, specific heat constant pressure. Extension of the First law to control volume; steady state-steady flow energy equation, important applications, analysis of unsteady processes such as filmg and evacuation of vessels with and without heat transfer. **7 Hrs**

Unit 4: Second Law of Thermodynamics: Devices converting heat to work; (a) in a thermodynamic cycle, (b) in a mechanical cycle. Thermal reservoir; direct heat engine; scheme representation and efficiency. Devices converting work to heat in a thermodynamics cycle; reserved heat engine, schematics representation, coefficients of performance. Keivin – Planck statement of the Second law of Thermodynamics; PMM II and PMM I, Celsius statement of second law of Thermodynamics, equivalence of the tow statements; reversible and irreversible processes; factors that make a process irreversible, reversible hat engines, Cannot cycle, cannot principles. Thermodynamic temperature scale. **7 Hrs**

PART – B

Unit 5: Introductory Concepts and Definitions: Modes of heat transfer: Basic laws governing conduction, convection, and radiation heat transfer; Thermal conductivity; convective heat transfer coefficient; radiation heat transfer; combined heat transfer mechanics. Boundary conditions of 1st, 2nd and 3rd Kind.
Conduction: Derivation of general three dimensional conduction equations in Cartesian coordinate, special cases, discussion on 3-D conduction in cylindrical and spherical coordinate systems (No derivation). One dimensional conduction equations in rectangular, cylindrical and spherical coordinates for plane and composite walls. Overall heat transfer coefficient. Thermal contact resistance. **7 Hrs**

Unit 6: Variable Thermal Conductivity: derivation for heat flow and temperature distribution in plane wall. Critical thickness of insulation without heat generation. Thermal resistance concept & its importance. Heat transfer in extended surfaces of uniform cross-section without heat generation. Long fin, short fin with insulated tip and without insulated tip and fin connected between two heat sources. Fin efficiency and effectiveness. Numerical problems. **6 Hrs**

Unit 7: Concepts and Basic Relations in Boundary Layers: Flow over a body velocity boundary layer; critical Reynolds number, general expressions for drag coefficient and drag force; thermal boundary layer; general expression for local heat transfer coefficient; average heat transfer coefficient, Average heat transfer coefficient; Nusselt number. Flow inside a duct velocity boundary layer, hydrodynamic entrance length and hydro dynamically developed flow; flow through tubes (internal flow discussion only). Numerical based on empirical relation given in data handbook.
Free or Natural Convection: Application of dimensional analysis for free convection- physical significance or Grashoff number; use of correlations of free convection in vertical, horizontal and inclined flat plates, vertical and horizontal cylinders and spheres, Numerical problems. 7 **Hrs**

Unit 8: Radiation Heat Transfer: Thermal radiation; definitions of various terms used in radiation heat transfer, Stefan-Boltzman law, Kircoff's law. Planck's law and Wein's displacement law. Radiation heat exchange between two parallel infinite black surface, between two parallel infinite gray surfaces; effect of radiation shield; intensity of radiation and solid angle; Lambert's law radiation heat exchange between two finite surfaces-configuration factor or view factor. Numerical problems. **6 Hrs**

Text books:

1. Basic and applied Thermodynamics, P. K. Nag, Tata McGraw Hul Pub. 2002.
2. Heat & Mass transfer, Tirumaleshwar, Pearson education 2006.

Reference Books:

1. Engineering Thermodynamics, J. B. Jones and G. A. Hawkins, John Wiley and Sons.
2. E. A. Venkatesh Basic Engineering Thermodynamicsdata hand book by B. T. Nijaguna. (To be supplied in the examination)
3. Thermodynamics, An Engineering approach, Yunus a. Cenegal and Michael a.Boles, Tata McGraw Hill publications, 2002.
4. Heat transfer-A basic approach, Ozisik, Tata McGraw Hilll 2002.
5. Heat transfer, P. K. Nag, Tata Mc Graw Hill 2002.
6. Heat transfer, a practical approach, Yunus a- Cengel Tata Mc Graw Hill.

ROBOTICS & MACHINE VISION SYSTEMS

Sub Code: 10MT72 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

PART – A

UNIT 1: Introduction and Mathematical Representation of Robotics: History of Robots, Types of Robots, Notation, Position and Orientation of a Rigid Body, Some Properties of Rotation Matrices, Successive Rotations, Euler Angles For Fixed Frames X-Y –Z and moving frame ZYZ. Transformation between coordinate system. Homogeneous coordinates, Properties of A/BT, Types of joints: Rotary, Prismatic joint, Spherical joint, Representation of Links using denvit-Hartenberg Parameters: Link Parameters for intermediate, first and last links, Link transformation matrices, Transformation matrices of 3R manipulator, PUMA560 manipulator, SCARA manipulator. **7 Hrs**

Unit 2: Kinematics of serial Manipulators: Direct kinematics of 2R, 3R; RRP, RPR manipulator, puma560 manipulator, SCARA manipulator. Stand ford arm. Inverse kinematics of 2R, 3R manipulator, puma560 manipulator. **6 Hrs**

Unit 3: Velocity and Static's of Manipulators: Differential relationships, Jacobian, Differential motions of a frame (translation and rotation), Linear and angular velocity of a rigid body, Linear and angular velocities of links in serial manipulators, 2R, 3R manipulators, Jacobian of serial manipulator, Velocity ellipse of 2R manipulator. Statics of serial manipulators, Static force and torque analysis of 3R manipulator. Singularity in force domain. **7 Hrs**

Unit 4: Dynamics of Manipulators: Kinetic energy, potential, Equation of motion using Lagrangian, Equation of motions of one and two degree freedom spring mass damper systems using Lagrangian formulation, Inertia of a link, Recursive formulation of Dynamics using Newtons Euler equation, Equation of motion of 2R manipulator using Lagrangian Newton-Euler Formulation. **6 Hrs**

PART – B

Unit 5: Trajectory Planning: Joint space schemes, cubic trajectory, joint space schemes with via points, Cubic trajectory with a via point, Third order polynomial trajectory planning, Linear segments with parabolic blends, Cartesian space schemes, Cartesian straight line and circular motion planning. **7 Hrs**

Unit 6: Control: Feedback control of a single link manipulator- first order, second order system, PID control, PID control of multi link manipulator, Force control of manipulator, force control of single mass, Partitioning a task for force and position control- lever, peg in whole Hybrid force and position controller. **8 Hrs**

Unit 7: Actuators: Types, Characteristics of actuating system: weight, power-to-weight ratio, operating pressure, stiffness vs. compliance, Use of reduction gears, comparison of hydraulic, electric, pneumatic actuators, Hydraulic actuators. Proportional feedback control, Electric motors: Reversible AC motors, Brushers DC motors, Stepper motors- structure and principle of operation, stepper motor speed-torque characteristics. **6 Hrs**

Unit 8: Sensors: Sensor characteristics, Position sensors- potentiometers, Encoders, LVDT, Resolvers, Displacement sensor, Velocity sensor-encoders, and tachometers. Acceleration sensors, Force and Pressure sensors piezoelectric, force sensing resistor, Torque sensors, Touch an tactile sensor, Proximity sensors-magnetic, optical, ultrasonic, inductive, capacitive, eddy-current proximity sensors. **5 Hrs**

Text Books:

1. **Fundamental Concepts and Analysis,** Ghosal A., Robotics, oxford, 2006.
2. **Introduction to Robotics analysis, Systems, Applications,** Niku, S. B., Pearso Education, 2008.

Reference Books:

1. **Introduction to Robotics, Mechanical and Control,** Craig, J. J. 2nd Edition, Addison-Wesley, 1989.
2. **Fundamentals of Robotics, Analysis and Control,** Schilling R. J. PHI, 2006.
3. **Industrial Robotics, Technology,** Programming and Applications, M. P. Grover McGraw Hill, USA, 1986.
4. **Machine Vision,** Ramesh Jam, Rangachari Kasturi, Brain G. Schunck, Tata McGraw-Hill, 1991.
5. **Robotics for Engineers,** Yomerkoren, McGraw-Hill, USA, 1987.
6. **Robotics and Image Processing,** P. a. Janaki Raman, Tata McGraw-Hill, 1991.

Wireless Networks

Subject Code:10MT73 **IA Marks: 28**
No. of Hrs/week: 04 **Exam Marks: 100**
Total no. Hrs: 52 **Exam Hrs: 03**

PART A

Unit 1 & 2: Review of fundamentals of wireless communication and networks: Wireless communication channel specifications, wireless communication systems, wireless networks, switching technology, communication problems wireless network issues and standards. **12 Hrs**

Unit 3: Wireless body area networks (WBAN), Properties, network architecture, components, **t**echnologies, design issues, protocols and applications. **08 Hrs**

Unit 4: Wireless personal area networks: Architecture, components, requirements, technologies and protocols, Bluetooth and Zigbee. **6 Hrs**

PART – B

Unit 5: Wireless LANs: Network components, design requirements, architecture, IEEE 802.11x, WLAN protocols, 802, 11 p and applications. **8 Hrs**

Unit 6 & 7: WMANs. IEEE 802.16, architecture, components, WiMax mobility support, protocols, broadband networks and applications, WWANs. Cellular networks, Satellite Networks, Applications. **10 Hrs**

Unit 8: Wireless adhoc networks, Mobile adhoc networks, Sensor Networks, VANETs, Research issues in wireless networks. **8 Hrs**

Text Book:

1. **S. S. Manvi, M. S. Kakkasageri,** "Wireless and Mobile Networks concepts and protocols", Wiley, First edition, 2010.

Reference Books:

1. **P. Kaveh, Krishnamurthy, "Principles of wireless networks: A unified approach",** PHI, 2006.
2. Iti saha Mishra, **"Wireless communication and networks3G and beyond** ", MCH, 2009.
3. Mullet, **"Introduction to wireless telecommunication systems and networks",** Cengage, 2009.
4. D. P. Agarwal, Qing An Zeng, **"Introduction to wireless and mobile systems",** Cengage, 2008.
5. Ivan stomenovic, **"Handbook of wireless networks and mobile computing",** Wiley, 2009.

SMART MATERIALS

Sub Code: 10MT751 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

PART – A

Unit 1: Introduction: Characteristics of composites and ceramics materials, Dynamics and controls, concepts, Electro-magnetic materials and shape memory alloys-processing and characteristics. **6 Hrs**

Unit 2: Sensing and Actuation: Principals of electromagnetic, acoustics, chemical and mechanical sensing and actuation, types of sensors and their applications, their compatibility writer conventional and advanced materials, signal processing, principals and characterization. **7 Hrs**

Unit 3: Control Design: Design of shape memory alloys, Types of MR fluids, Characteristics and application, principals of MR fluid value designs. Magnetic circuit design, MR Dampers, design issues. **6 Hrs**

Unit 4: Optics and Electromagnetic: Principals of optical fiber technology, characteristics of active and adaptive optical systems and components, design and manufacturing principles. **7 Hrs**

PART – B

Unit 5: Structures: Principles of drag and turbulence control through smart skins, applications in environment such as aerospace and transportation vehicles, manufacturing, repair and maintainability aspects. **7 Hrs**

Unit 6: controls: Principles of structural acoustic control, distributed, analog and digital feedback controls, Dimensional implications for structural control. **6 Hrs**

Unit 7: Principles of Vibration and Modal analysis: PZT Actuators, MEMs, magnetic shape memory Alloys. Characteristics and applications. **7 Hrs**

Unit 8: Information Processing: Neural Network, data Processing, Data Visualization and Reliability – Principals and application domains. **6 Hrs**

Text Books:

1. **Analysis and Design,** A. V. Srinivasan, 'Smart structures – Cambridge University Press, New York, 2001, (ISBN : 0521650267)
2. **Smart Materials and Structures,** M. V. Gandhi and B S Thomson Chapmen & Hall, London, 1992 (ISBN : 0412370107)

Reference Books:

1. **Smart Materials and Structures,** Banks HT, RC Smith, Y Wang, Massow S A, Paris 1996.
2. **G P Gibss' Adaptive Structures,** Clark R L, W R Saunolers, Jhon Wiles and Sons, New York, 1998
3. **An introduction for scientists and Engineers,** Esic Udd, Optic Sensors : Jhon Wiley & sons, New York, 1991, 1991 (ISBN : 0471830070)

SMART MATERIALS

Sub Code: 10MT752 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

PART – A

Unit 1: The Information Age: An Overview, The purpose, data, information, and information systems and their types. Ethical and society issues, information systems in business functions. Web empowered enterprises. **5 Hrs**

Unit 2: Strategic Uses of information Systems: Strategies and Strategic moves, achieving a competitive advantage, creating and maintaining strategic information systems. Business Functions and supply Chains – effectiveness and efficiency, accounting finance, engineering, supply chain management. Human resource management, Enterprise resource planning. **5 Hrs**

Unit 3: Information Technology: Business Hardware – components, classification of computers. Output devices, storage media, and purchasing, Business Software – programming languages and software development tools, language translation, compliers an interpreters, system software, open source software, software licensing, ethical issues. **8 Hrs**

Unit 4: Business Networks and Telecommunication: Telecommunication in Business and Daily Use, Bandwidths and Media, networks, protocols, internet networking services, Telecommuting – pros and cons, Future of Networking Technologies. 8 **Hrs**

PART – B

Unit 5: Web Enabled Commerce: Web enabled enterprises – web business and technologies, web enabled business, Challenges of Global Information Systems – Multinational organizations, international commerce, ethical issued. **7 Hrs**

Unit 6: Decision Support and business intelligence: Decision support and expert systems – decision support and decision making process, structured and unstructured problems, decision support systems. Expert systems, geographical systems. Business intelligence and Knowledge Management – Date Mining and online analysis, knowledge management. **6 Hrs**

Unit 7: Planning, Acquisition, and Control: Systems Planning and Development – planning information systems, systems development life cycle, agile methods, systems integration, ethical issues IS professionals certification. **7 Hrs**

Unit 8: Choices in Systems Acquisition: Options and Priorities, outsourcing, licensing applications, software as a service, user application development, and ethical issues- computer use policies for employees. **6 Hrs**

Text Books:

1. **Management information Systems,** Effy Oz, Cengage Learning, INDIA EDITION, 2009.
2. **Management Information Systems,** James A O'Brien, Irwin McGraw Hill, Fifth Edition.

Reference Books:

1. **Management Information Systems,** Laudon & Laudon, PHI 1998 Ed. ISBN 81-203-1280-1.
2. **Management Information Systems,** S. Sadagopan, Prentice hall of India, 1998 Ed. ISBN 81-203-1180-9.
3. **Information Systems for Modern Management** G RMurdick PHI 2002.

ARTIFICIAL INTELLIGENCE

Sub Code: 10MT753 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

PART – A

Unit 1: Artificial Intelligence: Introduction, defining, underlying assumption, importance f A1, Al and related fields. **6 Hrs**

Unit 2: Space Representation: Defining a problem, Production systems and its characteristics, Search and Control strategies – Generate and Test, Hill Climbing, Best – First Search, Problem reduction Constraint Satisfaction, Means – Ends Analysis. **7 Hrs**

Unit 3: Knowledge Representation Issues: Representation and Mappings, Types of Knowledge – Procedural Vs Declarative, Logic programming. Forward Vs Backward reasoning, Matching. **7 Hrs**

Unit 4: Use of Predicate Logic: Representing simple facts, Instance and Isa relationships, Syntax and Semantics for Prepositional logic, FQPL and properties of Wffs, Conversion to clausal form, Resolution, Natural deduction. **6 Hrs**

PART – B

Unit 5: Statistical and Probabilistic Reasoning: Symbolic reasoning under uncertainty, Probability and Bayers' theorem, Certainity factors and rule based systems, Bayesian Networks, Shafer Theory, Fuzzy Logic. **7 Hrs**

Unit 6: Expert Systems: Structure and uses, Representing and using domain knowledge, Expert System Shells, Pattern recognition learning classification patterns, recognizing and understanding speech. Introduction to knowledge Acquisition, Types of Learning. **7 Hrs**

Unit 7: Typical Expert Systems: MYCIN, Variants of MYCIN, PROSPECTOR, DENDRAL, PUFF, ETC. **6 Hrs**

Unit 8: Introduction to Machine Learning: Perceptions, Checker Playing Examples, Learning automata, Genetic Algorithms, Intelligent editors. **6 Hrs**

Text Books:

1. **Artificial Intelligence,** Elaine Rich & Kelvin Knight, M/H 1983.
2. **Introduction to Al & ED,** Dan w. Patterson, Prentice Hall of India, 1999.

Reference Books:

1. **Principles of Artificial intelligence,** Springer Vertag, Berlin, 1981.
2. **Artificial intelligence in business, Science & Industry,** Wendy B, Ranch
3. **A guide to Expert systems,** Waterman, D. A. Addison – Wesley inc. 1986.
4. **Building Expert Systems,** Hayes, Roth, Waterman, D. A. Addison Wesley, 1983.

MECHANICAL VIBRATIONS

Sub Code: 10MT754 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

PART – A

Unit 1: Introduction: Types of vibrations, Definitions, Simple Harmonic Motion (S.H.M), Work done y harmonic force, Principle of super position applied to SHM, Beats, Fourier theorem and problems. **6 Hrs**

Unit 2: Undamped (Single Degree of Freedom) Free Vibrations: Derivations for spring mass systems, Methods of analysis, Natural frequencies of simple systems, Spring in series and parallel, Torsional and transverse vibrations, Effect of mass of spring and Problems. **7 Hrs**

Unit 3: Damped Freed vibrations (IDOF): Types of damping, Analysis with viscous damping derivations for over, critical and under damped systems, Logarithmic decrement and Problems. **6 Hrs**

Unit 4: Forced Vibrations (1DOF): Introduction, Analysis of forced vibration with constant harmonic excitation – magnification factor, rotating and reciprocating unbalances, excitation of support (relative and absolute amplitudes), force and motion transmissibility, Energy dissipated due to damping and Problems. **7 Hrs**

PART – B

Unit 5: Vibration Measuring Instruments and Whirling of shafts: Seismic Instruments – Vibrometers, Accelerometer, Frequency measuring instruments and Problems, Whirling of Shafts with and without damping, discussion of speeds above and below critical speeds and Problems. **7 Hrs**

Unit 6: Systems with two degrees of Freedom: Principles modes of vibrations, Normal mode and natural frequencies of systems (without damping)- simple spring mass systems, masses on tightly stretched strings, double pendulum, Torsional systems, combined rectilinear and angular systems, geared systems and Problems. Undamped dynamic vibration absorber and Problems. **6 Hrs**

Unit 7: Numerical Methods for multi degree freedom of systems: Introduction, Maxwell's reciprocal theorem, Influence coefficients, Rayleigh's method, Dunkerley's method, Stodola method, Holzer's method, Orthogonality of principal modes, method of matrix iteration and Problems. **9 Hrs**

Unit 8: Modal analysis and Condition Monitoring: Signal analysis, dynamic testing of machines and structures, Experimental modal analysis, Machine condition monitoring and diagnosis. **5 Hrs**

Text books:

1. **Mechanical Vibrations,** S. S. Rao, Pearson Education Inc, 4th edition, 2003.
2. **Mechanical Vibrations,** V. P. Singh, Dhanpat Rai & Company, 3d edition, 2006.

Reference books:

1. **Theory of Vibration with Applications,** W. T. Thomson, M. D. Dahleh and C. Padmanabhan, Pearson Education Inc, 5th edition, 2008.
2. **Mechanical Vibrations:** S. Graham Kelly, Schaum's outline Series, Tata McGraw Hill, Special Indian Edition, 2007.
3. **Theory and Practice Mechanical Vibrations:** J. S. Rao & K. Gupta, New Age International Publications, New Delhi, 2001.
4. **Mechanical Vibrations,** G. K. Grover, Nemchand and Bros, 6th edition, 1996.
5. **Mechanical Vibrations: Prof.** A. R. K Swamy & Prof. Y. Krishna Murthy, 1st edition 2009.

OPERATION RESEARCH

Sub Code: 10MT755 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

PART – A

Unit 1: Introduction: Evolution of OR, definition of OR, scope of OR, application areas of OR, steps (phases) in OR study, characteristics and limitations of OR, models used in OR, linear programming (LP) problem-formulation and solution by graphical method. **4 Hrs**

Unit 2: Solution of Linear Programming Problems: The simple method-canonical and standard form of an LP problem, slack, surplus and artificial variables, big M method and concept of duality, dual simplex method. **8 Hrs**

Unit 3: Transportation Problems: Formulation of transportation problem, types, initial basic feasible solution using different methods, optimal solution by MODI method, degeneracy in transportation problems, application of transportation problem concept for maximization cases. Assignment Problem-formulation, types, application to maximization cases and travelling salesman problem. **8 Hrs**

Unit 4: Integer Programming: Pure and mixed integer programming problems, solution of Integer programming problems-Gomory's all integers cutting plane method and mixed integer method, branch and bound methods, Zero-One programming. **6 Hrs**

PART – B

Unit 5: Pert-Cpm Techniques: Introduction, network construction, network construction-rules, Fulkerson's rule for numbering the events, AON and AOA diagrams; Critical path method to find the expected completion time of a project, floats; PERT for finding expected duration of an activity and project, determining the probability of completing a project, predicting the completion time of project; crashing of simple projects. **8 Hrs**

Unit 6: Queuing Theory: Queuing systems and their characteristics, Pure-birth and Pure-death models (only equation), empirical queuing models – M/M/1 and M/M/C models and their steady state performance analysis. **6 Hrs**

Unit 7: Game Theory: Formulation of games, types, solution of games with saddle point, graphical method of solving mixed strategy games, dominance rule for solving mixed strategy games. **6 Hrs**

Unit 8: Sequencing: Basic assumptions, sequencing 'n' jobs on single machine using priority rules, sequencing using Johnsons's rule-'n' jobs on 3 machines, 'n' jobs on 'm' machines, Sequencing 2 jobs on 'm' machines using graphical metod. **6 Hrs**

Text Books:

1. **Operations Research,** P K Gupta and D S Hira, Chand Publications, New Delhi – 2007.
2. **Operation Research,** Taha HA, Pearson Education

Reference Books:

1. **Operations Research,** A P Verma, s K Kataria & sons, 2008.
2. **Operations Research,** Paneerselvan, PHI.
3. **Operations Research,** A. M Natarajan,P Balasubramani, Pearson Education, 2005.
4. **Introduction to Operations Research,** Hiller and Liberman, McGraw Hill.
5. **Operations Research,** S. D. Sharma, Ledamath Ramanath & Co., 2002.

REAL TIME SYSTEMS

Sub Code: 10MT761 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

PART – A

Unit 1: Introduction to Real-Time systems: Historical background, RTS definition, Classification of Real-time systems, Time constraints, Classification of Programs. **6 Hrs**

Unit 2: Concepts of computer control: Introduction, Sequence Control, Loop control, Supervisory control, Centralized computer control, Distributed system, Human-computer interface, Benefits of computer control systems. **6 Hrs**

Unit 3: Computer Hardware requirements for RTS: Introduction, General purpose computer, single chip microcontroller, specialized processors, Process-related Interfaces, Data transfer techniques, Communications, Standard Interface. **6 Hrs**

Unit 4: Languages for Real-Time applications: Introduction, Syntax layout and readability, declaration and Initialization of Variables and Constants, Modularity and Variables. Compilation. Data types, Control Structure, Exception Handling, Low-level facilities, Co routines, Interrupts and Device handling, concurrency, Real-time support, Overview of real-time languages. **8 Hrs**

PART – B

Unit 5 & 6: Operating Systems: Introduction, Real-time multi-tasking OS, Scheduling strategies. Priority Structures, Task management, Scheduler and real-time clock interrupt handles. Memory Management, Code sharing, Resource control, task co-operation and communication, Mutual exclusion. Data transfer, Liveness, Minimum OS kernel, Examples. **12 Hrs**

Unit 7: Design of RTSS- General Introduction: Introduction, Specification documentation, Preliminary design, single-program, Foreground/back, Multi-tasking approach, Mutual exclusion, Monitors. **8 Hrs**

Unit 8: RTS development methodologies: Introduction, Yourdon Methodology, Requirement definition for drying Oven, Ward and Mellr Method, Hately and Pirbhai method. **6 Hrs**

Text Books:

1. **Real – time Computer Control – an introduction,** Sturt Bennel, 2ne Edn. Pearson Education. 2005.

Reference Books:

1. **Real-Time Systems Design and Analysis,** Philip, a. Laplante, second edition, PHI, 2005.
2. **Real-Time Systems Development,** Rob Williams, 2006.
3. **Embedded Systems,** Raj Kamal, Tata McGraw Hill, India, 2005.

IMAGE PROCESSING

Sub Code: 10MT762 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

PART – A

Unit 1: Digital image fundamentals: What is Digital image processing? Fundamental steps in digital image processing, components of an image processing system, elements of Visual Perception. **6 Hrs**

Unit 2: Images sensing and Acquisition, images sampling and Quantization's, Some Basic Relationships between Pixels, Linear and Nonlinear Operations. **6 Hrs**

Unit 3: Image Transforms: Two-dimensional orthogonal & unitary transforms, properties of unitary transforms, two dimensional discrete Fourier transform. **6 Hrs**

Unit 4: Discrete cosine transform, sine transform, Hadamard transform, Haar transform, Slant transform, KL transform. **6 Hrs**

PART – B

Unit 5: Image Enhancement: Image Enhancement in Spatial domain, Some Basic Gray Level Transformations, Histogram Processing, Enhancement using Arithmetic/Logic Operations. **6 Hrs**

Unit 6: Basics of Spatial Filtering Image enhancement in the Frequency Domain filters, Smoothing Frequency Domain filters, Sharpening Domain filters, homomorphic filtering. **6 Hrs**

Unit 7: Model of image degrading/restoration process, noise models, Restoration in the Present of Noise, Only-Spatial Filtering Periodic Noise Reduction by Frequency Domain filtering, Linear Position-Invariant Degradations, inverse filtering, minimum mean square error (Weiner) filtering. **10 Hrs**

Unit 8: Color Fundamentals. Color Models, Pseudo color. Image Processing., processing basics of full color image processing. **6 Hrs**

Text Books:

1. **"Digital Image Processing",** Rafael C. Gonzalez and Richard e. Woods, Pearson Eucation, 2001, 2nd edition./

Reference Books:

1. **"Fundamentals of Digital Image Processing",** Anil K, Jain, Pearson Edun, 20010
2. **"Digital Image Processing and Analysis",** B. Chanda and D. Dutta Majumdar, PHI, 2003

DISPLAY SYSTEMS

Sub Code: 10MT763 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

Note: The syllabus has been designed to give the students about the basic concepts about the Display Systems design and its applications. No text is fully explained the below contents. Hence TWO books has been referred and the teaching faculty has to carefully teach the subject in explaining the concepts referring the above books. One of the texts is Display Technology Hand Book. It is vary vast hence depending on the requirement refer the hand book and teach.

PART – A

Unit 1: Basic concepts of the Display Systems, the human visual systems, Fundamentals of colors, **6 Hrs**

Unit 2: Display technology and applications, Practical and performance of the display interface. **8 Hrs**

Unit 3: Requirement of display systems, desktop electronic imaging, image features on a VDU. **6 Hrs**

Unit 4: Matching display technology for the applications, structure performance of passive matrix LCOs. **6 Hrs**

PART – B

Unit 5: Basic of Analog and Digital display Interface, Format and timing standards, Standards of Analog Videos. **8 Hrs**

Unit 6 & 7: Televison: Analog Video, The Personal Computer – digital display interface standards, Impact of Digital TV and HDTV. Display Interface – fundamentals and standards. **10 Hrs**

Unit 8: Display performance evaluation, measurement and standardization of CRT displays. **8 Hrs**

Text Books:

1. Joseph A Casterllano, **"Hand book of Display Technology",** Wiley Publications, 1992.
2. Lindsay, W MacDonold, Anthony, C Lowe, **"Display System: Design and Applications",** Wiley Series Publications, 1997. (ISBN: 047198700)

SOFT COMPUTING

Sub Code: 10MT763 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

PART – A

Unit 1: Learning and Soft Computing: Examples, basic tools of soft computing, basic mathematics of soft computing, learning and statistical approaches to regression and classification. **8 Hrs**

Unit 2: Single-Layer Networks: Perceptorn, adaptive linear neuron (Adaline), and the LMS algorithims. **6 Hrs**

Unit 3: Multilayer Percenptrons: Error back propagation algorithm, generalized delta rule, practical aspects of error back propagation. Algorithm. **8 Hrs**

Unit 4: Radial Basic Function Networks: Ill-posed problems and the regularization technique, stabilizers and basic functions, generalized radial basis function networks. **6 Hrs**

PART – B

Unit 5: Fuzzy Logic Systems: Basics of fuzzy logic theory, mathematical similarities between neural networks and fuzzy logic models, fuzzy additive models. **8 Hrs**
Unit 6 & 7: Support Vector Machines: Risk minimizations principles and the concepts of uniform convergence, VC dimension, structural risk minimization, support vector machine algorithms, **10 Hrs**

Unit 8: Case studies: Neural-networks based adaptive control, computer graphics. **6 Hrs**

Text Books:

1. Vojislav Kecman, "Learning and Soft Computing", Pearson Education (Asia) Pte. Ltd. 2004.

Reference Books:

1. S. Haykin, **"Neural networks: A Comprehensive Foundation",** Pearson Education (Asia) Pte. Ltd/Prentice Hall of India, 2003.
2. M. T. Hagan, H. B. Demuth and M. Beale, **"Neural Network Design,"** Thomson Learning, 2002.
3. Bark Kosko, **"Neural Networks and Fuzzy Systems",** Prentice Hall of India, 2005.
4. George J. Klir and Bo Yuan, **"Fuzzy Sets and Fuzzy Logic: Theory and Application",** Prentice Hall of India, 2001.

SAFETY AND SECURITY OF MECHATRONICS SYSTMES

Sub Code: 10MT765 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

PART – A

Unit 1: Types of automobiles. Limiting Dimensions as per Central Motor Vehicles Rules. Engines – classification, Construction, Materials of engine components. Prototype Testing as per Central motor Vehicles Rules. **7 Hrs**

Unit 2: Fuel system – Fuel tank, Fuel filter, Types of fuel system. Carburetor – Simple and Modern, Fuel injection System. Emission standards as per CMV Rules. **7 Hrs**

Unit 3: Electrical System – Storage battery Operations and Maintenance, Ignition System – Coil and Magneto Ignition System. Starting System, Lighting system, Horn System – Wind Shield. **6 Hrs**

Unit 4: Wiper motors, fans, heaters, traficators, automobile air conditioning. Central motor vehicles rules regarding lighting, windshields, Wipers. **6 Hrs**

PART – B

Unit 5: Transmission system – clutches – operation and fault finding of clutches, fluid flywheel, Gear box-types, steer systems, chassis springs, suspension. **7 Hrs**

Unit 6: Differential, dead and Live axles, Rims, Tyre etc. Brakes – types, construction and fault finding, CMV rules – brakes, Steering & tyre. **7 Hrs**

Unit 7: Lubrication systems – types, components, lubricating oil, cooling system – details of components, study of systems, types. **6 Hrs**

Unit 8: Miscellaneous – special gadgets and accessories for fire fighting vehicles. Automobile accidents. CMV rules regarding safety devices for drivers, passengers. **6 Hrs**

References:

1. William H. Crouse, **Automobile Chassis and Body constructions**, operation and Maintenance.
2. William H. Crouse, **Automobile machines – Principles & operations.**
3. CBS Narang, **Automobile Engineering.**
4. Kirpal Singh, **Automobile Engineering.**
5. Joseph Heitner, **Automotive Mechanics-Principles & Practices**
6. P. L. Kohli, **Automotive Electrical Equipments.**
7. **The central Motor Vehicles Rules,** 1989.

ROBOTICS & MACHINE VISION LABORATORY

Sub code: 10MT663 **IA Marks: 25**
Hrs/week: 04 **Exam Hrs: 03**
Total Lecture Hrs: 52 **Exam Marks: 100**

PART – A

1) Study of different types of robots based on configuration and application.
2) Study of different types of links and joints used in robots.
3) Study of components of robots with drive system and end effects.
4) Determination of maximum and minimum position of links.
5) Verification of transformation (Position and orientation) with respect to gripper and world coordinate system.
6) Estimation of accuracy, repeatability and resolution.

PART – B

1. Robot programming exercises.
   a. Point-to-point programming. (3 numbers)
   b. Continuous path programming. (4 numbers)

2. Advanced robot programming exercise. (2 numbers)

List of Equipment

Sl. No	Name of the Equipment/components	Number of Items
1	Any one type robot configuration with at least five degree of freedom.	1 set
2	Robot programming software inclusive of computer system.	10 Licenses
3	Models of different types of end effectors drive systems Links and Joints	5 Each
4	Models of different configuration robots	5 Each

Scheme of examination:

PART- A: 20 Marks
PART- B: 20 Marks
Viva-Voice: 10 Marks
Total : 50 Marks

DIGITAL SIGNAL PROCESSING LABORATORY

Sub Code: 10MTL78 **IA MARKS: 25**
Hrs/Week: 03 **Exam Hrs: 03**
Total Lecture Hrs: 42 **Exam Marks: 50**

PART – A

LIST OF EXPERIMENTS USING MATLAB / SCILAB / OCTAVE / WAB

1. Verification of sampling theorem.
2. Impulse response of a given system
3. Linear convolution of two given sequences.
4. Circular convolution of two given sequences
5. Autocorrelation of a given sequence and verification of its properties.
6. Cross correlation of given sequences and verification of its properties.
7. Solving a given difference equation.
8. Computation of N point DFT of a given sequence and to plot magnitude and phase Spectrum.
9. Linear convolution of two sequences using DFT and IDFT.
10. Circular convolution of two given sequences using DFT and IDFT
11. Design and implementation of FIR filter to meet given specifications.
12. Design and implementation of IIR filter to meet given specifications.

PART – B

LIST OF EXPERIMENTS USING DSP PROCESSOR

1. Linear convolution of two given sequences.
2. Circular convolution of two given sequences.
3. Computation of N- Point DFT of a given sequence
4. Realization of an FIR filter (any type) to meet given specifications .The input can be a
1. Signal from function generator / speech signal.
2. Audio applications such as to plot time and frequency (Spectrum) display of
3. Microphone output plus a cosine using DSP. Read a wav file and match with their
4. respective spectrograms
5. Noise: Add noise above 3kHz and then remove; Interference suppression using 400 Hz tone.
6. Impulse response of first order and second order system

VIII SEMESTER

RAPID PROTOTYPING

Sub. Code: 10MT81 **IA Marks: 25**
No. Lect. Hrs/week: 4 **Exam Hrs: 03**
Total no. Lect. Hrs: 52 **Exam Marks: 100**

PART – A

Unit 1: Introduction: Need for the compression in product development, history of RP systems, survey of applications, Growth of RP industry, and classification of RP systems.
Stereo Lithography Systems: Principle, Process parameter, Process details, Data preparation, data files and machine details, Application. **7 Hrs**

Unit 2: Selective Laser Sintering: Type of machine, Principle of operation, process parameters, Data preparation for SLS, applications.
Fusion deposition Modeling: Principle, Process parameter, Path generation, Applications. **7 Hrs**

Unit 3: Solid Ground curing: Principle of operation, Machine details, Applications. Laminated object manufacturing, Principle of operation, LOM materials. Process details, application. **6 Hrs**
Unit 4: Concepts Modelers: Principle, Thermal jet printer, sander's model market, 3-D printer. Genisys Xs printer HP system 5, object Quadra systems. **6 Hrs**

PART – B

Unit 5: Rapid Tooling: Indirect Rapid tooling, Silicone rubber tooling, Aluminium filled epoxy tooling, Spray metal tooling, Cast kirtsite, 3Q Keltool, etc. Direct Rapid Tooling Direct. AIM. **6 Hrs**

Unit 6: Rapid Tooling: Quick cast process, Copper polymide, Rapid Tool, DMILS, Prometal, sand Casting tooling, Laminate tooling soft Tooling vs. hard tooling. **6 Hrs**

Unit 7: Software For RP: STL files, Overview of Solid view, magic's, imics, magic communicator, etc. Internet based software, Collaboration tools. **6 Hrs**

Unit 8: Rapid Manufacturing Process Optimization: Factors influencing accuracy. Data preparation errors, Part building errors, Error in finishing, influence of build orientation. **8 Hrs**

Text Books:

1. **Stereo Lithography and other RP & M Technologies,** Paul F. Jacobs: SME, NY 1996.
2. **Rapid Manufacturing,** Flham D. T & Dinjoy S. S. Verlog London 2001.

Reference books:

1. **Rapid Prototyping,** Terry Wohlers Wholer's Report 2000, Wohler's Association 2000.
2. **Rapid Prototyping Materials,** Gurumurhi, IISc Bangalore.
3. **Rapid Automated,** Lamen wood. Indus press New York.

NANOTECHNOLOGY

Sub. Code: 10MT831 **IA Marks: 25**
No. Lect. Hrs/week: 4 **Exam Hrs: 03**
Total no. Lect. Hrs: 52 **Exam Marks: 100**

PART – A

Unit 1: An Overview of Nanoscience & Nanotechnology: Historical background – nature, scope and content of the subject – multidisciplinary aspects – industrial, economic and societal implications. **5 Hrs**

Unit 2: Experimental techniques and methods: For investigation and manipulating materials in the nano scale – electron microscope – scanning probe microscope – optical and other microscopes – light scattering – x-ray diffraction. **7 Hrs**

Unit 3: Fullerenes: Discovery, synthesis and purification – chemistry of fullerenes in the condensed phase – orientational ordering – pressure effects – conductivity and superconductivity – ferromagnetism – optical properties.
Carbon Nanotubes: Synthesis and purification – filling of nanotubes – mechanism of growth – electronics structure – transport properties – mechanical and physical properties – applications. **7 Hrs**

Unit 4: self-Assembled Monolayers: Monolayers on gold – growth process – phase transitions – patterning monolayer's – mixed Monolayers – applications.
Gas Phase Cluster – history of cluster science – formation and growth – detection and analysis – type and properties of clusters – bonding in clusters. **7 Hrs**

PART – B

Unit 5: Semiconductor Quantum dots: Synthesis – electronic structure of nano crystals – how quantum dots are studied – correlation of properties with size – uses. **5 Hrs**

Unit 6: Monolayer – Protected Metal Nanoparticles: Method of preparation – characterization – functionalized metal nanoparticles – applications- super lattices.
Core-Shell Nanoparticles: Types – characterization – properties – applications.
Nanoshells – Types – Characterization – Properties – Applications. **8 Hrs**

Unit 7: Nanobiology – Interaction between biolecules and nanoparticle surfaces – materials used for synthesis of hybrid nano-bio assemblies – biological applications – nanoprobes for analytical applications – nanobiotechnology – future perspectives.
Nanosensors: What make them possible – nanoscale organization for sensors – characterization – nanosensors based on optical properties – nano sensors based on quantum size effects – electrochemical sensors – sensors based on physical properties – nanobiosensors – sensors of the future.
Nanomedicines: Approach to development – nanotechnology in diagnostic and therapeutic application. **8 Hrs**

Unit 8: Molecular Nanomachines: Covalent and non-covalent approaches – molecular motors and machines – other molecular devices – single molecular devices – practical problems involved.
Nanotribology: Studying tribologu on the nanoscale – applications. **5 Hrs**

Text Books:

1. **NANO: The Essentials, Understanding Nanoscience and Nanotechnology;** T. Pradeep (Professor, IIT Madras); Tata McGraw-hill India (2007)
2. **Nanotechnology,** Richard Booker & Earl Boysen; Wiley (2005).

Reference Books:

1. **Introduction to Nanoscale Science and Technology [Series: Nanostructure science and Technology],** Di Ventra, et al (Ed); Springer (2004).
2. **Nanotechnology Demystifies,** Linda Williams & Wade Adams; McGraw-Hill (2007)
3. **Introduction to Nanotechnology,** Charles P Poole Jr. Frank JH Ownes, Wiley Pvt. Ltd., New Delhi, 2007.

DATABASE MANAGEMENT SYSTEM

Sub. Code: 10MT832 **IA Marks: 25**
No. Lect. Hrs/week: 4 **Exam Hrs: 03**
Total no. Lect. Hrs: 52 **Exam Marks: 100**

PART – A

Unit 1: Database And Database Users: Introduction, characteristics of database approach, intended uses of DBMS, advantages and implementation of approach. **6 Hrs**

Unit 2: Database Systems Concepts and Architecture: Data models, schemes and instances, DBMS architecture and data independence, database languages and interfaces, database system environment, classification of database management systems. **6 Hrs**

Unit 3: Data Modeling: High level conceptual data models for database design. Entity types, entity sets, attributes and keys, Relationships, relationship types, roles and structural constraints. Week entity types, ER diagram and design issue. **8 Hrs**

Unit 4: Record Storage and Primary File Organizations: Secondary storage devices, buffering of the stocks, placing file records on the disk, operations on files, heap files and sorted files, hashing techniques. **6 Hrs**

PART - B

Unit 5: Relational Data Model and Relational Algebra: Brief discussion on code rules, relational model concepts, constraints and schemas. Update operation on relations, basic and additional relational algebra operations, queries in relational algebra. **7 Hrs**

Unit 6: Structural Query Language (SQL): Data definition etc., inSQL2. Basic and complex queries in SQL, Insert, Delete; Update statements, and views in SQKL, embedded SQL. **7 Hrs**

Unit 7: Database design: Design guidelines for relational schemas, functional dependencies, normalizations 1st, 2nd, 3rd, 4th and 5th; normal forms. Database design process, factors influencing physical database design guidelines, and guidelines for relational systems. **7 Hrs**

Unit 8: System Implementation: System catalogue for RDBMs, transaction processing, and system concepts, properties of transaction, brief discussion on concurrency control and recovery techniques, database security and authorization. **5 Hrs**

Text Books:

1. **Fundamental of Database systems,** Ramez elmasri and Shanmkanth B. Navathe, 3rd Edition, Addison Pearson.
2. **Database Management System,** Raghu Ramakrishnan, Tata McGraw Hill, 3rd. 2002.

Reference Books:

1. **Database Management and Design,** Gray W.Hansen and James V. Hansen, 2nd Ed. Printice Hall India Pvt. Ltd., 2002.
2. **Database Management Systems,** Designing and Building business applications by Gerald V. Post, 3rd Edition, Tata Mc Graw Hill Publishing company Ltd. 2005.
3. **Project Management with PERT and CPM,** Moder Joseph J and Philips Cerel, R., VAN Noserand, Reinhold, 2nd Ed., 1976.

DESIGN OF EXPERIMENTS

Sub. Code: 10MT833 **IA marks: 25**
No.of Lect.Hrs/week: 4 **EXAM Hrs: 03**
Total NO of Lect hrs: 52 **EXAM MARKS: 100**

PART – A

Unit 1: Introduction: Strategy of Experimentation. Typical applications of Experimental design, Basic Principles, Guidelines for Designing Experiments. **5 Hrs**

Unit 2: Basic Statistical Concepts: Concepts of random variable, probility, density function cumulative distribution function, Sample and population, Measure of Central tendency; Mean median and mode, Measures of Variability, Concepts of confidence level. Statistical Distributions: Normal, Log Normal & Welbull distributions. Hypothesis testing, Probability plots, choice of samples size. Illustration through Numerical examples. **7 Hrs**

Unit 3: Experimental Design: Classical Experiments: Factorial Experiments: Terminology: factors, levels, interactions, treatment combination, randomization, Two-level experimental designs for two factors and three factors. Three-level experimental designs for two factors and three factors, Factor effects, Factor interactions, Fractional factorial design, Saturated Designs, Central composite designs. Illustrations through Numerical examples. **7 Hrs**

Unit 4: Analysis and Interpretations Methods: Measures of variability, Ranking method, Column effect method & Plotting method, Analysis of variance (ANOVA) in Factorial Experiments: YATE's algorithm for ANOVA, Regression analysis, Mathematical models from experimental models from experimental data. Illustration through Numerical examples **7 Hrs**

PART – B

Unit 5: Quality by Experimental Design: Quality, Western and Taguchi's quality philosophy, elements of cost, Noise factors causes of variation. Quadratic loss function & variations of quadratic loss function. Robust design. Steps in Robust design: Parameter design and Tolerance design. Reliability improvement through experiments, Illustration through Numerical examples. **6 Hrs**

Unit 6: Experiment Design Using Taguchi's Orthogonal Arrays: Types of Orthogonal arrays, selection of standard orthogonal arrays, Linear graphs and Interaction assignment, Dummy level Technique, Compound factor method, Modification of linear graphs, illustration through Numerical examples. **8 Hrs**

Unit 7: Signal to Noise Ratio: Evaluation of sensitivity to noise. Signal to Noise rations for static problems: Smaller-the-better type, Nominal-the-better-type, Larger-the-better type. Signal to Noise ratios for Dynamic problems. Illustration through Numerical examples. **6 Hrs**

Unit 8: Parameter and Tolerance design: Parameter and tolerance design concepts, Tauguchi's inner and outer arrays, parameter design strategy, tolerance design strategy. Illustratin through Numerical examples. **6 Hrs**

Text books:

1. **Design and analysis of experiments,** Douglas C. Montgomery, 5th Edition Wiley India Pvt Ltd. 2007.
2. **Quality engineering using Robust design,** Madhav S. Phadke, Prentice Hall PTR, Englewood Cliffs, New Jersy 07632, 1989.

Reference Book:

1. **Quality by Experimental design,** Thomas B. Barker, Marcel Dekker, Inc ASQC Quality Press, 1985.
2. **Experimentals Planning, Analysis, and parameter Design optimization,** C. F. Jeff Wu Michel Hamada, John Wiley editions, 2022.

FINITE ELEMETN ANALYSIS

Sub. Code: 10MT834 **IA marks: 25**
No.of Lect.Hrs/week: 4 **EXAM Hrs: 03**
Total NO of Lect hrs: 52 **EXAM MARKS: 100**

PART – A

Unit 1: Introduction: Equilibrium equations in elasticity subjected to body force, traction forces, and stress-strain relations for plane stress and plane strains. General descriptions of Finite Element method, application and limitations. Types of elements based on geometry. Node numbering, half and width. **7 Hrs**

Unit 2: Basic Procedure: Lagrauge equation for bar, beam (cartlevel/simply supported fixed) Principle of virtual work, principle of minimum potential energy, Raleigh's Ritz method. Direct approach for stiffness matrix formulation of bar element. Galerkin's method. **7 Hrs**

Unit 3: Interpoltion Models: Interpolation polymials- Linear, quadratic and cubic, Simplex complex and multiplex elements, 2D PASCAL's triangle. CST elements-Shape functions and Nodal load vector, Strain displacement matrix and Jacobian for triangular and rectangular element. **7 Hrs**

Unit 4: Solution of 1-D Bars: Solution of bars and stepped bars for displacements, reactions and stresses by using penalty approach and elimination approach. Guass-eliminations technique. **6 Hrs**

PART – B

Unit 5: Higher Order Elements: Langrange's interpolation, Higher order one dimensional elements-Quadratic and cubic element and their shape functions. Shape function of 2-D quadrilateral element-linear, quadric element Iso-parametric, Sub parametric and Super parametric elements, numerical integration : 1, 2 and 3 gauge point for 1D and 2D cases. **6 Hrs**

Unit 6: Trusses: Stiffness matrix of Truss element. Numerical problems. **6 Hrs**

Unit 7: Beams: Hermite shape functions for beam element, Derivation of stiffness matrix, Numerical problems of beams carrying concentrated, UDL and linearly varying loads. **6 Hrs**

Unit 8: Heat Transfer: Steady state heat transfer, 1D heat conduction governing equations. Functional approach for heat conduction. Galerkin's approach for heat conduction. 1D heat transfer in thin fins. **7 Hrs**

Text Books:

1. **Finite Elements in Engineering.** T. R. Chadrupatla, a. d. Belegunde, 3rd Ed PHI.
2. **Finite Elements Method in Engineering,** S. S. Rao, 4th Edition, Elsevier, 2006.

Reference Books:

1. **Finite Element Methods for Engineers,** U. S. Dixit, Cengage Learning, 2009.
2. **Concepts and applications of Finite Elements analysis,** R. D. Cook D. S. Maltus, M. E Plesha, R. J. Wilt, Wiley 4th Ed, 2009.
3. **Finite Element Methods,** Daryl. L. Logon, Thomson Learning 3rd edition, 2001.
4. **Finite Element Method,** J. N. Reddy, McGraw Hill International Edition.

INDUSTRIAL ENGINEERING & ERGONOMICS

Sub. Code: 10MT835 **IA Marks: 25**
Lect.hrs/week: 4 **Exam Hrs: 3**
Total No. of Lect. Hrs: 52 **Exam Marks: 100**

PART – A

Unit 1: Productivity & Work Study: Definition of productivity, factors affecting productivity, definition, objective & scope of work study, human factors in work study, work study & management, work study & supervisor, work study & worker. **6 Hrs**

Unit 2: Method Study: Definition, objective & scope, charts to record movements in shop, process charts, flow process charts, Multiple activity chats, two handed process charts, SIMO chart, principles of motion economy. **8 Hrs**

Unit 3: Work Measurement: definition, objectives, techniques of work measurement, work sampling, need of confidence levels, sample size determination, random observation with simple problems. **6 Hr**

Unit 4: Time Study: Definition, time study equipments, selection of jobs, steps in time study, breaking jobs into elements, recording information, rating, standard performance, scales of rating, factors affecting rate of working, allowances, standard time determination. **6 Hrs**

PART – B

Unit 5: Introduction to industrial design: elements of design structure for industrial design in engineering application in modern manufacturing systems. Ergonomics and Industrial Design: Introduction, general approach to the man-machine relationship, workstation design-working position. **8 Hrs**

Unit 6: Visual Effects of Line and form: The mechanics of seeing psychology of seeing general influences of line and form. **6 Hrs**

Unit 7: Color Models: RGB, CMY, HSV, Color and light, color and object solor and the eye-color consistency-color terms reactions to color and color continuation-color on engineering equipments. **6 Hrs**

Unit 8: Aesthetic Concepts: Concepts of unity-concepts of order with variety concept of purpose style and environment – Aesthetic expressions. Style – components of style house style, observation style in capital goods, case study. **6 Hrs**

Text books:

1. **Work Study, ILO,** 3rd Ed, 2006.
2. **Human Factor Engineering:** Sanders & McCormick McGraw Hill Publications.

Reference Books:

1. **Applied Ergonomics Hand Book,** Brain Shakel, Butterworth Scientific, London 1988.
2. **Introduction to Ergonomics,** R. C. Bridger, McGraw Hill Publications.
3. **Industrial design to Engineers,** Mayall w. H. London Hffee Books Ltd., 1988.
4. **Work Study & Ergonomics,** Suresh Dalele & Saurabh, Standard publishers & distributors, 1999.

OPTIMUM DESIGN

Sub. Code: 10MT836 **IA Marks: 25**
Lect.hrs/week: 4 **Exam Hrs: 3**
Total No. of Lect. Hrs: 52 **Exam Marks: 100**

PART – A

Unit 1: Introduction: Engineering application of optimization, Statement of optimization problems, Classification of optimization problems,
Classical optimization Techniques I : Single variable optimization, Multivariable optimization with no constraints. **7 Hrs**

Unit 2: Classical Optimization Techniques II : Multivariable optimization with equality constraints and inequality constraints, Kuhn – Tucker conditions **7 Hrs**

Unit 3: Non – linear Programming: One – Dimensional Minimization Methods: Unimodal function, Unrestricted search, Exhaustrive search, Dichotomous search, Fibonacci method, Golden section method. **6 Hrs**

Unit 4: Interpolation Methods: Quadratics, Cubic and Direct root interpolation methods. **5 Hrs**

PART – B

Unit 5: Unconstrained Optimization Techniques: Direct Search Methods: Unvariate method, Hook and Jeeves' method, Powell's method, Simplex method. **7 Hrs**

Unit 6: Descent Methods: Steepest descemt. Conjucgate gradient, Quasi – Newton, Davidon – Fletcher – problem, Indirect methods: Transformation techniques, Basic approach of the penalty function method. **6 Hrs**

Unit 7: Constrained Optimization Techniques: Direct methods: characteristics of constrained problems, Indirect methods: Transformation techniques, Basic approach of the penalty function method. **6 Hrs**

Unit 8: Dynamic Programming: Introduction, Multistage decision processes, Principles, Principle of optimality, computational procedure in dynamic programming, Initial value problem, Examples. **7 Hrs**

Text Books:

1. **Optimisation,** S. S. Rao, Theory and Application, Willey Eastern.
2. **Optimization Methods for Engg. Design,** R. L Fox Addison, Wesley

Reference Books:

1. **Optimization and Probility in System Engg . Ram, Van Nostrand.**
2. **Optimization methods,** K. V. Mital & C. Mohan, New Age international Publishers, 1999.

Wireless Communication

Sub. Code: 10MT841 **IA Marks: 25**
Lect.hrs/week: 4 **Exam Hrs: 3**
Total No. of Lect. Hrs: 52 **Exam Marks: 100**

PART - A

Unit – 1: Introduction to wireless telecommunication systems and Networks, History and Evolution Different generations of wireless cellular networks 1G, 2g,3G and 4G networks. **6 Hrs**

Unit – 2: Common Cellular System components, Common cellular network components, Hardware and software, views of cellular networks, 3G cellular systems components, Cellular component identification Call establishment. **7 Hrs**

Unit – 3: Wireless network architecture and operation, Cellular concept Cell fundamentals, Capacity expansion techniques, Cellular backbone networks, Mobility management, Radio resources and power management Wireless network security. **7 Hrs**

Unit – 4: GSM and TDMA techniques, GSM system overview, GSM Network and system Architecture, GSM channel concepts, GSM identifiers. **6 Hrs**

PART B

Unit – 5: GSM system operation, Traffic cases, Cal handoff, Roaming, GSM protocol architecture. TDMA systems. **6 Hrs**

Unit – 6: CDMA technology, CDMA overview, CDMA channel concept CDMA operations. **6 Hrs**

Unit – 7: Wireless Modulation techniques and Hardware, Characteristics of air interface, Path loss models, wireless coding techniques, Digital modulation techniques, OFDM, UWB radio techniques, Diversity techniques, Typical GSM Hardware. **7 hrs**

Unit – 8: Introduction to wireless LAN 802.11X technologies, Evolution of Wireless LAN Introduction to 802.15X technologies in PAN Application and architecture Bluetooth Introduction to Broadband wireless MAN, 802.16X technologies. **7 Hrs**

Text Book:

2. **Wireless Telecom Systems and networks**, Mullet: Thomson Learning 2006.

Reference Books:

9. **Mobile Cellular Telecommunication**, Lee W.C.Y, MGH, 2002.
10. **Wireless communication** - D P Agrawal: 2nd Edition Thomson learning 2007.
11. **Fundamentals of Wireless Communication**, David Tse, Pramod Viswanath, Cambridge 2005.

AUDIO AND VIDEO PROCESSING

Sub. Code: 10MT842 **IA Marks: 25**
No. Lect. Hrs/week: 4 **Exam Hrs: 03**
Total no. Lect. Hrs: 52 **Exam Marks: 100**

PART A

UNIT 1:

a. **Digital Models for the Speech Signal:** Process of speech production, Acoustic theory of speech production, Lossless tube models, and Digital models for speech signals. **4 Hrs**
b. **Time Domain Models for Speech Processing:** Time dependent processing of speech, Short time energy and average magnitude, Short time average zero crossing rate, 4 **Hrs**

UNIT 2: Digital Representations of the Speech Waveform: Sampling speech signals, Instantaneous quantization, Adaptive quantization, Differential quantization, Delta Modulation, Differential PCM, Comparison of systems, direct digital code conversion. **6 Hrs**

Unit 3: Linear Predictive Coding of Speech: Basic principles of linear predictive analysis, Solution of LPC equations, Prediction error signal, Frequency domain interpretation, Relation between the various speech parameters, Synthesis of speech from linear predictive parameters. **6 Hrs**

Unit 4: Audio Processing Auditory perception and psychoacoustics-Masking, frequency and loudness perception, spatial perception, digital Audio, audio Coding – High quality, low-bit-rate audio coding standards, MPEG, multichannel audio. Stereo 3D binaural and Multichannel surround sound. **8 Hrs**

PART – B

Unit 5: Image sampling and quantization: Introduction, 2D sampling theory. Limitations in sampling & reconstruction, Quantization, Optimal quantizer, Compander, Visual quantization. **4 Hrs**

Unit 6: Image transforms: Introduction, 2D orthogonal & unitary transform, Properties of unitary transforms, DFT. DCT, DST, Hadamard, Haar, Alant, KLT, SVD transform. **6 Hrs**

Unit 7: Image Data Compression: Introduction, Pixel coding, Predictive techniques, Transform coding, Inter-frame coding, coding of two tone images, image compression standards. **6 Hrs**

Unit 8: Video Processing: Fundamental Concepts in Video – Types of video signals, analog video, Digital video, color models in video, Video compression Techniques – Motoin compensation, Search for motion compensation, Search for motion vectors, H261, H.263, MPEG. 1, MPRG. 2. MPEG. **8 Hrs**

Text books:

1. L. R. Rabiner and R. W. Schafer, "Digital Processing of Speech", Pearson Education (Asia) Pte. Ltd, 2004.
2. K. Jain, "Fundamentals of digital image Processing", Pearson Education(Asis) Pte.Ltd./Prentice Hall of India, 2004.

Reference Books:

1. **L. R. Rabiner and B. Juang, "Fundametnals of speech Recognitions", Pearson Education (Asia) Pte. Ltd, 2004.**
2. **R. C. Gonzalez and R. E. Woods, "Digital Image Processing", 2nd edition, Pearson Education (Asia) Pvt. Ltd/Prentice Hall of India, 2004.**

VIRTUAL INSTRUMENTATION

Sub. Code: 10MT843 **IA marks: 25**
No.of Lect.Hrs/week: 4 **EXAM Hrs: 03**
Total NO of Lect hrs: 52 **EXAM MARKS: 100**

PART A

UNIT 1:Review of Digital Instrumentation: Representation of analog signals in the digital domain – Review of quantization in amplifier and time areas, sample and hold, sampling theorem, ADC and DAC. **6 Hrs**

UNIT 2 & 3:Fundamentals of Virtual Instrumentation: Concept of Virtual Instrumentation – PC based data acquisition – Typical on board DAQ card – Resolution and sampling frequency – Multiplexing of analog inputs – Single-ended and differential inputs – Different strategies for sampling of multi channel analog inputs. Concept of universal DAQ card – Use of timer- counter and analog outputs on the universal DAQ card. **12 Hrs**

UNIT 4:Cluster of Instruments in System: Interfacing of external instruments to a PC – RS 232C, RS – 422, RS 485 and USB standards – IEEE 488 standard – ISO –OSI model for series bus – introduction to bus protocols of MOD bus and CAN bus. **8 Hrs**

PART B

UNIT 5 & 6: Graphical Programming Environment in VI: Concepts of graphical programming – Lab-view software – Concept of VIs and sub VIs – Display types – Digital – Analog – Chart – Oscilloscope types – Loops – Case and sequence structures – Types of data – Arrays – Formulate nodes – Local and Global variables – String and file I/O. **14 Hrs**

UNIT 7 & 8:Analysis Tools and Simple Application in VI: Fourier transform – Power spectrum – Correlation – Windowing and filtering tools – Simple temperature indicator – ON/OFF controller – PID controller – CRO emulation – Simulation of a simple second order system–Generation HTML page. **12 Hrs**

Reference Books:

12. S. Gupta and J P Gupta,"**PC Interfacing for Data Acquisition and Process Control"**, Instrument Society of America, 1994

DSP ARCHITECTURE AND ALGORITHMS

Sub Code: 10MT844 **IA MARKS: 25**
Hrs/Week: 04 **Total Marks: 10**
Exam Hrs: 03 **Total Hrs: 52**

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. **5 Hrs**

Unit – 2: Architectures for Programmable Digital Signal-Processors: Introduction, Basic Architectural Features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Features for External Interfacing. **8 Hrs**

Unit – 3: Programmable Digital Signal Processors: Introduction, Commercial Digital Signal-processing Devices, Data Addressing Modes of TMS32OC54xx., Memory Space of TMS32OC54xx Processors, Program Control. **6 Hrs**

Unit – 4: Detail Study of TMS320C54X & 54xx Instructions and Programming, On-Chip peripherals, Interrupts of TMS32OC54XX Processors, Pipeline Operation of TMS32OC54xx Processor. **6 Hrs**

PART – B

Unit – 5: Implementation of Basic DSP Algorithms: Introduction, The Q-notation, FIR Filters, IIR Filters, Interpolation and Decimation Filters (one example in each case). **6 Hrs**

Unit – 6:Implementation of FFT Algorithms: Introduction, An FFT Algorithm for DFT Computation, Overflow and Scaling, Bit-Reversed Index Generation & Implementation on the TMS32OC54xx. **6 Hrs**

Unit – 7: Interfacing Memory and Parallel I/O Peripherals to 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). **8 Hrs**

Unit – 8: Interfacing And Applications of DSP Processor: Introduction, Synchronous Serial Interface, A CODEC Interface Circuit. DSP Based Bio-telemetry Receiver, A Speech Processing System, An Image Processing System. **6 Hrs**

Text Book:
1. **"Digital Signal Processing"**, Avatar Singh and S. Srinivasan, Thomson Learning, 2004.

Reference Books:

- **Digital Signal Processing: A practical approach**, Ifeachor E. C., Jervis B. W Pearson-Education, PHI/2002
- **"Digital Signal Processors"**, B Venkataramani and M Bhaskar TMH, 2002
- **"Architectures for Digital Signal Processing"**, Peter Pirsch John Weily.

LOW POWER RF

Sub. Code: 10MT845 **IA Marks: 25**
No. Lect. Hrs/week: 4 **Exam Hrs: 03**
Total no. Lect. 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. **8 Hrs**

Unit 2: Device & Technology Impact on Low Power: Dynamic dissipation in CMOS, Transistor sizing & gate oxide thickness, impact of technology Scaling. Technology & Device innovation. **6 Hrs**

Unit 3 & 4: Wave propagation in Networks: Introduction to RF concepts and applications; RF electronics concepts; fundamental concepts in Wave propagation; circuit representations of two port RF networks. Basic concepts of linear and non-linear and non-linear design. **10 Hrs**

PART – B

Unit 5: Introduction to RF wireless technology: Design and Applications, complexity and choice of technology. Basic concepts in RF design: Nonlinearly and Time Variance, Inter symbol interference, random processes and noise. **8 Hrs**

Unit 6 & 7: RF Modulation: Analog and Digital modulation of RF circuits, Comparison of various techniques for power efficiency, coherent and non-coherent detection, Mobile RF communication and basics of Multiple Access techniques Receiver and Transmitter architectures, Direct conversion and two-step transmitters. **12 Hrs**

Text Books:

1. Mathew M. Radmanesh, "Radio Frequency and Microwave Electronics Illustrated", Pearson Education (Asia) Pte. Ltd., 2004.
2. Kaushik Roy. Sharat Prasad, "Low-Power CMOS VLSI Circuit Design", Wiley, 2009.

Reference Books:

1. **B. Razavi, "RF Microelectronics" PHI 1998.**
2. **"RF MEMS" V K Varadan, A**
3. **"RF MEMS Circuit Design"** J De Los Santos, Artech House, 2002.

Reliability & Fault Tolerance

Subject Code: 10MT82 **Marks: 25**
No. of Hrs/week: 04 **Exam Marks: 100**
Totalno.Hrs:52 **Exams Hrs: 03**

PART – A

Unit |I: Introduction & Basic concept of reliability, reliability and quality, failures and failure modes, causes of failures and unreliability, maintainability and availability, failure frequency distribution, graphical analysis of its item, failure data, **07Hrs**

Unit II: Design for reliability: Reliability analysis, mathematical models and, numerical evaluations, designing for higher reliability, redundancy techniques, equipment hierarchy, Trend analysis, Failure Mode Affix Of Criticality Analysis (FMECA), Fault Tree Analysis (FTA) , Root Cause Analysis **07Hrs**

Unit III: Maintained system: Definition of critical Maintenance, the basic model of the maintenance system, maintenance approaches, relationship between reliability and failure, common types of failure in components, safe system of work maintenance, principles of preventive maintenance. Definition of plant item, maintenance diagrams. **06Hrs**

Unit IV: Productive maintainance: Introduction, selection of two best maintenance procedure in the light of cost and safety factors. Top-down bottom Up (TIBU) approval to the formulation of maintenance strategy. reliability for central maintenance, its user a limitations, total prodetive maintenance, integrated condition based maintenance, machine life cycle, lubrication maintenance, vibration monitors, mechanical faults and frequency range of symptoms **07Hrs**

PART – B

Unit V : **Introduction To Fault Toleranc**e, Faults classification, Failure Models, Failure Masking by Redundancy, Active and Standby Redundancy, Active Parallel , Standby Parallel , Constant Failure Rate Models, Redundancy Limitations , Common Mode Failures , Multiply Redundant Systems , Active Redundancy . **07Hrs**

Unit VI: Fault-tolerant components and control: Fault-tolerance sensors, Hardware sensor redundancy, Analytical sensor redundancy, Fault-tolerant actuators, Fault-tolerant communication, Fault-tolerant control system, Automatic fault-management system **05Hrs**

Unit VII: System Safety Analysis:-Introduction, Product and Equipment Hazards, Human Error , Routine Operations , Emergency Operations , Methods of Analysis, Failure Modes and Effects Analysis , Event Trees , Fault Trees , Fault-Tree Construction , Fault Classification , Direct Evaluation of Fault Trees, **06Hrs**

Unit VIII: Fault detection and diagnosis: DC motor drives : models, , parity equations, parameter estimation, Industrial robots:-models, a simple model based fault diagnosis, fault detection and Identification, A Hydraulic system:- models, Parity equations and parameter estimation, An automotive suspension and the tire pressure:-model, parameter estimation, parity equations **07Hrs**