



MANGALORE INSTITUTE OF TECHNOLOGY AND ENGINEERING
(An ISO 9001:2015 Certified Institution)

1.3.2. Average percentage of courses that include experiential learning through project work/field work/internship during last five years

ACADEMIC YEAR 2016-17

MECHATRONICS ENGINEERING

Document contains list and syllabus of courses that includes experiential learning through project works, internships and field work for the department.

Documents Enclosed

Sl. No	Particulars	Page Nos
1.	List of course that include experiential learning	1-2
2.	Syllabus of mapped Courses	3-78

LIST OF COURSE THAT INCLUDE EXPERIENTIAL LEARNING**Total mapped course : 42**

1	10MAT11	ENGG. MATHEMATICS - I
2	10PHY12	ENGINEERING PHYSICS
3	10ELE15	BASIC ELECTRICAL ENGG.
4	10WSL16	WORKSHOP PRACTICE
5	10PHYL17	ENGG. PHYSICS LAB
6	10CHE12	ENGINEERING CHEMISTRY
7	10MAT21	ENGG. MATHEMATICS - II
8	10PCD13	COMPUTER PROGRAMMING IN C
9	10ELN15	BASIC ELECTRONICS
10	10CHEL17	ENGG. CHEMISTRY LAB
11	10MAT31	ENGG, MATHEMATICS III
12	10MT32	MATERIAL SCIENCE AND METALLURGY
13	10MT33	MECHANICS OF MATERIALS
14	10MT34	FLUID MECHANICS
15	10MT35	ANALOG AND DIGITAL ELECTRONICS
16	10MT36	SIGNALS & SYSTEMS
17	10MT37	MATERIALS TESTING & METALLURGY LAB
18	10MT38	ANALOG AND DIGITAL ELECTRONICS LAB
19	10MAT41	ENGG, MATHEMATICS IV
20	10MT42	MANUFACTURING TECHNOLOGY
21	10MT43	KINEMATICS OF MACHINERY
22	10MT44	POWER ELECTRONICS
23	10MT45	INSTRUMENTATION & MEASUREMENTS
24	10MT46	ELECTRICAL MACHINES AND DRIVES
25	10MT47	POWER ELECTRONICS LAB
26	10MT48	ELECTRICAL MACHINES LAB DRIVES LAB
27	10MT51	METROLOGY AND MEASUREMENTS
28	10MT52	COMPUTER GRAPHICS
29	10MT53	HYDRAULICS AND PNEUMATICS
30	10MT54	MICRO CONTROLLER
31	10MT55	AUTOMOTIVE ELECTRONICS
32	10MT56	SENSORS & NETWORK
33	10MTL57	METROLOGY & MEASUREMENTS LAB
34	10MTL58	MICROCONTROLLER & PLC LAB
35	10AL61	MANAGEMENT & ENTREPRENEURSHIP
36	10MT62	MODELING & SIMULATION

37	10MT63	MICRO AND SMART SYSTEM TECHNOLOGY
38	10MT64	EMBEDDED SYSTEMS
39	10MT65	ADVANCED COMPUTER PROGRAMMING
40	10MT664	PROGRAMMABLE LOGIC CONTROLLER (PLC)
41	10MTL67	MICRO AND SMART SYSTEMS TECHNOLOGY LAB
42	10MTL68	ADVANCED COMPUTER PROGRAMMING LAB

Syllabus of mapped course

ENGINEERING MATHEMATICS – I

Sub Code	:	10MAT11	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

PART-A

UNIT – 1

Differential Calculus - 1

Determination of n^{th} derivative of standard functions-illustrative examples*. Leibnitz's theorem (without proof) and problems.

Rolle's Theorem – Geometrical interpretation. Lagrange's and Cauchy's mean value theorems. Taylor's and Maclaurin's series expansions of function of one variable (without proof).

6 Hours

UNIT – 2

Differential Calculus - 2

Indeterminate forms – L'Hospital's rule (without proof), Polar curves: Angle between polar curves, Pedal equation for polar curves. Derivative of arc length – concept and formulae without proof. Radius of curvature - Cartesian, parametric, polar and pedal forms.

7 Hours

UNIT – 3

Differential Calculus - 3

Partial differentiation: Partial derivatives, total derivative and chain rule, Jacobians-direct evaluation.

Taylor's expansion of a function of two variables-illustrative examples*. Maxima and Minima for function of two variables. Applications – Errors and approximations.

6 Hours

UNIT – 4

Vector Calculus

Scalar and vector point functions – Gradient, Divergence, Curl, Laplacian, Solenoidal and Irrotational vectors.

Vector Identities: $\text{div}(\nabla A)$, $\text{Curl}(\nabla A)$, $\text{Curl}(\text{grad } \phi)$, $\text{div}(\text{Curl} A)$, $\text{div}(A \times B)$ & $\text{Curl}(\text{Curl} A)$.

Orthogonal Curvilinear Coordinates – Definition, unit vectors, scale factors, orthogonality of Cylindrical and Spherical Systems. Expression for Gradient, Divergence, Curl, Laplacian in an orthogonal system and also in Cartesian, Cylindrical and Spherical System as particular cases – No problems

7 Hours

PART-B

UNIT – V

Integral Calculus

Differentiation under the integral sign – simple problems with constant limits. Reduction formulae for the integrals of $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$ and evaluation of these integrals with standard limits - Problems.

Tracing of curves in Cartesian, Parametric and polar forms – illustrative examples*. Applications – Area, Perimeter, surface area and volume.

Computation of these in respect of the curves – (i) Astroid: $x^{2/3} + y^{2/3} = a^{2/3}$
(ii) Cycloid: $x = a(\theta - \sin \theta)$, $y = a(1 - \cos \theta)$ and (iii) Cardioid:
 $r = a(1 + \cos \theta)$

6 Hours

UNIT – VI

Differential Equations

Solution of first order and first degree equations: Recapitulation of the method of separation of variables with illustrative examples*. Homogeneous, Exact, Linear equations and reducible to these forms. Applications - orthogonal trajectories.

7 Hours

UNIT – VII

Linear Algebra-1

Recapitulation of Matrix theory. Elementary transformations, Reduction of the given matrix to echelon and normal forms, Rank of a matrix, consistency of a system of linear equations and solution. Solution of a system of linear homogeneous equations (trivial and non-trivial solutions). Solution of a system of non-homogeneous equations by Gauss elimination and Gauss – Jordan methods.

6 Hours

UNIT – VIII:

Linear Algebra -2

Linear transformations, Eigen values and eigen vectors of a square matrix, Similarity of matrices, Reduction to diagonal form, Quadratic forms, Reduction of quadratic form into canonical form, Nature of quadratic forms

7 Hours

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

Text Books:

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

Reference Books:

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

ENGINEERING PHYSICS

Sub Code	: 10PHY12/10PHY22	IA Marks	: 25
Hrs/ Week	: 04	Exam Hours	: 03
Total Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT-1

Modern Physics

Introduction to Blackbody radiation spectrum, Photo-electric effect, Compton effect. Wave particle Dualism. de Broglie hypothesis – de Broglie wavelength, extension to electron particle. – Davisson and Germer Experiment.

Matter waves and their Characteristic properties. Phase velocity, group velocity and Particle velocity. Relation between phase velocity and group velocity. Relation between group velocity and particle velocity. Expression for deBroglie wavelength using group velocity.

7 Hours

UNIT-2

Quantum Mechanics

Heisenberg's uncertainty principle and its physical significance. Application of uncertainty principle (Non-existence of electron in the nucleus, Explanation for β -decay and kinetic energy of electron in an atom). Wave function. Properties and Physical significance of a wave function. Probability density and Normalisation of wave function. Setting up of a one dimensional, time independent Schrödinger wave equation. Eigen values and Eigen functions. Application of Schrödinger wave equation – Energy Eigen values for a free particle. Energy Eigen values of a particle in a potential well of infinite depth.

6 Hours

UNIT-3

Electrical Conductivity in Metals

Free-electron concept. Classical free-electron theory - Assumptions. Drift velocity. Mean collision time and mean free path. Relaxation time. Expression for drift velocity. Expression for electrical conductivity in metals. Effect of impurity and temperature on electrical resistivity of metals. Failures of classical free-electron theory.

Quantum free-electron theory - Assumptions. Fermi - Dirac Statistics. Fermi-energy – Fermi factor. Density of states (No derivation). Expression for electrical resistivity / conductivity. Temperature dependence of resistivity of metals. Merits of Quantum free – electron theory.

7 Hours

UNIT-4

Dielectric & Magnetic Properties of Materials

Dielectric constant and polarisation of dielectric materials. Types of polarisation. Equation for internal field in liquids and solids (one dimensional). Clausius – Mossotti equation. Ferro and Piezo – electricity (qualitative). Frequency dependence of dielectric constant. Important applications of dielectric materials. Classification of dia, para and ferromagnetic materials. Hysteresis in ferromagnetic materials. Soft and Hard magnetic materials. Applications.

7 Hours

PART – B

UNIT - 5

Lasers

Principle and production. Einstein's coefficients (expression for energy density). Requisites of a Laser system. Condition for Laser action. Principle, Construction and working of He-Ne and semiconductor Laser. Applications of Laser – Laser welding, cutting and drilling. Measurement of atmospheric pollutants. Holography – Principle of Recording and reconstruction of 3-D images. Selected applications of holography.

6 Hours

UNIT-6

Optical Fibers & Superconductivity

Propagation mechanism in optical fibers. Angle of acceptance. Numerical aperture. Types of optical fibers and modes of propagation. Attenuation. Applications – block diagram discussion of point to point communication.

Temperature dependence of resistivity in superconducting materials. Effect of magnetic field (Meissner effect). Type I and Type II superconductors - Temperature dependence of critical field. BCS theory (qualitative). High temperature superconductors. Applications of superconductors– Superconducting magnets, Maglev vehicles and squids

7 Hours

UNIT-7

Crystal Structure

Space lattice, Bravais lattice - unit cell, primitive cell. Lattice parameters. Crystal systems. Direction and planes in a crystal. Miller indices. Expression for inter-planar spacing. Co-ordination number. Atomic packing factor. Bragg's Law. Determination of crystal structure by Bragg's x-ray spectrometer. Crystal structures of NaCl, and diamond.

6 Hours

UNIT-8**Material Science**

Introduction to Nanoscience and Nanotechnology. Nanomaterials: Shapes of nanomaterials, Methods of preparation of nanomaterials, Wonders of nanotechnology: Discovery of Fullerene and carbon nanotubes, Applications. Ultrasonic non-destructive testing of materials. Measurements of velocity in solids and liquids, Elastic constants.

6 Hours**Text Books**

	Title		Author/s / Editor		Publishers
1	Solid State Physics – Sixth Edition	-	S.O. Pillai	-	New Age International
2	Engineering Physics	-	V. Rajendran	-	Tata Mc-Graw Hill Company Ltd., New Delhi

Reference Books

	Title		Author/s / Editor		Publishers
1	Nanosystems- Molecular Machinery, Manufacturing and Computation	-	K.Eric Drexler	-	John Wiley & Sons 2005 Ed.
2	Fundamentals and Applications of Ultrasonic Waves	-	J David N Cheeke and Cheeke N Cheeke	-	CRC Press
3	Nano Materials	-	Vishwanathan	-	Narosa Publications
4	Engineering Physics	-	G.K Shivakumar	-	Prism Books Pvt. Ltd.

ENGINEERING CHEMISTRY

Sub Code	: 10CHE12/ 10CHE 22	IA Marks	: 25
Hrs/ Week	: 04	Exam Hours	: 03
Total Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT – 1

Electrode Potential and Cells

Introduction, Differences between galvanic and electrolytic cells, Construction of galvanic cell, EMF of a cell, Origin of single electrode potential, Sign convention and cell notation, Standard electrode potential, Derivation of Nernst equation for single electrode potential.

Types of electrodes: Reference electrodes – Primary and secondary, Limitations of standard hydrogen electrode, Construction and working of calomel electrode and Ag – AgCl electrode, Measurement of single electrode potential, Numerical problems on electrode potential and EMF of a cell, Ion selective electrode: Glass electrode – Construction, Determination of pH of a solution using glass electrode, concentration cells, numerical problems.

7 Hours

UNIT - 2

Batteries and Fuel Cells

Basic concepts, Battery characteristics – primary, secondary and reserve batteries with examples, super capacitors

Classical batteries: Construction, working and applications of Zn – MnO₂, Lead acid storage and Ni – Cd batteries.

Modern batteries: Construction, working and applications of Zn – air, Ni – metal hydride and Li – MnO₂ batteries.

Fuel cells – Differences between battery and fuel cell, construction and working of H₂ – O₂ and CH₃OH– O₂ fuel cells.

6 Hours

UNIT - 3

Corrosion and its control

Electrochemical theory of corrosion, Galvanic series, Types of corrosion- Differential metal corrosion, Differential aeration corrosion (Pitting and water line corrosion), Stress corrosion (caustic embrittlement in boilers), Factors affecting the rate of corrosion

Corrosion control: Inorganic coatings – Anodizing and phosphating, Metal coatings – Galvanizing and Tinning, Corrosion inhibitors, cathodic protection.

7 Hours

UNIT - 4

Metal Finishing

Technological importance, Significance of Polarization, Decomposition potential and Overvoltage in electroplating, Theory of electroplating. Effect of plating variables on the nature of electrodeposit- Electroplating process, Electroplating of gold and Chromium.

Distinction between electroplating and electrolessplating, Electrolessplating of copper and nickel.

6 Hours

PART – B

UNIT – 5

Chemical fuels and Photovoltaic cells

Introduction, Classification of chemical fuels Calorific value – High and Low calorific values, Determination of calorific value –solid or liquid fuel using Bomb calorimeter - numerical problems .

Petroleum – Cracking by fluidized catalytic cracking process, Reformation of petrol, Octane and Cetane numbers. Knocking – mechanism and harmful effects. Antiknocking agents – TEL, Catalytic converters – Principle and working, Unleaded petrol, Power alcohol and Biodiesel.

Photovoltaic cells – Production of solar grade silicon, Doping of silicon, Construction and working of photovoltaic cell, Advantages.

7 Hours

UNIT – 6

The Phase rule and Instrumental methods of analysis

Statement of Gibb's phase rule and explanation of the terms involved, Phase diagram of one component system – water system, Condensed phase rule , Phase diagram of two component system- Eutectic Pb – Ag system and Fe – C system. Application – Desilverization of lead.

Instrumental methods of analysis- Theory , Instrumentation and applications of Colorimetry, Potentiometry , Conductometry and Flame photometry.

6 Hours

UNIT - 7

Polymers

Types of polymerization – Addition and Condensation, Mechanism of polymerization – Free radical mechanism taking ethylene as example. Glass transition temperature (T_g) , Structure – property relationship. Types of plastics – Thermosetting and thermoplastics. Manufacture of plastics by compression ,injection and extrusion moulding.

Synthesis and applications of Teflon, PMMA, Polyurethane and Phenol – formaldehyde resins.

Elastomers: Deficiencies of natural rubber, Vulcanization of rubber. Synthesis and applications of Neoprene and Butyl rubber, Silicone rubbers. Adhesives: Synthesis and applications of epoxy resins. Polymer composites - Synthesis and applications of Kevlar and Carbon fibers. Conducting polymers – Definition, Mechanism of conduction in Polyacetylene, applications.

7 Hours

UNIT - 8

Water Chemistry

Impurities in water ,Water analysis – Determination of different constituents in water – Hardness, alkalinity, chloride , fluoride , nitrate , sulphate and dissolved oxygen. Numerical problems on hardness and alkalinity. Sewage – BOD and COD, Numerical problems, Sewage treatment. Desalination of water – Reverse Osmosis and Electrodialysis

6 Hours

Text Books:

1. Chemistry for Engineering students by B.S. Jai Prakash, R.Venugopal, Sivakumaraiah and Pushpa Iyengar
2. Engineering Chemistry by O.G. Palanna, Tata McGraw Hill Publishing Pvt.Ltd. New Delhi 2009

Reference Books:

1. Principles of Physical Chemistry B.R. Puri , L.R.Sharma & M.S. Pathania, S. Nagin chand and Co.
2. A text book of Engineering Chemistry P.C. Jain and Monica Jain Dhanpatrai Publications , New Delhi.
- 1 Corrosion Engineering M.G. Fontana Mc. Graw Hill Publications.
- 2 Chemistry in Engineering and Technology (Vol. 1 &2) J.C. Kuriacose and J. Rajaram.
- 3 Polymer Science V.R. Gowariker , Wiley Eastern Ltd.

COMPUTER CONCEPTS AND C PROGRAMMING

Subject Code	: 10CCP13/10CCP23	IA Marks	: 25
Hrs/Week	: 04	Exam Hours	: 03
Total Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT-1

Introduction to Computer Systems, Interacting with the Computer, Computer Organization

The Computer defined, Early history, Basic parts and structure of a computer, Categorizing Computers, Information Processing life cycle, Essential computer hardware, Essential computer software.

Keyboard, Mouse, Inputting data in other ways: Pen-based systems, Data scanning devices, Game controllers, Voice recognition devices, Microphone, Visual input devices, Video and sound, Monitors, Printers, Plotters, Data projectors, Sound systems. Number systems, ASCII, BCD, CPU, Buses, Mother Board, Chip sets, Microprocessors.

7 Hours

UNIT-2

Storage Device Concepts, Operating Systems, Networking

Storage media, Floppy drive, Hard disks, Optical media, CD-ROM, CD-R, CD-RW, DVD-ROM, Recordable DVD.

Software, Custom-made Software, Shrunken-wrapped software, Types of operating systems, Computer processing techniques, Functions of Operating Systems, Management of processor, Memory, Virtual storage, devices, and information.

Networking, Convergence of computing with communications, Networking basics, Need for networking, Basic components of a network.

7 Hours

UNIT-3

Fundamentals of Problem Solving, Introduction to C Language

Creating and running programs, System development, Software Engineering. Introduction to C Language: Background, C Programs, Identifiers, Types, Variables, Constants, Input / Output, Programming example, Software Engineering, Tips and common programming errors.

6 Hours

UNIT-4

Structure of a C Program

Expressions, Precedence and associativity, Side effects, Evaluating expressions, Type conversion, Statements, Programming examples, Software Engineering, Tips and common programming errors.

6 Hours

PART - B

UNIT-5

Functions

Designing structured programs, Functions in C, User-defined Functions, Inter-function communication, Standard functions, Scope, Programming examples, Software Engineering, Tips and common programming errors.

6 Hours

UNIT-6

Selection – Making Decisions, Repetition

Logical data and operators, Two-way selection, Multiway-selection, Concept of a loop, pre-test and post-test loops, Initialization and updating, Event controlled and count controlled loops, Loops in C, Other statements related to looping, looping applications, Recursion, Programming examples, Software Engineering, Tips and common programming errors.

7 Hours

UNIT-7

Arrays, Strings

Concepts, Using arrays in C, Inter-function communication, Array applications, Bubble Sort, Binary search, Two-dimensional Arrays, Multi-dimensional arrays, String concepts, C strings, String input/output, Programming examples, Software Engineering, Tips and common programming errors.

7 Hours

UNIT-8

Basic Concepts of Parallel Programming

Motivating parallelism, Scope for parallel computing, Thread basics, Why threads? OpenMP: A standard for directive – based parallel programming, The OpenMP programming model, Specifying concurrent tasks in OpenMP, Synchronization constructs in OpenMP, Data handling in OpenMP, OpenMP library functions, Environment variables in OpenMP.

6 Hours

Text Books:

1. Vikas Gupta: Computer Concepts and C Programming, Dreamtech Press/Wiley India, 2009.
2. Behrouz A. Forouzan, Richard F. Gilberg: Computer Science - A Structured Approach Using C, 3rd Edition, Cengage Learning, 2007.
3. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar: Introduction to Parallel Computing, 2nd Edition, Pearson Education, 2003.

Reference Books:

1. Peter Norton: Introduction to Computers, 7th Edition, Tata McGraw Hill, 2010.
2. E. Balagurusamy: Programming in ANSI C, 4th Edition, Tata McGraw Hill, 2008.
3. Brian W. Kernighan and Dennis Ritchie: The C Programming Language, 2nd Edition, PHI, 1998.

Web Reference: <http://elearning.vtu.ac.in>

BASIC ELECTRICAL ENGINEERING

Sub Code	:	10ELE15/ 10ELE25	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT-1

1-a) D. C. Circuits: Ohm's Law and Kirchoff's Laws, analysis of series, parallel and series- parallel circuits excited by independent voltage sources. Power and Energy. Illustrative examples.

4Hours

1-b) Electromagnetism: Faradays Laws, Lenz's Law, Fleming's Rules, Statically and dynamically induced emf's. Concept of self inductance, mutual inductance and coefficient of coupling. Energy stored in magnetic field. Illustrative examples.

3Hours

UNIT-2

2.Single-phase A.C. Circuits: Generation of sinusoidal voltage, definition of average value, root mean square value, form factor and peak factor of sinusoidally varying voltage and current, phasor representation of alternating quantities. Analysis, with phasor diagrams, of R, L, C, R-L, R-C and R-L-C circuits, real power, reactive power, apparent power and power factor. Illustrative examples involving series, parallel and series- parallel circuits.

7 Hours

UNIT-3

3 Three Phase Circuits: Necessity and advantages of three phase systems, generation of three phase power, definition of Phase sequence, balanced supply and balanced load. Relationship between line and phase values of balanced star and delta connections. Power in balanced three-phase circuits, measurement of power by two-wattmeter method. Illustrative examples.

6 Hours

UNIT-4

4-a) Measuring Instruments: Construction and Principle of operation of dynamometer type wattmeter and single-phase induction type energy meter (problems excluded).

3 Hours

4-b) Domestic Wiring: Service mains, meter board and distribution board. Brief discussion on Cleat, Casing & Capping and conduit (concealed) wiring. Two-way and three-way control of a lamp. Elementary discussion on fuse and Miniature Circuit Breaker (MCB's). Electric shock, precautions against shock –Earthing: Pipe and Plate.

3 Hours

PART – B

UNIT-5

5.DC Machines: Working principle of DC machine as a generator and a motor. Types and constructional features. emf equation of generator, relation between emf induced and terminal voltage enumerating the brush drop and drop due to armature reaction. Illustrative examples. DC motor working principle, Back emf and its significance, torque equation. Types of D.C. motors, characteristics and applications. Necessity of a starter for DC motor. Illustrative examples on back emf and torque.

7 Hours

UNIT-6

6. Transformers: Principle of operation and construction of single-phase transformers (core and shell types). emf equation, losses, efficiency and voltage regulation (Open Circuit and Short circuit tests, equivalent circuit and phasor diagrams are excluded). Illustrative problems on emf equation and efficiency only.

7 Hours

UNIT-7

7. Synchronous Generators: Principle of operation. Types and constructional features. emf equation. Concept of winding factor (excluding derivation of distribution and pitch factors). Illustrative examples on emf equation.

6 Hours

UNIT-8

8. Three Phase Induction Motors: Concept of rotating magnetic field. Principle of operation. Types and Constructional features. Slip and its significance. Applications of squirrel - cage and slip - ring motors. Necessity of a starter, star-delta starter. Illustrative examples on slip calculations.

6 Hours

Text Books:

1. “Basic Electrical Engineering”, D C Kulshreshtha, ,TMH,2009 Edition.
2. “Fundamentals of Electrical Engineering”, Rajendra Prasad, PHI, Second Edition, 2009.

Reference Books:

- 1 "Electrical Technology", E. Hughes International Students 9th Edition, Pearson, 2005.
- 2 "Basic Electrical Engineering", Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, TMH, First reprint 2009.
- 3 Problems in Electrical Engineering, Parker Smith, CBS Publishers and Distributors, 9th Edition, 2003.

BASIC ELECTRONICS

Sub Code	: 10ELN15 / 10ELN25	IA Marks	: 25
Hrs/ Week	: 04	Exam Hours	: 03
Total Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT-1

SEMICONDUCTOR DIODES AND APPLICATIONS: p-n junction diode, Characteristics and Parameters, Diode approximations, DC load line, Temperature dependence of p-n characteristics, AC equivalent circuits, Zener diodes Half-wave diode rectifier, Ripple factor, Full-wave diode rectifier, Other full-wave circuits, Shunt capacitor filter - Approximate analysis of capacitor filters, Power supply performance, Zener diode voltage regulators, Numerical examples as applicable.

7 Hours

UNIT-2

TRANSISTORS: Bipolar Junction transistor, Transistor Voltages and currents, amplification, Common Base, Common Emitter and Common Collector Characteristics, DC Load line and Bias Point.

6 Hours

UNIT-3

BIASING METHODS: Base Bias, Collector to Base Bias, Voltage divider Bias, Comparison of basic bias circuits, Bias circuit design, Thermal Stability of Bias Circuits (Qualitative discussions only).

6 Hours

UNIT-4

OTHER DEVICES: Silicon Controlled Rectifier (S.C.R), SCR Control Circuits, More S.C.R applications; Unijunction transistor, UJT applications, Junction Field effect Transistors(Exclude Fabrication and Packaging), JFET Characteristics, FET Amplifications, Numerical examples as applicable.

7 Hours

PART - B

UNIT-5

AMPLIFIERS & OSCILLATORS: Decibels and Half power points, Single Stage CE Amplifier and Capacitor coupled two stage CE amplifier(Qualitative discussions only), Series voltage negative feedback and Additional effects of Negative feed back(Qualitative discussions only), The Barkhausen Criterion for Oscillations, BJT RC phase shift oscillator, Hartley, Colpitts and crystal oscillator (Qualitative discussions only) Numerical problems as applicable.

6 Hours

UNIT-6

INTRODUCTION TO OPERATIONAL AMPLIFIERS: Ideal OPAMP, Saturable property of an OP AMP, Inverting and Non Inverting OPAMP circuits, Need for OPAMP, Characteristics and applications - voltage follower, addition, subtraction, integration, differentiation; Numerical examples as applicable Cathode Ray Oscilloscope (CRO).

6 Hours

UNIT-7

COMMUNICATION SYSTEMS: Block diagram, Modulation, Radio Systems, Superhetrodyne Receivers, Numerical examples as applicable

NUMBER SYSTEMS: Introduction, decimal system, Binary, Octal and Hexadecimal number systems, addition and subtraction, fractional number, Binary Coded Decimal numbers.

7 Hours

UNIT-8

DIGITAL LOGIC:, Boolean algebra, Logic gates, Half-adder, Full-adder, Parallel Binary adder.

7 Hours

Text Books:

1. Electronic Devices and Circuits: David. A. Bell; Oxford University Press, 5th Edn., 2008.

Reference Books:

1. Electronic Devices and Circuits: Jacob Millman, Christos C. Halkias TMH, 1991 Reprint 2001.
2. Electronic Communication Systems, George Kennedy, TMH 4th Edition.
3. Digital Logic and Computer Design, Morris Mano, PHI, EEE.
4. Basic Eelctronics, RD Sudhaker Samuel, U B Mahadevaswamy, V. Nattarsu, Saguine-Pearson, 2007.

WORKSHOP PRACTICE

Sub Code	: 10WSL16/ 10WSL26	IA Marks	: 25
Hrs/ Week	: 03	Exam Hours	: 03
Total Hrs.	: 42	Exam Marks	: 50

1. Fitting

- i. Study of fitting tools
- ii. Study of fitting operations & joints
- iii. Minimum 5 models involving rectangular, triangular, semi circular and dovetail joints.

2. Welding

- iv. Study of electric arc welding tools & equipments
- v. Minimum 4 Models- electric arc welding-Butt joint, Lap joint, T-joint & L-joint.

3. Study and demonstration of Sheet metal and soldering work.

4. Study & demonstration of power Tools in Mechanical Engineering

Scheme of Examination:

Fitting	30 Marks
Welding	10 Marks
Viva Voce	10 marks

Reference Book:

1. The Elements of Workshop Technology -, Vol 1 & 2, S.K.H. Choudhury, A.K.H.Choudhury, Nirjhar Roy, 11th edition, 2001, Media Promoters and Publishers, Mumbai.

COMPUTER PROGRAMMING LABORATORY

Subject Code	: 10CPL16 / 10CPL26	IA Marks	: 25
Hrs/Week	: 03	Exam Hours	: 03
Total Hrs.	: 42	Exam Marks	: 50

PART – A

1. Design, develop and execute a program in C to find and output all the roots of a given quadratic equation, for non-zero coefficients.
2. Design, develop and execute a program in C to implement Euclid's algorithm to find the GCD and LCM of two integers and to output the results along with the given integers.
3. Design, develop and execute a program in C to reverse a given four digit integer number and check whether it is a palindrome or not. Output the given number with suitable message.
4. Design, develop and execute a program in C to evaluate the given polynomial $f(x) = a_4x^4 + a_3x^3 + a_2x^2 + a_1x + a_0$ for given value of x and the coefficients using Horner's method.
5. Design, develop and execute a program in C to copy its input to its output, replacing each string of one or more blanks by a single blank.
6. Design, develop and execute a program in C to input N integer numbers in ascending order into a single dimensional array and perform a binary search for a given key integer number and report success or failure in the form of a suitable message.
7. Design, develop and execute a program in C to input N integer numbers into a single dimensional array, sort them in ascending order using bubble sort technique and print both the given array and the sorted array with suitable headings.
8. Design, develop and execute a program in C to compute and print the word length on the host machine.

PART – B

9. Design, develop and execute a program in C to calculate the approximate value of $\exp(0.5)$ using the Taylor Series expansion for the exponential function. Use the terms in the expansion until the last term is less than the machine epsilon defined FLT_EPSILON in the header file <float.h>. Also print the value returned by the Mathematical function $\exp()$.
10. Design, develop and execute a program in C to read two matrices A (M x N) and B (P x Q) and compute the product of A and B if the matrices are compatible for multiplication. The program must print the input matrices and

the resultant matrix with suitable headings and format if the matrices are compatible for multiplication, otherwise the program must print a suitable message. (For the purpose of demonstration, the array sizes M, N, P, and Q can all be less than or equal to 3)

11. Design, develop and execute a parallel program in C to add, element-wise, two one-dimensional arrays A and B of N integer elements and store the result in another one-dimensional array C of N integer elements.

12. Design and develop a function `rightrot(x, n)` in C that returns the value of the integer x rotated to the right by n bit positions as an unsigned integer. Invoke the function from the main with different values for x and n and print the results with suitable headings.

13. Design and develop a function `isprime(x)` that accepts an integer argument and returns 1 if the argument is prime and 0 otherwise. The function must use plain division checking approach to determine if a given number is prime. Invoke this function from the main with different values obtained from the user and print appropriate messages.

14. Design, develop and execute a parallel program in C to determine and print the prime numbers which are less than 100 making use of algorithm of the Sieve of Eratosthenes.

15. Design and develop a function `reverses(s)` in C to reverse the string s in place. Invoke this function from the main for different strings and print the original and reversed strings.

16. Design and develop a function `match any(s1,s2)` which returns the first location in the string s1 where any character from the string s2 occurs, or - 1 if s1 contains no character from s2. Do not use the standard library function which does a similar job! Invoke the function `match any(s1, s2)` from the main for different strings and print both the strings and the return value from the function `match any(s1,s2)`.

Note: In the practical examination, the student has to answer two questions. One question from Part A and one question from Part B will be selected by the student by lots. All the questions listed in the syllabus have to be included in the lots. The change of question (Part A only / Part B only / Both Part A & Part B) has to be considered, provided the request is made for the same, within half an hour from the start of the examination. The allotment of marks is as detailed below:

Sl. No.	Activity		Max. Marks
1.	Procedure Writing program & procedure for the assigned problems along with algorithms / flowchart	Part A	5*
		Part B	5*
2.	Conduction Execution of the program and	Part A	10

	showing the results in proper format	Part B	20
3.	Viva-voce**		10
Total Max. Marks			50
Minimum passing Marks (40% of Max. Marks)			20

* To be considered as zero if student has been allowed change of question.

LABORATORY EXPERIMENTS IN ENGINEERING PHYSICS

Sub Code	: 10PHYL17/10PHYL27	IA Marks	: 25
Hrs/ Week	: 03	Exam Hours	: 03
Total Hrs.	: 10 (To be completed)	Exam Marks	: 50

EXPERIMENTS :

1. Series & Parallel LCR Circuits.(Determination of resonant frequency & quality factor)
2. I-V Characteristics of Zener Diode.(determination of knee voltage, zener voltage & forward resistance)
3. Characteristics of a Transistor.(Study of Input & Output characteristics and calculation of input resistance, output resistance & amplification factor)
4. Photo Diode Characteristics.(Study of I-V characteristics in reverse bias and variation of photocurrent as a function of reverse voltage & intensity)
5. Ultrasonic Interferometer (Measurement of velocity of sounds in solids/liquids).
6. Dielectric constant (Measurement of dielectric constant).
7. Magnetic properties (Study of retentivity and coercivity by B-H graph method).
8. Diffraction (Measurement of wavelength of laser / Hg source using diffraction grating).
9. Planck's constant (Using the principle of photoelectric effect/LED's).
10. Electrical Resistivity (Determination of resistivity in semiconductor by Four probe method).
11. Verification of Stefan's law.
12. Determination of Fermi energy.(Measurement of Fermi energy in copper)
13. Uniform Bending Experiment.(Determination of Youngs modulus of material bar)
14. Newtons Rings.(Determination of radius of curvature of planoconvex lens)

ENGINEERING CHEMISTRY LABORATORY

Sub Code	: 10CHEL17/10CHEL27	IA Marks	: 25
Hrs/ Week	: 03	Exam Hours	: 03
Total Hrs.	: 42	Exam Marks	: 50

PART – A

1. Potentiometric estimation of FAS using standard $K_2Cr_2O_7$ solution
2. Colorimetric estimation of Copper
3. Conductometric estimation of an Acid mixture using standard NaOH solution
4. Flame Photometric estimation of Sodium and Potassium in the given sample of Water
5. Determination of pKa of a weak acid using pH Meter
6. Determination of Viscosity co-efficient of a given liquid using Ostwald's Viscometer.

PART – B

1. Determination of Total Hardness of a sample of Water using Disodium salt of EDTA.
2. Determination of CaO in the given sample of Cement by Rapid EDTA method.
3. Determination of Percentage of Copper in Brass using standard Sodium thiosulphate solution.
4. Determination of Iron in the given sample of Haematite ore solution using Potassium dichromate Crystals by external indicator method.
5. Determination of COD of the given Industrial Waste water sample.
6. Determination of Total Alkalinity of a given Water Sample using standard Hydrochloric acid.

References Books:

- 1) Laboratory manual in Engineering Chemistry Sudharani, Dhanpatrai Publishing Company.
- 2) Vogel's Text Book of Quantitative Chemical Analysis revised by G.H.Jeffery, J. Bassett, J. Mendham and R.C Denney.

Scheme of Examination:

One experiment from Part- A and another from Part - B shall be set. Different experiments may be set from Part- A and a common experiment from Part – B.

ENGINEERING MATHEMATICS – II

Sub Code	:	10MAT21	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

PART-A

UNIT-1

Differential Equations - 1

Equations of first order and higher degree (p-y-x equations), Equations solvable for p-y-x. General and singular solutions, Clairaut's equation. Applications of differential equations of first order–illustrative examples*.

6 Hours

UNIT-2

Differential Equations – 2

Linear differential equations: Solution of second and higher order equations with constant coefficients by inverse differential operator method. Simultaneous differential equations of first order – Applications.

7 Hours

UNIT-3

Differential Equations – 3

Method of variation of parameters, Solutions of Cauchy's and Legendre's linear equations, Series solution of equations of second order, Frobenius method – simple problems.

6 Hours

UNIT-4

Partial Differential Equations (PDE)

Formation of Partial differential equations (PDE) by elimination of arbitrary constants/ functions. Solution of non-homogeneous PDE by direct integration. Solution homogeneous PDE involving derivative with respect to one independent variable only. Solution of Lagrange's linear PDE. Solution of PDE by the Method of separation of variables (first and second order equations)

7 Hours

PART-B

UNIT-5

Integral Calculus

Multiple Integrals – Evaluation of Double integrals and triple integrals. Evaluation of double integrals over a given region, by change of order of integration, by change of variables. Applications to area and volume – illustrative examples*.

Beta and Gamma Functions - Properties and problems

6 Hours

UNIT-6**Vector Integration**

Line integrals – definition and problems, Surface and volume integrals- definition. Green's theorem in a plane, Stoke's and Gauss divergence theorem (statements only).

6 Hours

UNIT-7**Laplace Transforms-1**

Definition, transforms of elementary functions, properties, Periodic function, Unit step function and unit impulse function.

7 Hours

UNIT-8**Laplace Transforms-2**

Inverse Laplace Transforms, Convolution theorem, solution of linear differential equations using Laplace transforms. Applications – illustrative examples*.

7 Hours

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

Text Books:

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

Reference Book:

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

ENGINEERING MATHEMATICS – III

Sub Code : 10MAT31

Hrs/ Week : 04

Total Hrs. : 52

IA Marks : 25

Exam Hours : 03

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 Hours

UNIT-2

Fourier Transforms Infinite Fourier transform, Fourier Sine and Cosine transforms, properties, Inverse transforms

6 Hours

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 Hours**

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 , $y = b y^{2/3} a e^{2/3 ax}$ Optimization: Linear programming, mathematical formulation of linear programming problem (LPP), Graphical method and simplex method.

7 Hours

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.

Hours

6

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)

Hours

7

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 Hours

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 Hours**

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

TEXT BOOKS:

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

REFERENCE 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,
Hours/Week : 04,
Total Hours : 52,

IA Marks : 25
Exam Hours : 03
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 Hours**

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 Hours**

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 Hours**

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 Hours**

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. **6Hours**

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 Hours**

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.

Hours

06

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 Hours**

TEXT BOOKS:

1. **Foundations of Materials Science and Engineering**, Smith, 4th Edition McGraw Hill, 2009
2. **Materials Science, Shackelford., & 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. Asklund and Pradeep.P. Phule, Cengage Learning, 4th Ed., 2003.

MECHANICS OF MATERIALS

Subject Code : 10MT33
Hours/Week : 04
Total Hours : 52

IA Marks : 25
Exam Hours : 03
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 - behaviour 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 Hours**

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 Hours

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

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

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 Hours

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 Hours**

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 Hours**

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 Hours**

TEXT BOOKS:

1. "Mechanics of Materials", by R.C.Hibbeler, Prentice Hall. Pearson Edu., 2005
2. "Mechanics of materials", James.M.Gere, Thomson, Fifth edition 2004.
3. "Mechanics of materials", in SI Units, Ferdinand Beer & Russell Johnston, 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

Hours/Week: 04

Total Hours: 52

IA Marks: 25

Exam Hours: 03

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 Hours

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 Hours

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 Hours

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 Hours

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 π theorem, dimensionless numbers, similitude, types of similitudes.

07 Hours

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

Hours

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

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**

Hours

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.

SIGNALS & SYSTEMS

Sub code : 10MT36
Hrs/Week: 4
Hours: 03

IA MARKS: 25
Total Marks: 100 Exam
Total Hours: 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**

Hours

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

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

7 Hours

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

PART – B

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

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 Hours**

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

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

TEXT BOOK:Simon Haykin and Barry Van Veen “Signals and Systems”, John Wiley & Sons,2001.

REFERENCE BOOKS:

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

ANALOG AND DIGITAL ELECTRONICS

Sub Code : 10MT35
Hrs/Week :04
Total Lecture Hrs : 52

IA Marks : 25
Exam Hours :03
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 Hours**

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 Hours**

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 Hours**

UNIT: 4 Comparators and 555 timer: Basic comparators, zero crossing detector, schmitt trigger, the 555 timer, monostable multivibrator, astable multivibrator, applications of astable multivibrator. **6 Hours**

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 Hours**

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

UNIT: 7 Combinational circuits: multiplexers, demultiplexers, encoders, decoders, adders **6 Hours**

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

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 edition, PHI.

REFERENCE 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.

MATERIAL TESTING AND METALLOGRAPHY LABORATORY

Sub Code: 10MTL37
Hrs/week: 03
Total Lecture Hrs: 42

IA Marks : 25
Exam hours: 03
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, rockwellll 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**

ENGINEERING MATHEMATICS - IV

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

UNIT 1:

Numerical Methods

Numerical solutions of first order and first degree ordinary differential equations – Taylor’s series method, Modified Euler’s method, Runge – Kutta method of fourth order, Milne’s and Adams-Bashforth predictor and corrector methods (All formulae without Proof).

UNIT 2:

Complex Variables

Function of a complex variable, Limit, Continuity Differentiability – Definitions. Analytic functions, Cauchy – Riemann equations in cartesian and polar forms, Properties of analytic functions. Conformal Transformation – Definition. Discussion of transformations: $W = z^2$, $W = e^z$, $W = z + (1/z)$, $z \neq 0$ Bilinear transformations.

UNIT 3:

Complex Integration

Complex line integrals, Cauchy’s theorem, Cauchy’s integral formula. Taylor’s and Laurent’s series (Statements only) Singularities, Poles, Residues, Cauchy’s residue theorem (statement only).

UNIT 4:

Series solution of Ordinary Differential Equations and Special Functions

Series solution – Frobenius method, Series solution of Bessel’s D.E. leading to Bessel function of first kind. Equations reducible to Bessel’s D.E., Series solution of Legendre’s D.E. leading to Legendre Polynomials. Rodrigue’s formula.

UNIT 5:

Statistical Methods

Curve fitting by the method of least squares: $y = a + bx$, $y = a + bx + cx^2$, $y = ax^b$, $y = ab^x$, $y = ae^{bx}$, Correlation and Regression.

Probability: Addition rule, Conditional probability, Multiplication rule, Baye's theorem.

UNIT 6:

Random Variables (Discrete and Continuous) p.d.f., c.d.f. Binomial, Poisson, Normal and Exponential distributions.

UNIT 7:

Sampling, Sampling distribution, Standard error. Testing of hypothesis for means. Confidence limits for means, Student's t distribution, Chi-square distribution as a test of goodness of fit.

UNIT 8:

Concept of joint probability – Joint probability distribution, Discrete and Independent random variables. Expectation, Covariance, Correlation coefficient.

Probability vectors, Stochastic matrices, Fixed points, Regular stochastic matrices. Markov chains, Higher transition probabilities. Stationary distribution of regular Markov chains and absorbing states.

Text book:

1. **Higher Engineering Mathematics** by Dr. B.S. Grewal, 36th Edn. Kanna Publications.
2. **Probability** by Seymour Lipschutz (Schaum's series)

Reference Books:

1. **Higher Engineering Mathematics** by B.V. Ramana (Tata-Macgraw Hill).
2. **Advanced Modern Engineering Mathematics** by Glyn James – Pearson Education.

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MANUFACTURING TECHNOLOGY

Sub Code: 10MT42
Hrs/week: 04
Total Lecture Hrs: 52

IA Marks: 25
Exam Hours: 03
Exam Marks: 100

PART – A

UNIT 1: Theory of Metal Cutting: Single point cutting tool nomenclature, geometry. Mechanics of Chip Formation, Types of Chips. Merchant's circle diagram and analysis, Ernst Merchant's solution, shear angle relationship, problems of Merchant's 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 Hours**

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 Hours**

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 Hours**

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

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 Hours**

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 Hours**

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 Hours**

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

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 Hours**

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

Marks: 25

Hrs/week: 04

Hours: 03

Total Lecture Hrs: 52

IA

Exam

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 Hours

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 Hours**

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 Hours**

Unit 4: Cams: Types of cams, Types of followers. Displacement, Velocity and, Acceleration time curve for cam profiles. Disc cam with reciprocating follower 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**

Hours

Part - B

Unit 5: Friction and Belt Drives: 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**

Hours

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 Hours**

Unit 7: Spur Gears: Gear terminology, law of gearing, characteristics of involute 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 Hours**

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 Hours**

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, Norton, McGraw Hill, 2001.
3. **Mechanisms and Dynamics of Machinery,** J Srinivas, Scitech Publications, Chennai, 2002.

POWER ELECTRONICS

Sub Code: 10MT44
Hrs/week: 04
Total Lecture Hrs: 52

IA Marks: 25
Exam Hours: 03
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 Hours

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

06 Hours

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 Hours**

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

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**

Hours

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 Hours**

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**

Hours

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 Hours**

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 Applications**”, 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

Hrs/week : 04

Total Lecture Hrs : 52

IA Marks : 25

Exam Hours : 03

Exam Marks : 100

PART – A

Unit 1: Introduction: (a) Measurement Errors: Gross errors and systematic errors, Absolute and relative errors. Accuracy, Precision, Resolution and Significant figures.

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

(07 Hours)

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 Hours)

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.

(06 Hours)

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

(06 Hours)

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 Hours)

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 Hours)

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 Hours)

Unit 8: Miscellaneous Topics: (a) Transducers – II Piezoelectric transducer, Photoelectric transducer, Photovoltaic transducer, Semiconductor photo devices, Temperature transducers-RTD, Thermocouple

(b) Display Devices: Digital display system, classification of display, Display devices, LEDs, LCD displays **(c)**

(06 Hours)

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.

ELECTRICAL MACHINES AND DRIVES

Sub Code: 10MT46
Hrs/week: 04
Total Lecture Hrs: 52

IA Marks: 25
Exam Hours: 03
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

Hrs/Week: 03

Total Lecture Hrs: 42

IA Marks: 25

Exam Hours: 03

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
Hrs/week: 04
Total Lecture Hrs: 52

IA Marks: 25
Exam Hours: 03
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.

METROLOGY MECHANICAL MEASUREMENTS

Subject Code : 10MT51
Hours/Week : 04
Total Hours : 52

IA Marks : 25
Exam Hours : 03
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, Wringing phenomena, Indian Standards (M-81, M12), Numerical problems on building of slip gauges. **06 Hours**

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 of fits, 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 Hours**

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

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 Hours**

PART – B

UNIT 5: Measurements and Measurement systems: Definition, Significance of measurement, generalized measurement system, definitions and concept of accuracy, precision, calibration, threshold, sensitivity, hysteresis, 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. **7 Hours**

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. **6 Hours**

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, McLeod gauge, Pirani Gauge. **6 Hours**

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 Hours**

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 Measurements:** 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

– 25

Hrs/week : 4

Hours : 03

**Total Leccture Hrs : 52
:100**

IA Marks

Exam

Exam Marks

PART - A

UNIT 1: Scan Conversion and Clipping Representation of points, lines, Line Drawing

Algorithms:

DDA algorithm, Bresenham's integer line algorithm, Bresenham's circle algorithm, mid point line and circle, Polygon filling algorithms: scan conversion, seed filling, scan line algorithm.

Viewing transformation, Clipping – points, lines, text, polygon, Cohen-Sutherland line clipping, Sutherland-Hodgmen algorithm. **7 Hours**

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 Hours**

UNIT 3: Three Dimensional Transformations and Projections 3D Transformation matrix :

General matrix, Translation, scaling, Shearing, Rotation, Reflection, Multiple transformations, Rotation about an axis parallel to coordinate axis, Rotation about an arbitrary axis in space, Reflection through an arbitrary plane, Orthographic, Parallel projection Transformations, one, Perspective projections – one point, two point and three point. **6 Hours**

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.

PART- B

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

UNIT 6:Visual Realism – 1

Introduction, hidden line removal- visibility of object views, Visibility techniques ; minimax test, containment test, surface test, Silhouettes, Homogeneity test, Sorting, Coherence, Hidden line priority algorithm, Hidden surface removal- z-buffer algorithm, Warnock's algorithm, Hidden solid removal- ray tracing algorithm. **6 Hours**

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 Hours**

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 Hours

Text Books:

- 1.CAD/CAM-Theory and Practice, Ibrahim Zeid, McGraw Hill, 2006
2. Mathematical Elements for Computer Graphics, Roger'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

Hours/Week : 04

Total Hours : 52

IA Marks : 25

Exam Hours : 03

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 Hours**

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

HYDRAULICS AND PNEUMATICS

Subject Code : 10MT 53

Hours/Week : 04

Total Hours : 52

IA Marks : 25

Exam Hours : 03

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 Hours**

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
Hrs/Week: 4
Total Hrs: 52

IA Marks: 25
Exam Hrs: 3
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.

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 (O₂/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 speed 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 Hours**

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) **William 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
Hrs/week : 04
Total Lecture Hrs : 52

IA Marks : 25
Exam Hours : 03
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 issue 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 Hours

PART – B

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

6 Hours

UNIT: 6 BROADCAST, MULTICAST and GEOCAST.Concepts and major challenges, design guidelines, Broad casting mechanism, Blind broad cast,probability based broadcast,counterbased broad cast,energy Efficient broadcast, Multicasting mechanisms:Distance Vector,Centralised and Localised Multicast, Geocasting mechanisms: Direct Flooding Based geocast

8

Hours

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 Hours.

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 Hours.

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 –** Walteneus 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

Hours/week : 03

: 03

Total Hours : 42

: 50

IA Marks : 25

Exam Hours

Exam Marks

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/Gear 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 Hours: 03	Total
Hours: 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

MANAGEMENT & ENTREPRENEURSHIP

Sub code: 10AL61
Hrs/week : 04
Total Lecture Hrs ; 52

IA Marks : 25
Exam Hours : 03
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

Hrs/week: 04

Total Lecture Hrs; 52

IA Marks: 25

Exam Hours: 03

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: Discrete Event Simulation: Concepts in discrete 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 Chi-square test-the Kolmogorov-Smirnov test – Runs test – Gap test – poker test. **7 hrs.**

UNIT 4: Random – Variate 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
Hrs/week : 04
Total Lecture Hrs; 52

IA Marks: 25
Exam Hours : 03
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 electromechanics. Electromagnetic actuation. Capillary electrophoresis. 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 from smart systems and micromachined accelerometer or a thermal cyclor. **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 cyclers 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. Microsystem 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 Methodologies, Smart Material Systems and MEMS: V. Varadan, K. J. Vinoy, S. Goplakrishnan, Wiley.
5. MEMS- Nitaigour Premchand Mahalik, TMH 2007.

Programmable Logic Controllers (PLCs)

Subject Code: 10MT73
No. of Hrs.week: 04
Total no Lecture Hrs: 52

IA Marks: 28
Exam Marks: 100
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, Chronological 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, equivalent 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 THAN OR 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 hazardous 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 and 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, pernam 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

ADVANCED COMPUTER PROGRAMMING

SUBJECT CODE: 10MT65

No. of lect /week: 04

Total lect. Hrs: 52

IA MARKS: 25

EXAM Hrs: 03

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 MATRICES: 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: PRIORITY QUEUES: Linear lists, Heaps, Leftist trees. **6 Hrs**

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

TEXT BOOK:

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

REFERENCE BOOKS:

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

ELECTRIC HYBRID VEHICLES

Sub code: 10MT663
Hrs/week: 04
Total Lecture Hrs: 52

IA Marks: 25
Exam Hours: 03
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.

Sensor LAB

IA MARKS: 25

Exam Marks: 50

Sub code No: 10MT68

Hrs/Week: 04

Exam Hours: 03

Total Hours: 42

2. PROGRAMMING

USE SIMULATOR NS2 for the following exercises.

3. Familiarity of using the simulator.
4. Familiarity of language used in the simulator, like ack, Tcl etc
5. Write simple programs to use the simulator, like creating nodes, connecting the nodes using different topologies.
6. Write Program to find the shortest path algorithms.
7. Model the simple 4 node network and measure the delay time, transmission speed.
8. MAC protocol design for a simple 4 node network.

ADVANCED PROGRAMMING LAB

IA MARKS: 25

Exam Marks: 50

Hrs/Week: 04

Exam Hours: 03

3. PROGRAMMING

9. Write a Program to perform Matrix Multiplication in C/C++.
10. Write a Program to perform Ascending / Descending order of Numbers or Names.
11. Write a program to implement of the operation of Queue, Tree, and Stack.
12. Write a program to implement the linear search & binary search algorithm.
13. Write a program to implement the shortest minimum path algorithm.
14. Write a program to perform the operation of the palindrome.
15. Write a program to perform the inverse matrix operation.
16. Write a program to perform the operation of a power function ($x^{**}y$).
17. Write a program to perform the operation of recursion.
18. Write a program to perform the operation of a fork operation.