

MA – 101 Mathematics-I**[3 1 0 4]**

Calculus: Differential calculus of functions of several variables, Partial differentiation, homogeneous functions and Euler's theorem, Taylor's and Maclaurin's series, Taylor's theorem and mean value theorem for functions of two variables, Errors and approximations.

Applications of Differential Calculus: Maxima and minima of several variables, Lagrange's method of multipliers for maxima and minima, Curvature of cartesian curves, Curvature of parametric & polar curves, Curve tracing.

Applications of Definite Integrals: Application of definite integrals to area, arc length, surface area and volume, double integrals, Triple integrals, Change of order of integration, Applications.

Vector Calculus: Scalar and vector fields, differentiation of vectors, Velocity and acceleration, Vector differential operator, Del, Gradient and Divergence, Physical interpretation of the above operators, Formulae involving Del applied to product of point function, Line, surface and volume integrals.

Application of Vector Calculus: Flux, solenoidal and irrotational vectors, Gauss divergence theorem, Green's theorem in plane, Stoke's theorem, Applications to electromagnetics and fluid mechanics.

Ordinary Differential Equations: Formation of ordinary differential equations, solution of first order differential equations by separation of variables, Homogeneous equations, Exact differential equations, equations reducible to exact form by integrating factors, Equations of the first order and higher degree, Clairaut's equations, Applications.

Matrices: Linear dependence of matrices and rank of matrices, Linear transformations & inverse of matrices, Reduction to normal form, bilinear form and quadratic form, Consistency and solution of linear algebraic system of equations, eigen values, eigen vectors and their applications to system of ordinary differential equations, Cayley Hamilton theorem, Orthogonal, Unitary, Hermitian and similar matrices

Books Recommended

1. Kreyszig E, "*Advanced Engineering Mathematics*", 8th Ed., John Wiley, Singapore (2001).
2. Greenberg M D, "*Advanced Engineering Mathematics*", 2nd Ed., Pearson Education, Singapore (2003).
3. Jain, R K and Iyengar S R K, "*Advanced Engineering Mathematics*", 2nd Ed., Narosa Publishing House, New Delhi (2003).
4. Piskunov N "*Differential and Integral Calculus Vol. I & II*", 2nd Ed., CBS, Delhi (1996)
5. Thomas G B Jr., "*Calculus and Analytic Geometry*", 9th Ed., Addison-Wesley, Delhi (2001).

MA – 102 Mathematics-II**[3 1 0 4]**

Linear Differential Equations: Linear differential equations with constant coefficients, Cauchy's homogeneous linear equations, Legendre's linear equations, Simultaneous linear equations with constant coefficients, Applications.

Partial Differential Equations: Formulation and classification of PDE's, Solution of first order linear equations, Four standard forms of non-linear equations, Linear equations with constant coefficients, Applications, separation of variable method for solution of heat, wave and Laplace equation

Fourier Series and Transforms: Fourier series of periodic functions, even and odd functions, Half range expansions and Fourier series of different wave forms, Complex form of Fourier series and practical harmonic analysis, Fourier integral theorem, Fourier sine, cosine integrals and transforms, Fourier transforms of derivatives of a function, Inverse Laplace transform by the method of residues, Application of transforms to boundary value problems.

Laplace Transform: Laplace transform of various standard functions, properties of Laplace transforms and inverse Laplace transforms, Convolution theorem, Laplace transform of unit step functions, impulse functions and periodic functions, Application to solution of ordinary differential equations with constant coefficients and simultaneous differential equations.

Complex Analysis: Limit and derivative of a complex function, Analytic functions and Cauchy Riemann equations, Line integral of elementary functions, Cauchy's integral theorem, Cauchy's integral formula and derivatives of analytic functions, Convergence of sequences, series and power series, Taylor and Laurent series, Zeros and singularities, residues and residue theorem, Evaluation of real improper integrals, Conformal mappings, linear fractional transformations and mappings by elementary functions

Books Recommended

1. Kreyszig E, "*Advanced Engineering Mathematics*", 8th Ed. John Wiley, Singapore (2001)
2. Greenberg M D, "*Advanced Engineering Mathematics*", 2nd Ed, Pearson Education, Singapore, Indian Print (2003).
3. Jain R K and Iyengar, S R K., "*Advanced Engineering Mathematics*", 2nd Ed, Narosa Publishing House, New Delhi (2003).
4. Sneddon I N, "*The Use of Integral Transforms*", Tata McGraw Hill, Delhi (1974)
5. Thomas, G B Jr, "*Calculus and Analytic Geometry*", 9th Ed., Addison-Wesley, Delhi (2001).

PH – 101 Physics

[3 1 0 4]

Electrostatics: Gradient of a scalar, Divergence and curl of a vector, Gauss's law and its applications, Electric potential and electric field (in vector form), Potential due to a monopole, Dipole and multipoles (multipole expansion), Work and energy in electrostatics; dielectrics, Polarization, electric displacement, Susceptibility & permittivity, Clausius Mossotti equation.

Magnetostatics and Electrodynamics: Lorentz Force Law; magnetic field of a steady current (Biot – Savart law), Ampere's law and its applications, Ampere's law in magnetized materials, electromotive force, Faraday's law, Maxwell's Equations, Wave Equation.

Lasers: Spontaneous and stimulated emission, Einstein's coefficients, population inversion and optical pumping; Three and four-level lasers, Ruby, He-Ne, Nd:YAG, CO₂, Semiconductor lasers, Industrial and medical applications of lasers.

Theory of Relativity: Invariance of an equation and concept of ether, Michelson Morley experiment, Einstein's postulates and Lorentz transformation equations, length, time and simultaneity in relativity, addition of velocity, variation of mass with velocity, mass-energy relation, energy- momentum relation.

Quantum Theory: The Compton effect, matter waves; group and phase velocities, Uncertainty principle and its application; time independent and time dependent, Schrodinger wave equation, Eigen values and Eigen functions, Born's interpretation and normalization of wave function, orthogonal wave functions, applications of Schrodinger wave equation (particle in a box and harmonic oscillator).

Radioactivity: Radioactive Decay, Half-Life, Radiometric Dating, Radioactive Series, Alpha Decay, Beta Decay, Gamma Decay, Radiation Hazards, Uses of Radio-Isotopes, Nuclear Fission, Nuclear Fusion, Nuclear reactions, Laws of nuclear reactions, Nuclear energy, Different types of nuclear reactors.

Books Recommended

1. Griffiths D, "*Introduction to Electrodynamics*", 2nd Ed., Prentice Hall of India, New Delhi (1998).
2. Thyagarajan K and Ghatak A K, "*Lasers,- Theory and Applications*", Macmilan India Ltd., New Delhi (2000).
3. Beiser, "*Perspective of Modern physics*" 5th Ed., McGraw-Hill KOGAKUSHA Ltd., NewDelhi (2002).
4. Arya A P "*Elementary Modern Physics*" Addison-Wesley, Singapore
5. Mani, H S and Mehta G K "*Introduction to Modern Physics*", Affiliated East West Press, New Delhi.

PH-103 Physics Laboratory

[0 0 2 1]

List of Experiments

1. To determine the frequency of AC Mains by Melde's experiment.
2. To determine the impedance of A.C. Circuit.
3. To study the characteristics of PN diode and Zener diode as power regulator.
4. To find out the intensity response of a solar cell/photo diode.
5. To analyze the suitability of a given Zener diode as a power regulator.
6. To determine the band gap of a semiconductor.
7. To determine the Refractive index of the prism material using spectrometer.
8. To determine the wavelength using Fresnel's biprism/diffraction grating.
9. To determine the wavelength of sodium light using Newton's ring method.
10. To determine the specific rotation of sugar using Laurent's half-shade polarimeter.
11. To determine the Laser Parameters like divergence, wavelength etc. for a given laser source.
12. To find the coefficient of thermal conductivity of copper using Searle's conductivity apparatus.
13. To determine the velocity of ultrasonic waves in liquids.
14. To measure the attenuation and numerical aperture of an optical fiber.
15. To study the effect of voltmeter resistance on voltage measurement.

CH-10I Chemistry

[3 1 0 4]

Part I : Conceptual Chemistry

Molecular Structure and Bonding: The VSEPR model, Valence-bond theory, Molecular orbital theory, Molecular orbitals of polyatomic molecules, The molecular orbital theory of solids, Semiconduction and Superconduction.

Redox Behaviour and its Implications: Reduction Potentials, Redox stability in water, The diagrammatic presentation of potential data, The effect of complex formation on potentials.

Chemical and Phase Equilibria: Phase diagram for single component system, Phase diagram for mixtures, Properties of non-electrolyte solutions, Kind of Electrodes, Concentration Cells, Corrosion of Metals in Acids, Corrosion by oxygen, Corrosion by Metal contact, The Lead storage cell and Fuel Cell.

Chemical Response to Photons: Laws of Photochemistry, Photo physical processes, Fluorescence and Phosphorescence, Flash proteolysis, Photochemical reactions: photolysis of HI, Photochemical reaction between H_2 and Br_2 , Photosensitized reactions and Photocleavage of water.

Probes (Tools) for Structural Elucidation: Lambert Beer's Law, Principles and applications of U.V. Visible, Molecular Absorption Spectroscopy; Chromophores, Effect of Conjugation on Chromophores, Absorption by aromatic systems, Rotational and Vibrational Spectroscopy—Principles and application to simple molecules, Magnetic Resonance Spectroscopy—Principles and Application to simple molecules and Introduction to Photoelectron Spectroscopy.

Coordination Bond and its Implications: Bonding in tetrahedral and Octahedral Complexes, Applications in analytical chemistry, Biological system, Catalysis and Sandwich Compounds, Oxygen Storage and Transport.

Thermodynamic and Kinetics Aspects of Chemical Conversion: Free Energy and its Implications in Occurrence of a Chemical Reaction, Kinetic Aspects of Occurrence of a Chemical Reaction and Examples of Significant Chemical Reactions.

Solid State, Adsorption and Diffusion: Introduction to Solid State Chemistry, Physical and Chemical Adsorption, Theories of Adsorption, Adsorption Isotherms, Laws of Diffusion and its Implications, Nernst Distribution Law and Solvent Extraction.

Basic Principles of Organic Synthesis: Substitution, Elimination, Addition and Rearrangement Reactions, Reagents used in organic synthesis.

Part II: Chemistry in the Service of society

(Illustrative Examples and application Only) Building and Construction Materials, Health and Medicine, Materials for Electronics, Material for Transport Technology, Materials for Energy Devices, Environment-Pollution Monitoring and Control and Catalysis and catalyst Development.

Books Recommended

1. Shriver D F and Atkin A W, "*Inorganic Chemistry*", 3rd Ed., ELBS, Oxford Press, Delhi (1999).
2. Castellan G W "*Physical Chemistry*" 3rd Ed., Narosa (1995).
3. Morrison R T and Boyd R N "*Organic Chemistry*", 6th Ed., Pearson Education, New Delhi (2002).

4. Skoog D A, and Holles F J, "*Principles of Instrumental Analysis*", 5th Ed., Hercaurt Asia PTE Ltd., Singapore (2001).
5. Hill J W "*Chemistry for changing times*" 6th Ed., Macmillan ,Canada (1995).

CH-103 Chemistry Laboratory

[0 0 2 1]

1. To draw the phase diagram of lead-in binary system
2. To study the adsorption of acetic acid on activated charcoal
3. To verify Bear's law for a coloured solution and to determine the concentration of a given unknown solution.
4. Determine the partition coefficient of iodine between carbon tetrachloride and water
5. Determine the viscosity of a given liquid by Oswald's viscometer
6. To determine the molecular weight of a given compound by cryoscopy.
7. Isolation of caffeine from tea leaves
8. To Synthesize paracetamol and determine percentage yield of the product
9. To synthesize Phenol and Urea formaldehyde resin
10. Thin layer-chromatographic separations of amino acids/organic molecules
11. Determination of ion-exchange capacity of given ion-exchanger(cationic /Anionic).
12. Determination of COD of water sample
13. To draw the pH-titration curve of strong acid vs strong base
14. To determine concentration of a trace metals by atomic absorption spectrophotometer
15. An investigatory project (compulsory for all students)

EC- 101 Basic Electronics

[3 1 0 4]

Basic Semiconductor Concepts and Devices: Intrinsic and extrinsic semiconductors, diffusion and drift currents, p-n junction under open-circuit, reverse bias and forward-bias conditions, p-n junction in the breakdown region, Ideal diode, terminal characteristics of junction diode, Load-line analysis of diode circuits, Bipolar junction transistor- physical structure and modes of operation, Transistor as a switch, CB, CE and CC Configurations, Transistor Biasing.

Amplifiers: BJT as an amplifier, Frequency response of an amplifier, amplifier bandwidth and Concept of Cascaded Amplifiers

Feedback and Oscillators: Concept of feedback, positive and negative feedback, General feedback structure, Effect of positive and negative feedback on amplifier gain and bandwidth, advantages of negative feedback, Basic principles of sinusoidal oscillators, Oscillation criteria, Brief idea about LC and RC oscillators, Crystal Oscillators (No mathematical treatment)

Operational Amplifiers: Op-amp terminals, ideal Op-amp, equivalent model, Inverting and non-inverting configurations, Application of op-amps as summing amplifier, differentiator and integrator, Practical op-amps (non-ideal performance of op-amps)

Power Suppliers: Block diagram of power supply, Half-wave, Full-wave and Bridge rectifiers, passive filters, Regulators, Line regulation and load regulation, Zener diode as voltage regulator, Working of Switched Mode Power Supply (SMPS).

Digital Electronics: Binary, Octal and Hexadecimal number systems and conversions, Boolean Algebra, Truth tables of logic gates (AND, OR, NOT), NAND, NOR as universal gates, Difference

between combinational circuits and sequential circuits, Combinational Circuits: Half Adder, Full Adder, MUX, DEMUX, Encoder, Decoder, Working of S-R and J-K flip-flops, Counters, General memory operation, idea about ROM, RAM, EPROM.

Electronics Instruments: Role and importance of general-purpose test instruments viz Multimeter, Cathode Ray Oscilloscope (CRO), Function/Signal Generator, Block diagram and working of CRO, Amplitude, frequency and phase measurements using CRO

Displays: LED Display, Liquid Crystal Display

Books Recommended

1. Sedra A S and Smith K C, "*Microelectronic Circuits*" 4th Ed., New York, Oxford University Press, New York (1997).
2. Tocci R J and Widmer N S, "*Digital Systems – Principles and Applications*", 8th Ed., Pearson Education India, New Delhi (2001).
3. Cooper and Helfrick, "*Modern Electronic Instrumentation and Measuring Techniques*", 4th print Prentice Hall of India, New Delhi (1996).
4. Boylestad and Nashelsky, "*Electronic Devices and Circuit Theory*", 8th Ed, Pearson Education India, New Delhi (2002).
5. Millman and Grabel, "*Microelectronics*", 2nd Ed. Tata McGraw-Hill (1999).

EC-103 Basic Electronics Laboratory

[0 0 2 1]

1. To get familiar with the working knowledge of the following instruments:
 - a) Cathode ray oscilloscope (CRO)
 - b) Multimeter (Analog and Digital)
 - c) Function generator
 - d) Power supply
2.
 - a) To measure phase difference between two waveforms using CRO
 - b) To measure an unknown frequency from Lissajous figures using CRO
3.
 - a) Plot the forward and reverse V-I characteristics of P-N junction diode
 - b) Calculation of cut-in voltage
 - c) Study of Zener diode in breakdown region
4. To plot and study the input and output characteristics of BJT in common-emitter configuration
5. To find frequency response of a given amplifier and calculate its bandwidth
6. To get familiar with pin-configuration of typical op-amp(741) and its use as:
 - a) Inverting amplifier
 - b) Non-inverting amplifier
 - c) Summing amplifier
 - d) Difference amplifier
7. Use of op-amp as
 - a) Integrator
 - b) Differentiator
8. To assemble Wein Bridge oscillator circuit and calculation of oscillation-frequency and its verification from the observed output
9. To assemble and test 5V/9 V DC regulated power supply and find its line-regulation and load-regulation
10. Verification of truth tables of logic gates (OR,AND, NOT, NAND, NOR)
11. Verification of truth tables of flip-flops (S-R, J-K)
12. To get familiar with the working and use of seven-segment display.

Part-I: Management

Nature of Management: Definition and nature of management, Management Science or Art, Management as a Profession, Universality of Management, Professionalisation of management in India, Management by objectives.

Schools of Management thought: Contributions of Taylor, Fayol, Mayo, Drucker and McGregor, Systems approach, contingency approach

Functions of Management: Planning: Meaning, Characteristics, Steps in planning, types of plans;

Organizing: Nature, Process and departmentation, Directing: Leadership, Leadership Styles, Theories, Motivation: Maslow and Herzberg's Theories, Controlling: Meaning Characteristics, Process and Techniques.

Decision Making: Decision making ,types of decision making, Decision making Process, Decision making under certainty, uncertainty and risk, Decision support system, Strategic and tactical decisions.

Manufacturing Management: Production Planning: Function and Elements of Production, - Quality Management Systems: Quality Circle, Total Quality Management, Kaizen, Manufacturing systems.

Part - II : Communication Skills

Communication: Communication : Meaning, process, types and channels, Barriers to communication, making communication effective.

Business Correspondence: Elements of business writing, business letters - components and kinds, memorandum, report writing, purchase order, quotations and tenders, Job application letters, resume writing.

Discussion, Meeting and Telephonic skills: Group discussion, conducting a meeting, attending telephonic calls, Oral presentation.

Books Recommended

1. Koontz. Hand Weirich, H, "*Essentials of Management*", 5th Ed., Tata McGraw-Hills, New Delhi (1998).
2. Prasad L M, "*Principles and Practices of Management*", 5th Ed., Sultan Chand and Sons, New Delhi (1999).
3. Rodrigues M V, "*Effective Business Communication*", Concept Publishing Company New Delhi, 1992 reprint (2000).
4. Stoner J A F, Freeman R E and Gilbert D R, "*Management*", 6th Ed., Prentice Hall of India, New Delhi (2002).
5. Singh R N, "*Management Thought and Thinkers*", 2nd Ed., Sultan Chand and Sons, New Delhi (1999).

Part - I: Economics

Introduction to Economics: Economics: meaning, nature and scope, Types of Economics, Economic Problems

Theory of Consumer Behaviour: Cardinal approach, Ordinal Utility theory.

Demand Analysis: Demand, types of demand, Determinants of demand, Law of demand, Price elasticity Income elasticity and Advertisement elasticity.

Supply and Theory of Production: Law of supply, determinants and elasticity of supply, Average Physical Product, Marginal Physical Product and Total Physical Product, Isocost and Isoquant approach.

Cost and Revenue: Cost: Meaning and types, Cost curves in short and long run, Shapes of TR, AR and MR curves, Profit maximization rule, Economies and diseconomies of scale. **Analysis of Market**

Equilibrium: Perfect competition, Monopoly, Monopolistic competition, Oligopoly.

Macroeconomic Issues: National Income : concept and methods of measuring National Income, Business Cycle : meaning, characteristics Phases and causes of different phases, Fiscal Policy, Monetary Policy, Inflation, International Trade.

Part –II Financial Management

Break-Even Analysis: Assumptions, formulae, charts, Applications of Break-Even Analysis. **Investment Decisions:** Investment: Meaning, types of Investment decisions, factors influencing Investment decisions, Capital Budgeting Techniques: Payback Period, ARR, NPV and IRR methods, Depreciation: Meaning, uses and Methods.

Financial Accounting: Book keeping, Accounting, types of Accounts, Rules of debit and credit, Preparation of Journal, Ledger, cash book, Preparation of Trial balance, Trading A/C, Profit and Loss A/C and Balance sheet

Books Recommended

1. Sloman J, "*Economics*", 3rd Ed, Prentice Hall of India, New Delhi (2001).
2. Sharma R K and Gupta S K, "*Management Accounting Principles and Practices*", 7th Ed., Kalyani Publishers, 1992 New Delhi reprint (1999).
3. Samuelson, "*Economics*", 16th Ed., Tata McGraw-Hills, New Delhi (2001).
4. Jain S P and Narang K L, "*Cost Accounting*", 7th Kalyani Publishers, New Delhi (2000).
5. Koutsoyannis A, "*Modern Microeconomics*", Mac Millan Press, London (1993).

HM-103 Communication Laboratory

[0 0 2 1]

1. Business Letters
 - Structure of business letters, language in a business letter
 - Letters of inquiry and their places
 - Sales letters
 - Memorandum, quotations/tenders
 - Bank correspondence
 - Memorandum, quotations/tenders

- Bank correspondence
 - Letters of application and appointments
 - Resume writing
2. Report writing
 3. Conducting a meeting
 4. Minutes of meeting
 5. Oral presentations
 6. Group discussions

IE- 101 **Manufacturing Processes**

[2 0 0 2]

Manufacturing: Introduction to manufacturing processes, Basic terminology used, Economical and technological considerations

Materials properties and their application: Different engineering materials, Properties, Nomenclature, Basics of heat treatment.

Carpentry: Introduction, Classification of wood, Seasoning of wood, Classification of carpentry tools, Joints and joining processes, Wood working machines and processes, Safety precautions.

Fitting: Introduction, Tools used in fitting, Measuring and marking tools, the process of making sawing, Filing, Tapping and die, Introduction to drills.

Welding: Introduction, Various welding processes with brief introduction, Electric Arc welding, Arc welding procedure, List of equipment for electric arc welding, Gas welding process and equipment is in the process, Soldering and Brazing process.

Smithy: Introduction, Types of forging, Equipment used in the smithy shop, Smithy tools, Black smith's hearth, Hand forging operations.

Foundary: Introduction, Basic terminology, Pattern, Types of patterns, Patterns allowances, Tools for hand Moulding, Moulding sand and Moulding process, Crucible furnace, Operation of cupola, Foundry containers, Casting defects, Safety precautions.

Sheet metal working : Introduction, Types of sheets (ferrous/non ferrous), Standard sheet sizes and their measurement, Tools used in sheet metal.

Metal cutting: Introduction, Classification of machine tools and cutting tools, Basic operations on lathe, Drilling, Shaper, Milling, Cutting tool material, Work-holding devices, Cutting parameters i.e speed, feed and depth of cut.

Books Recommended

1. Chapman W A J, "*Workshop Technology Part 1-3*", 5th Ed., Viva Books Pvt. Ltd, New Delhi (1998)
2. Hajra Chowdary S K and Hajra Chowdhay A K, "*Work Shop Technology*" 10th Ed. Media Promoters and Publishers
3. Raghuwanshi R S, "*Work Shop Technology*", 9th Ed. Dhanpat Rai and Sons, New Delhi
4. Jain R K, "*Production Technology*", 5th Ed. Khanna Publishers, New Delhi (1995)
5. **Lindberg R A "*Process and materials of Manufacturing*", 4th Ed., Prentice Hall of India, New Delhi (1999).**

IE-103 Manufacturing Process Laboratory**[0 0 4 2]****List of experiments**

| | |
|--|---------|
| Carpentry shop | -2 jobs |
| Fitting shop | -2 jobs |
| Arc welding | -1 job |
| Gas welding | -1job |
| Smithy shop | -2 jobs |
| Foundry Shop | -1 job |
| Sheet metal working | -2jobs |
| Machine shop covering various operations | -2 jobs |
| Electric shop | -1 job |

IC-101 Electrical Science**[3 1 0 4]**

Network Laws and Theorems: Network Laws for d.c. networks, Node voltage & Mesh Current methods, Delta – star and star – delta conversion, Classification of network elements, Principle of superposition and Thevenin's & Norton's Theorems.

Single Phase A.C. Circuits: 1-phase EMF generation, Effective and Average values of sinusoids and determination of form factor, Analysis of simple RLC-series circuits, Solution of parallel circuits and Resonance.

Three Phase A.C. Circuits: 3-phase EMF generation, Delta and star connection, Line & phase quantities and relations, Solution of 3-phase circuits – balanced voltage & balanced load, Phasor diagrams, Measurement of power in three-phase circuits and Three-phase, 4-wire circuits.

Magnetic Circuits: Analogy between electric & magnetic circuits, Ampere's circuital law, Solutions of Magnetic circuits, Hysteresis and Eddy current losses.

Transformers: Constructional details, EMF equation, rating and phasor diagrams on no load & full load, Equivalent circuits, Regulation and efficiency, Open circuit & short circuit tests, Auto transformers.

Induction Motors: Production of revolving magnetic field, Principle of operation, Equivalent circuit, Torque-speed characteristics, Starter for squirrel cage & wound rotor induction motors, Single-phase induction motors – applications.

D.C. Machines: Construction, EMF equation for generator & T-equation for motor, Characteristics of D.C. Generators & Motors, Speed Control of D.C. motors, D.C. motor – starters, Armature reaction & commutation.

Electrical Measuring Instruments: Operation of an instrument, PMMC instruments, Shunts & Multipliers, Multi-meters and uses, Moving iron ammeters & voltmeters, Dynamometer wattmeters, A.C. watt-hour meters.

Power Supply Systems: General structure of electrical power systems, Transmission & distribution of power using overhead lines and underground cables, 1-line diagram of power system.

Books Recommended

1. Del Torro, "*Electrical Engineering Fundamentals*", 2nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi (1994)
2. Murthy K V B and Kamath M S, "*Basic Electrical Circuits*", Tata McGraw Hill Co., New Delhi (1996).
3. Kothari D P and Nagrath I J, "Basic Electrical Engineering", Tata McGraw Hill, New Delhi (1996).
4. Nagsarkar T K and Suhija M S, "Basic Electrical Engineering", Exford Univ. Press, New Delhi (2005).
5. Cotton H, "*Advanced Electrical Technology*", Pitman, London (1969), reprint (1999).

IC-103 Electrical Science Laboratory

[0 0 2 1]

List of Experiments

1. To measure the armature and field resistance of a DC Machine
2. To calibrate a test (moving iron) ammeter and a (dynamometer) wattmeter with respect to standard (DC PMMC) ammeter and voltmeters.
3. Verification of circuit theorems, Thevenin's and Superposition theorems (with DC sources only).
4. Voltage-current characteristics of incandescent lamps and fusing time-current characteristics of fuse wire.
5. Measurement of current, voltages and power in R-L-C series circuit excited by (single phase) AC supply.
6. To verify line voltage and phase voltage.
7. Open circuit and short circuit tests on a single-phase transformer.
8. Connection and starting of a three-phase induction motor using direct on line (DOL), or star-delta starter.
9. Connection and measurement of power consumption of a fluorescent lamp.
10. Determination of open circuit characteristics (OCC) of a DC machine.
11. Starting and speed control of a DC shunt motor.
12. Connection and testing of a single-phase energy meter (unit power factor load only).
13. Two-wattmeter method of measuring power in three-phase circuit (resistive load only).
14. Measurement of thermo emf between different types of thermocouples as a function of temperature difference between the junction, measurement of an unknown temperature.
15. Design and use of potentiometer.
16. Study of LCR circuits with AC current.
17. Measurement of earth resistance.

Note: Students are required to perform 10-experiments out of the above list.

MC – 101 Mechanics of Solids And Fluids

[3 0 0 3]

Part-I : Mechanics of Solids

Introduction: System of forces, Coplanar concurrent force system, Composition and Resolution of forces, Equilibrium of rigid bodies, Free body diagram, Lami's Theorem.

Analysis of Framed Structure: Reaction in beam with different end conditions, Determination of reactions in members of trusses: a) Analytical Methods b) Graphical Method

Centre of Gravity and Moment of Inertia: Concept of C.G. and centroid, Position of Centroid, Theorem of Parallel and Perpendicular Axes, Moment of inertia of simple geometrical figures.

Stress and Strain: Concept of Stress and Strain, Simple Stresses, Tensile, Compressive , Shear, Bending and Torsion, Stress-Strain Curves, Elongation of bars, Composite bars, Thermal Stresses, Elastic Constants, Mohr's Circle

Part II : Mechanics of Fluids

Physical Properties of fluids: System, Extensive and intensive properties: specific weight, mass density, specific gravity, viscosity , specific gravity, surface tension and capillarity , evaporability and vapour pressure, Newtonian and Non-Newtonian fluids

Fluids Statics : Pressure, Hydrostatic law, Pascal' s law, Different types of manometer and other pressure measuring devices, Determination of metacentric height.

Fluid Kinematics and Dynamics: Classification of fluids, Streamline, Streakline and Pathlines, Flow rate and continuity equation, Bernoulli's Theorem, Kinetic energy correction factor and momentum correction factor in Bernoulli's equation.

Laminar Viscous flow and Flow Measurement Devices: Flow regimes and Reynold's number, Laminar flow in circular pipes Hagen Poiseuille's Law, Venturimeter, orifice meter.

Books Recommended

1. Bhavikatti S S and Rajashekarappa K G, "*Engineering Mechanics*", New Age International, New Delhi (1998).
2. Timoshenko S P and Young D H, "*Engineering Mechanics*", McGraw Hill (International) 4/e, New Delhi (1984).
3. Kumar D S, "*Fluid Mechanics*", S.K.Katira and Sons, Delhi (1998).
4. Modi P N and Seth S N, "*Fluid Mechanics*", Standard Book House, New Delhi (1998),
5. Massey B S, "*Mechanics of Fluids*", ELBS, Van Nostrand Reinhold Co. Ltd., U.K. (1983).

MC-103 Mechanics Of Solids And Fluid Laboratory

[0 0 2 1]

List of Experiments

1. Determination of Young's modulus, tensile, strength and percentage elongation for steel specimen on universal testing machine.
2. Plot stress-strain diagram and determine the yield point and percentage reduction in area for steel specimen.
3. Determination of deflection and verification of beam formula for a specimen in bending.
4. To determine the compressive strength for cast iron specimen on Universal Testing Machine.
5. To perform the bending test on mild steel specimen.
6. To determine the shear strength using mild steel specimen on torsional testing machine.
7. To verify Bernoulli's equation using hydraulic bench.
8. To find coefficient of friction in pipes of different materials.
9. To find losses due to sudden expansion and sudden contraction in pipes.
10. To calculate Reynold's number for laminar and turbulent flow.
11. To calculate metacentric height.

ME-101 Thermal Science

[3 1 0 4]

Basic Concepts: Introduction and scope of Thermodynamics, Thermostatics, Thermodynamics properties, Cycle integral for property and non-property variable, Stored and transit forms of energy,

Thermodynamic systems and control volume, Isolated system Universe, Steady flow system, their characteristics and examples, Types of work viz. displacement work, flow work, Their estimation in relation to different systems.

Thermodynamic Processes and cycle: Different thermodynamic processes and estimation of work in these processes, Quasi-static process, Free expansion, Concept of thermodynamic cycle state and path function.

Zeroth Law of Thermodynamics: Zeroth Law, Thermodynamic equilibrium, Concept of Temperature and its measurement, Temperature scales.

First Law of Thermodynamics: Heat and work interactions, internal energy, enthalpy, Definition of First Law, First Law applied to process and cycle, Steady flow energy equation.

Second Law of Thermodynamics: Second Law – Statements, Carnot Theorem and its Corollary, Concept of entropy, availability and irreversibilities for different processes.

Air Standard Cycles: Assumptions, Analysis of Otto, Diesel, Dual and Joule cycles, Calculation of cycle work and state values.

Behaviour of Real Gases and their Laws: Properties of mixture of ideas gases.

Pure Substances – Steam: Behaviour of pure substances, Conditions of steam quality, Properties of steam and their calculations, Vapor power cycle-Rankine vs. Carnot, Rankine and modified Rankine cycle.

Refrigeration cycles: Calculation of COP.

Heat Transfer: Modes of heat transfer, Laws of heat transfer, Heat conduction through composite wall, cylinder and sphere, Importance of radiative heat transfer, Concept of black and gray bodies, Laws of radiative heat transfer.

Books Recommended

1. Rogers G and Mayhew Y, "*Engineering Thermodynamics*", 4th Ed, Pearson Education, New Delhi (1980).
2. Jones J B and Hawkins J A, "*Engineering Thermodynamics*", John Wiley and Sons, Delhi (1998).
3. Nag P K, "*Engineering Thermodynamics*", Tata McGraw Hill Book Co, New Delhi (1999).
4. Joel R, "*Basic Engineering Thermodynamics*", 5th Ed, Addison Wesley, New Delhi (1999).
5. Sonntag R E, Borgnakke and Van Wylen G, "*Fundamentals of Thermodynamics*", John Wiley, New Delhi (2000).

ME -102 Engineering Graphics

[2 0 0 2]

Introduction: Engineering Graphics/Technical Drawing-a Visual Science, Types of Engineering Drawing, Introduction to drawing equipment and use of instruments, Application of Symbols and conventions in

drawing Practice, Types of lines and their use, BIS codes for lines, Technical lettering as per BIS codes, Introduction to dimensioning, Concepts of scale in drawing, Types of scales.

Theory of Projections: Relevance of projection, Theory of projections, Perspective, Orthographic, Axonometric and their basic principles, System of orthographic projection: in reference to quadrants and octants, Illustration through simple problems of projection.

Projection of Points: Projection in quadrants and octants, Projection of point on auxiliary planes.

Projection of Lines: Parallel to both H P and V P, Parallel to one and inclined to other, Contained in profile plane, Other typical cases: three view projection of straight lines, True length and angle orientations of straight line: rotation method and auxiliary plane method, Distance between two non-intersecting lines, Trace of lines.

Projection of Planes: Difference between plane and lamina, Projection of lamina, Parallel to one and perpendicular to other, Perpendicular to one and inclined to other, Inclined to both reference planes, Plane oblique to three reference planes, Application of auxiliary planes, Trace of planes.

Projection of Solids: Definition of Solids, types of solids, and elements of solids, Projection of solids in first or third quadrant, Axis parallel to one and perpendicular to other, Axis parallel to one inclined to other, Axis inclined to both the principal plane, Axis perpendicular to profile plane and parallel to both H.P. and V.P., Visible and invisible details in the projection, Use of rotation and auxiliary plane method.

Section of Solids: Definition of Sectioning and its purpose, Procedure of Sectioning, Illustration through examples, Types of sectional planes-application to few typical examples.

Intersection of Surfaces/Solids: Purpose of intersection of surfaces, Intersection between the two cylinder, two prisms, prism and pyramid, pyramid and pyramid, cylinder and prism, cone and cylinder, sphere and cylinder etc., Use of cutting plane and line method.

Development of Surfaces: Purpose of development, Parallel line, radial line and triangulation method, Development of prism, cylinder, cone and pyramid surfaces for both right angled and oblique solids, Development of surface.

Isometric Projection : Classification of pictorial views, Basic Principle of Isometric projection, Difference between isometric projection and drawing, Isometric projection of solids such as cube, prism, pyramid and cylinder, Discussion on isometric projection of simple machine parts.

Orthographic Projection: Review of principle of Orthographic Projection, Examples of simple machine parts, Drawing of Blocks and machine parts.

Books Recommended

1. Naryana K L and Kanaiah P, "*Engineering Graphics*", Tata Mc GrawHill Publishing Company Limited, New Delhi (1992).
2. Gill P S, "*Engineering Graphics and drafting*", Katria and Sons, Delhi (2001).
3. Bhat N D, "*Elementary Engineering Drawing-Plane and Solid Geometry*", Chartotar Publishing House, Anand (1988).

4. Luzzadde Warren J, "*Fundamentals of Engineering Drawing*", Prentice Hall of India Private Limited, New Delhi (1988).
5. Bertoline G R, Wiebe E N, Miller G L, and Mother J L, "*Technical Graphics Communication*", Irwin McGraw Hill New York (1997).

ME -103 Engineering Graphics Laboratory

[0 0 4 2]

This course involves intensive drawing and sketch work. A number of drawing sheets are to be made by the students in addition to the sketch work on the sketchbook.

List of Class Home assignment sheets

| | |
|--------------------|---|
| Sheet No.1 | Types of lines. |
| Assignment No.1 | Lettering-practice on graph paper and in sketchbook. |
| Assignment No.2 | Dimensioning practice (Take home assignment-Study and draw sketches on sketchbook). |
| Sheet No.2 | Drawing of plane scale and diagonal Scale. |
| Assignment No.3 | Geometrical constructions (Study and draw on sketch book). |
| Sheet No. 3 | Projection of points in quadrants and octants, and on auxiliary planes. Simple and typical problems. |
| Sheet No. 4 | Projection of lines, Simple and typical problems. |
| Sheet No.5 | Projection planes-two view and there view problems. Solving the problems both by rotation and Auxiliary plane method Simple and typical problems. |
| Sheet No.6 | Projection of solids, Projection of solids using rotation and auxiliary plane method. Special emphasis may be given on visible and indivisible details in projection of solids. |
| Sheet No.7 | Sectioning of solids, determination of true section, simple and typical problems. |
| Sheet No.8 | Intersection of surfaces/solids – simple and typical problems on intersection of solids, use of line and cutting plane method. |
| Sheet No.9 | Development of surfaces- simple and typical problems related to prisms cylinders, cone, pyramid (right angled and oblique solids). |
| Sheet No.10 | Isometric Projections, Problems on Isometric projection from Orthographic, Projection of simple objects. |
| Sheet No.11 | Orthographic Projection, Problems on projection of simple blocks and machine Parts. |

CS-101 Computer Software – Theory and Practice

[1 0 2 2]

Computer system-software and hardware concepts. Introduction to word processor and database management system viz. MS Office System Softwares viz. DOS, Windows, UNIX, LINUX, Basics of networking. Object Oriented programming languages and implementation of their concepts in C++ or any

object oriented programming language. In this syllabus, emphasis has to be laid on the use of different softwares through laboratory exercises.

Books Recommended

1. Mano M M, "*Computer System Architecture*", 3rd Ed., Pearson Education, Inc., New Delhi (1993).
2. Lafore R, "*Object Oriented Programming in C++*", 4th Ed., Techmedia, New Delhi (2002).
3. Kroene D M, "*Database concepts*", 1st Indian Ed., Pearson Edu., Inc., New Delhi (2003).
4. Comer D E, "*Internet*", 2nd Ed., PHI (1999).
5. Taxali R K, "*P C Software*", 1st Ed., McGraw Hill, New Delhi (2001).