

AC-3101 APPLIED CHEMISTRY

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Sessional Marks:25

End Term Exam Marks:75

UNIT - I

Organic Chemistry: Functional Group I: (Halides and hydroxy compounds): Nomenclature of compounds containing halogen atoms and hydroxyl groups: haloalkanes, haloarenes; alcohols and phenols. physical, chemical properties and use; Functional Group II: (Ethers aldehydes, ketones, carboxylic acids and their derivatives). Nomenclature of Ethers aldehydes, ketones, carboxylic acids and their derivatives, physical, chemical properties and uses (acyl halides, acid anhydrides, amides and esters); Functional Group II: (Cyanides, isocyanides,, nitro compounds and amines) Nomenclature of Cyanides, isocyanides, nitro compounds and amines and their methods of preparation, physical, chemical properties and uses.

(11 Hrs)

UNIT - II

Transition Metals and Coordination Chemistry: Transition Metals: Electronic configuration, general characteristic properties, oxidation states of transition metals. First row transition metals and general properties of their compounds oxides, halides and sulfides.

Coordination Compounds: Nomenclature, isomerism in coordination compounds, bonding in coordination compounds, stability of coordination compounds, application of coordination compounds, compounds containing metal-carbon bond; application of organo-metallics.

(11 Hrs)

UNIT - III

Chemical Thermodynamics: First law of Thermodynamics: Internal energy, enthalpy, and application of first law of thermodynamics, Second and third law of thermodynamics: Entropy, Free energy, spontaneity of a chemical reaction, Free-energy change and chemical equilibrium.

(06 Hrs)

Surface Chemistry: Surfaces: Adsorption, Colloids (preparation and general properties), emulsions, micelles; Catalysis: Homogeneous and heterogeneous, structure of catalyst.

(04 Hrs)

UNIT - IV

Bio-molecules: Carbohydrates: Monosaccharides, disaccharides, polysaccharides; Amino acids and peptides: Structure and classification; Proteins and Enzymes: Structure of proteins, role of enzymes Nucleic acids: DNA and RNA; Lipids: Structure, membranes and their functions.

(06 Hrs)

Chemistry in Action: Dyes: Classification of dyes with examples; Chemicals in medicines: Antipyretics, Antibiotics, analgesics, antiseptics, disinfectants, anti-malarial, tranquilizers, germicides and anesthetics, (only definition and examples); Rocket propellants: Types of propellants- solid, liquid and hybrid.

(04 Hrs)

Recommended Books:

1. Chemistry for class XI and XII, published by NCERT
2. Organic Chemistry, Morrison & Boyd
3. Physical Chemistry, G. W. Castellan
4. Inorganic Chemistry, Ramesh Kapoor

AM-3101 APPLIED MATHEMATICS

L T P
3 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 75

UNIT-I

Successive differentiation, Leibnitz's theorem. Fundamental theorems: Rolle's theorem & Lagrange's mean value theorem. Expansion of function using Taylor and Maclaurin's series. Indeterminate forms, L'Hospital's Rule.

(11 hrs)

UNIT-II

Ordinary differential equations, its order and degree. Linear and non-linear differential equations. Formation of differential equation. General and particular solution of differential equation by variable separable method, homogeneous differential equation of first order and their solution, Solution of linear differential equation. Exact differential equation, differential equations reducible to these forms.

(10 hrs)

UNIT-III

Introduction to matrices; addition; subtraction and multiplication of matrices, inverse of 2×2 and 3×3 matrix by adjoint method and solution of linear simultaneous equations. Determinants, minors, cofactors, expansion of a determinant, properties of determinants, solution of linear simultaneous equations containing three variables by Cramer's rule.

(10 hrs)

UNIT-IV

Organization of data. Measures of Central Tendency- Mean, median, mode. Measures of Dispersion - Standard deviation. Karl Pearson's coefficient of correlation. Probability and its laws. Conditional probability. Baye's theorem (without proof). Random Variable, Binomial and Poisson distributions.

(13 hrs)

RECOMMENDED BOOKS:

Text Book:

Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Ltd

Reference Books:

Schaum's Outline Series, Probability & Statistics, Tata McGraw Hill

Thomas & Finney, Calculus, Pearson Education

L T P
3 1 0Sessional Marks:25
End Term Exam Marks:75**UNIT – I**

ROTATIONAL MOTION: Center of Mass, Centre of mass of a two-particle system, motion of centre of mass and momentum conservation, Rotational motion of a single particle in two dimensions. Torque, angular momentum and its geometrical and physical meaning, law of conservation of angular momentum, centripetal force, banking of tracks and bending of cyclist, motion in vertical circle. Numerical Problems

(12 Hrs)

UNIT – II

MOMENT OF INERTIA: Moment of inertia of rigid body, radius of gyration, theorem of parallel and perpendicular axes, moment of inertia of a straight rod, circular ring, circular disc, cylinder (solid and hollow) sphere, relation between torque and moment of inertia, Kinetic energy and angular momentum, motion of cylinder and sphere rolling without slipping on an inclined plane. Numerical Problems

(10 Hrs)

UNIT – III

KINETIC THEORY OF GASES: Boyle's and Charles's laws, gas equation, pressure exerted by gas, K.E. of molecules, Kinetic interpretation of temperature, derivation of gas laws from kinetic theory of gases. Numerical Problems.

(04 Hrs)

WAVE MOTION and ELECTROMANETIC WAVES: Longitudinal and transverse waves, reflection of waves, standing waves, beats and Doppler effect History of e.m. waves. Hertz experiment, production, properties of e.m. waves, transverse nature and velocity of e.m. waves, propagation of radio waves in earth;s atmosphere. Numerical Problems.

(06 Hrs)

UNIT – IV

ELECTRONICS AND PHOTONS: Discharge through gases at varying pressure, cathode rays and their properties, specific charge on electron by J.J. Thomson, Milikon's Oil drop method.

(04 Hrs)

ATOMIC AND NUCLEAR PHYSICS: Photoelectric effect, laws and experimental verification of laws, photocell and its applications, production of x-rays, soft and hard x-rays, uses of x-rays, Radioactivity laws, half life and average life, α , β and γ decay, mass defect, binding energy, Nuclear Fission and Fusion. Numerical Problems.

(06 Hrs)

RECOMMENDED BOOKS**Text Book**

APPLIED PHYSICS R K Gaur

REFERENCE BOOK

Resnick and Halliday Fundamentals of PHYSICS

CH-3101 INTRODUCTION TO CHEMICAL TECHNOLOGY

L T P
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Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit-I

Introduction: History and scope of Chemical Technology, introduction, importance and job opportunities, classification of chemical process industries, concept of flow diagrams with examples from various industries like fertilizers, petroleum, polymer, pulp and paper, overview of various unit processes and operations with examples (excluding design calculations).

(12 Hrs)

Unit-II

Units and Dimensions: Units and dimensions, concept of dimensional analysis and common dimensionless groups, simple numerical problems.

(12 Hrs)

Unit-III

Study of Process Parameters and Gas Laws: Process parameters, temperature, volume, pressure, viscosity, density, solubility, specific gravity, thermal properties, Gas Laws- Boyle's Law, Charles's Law, Dalton's Law, Graham's Law, Ideal gas equation and Vander Wall's equation and their relevant applications in different chemical processes and numerical based on these laws. Effect of pressure, volume and temperature on various processes.

(10 Hrs)

Unit-IV

Material and Energy Balance: Simple material balance, simple energy balance.

(10 Hrs)

Recommended Books:

1. Chemical Process Principles (Part-I) by Hougen and Wastson, Wiley International Edition.
2. Elementary Chemical Engineering by Peters, McGraw Hill Publication.
3. Introduction to Chemical Engineering by Anderson, McGraw Hill Publication.
4. Unit Operations of Chemical Engineering by McCabe & Smith, McGraw Hill Publications.
5. Introduction to Chemical Engineering by Badger and Banchemo, McGrawHill Publications.
6. Introduction to Chemical Engineering by Sanyal and Ghosal, McGraw Hill Publication.
7. Introduction to Chemical Technology by Perkinson, McGraw Hill Publications

CH-3102 ENGINEERING MATERIALS

L T P
3 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 75

Unit-I

Ferrous Metals: Important varieties of iron ores. Cast iron: types, properties and uses of cast iron. Pig iron: types of pig iron. Wrought iron: properties and uses of wrought iron. Steel: factors affecting physical properties of steel and uses of steel (no manufacturing process).

Non Ferrous Metals: Aluminum, cobalt, copper, lead, magnesium, nickel, tin and zinc, their properties and uses.

(11 Hrs)

Unit-II

Alloys: Various alloys of aluminum, copper, magnesium nickel and steel.

Ceramics: Definition of ceramic, clay: properties of clay, earthen wares and stoneware's, uses of stone wares.

Glass: Definition, classification, composition, types and properties of glass.

(10 Hrs)

Unit-III

Refractories: Definition of refractory, classification of refractories, properties of refractories. Common refractory bricks like silica bricks, fire clay bricks, dolomite bricks, high alumina bricks and carbon bricks.

Polymers: Nylon-66, nylon-6, polyesters, polycarbonates, polyurethanes, PVC, polypropylene, rubber.

(10 Hrs)

Unit-IV

Mechanical, Thermal and Electrical Properties: Tensile strength, compressive strength, shear strength, ductility and malleability. Methods of improving strength; specif heat, glass transition temperature, crystalline melting temperature, thermal conductivity; dielectric strength, dielectric constant, power loss and electrical diffusivity.

Corrosion: Principle of corrosion, types of corrosion, mechanism of wet or electro chemical corrosion, galvanic corrosion, atmospheric corrosion, pitting corrosion, wet like corrosion, microbiological corrosion, corrosion control.

(11 Hrs)

Recommended Books:

Text Books

Introduction to Engineering Materials by Aggarwal, TMH

Reference Books

Materials in Industry by W.J. Patton, Prentice Hall Publication.

Material Science by Narula, TMH

Elements of Metallurgy by HS Bawa, TMH

CH-3201 MECHANICAL OPERATIONS

L T P
2 1 0

Sessional Marks: 25
End Term Examination Marks: 50

Unit-I

Solid Handling: Classification of solid particles, properties of particulate masses, storage of solids, transportation of solid materials, hydraulic and pneumatic conveying equipments.

(08 Hrs)

Unit-II

Size reduction: Principles of size reduction, determination of mean particles size, size distribution equations, laws of crushing and grinding, Kick's Law, Bond's Law and Rittinger's Law. Classification of industrial mills such as ball mill, fluid energy mill, jaw crusher and blake crusher; chippers, choppers and cutters.

(08 Hrs)

Unit-III

Separation techniques: Industrial screening, effectiveness of screen, methods of solid, solid, solid-liquid, solid-gas separation, mixing of solids and pastes, filtration, centrifugation and cyclone separators.

(07 Hrs)

Unit-IV

Settling: Elutriation, classification and sedimentation, flow of fluids past solid; fluidization, Stoke's Law, free and hindered setting, types of thickness; batch and continuous and their industrial applications.

(07 Hrs)

RECOMMENDED BOOKS:

TEXT BOOKS:

Unit Operation of Chemical Engineering by McCabe & Smith, McGraw Hill Publications.

REFERENCE BOOKS:

1. Chemical Engineering, Vol. I & II by Coulson and Richardson, Pergamon Press Publications.
2. Introduction to Chemical Technology by Badger & Banchero, McGraw Hill Publications.
3. Fluid Mechanics and its Applications by Gupta & Gupta, Wiley Eastern Publications.
4. Principles of Unit Operations by Foust, John Wiley Publications.

CH-3202 FLUID FLOW OPERATIONS

L T P
3 1 0

Sessional Marks: 25
End Term Examination Marks: 75

Unit-I

Fluid Properties: Various types of flow, steady and unsteady flow, uniform and non-uniform flow, stream line flow, laminar and turbulent flow. Types of fluid, compressible and incompressible fluid, Newtonian and non-Newtonian fluid. Physical properties of fluids.

(11 Hrs)

Unit-II

Flow through the pipes and channels, concept of boundary layer. Continuity equation, Bernoulli's theorem and its application (without correction factor) and Reynolds number, Skin friction and form friction, Dimensional analysis, Fanning factor, frictional losses in pipes and fittings.

(10 Hrs)

Unit-III

Fluid Meters & Flow Measurement: Fluid pressure, various types of manometers, Pilot tube, Introduction to variable head meters and variable area meters. Wet gas meter, magnetic flow meter and anemometer, Simple numerical problems related to these topics.

(10 Hrs)

Unit-IV

Fluid-Moving Machinery: Pumps, construction and performance of centrifugal pump, reciprocating pump, rotary pump, characteristics curves of centrifugal pump, cavitations, Net positive suction Head & Priming. Selection and specification of pumps. Blowers and compressors.

(11 Hrs)

Recommended Books:

Text Books:

1. Fluid Mechanics and its Applications by Gupta & Gupta, Wiley Eastern Publications.
2. Unit Operations of Chemical Engg. Vol. I by P. Chattopadhyay, Khanna Publishers.

REFERENCE BOOKS:

1. Chemical Engineering, Vol. I & II by Coulson and Richardson, Pergamon Press Publications.
2. Unit Operation of Chemical Engineering by McCabe & Smith, McGraw Hill Publications.
3. Introduction to Chemical Technology by Badger & Banchemo, McGraw Hill Publications.
4. Principles of Unit Operations by Foust, John Wiley Publications.
5. Unit Operations by Brown, John Wiley Publications.

CH-3203 HEAT TRANSFER

L T P
2 1 0

Sessional Marks: 25
End Term Examination Marks: 50

Unit-I

Modes of Heat Transfer: Conduction, convection and radiation

(09 Hrs)

Conduction: Fourier's Law, Thermal resistance, thermal conductivity of materials, one-dimension steady state heat conduction through composite walls, cylinders, spheres. Insulation and insulating materials, critical thickness of insulation, physical properties of insulating materials. Concept of unsteady state heat transfer.

(10 Hrs)

Unit-II

Convection: Concept of heat transfer coefficient, Free and forced convection, Significance of dimensionless groups such as Reynolds number, Prandtl's number, Nusselt's Number, Stanton number and Grashof number. Empirical correlations for free and forced convection. Heat transfer with phase change.

(08 Hrs)

Unit-III

Radiation: Laws of radiation, Black body, Grey body, angle factor, view factor. Exchange of radiant heat between black bodies, grey bodies. Radiation from gas and vapour, Radiant exchange between gray surfaces, Radiant flux, Radiation intensity.

(07 Hrs)

Unit-IV

Heat Exchange Equipments: General discussion about various types of heat exchangers, evaporators, condensers and furnaces.

(03 Hrs)

Recommended Books:

Text Books:

Heat & Mass Transfer by D.S. Kumar, S.K. Kataria & Sons

Reference Books:

1. Process Heat Transfer by Kern, McGraw Hill Pub.
2. Heat Transfer by McAdams, McGraw Hill Pub.
3. Principles of Heat Transfer by Kreith, Harper & Row Publications.
4. Unit Operations of Chemical Engineering by McCabe & Smith, McGraw Hill Pub.
5. Heat Transfer by Chapman, Macmillan Publications.

CH-3204 CHEMICAL TECHNOLOGY-I

L T P
2 1 0

Sessional Marks: 25
End Term Examination Marks: 50

Unit-I

Fertilizer: Major components in fertilizer, process description, raw materials, flow sheet and major engineering problems associated for the following processes: Ammonia, Urea, Ammonium Nitrate, Ammonium Phosphate. Coal Based Industries: Coal carbonization, aromatic compounds, destructive distillation of coal, coal chemicals.

(07 Hrs)

Unit-II

Chloro- Alkali Industry: Definition of electro-chemistry, manufacture of soda ash by Solvay process, manufacturing of chlorine and caustic soda by diaphragm and mercury cell, advantages and dis-advantages of diaphragm & mercury cell, membranes.

(07 Hrs)

Unit-III

Glass Industry: Definition of glass, general composition of glass, raw material required detailed methods of manufacture of glass, manufacture of special glasses viz. fused silica glass, high silica glass, color and coated glasses and safety glasses.

(07 Hrs)

Unit-IV

Inorganic Acids & allied industries: Detailed flow sheet, raw material requirement, industrial applications and major engineering problems associated for the following processes: Sulfuric acid, Hydrochloric acid and Nitric acid.

Cement: Definition of cement and Portland cement, major cement industries in India, composition of Portland cement, process description, raw material, flow sheet and major engineering problems associated with the dry processes for manufacturing of Portland cement.

(09 Hrs)

Recommended Books:

Text Books:

A Text Book of Chemical Technology, Vol. I by G.N. Pandey, Vikas Publications.

REFERENCE BOOKS:

1. Outlines of Chemical Technology by Dryden, East West Press Publications.
2. Chemical Process Industries by Shreve, McGraw Hill Publications.

CH-3205 INDUSTRIAL STIOCHIOMETRY

L T P
3 1 0

Sessional Marks: 25
End Term Examination Marks: 75

Unit-I

Basic Chemical Calculations: Units and dimensions, conversion factors, method of expressing composition, chemical formula, chemical stoichiometric equations, gas laws (for ideal and real gases), Raoult' Law for ideal solutions, Henry's Law.

(11 Hrs)

Unit-II

Material Balance (Steady State): Key components, techniques of problem solving, material balance problems with or without chemical reactions, bypass, recycle and purge systems.

(10 Hrs)

Unit-III

Energy Balance (Steady State): First Law of thermodynamics, heat effects, heat capacities of solid, liquid, gases and solutions, heat of formation, heat of combustion, heat of dissolution, heat of reaction, heat of fusion, heat of vaporization.

(11 Hrs)

Unit-IV

Stoichiometry & Unit Operations: Applications of stoichiometric calculations to chemical engineering processes/operations such as distillation, humidification, evaporation, crystallization and drying.

(10 Hrs)

Recommended Books:

Text Books:

Basic Principles and Calculation in Chemical Engineering by Himmelblau, Prentice Hall Publications.

Reference Books:

1. Chemical Process Principles by Hougen & Watson, Wiley International Edition.
2. Industrial Stiochiometry by Bhatt & Vohra, Tata McGraw Hill Pub.
3. Industrial Stiochiometry by Lewis & Lewis, McGraw Hill Publications.
4. Solved Examples in Chemical Engineering by G.K. Ray, Khanna Publications.

CH-3206 MASS TRANSFER

L T P
2 1 0

Sessional Marks: 25
End Term Examination Marks: 50

Unit-I

Mass Transfer: Mass Transfer operations and their applications, molecular diffusion, eddy diffusion, diffusion of solids.

(07 Hrs)

Unit-II

Distillation: Relative volatility, vapor liquid equilibrium, various distillation methods: flash distillation, batch distillation, continuous distillation, steam distillation. Introduction to azeotropic, extractive distillation. Different types of distillation columns, concept of flooding, weeping, entrainment and loading in distillation columns.

(08 Hrs)

Unit-III

Gas-Liquid, Liquid-Liquid and Solid-Liquid Operations: Principles and equipments for absorptions, extraction, leaching and humidification.

(07 Hrs)

Unit-IV

Crystallization: Study of various factors effecting crystallization. Nucleation, crystal growth, size and shape variation of different materials during crystallization, types of crystallizers.

Drying: Principles of drying operations and drying equipments, industrial applications of drying.

(08 Hrs)

Recommended Books:

Text Books:

Mass Transfer Operations by Treybal, Kogakusha Publications.

Reference Books:

1. Introduction to Chemical Engineering by Badger & Banchero, McGraw Hill Publications.
2. Unit Operations of Chemical Engineering by McCabe & Smith, McGraw Hill Publications.
3. Mass Transfer by Sherwood Pigford & Wilke, McGraw Hill Publications.
4. Chemical Engineers Handbook by Perry, McGraw Hill Publications.

CH-4101 ENVIRONMENTAL ENGINEERING & SAFETY

L T P
3 1 0

Sessional Marks: 25

End Term Examination Marks: 75

Unit-I

Introduction: Concept of clean environment, different type of effluents from Chemical and food industries, techniques for measurement of different types of pollutants, reporting of effluent discharge, effect of chemical pollution on ecology and environment.

Liquid Effluents/Water Pollution: Different parameters used to measure liquid effluent discharge, different treatments for testing the liquid effluents, primary, secondary and tertiary treatment methods for effluent, different types of equipments used for treatment of liquid effluents with principles, mechanical details, installation details and applications, BOD, CODD, analysis. (12 Hrs)

Unit-II

Air Pollution: Types, sources and effects of air pollutants, different parameter used to measure gas discharge, different treatments for combating air pollution, various techniques and equipment used for controlling air pollution. For such equipment – basic principles, mechanical details, installation details and applications.

Sold Waste management: Classification of reuse materials, types, sources and properties of solid wastes, abatement methods.

(10 Hrs)

Unit-III

Legislation to control the Environment: The relevant Acts passed by Indian Parliament and Laws framed by Government of India, Law enforcing Agencies.

Environmental Impact Assessment: Environmental impact assessment as a result of activities like industry, housing, dams, multistoried buildings, and other constructional activities. Deforestation and its impact.

(10 Hrs)

Unit-IV

Safety: Importance of safety in chemical industry, knowledge of statutory required for labor and industry.

Toxic Gases/Chemicals: Threshold limit values, hazards from wastes and gases/chemicals, symptoms and their remedial action.

Fire and Preventions: Fire triangle, classification of fires, flammable/inflammable liquids, various types of fire extinguishers and their applications.

Noise Pollution: Sound analysis, units of sound and noise, effect of thunder and typical sound on human beings, control of noise and apparatus used.

(10 Hrs)

Recommended Books:

1. Safety 7 Accident Prevention in Chemical Operation by Fawelt and Wood, Inter Science Pub.
2. Chemical Engineering, Vol. I-IV, by Coulson & Richardson, Pergamon Press Pub.
3. Air Pollution by Perkins, McGraw Hill Pub.
4. Fundamentals of air-Pollution by Williamson, Addison Wesley Pub.
5. Liquid Wastes of Industries by Nemerow, Addison Wesley Pub.
6. Waste Water Engineering by Metcalf and Eddy, McGraw Hill Pub.

CH-4102 CHEMICAL ENGINEERING THERMODYNAMICS

L T P
3 1 0

Sessional Marks: 25
End Term Examination Marks: 75

Unit-I

Basic Concept: Concept of enthalpy, internal energy, entropy, free energy and equilibrium. Laws of thermodynamics. Volumetric properties of fluids, heat effects, heat conduction in gases and liquids, Thermal conductivity of gases and liquids.

(11 Hrs)

Unit-II

Thermodynamics Properties of fluids: Properties of homogeneous mixtures; partial molar properties, fugacity, fugacity coefficient, chemical potential, activity coefficient.

(10 Hrs)

Unit-III

Phase Equilibria: Vapor liquid equilibria, dew point and bubble point and their calculations for two phase systems, Gibbs Duhem equation.

Chemical Reaction Equilibria: Clausius-clapeyron equation.

(10 Hrs)

Unit-IV

Refrigeration and Liquification: Various cycles of refrigeration. Carnot vapor compression, vapor absorption, Concept of solar refrigeration. Liquification process cycles, coefficient of performance, Choice of refrigerant, properties of refrigerant.

(11 Hrs)

Recommended Books:

Text Books:

Introduction to Chemical Engineering Thermodynamics by Smith & Van Ness, McGraw Hill Pub.

Reference Books:

1. Chemical & Process Thermodynamics by Kyle, Prentice Hall Publications.
2. Chemical Engineering Thermodynamics by YVC Rao, Universities Press Publications.
3. Chemical Engineering Thermodynamics by Dodge, McGraw Hill Publications.

CH-4103 CHEMICAL TECHNOLOGY-II

L T P
3 1 0

Sessional Marks: 25
End Term Examination Marks: 75

Unit-I

Fats & Oils: Chemical composition and physical properties of oils and fats. Process description of solvent extraction with flow sheet. Flow sheet, chemical reaction, raw material required, process description and major engineering problems associated with hydrogenation of oil.

Paint & Varnish: Definition of paint and varnish, Constituents of paints and varnishes. Enamel and constituents of enamel. Special paints viz Luminescent paint, heat resistant paint and fire retardant paint.

(10 Hrs)

Unit-II

Polymer: Definition, degree of polymerization, types of polymerization, physical properties of polymers, classification of polymers, process description of manufacture of polyethylene, PCV and Teflon.

Sugar Industry: Process description, flow sheet and major engineering problems associated with the manufacturing of sugar from sugarcane, sugar by-product utilization.

(11 Hrs)

Unit-III

Rubber: Classification of rubber, pertinent properties of rubber polymers, vulcanization of rubber manufacture of Butadiene and Styrene, Butadiene Rubber (SBR), Manufacture of Nylon 66 with flow sheets. Industrial applications of rubber.

Petroleum: Introduction, origin and composition of petroleum, classification of crude petroleum, refining of petroleum, uses of petroleum products, petroleum refining in India, definition of Octane number and Cetane number.

(11 Hrs)

Unit-IV

Paper Industry: Definition, types of paper product, raw materials required like bamboo, agricultural waste residue, baggase, and recycled fibers. Various additives and speciality chemicals like sizing materials, sizing materials, dry and wet strength additives, surface treatment additives and fillers used for paper making.

(10 Hrs)

Recommended Books:

Text Books:

Outlines of Chemical Technology by Dryden, East West Press.

Reference Books:

1. Chemical Process Industries by Shreve, McGraw Hill Publications.
2. A Textbook of chemical Technology, Vol.-II by G.N. Pandey, Vikas Publications.

CH-4104 CHEMICAL REACTION ENGINEERING

L T P
3 1 0

Sessional Marks: 25
End Term Examination Marks: 75

Unit-I

Kinetics of Homogeneous Reactions: Introduction to different chemical reactions, fundamentals of Chemical reaction equilibrium, order of reaction, molecularity, effect of temperature and pressure on equilibrium constant.

(10 Hrs)

Unit-II

Variable affecting reaction rate: zero order, first order, second order and higher order reactions for irreversible and reversible reactions: Residence time, space time and space velocity. Representation of a Reaction rate, kinetic models for non-elementary reactions, temperature dependent term of a rate equation, Activation energy and temperature dependency.

(12 Hrs)

Unit-III

Different Reaction Vessels: Introduction to single and multiple reactions, different types of reactors and their applications: Exposure to ideal and non-ideal reactions in different types of reactors and ideal reactors.

(10 Hrs)

Unit-IV

Steady state mixed flow reactor, steady state plug flow reactor, holding time and space time for flow systems.

(10 Hrs)

Recommended Books:

Text Books:

Chemical Reaction Engineering by Levenspiel, John Wiley Publications.

REFERENCE BOOKS:

1. Chemical Engineering Kinetics by Smith, McGraw Hill Publications.
2. Elements of Chemical Reaction Engineering by Fogler, Prentice Hall Publications.
3. Reaction Kinetics for chemical Engineers by Wales, McGraw Hill Publications.
4. Chemical Reaction Theory – An Introduction by Denbigh & Turner Cambridge University Press Publications.

CH-4105 PROCESS INSTRUMENTATION

L T P
3 1 0

Sessional Marks: 25
End Term Examination Marks: 75

Unit-I

Importance of instruments in chemical process industries: general classification of instrument. Indicating and recording type instrument, Description and construction details, working principle, range and application of following instruments.

Pressure and Vacuum Gauge: Liquid column gauge, bourdon tube gauge.

Thermometer and Pyrometer: Liquid expansion thermometer, bimetallic thermometer, thermocouple, resistance thermometer, optical and radiation pyrometer.

(11 Hrs)

Unit-II

Liquid Level Meter: visual indicators, float actuated level meter, static pressure instrument, Flow meter orifice, venture, pitot tube, rotameter.

Analyzer: pH meter, chemical composition analyzer, various types of analyzers, oxygen analyzer and infra-red analyzer, orsat analysis.

(10 Hrs)

Unit-III

Transmission: Pneumatic and electrical transmission (inductance transmission only) and their fields of application, Process instrumentation, recording instruments, indicating and recording instruments, transmission of instrument reading, control centre, instrumentation diagram, instrumentation in modern chemical plant.

(11 Hrs)

Unit-IV

Basic concept of process control, types of controllers and control valves.

(10 Hrs)

Recommended Books:

Text Books:

Industrial Instrumentation and Control by S.K. Singh, Tata McGraw Hill Pub.

Reference Books:

1. Principles of Industrial Instrumentation by D. Patranabis, Tata McGraw Hill Pub.
2. Principles of Process Control by D. Patranabis, Tata McGraw Hill Pub.
3. Industrial Instrumentation by Eckman, Wiley Eastern Publication.
4. Process System Analysis and Control by Coughnour, McGraw Hill Pub.

CH-4106 A FERMENTATION TECHNOLOGY

L T P
3 1 0

Sessional Marks: 25
End Term Examination Marks: 75

Unit-I

Introduction: Fundamentals of Micro-organisms, types of Micro-organisms, Definition of Fermentation, Types of Fermentation Process, different substrates.

Products Recovery Operations: Recovery of cells and solid particles by filtration, centrifugation decantation and chromatographic separation.

(11 Hrs)

Unit-II

Fermenters: Definition, design, different types of agitators, impellers, aerators, baffles, process control and function of various types of fermenters.

(10 Hrs)

Unit-III

Technology of Fermented Products: Production of ethanol, beer, glutamic acid, vitamins, penicillin, citric acid production.

(10 Hrs)

Unit-IV

Immobilization Technology: Definition, Cell immobilization, types of different supports/matrices used, methods of immobilization a general account.

(11 Hrs)

Recommended Books:

Text Books:

1. Industrial Microbiology by Prescott and Dunn, CBS Publications.
2. Industrial Microbiology by Casida, AVI Publication.
3. Enzyme Technology by Deman, CBS Publication

CH-4106 B AGRO RESIDUE UTILIZATION

L T P
3 1 0

Sessional Marks: 25
End Term Examination Marks: 75

Unit-I

Classification: Rice husk, wheat straw, rice straw, grass, bagasse, biomass from sea. (10 Hrs)

Unit-II

Characterization: Calorific value, ash content, density, size. (11 Hrs)

Unit-III

Applications: Chemicals: Furfural, alcohol, cellulose, silica and silica chemicals. (10 Hrs)

Unit-IV

Commercial: wood, paper, paper board, packing material.
Fuels: degasifiers, internal combustion engine, carbonization. (11 Hrs)

Recommended Books:

1. Pulp & Paper by McDonald, Tappi Press Publications.
2. Sugar Industry by Product Utilization by Patureau.

CH-4106 C COMBUSTION TECHNOLOGY

L T P
3 1 0

Sessional Marks: 25
End Term Examination Marks: 75

Unit-I

Classification, Source and Characterization of fuels: Conventional; solid fuels, coal, coke, wood. Liquid fuels; petroleum based. Gaseous fuels: water gases. Natural gas, producer gas, LPG, CNG, LPN.

(10 Hrs)

Unit-II

Non-conventional : rice husk, bagasse, methanol, biogas, ethyl alcohol.

(10 Hrs)

Unit-III

Storage and Handling of Fuels: Basics of combustion; stoichiometry of combustion, air fuels ratio, fuel gas analysis, calorific value, flame temperature calculations.

(11 Hrs)

Unit-IV

Combustion equipments: Burners for gaseous, liquids and pulverized solid fuels. Gratos, draughts; natural, induced, forced and balanced draughts. Stack; stack height. Heat recovery equipments; economizers, preheaters and super heaters.

(11 Hrs)

Recommended Books:

1. Fuels, Furnaces and Refractories by OP Gupta, Khanna Publications.
2. Fuels and Furnaces by Grishold
3. Industrial Stiochiometry by Bhatt & Vohra., Tata McGraw Hill Publications
4. Fuels and Furnaces by Brame & King
5. Coal, Coke and coal chemicals by P.L. Wilson & J.H. Wells, Tata McGraw Hill Pub.

CH-4106 D CORROSION ENGINEERING

L T P
3 1 0

Sessional Marks: 25
End Term Examination Marks: 75

Unit-I

Introduction: Fundamentals of corrosion, corrosion and pitting.

Types of Corrosion: Corrosion by oxidation and reduction, atmospheric corrosion, aqueous and non-aqueous corrosion.

(10 Hrs)

Unit-II

Prevention & Control: Passivation, cathodic and anodic protection, heat treatment.

(10 Hrs)

Unit-III

Protection: Metals and alloys and their corrosion and fabrication, characteristics for process plant application, glass and glass lined equipment. Application of bricks, ceramics and cement in process industries, FRP, plastics and elastomers, paints & protective coatings.

(10 Hrs)

Unit-IV

Case Studies: Fertilizer plant, sugar mill, paper plant, shipping industry.

(10 Hrs)

Recommended Books:

Text Books:

Engineering Chemistry by Jain & Jain, Dhanpat Rai Publications.

REFERENCE BOOKS:

1. Materials in Industry by W.J. Patton, Prentice Hall Publications.
2. Pitman Metallurgical Series by SISCO F.T., Advisory Editor, Pitman Publications.
3. Fundamentals of Engineering Metallurgy by F.W. Bailey, Cassel Publications.

CH-4107 INSTRUMENTATION AND PROCESS CONTROL

L T P
3 0 0

Sessional Marks: 25
End Term Examination Marks: 50

UNIT-1

Introduction: importance of instruments in process industries, classification of instruments, static and dynamic characteristic of instrument.

Instruments for temperature measurement: thermometer, thermocouple, thermister and pyrometer, application and working (10hrs)

UNIT-II

Instruments for pressure measurements: use of manometers, bourdan gauge, measurement of vacuum and pressure, liquid level measurement-direct and differential method (10hrs)

UNIT-III

Instruments for miscellaneous measurements: measurements of nuclear radiation, instruments for gas analysis, viscosity, conductivity, humidity and PH-value, Industrial weighing and feeding systems. (10hrs)

UNIT-IV

Controls: Concept of automatic process control and its classification. Types of controller and their applications, instrumentation and control of Units like reactors and evaporators (10hrs)

RECOMMENDED BOOKS

Sr. No.	AUTHOR	TITLE	PUBLISHER
1	Harriott & peter	Process control	Tata McGraw Hill
2	Donald P. Eckman	Industrial instrumentation	Wiley Eastern
3	Coughanour	Process system analysis & control	Tata McGraw Hill
4	Pollard	Process control for chemical And allied industries	Heinemann
5	Weber	Introduction to process Dynamics & control	John Wiley

CH-4201 PETROLEUM TECHNOLOGY

L T P
3 1 0

Sessional Marks: 25
End Term Examination Marks: 75

Unit-I

Origin of Petroleum: Mendeleev & Englers theories, composition of petroleum, India oil fields, composition of Indian crude, Physical Properties of Crude and Products.

(10 Hrs)

Unit-II

Evaluation of oil stock: Power number, octane, cetane number, Flash point, Fire point, Viscosity index, Pour point, cloud point, inorganic acidity, organic acidity, Base of crude oil characteristics factor – T.B.P. apparatus, Gravity mid percent curve, yield curve. Equilibrium flash vaporization curve. ASTM distillation characteristics of products. ASTM end points & T.B.B. cut point.

Processing of Crude: Desalting & dehydration of crude. Topping, atmospheric and vacuum distillation.

(12 Hrs)

Unit-III

Cracking and Reforming: Importance cracking and reforming reaction, Thermal cracking, Fixed bed, moving bed and fluidized bed catalytic cracking. Catalytic reforming processes like polyforming and hydro forming.

Conversion of petroleum gases into motor fuels with special reference to Alkylation, Polymerization and isomerization.

(10 Hrs)

Unit-IV

Treatment Processes: Chemical Extraction, selection of solvent, Edeleanun process. Furfural Process, Solvent extraction, Sweetening Processes and desulfurization, Characteristics of important products like gasoline, kerosene, diesel, jet fuels and lubricating oils.

(10 Hrs)

Recommended Books:

1. Petroleum Refinery Engineering by W.L. Nelson.
2. Petroleum Processing by R.J. Hengsbeck.

CH-4203 A POLYMER TECHNOLOGY

L T P
3 1 0

Sessional Marks: 25
End Term Examination Marks: 75

Unit-I

Polymer Science: Classification of polymers, average molecular weight, Number average, weight average, viscosity average, z. average, measurement of these average molecular weights, polymerization techniques.

(10 Hrs)

Unit-II

Addition polymerization: free radical, anionic, cationic, coordinate; condensation polymerization; catalytic and without catalyst. Kinetics with catalyst/without catalyst; chain retarders, inhibitors; Copolymers: copolymer equation and application of copolymers.

(10 Hrs)

Unit-III

Polymer Characterization: Analytic: acid value, Hydroxyl value, specification, iodine no. instrumental; viscosity, GPC, FTIR, UV, NMR, Atomic absorption, Thermal Properties: Tg, Tm TGA, DSC, thermal conductivity, specific heat, Mechanical: Tensile strength, compressive, impact, Flexural.

(10 Hrs)

Unit-IV

Polymer Technology: Curing of Polymers, Polymer processing such as injection molding, compression molding, blow molding, extruders, rotational molding, thermoforming, calendaring, spinning.

(10 Hrs)

Recommended Books:

Text Books:

Polymer Science by V.R. Gowariker, New Age International (P) Ltd.

Reference Books:

1. Principles of Polymerization by G. Odian, McGraw Hill Publications.
2. Plastic Materials by Brydson, Butterworths Publications.

CH-4203 B PAPER TECHNOLOGY

L T P
3 1 0

Sessional Marks: 25
End Term Examination Marks: 75

Unit-I

Introduction: General description of pulp and paper from the end use point of view. Broad categorization, writing and printing grades, packaging grades, specialty paper, introduction to paper properties.

(10 Hrs)

Unit-II

Raw Materials: Availability and consumption trends for different raw materials, forest based raw materials like wood, and bamboo, agricultural waste residue, bagasse, recycled specially in the Indian context.

(11 Hrs)

Unit-III

Additives: Various additives and specialty chemicals like sizing materials, dry and wet strength additives, surface treatment additives and filters used for paper making. Process utilities: viz. water stream.

(10 Hrs)

Unit-IV

The integrated Pulp and paper Mill: Flow diagram of an integrated pulp and paper mill showing the sequence of operations and the point of input of various ingredients, Brief description of each process step with emphasis on important process parameters.

(11 Hrs)

Recommended Books:

Text Books:

Handbook for Pulp and Paper Technology by Smook, TAPPI Publications.

REFERENCE BOOKS:

1. Pulp and Paper Chemistry & Chemical Technology, Vol. 1 & 3 by Casey, Wiley Eastern Publications.
2. Pulp and Paper Manufacture, Vol. 1 by McDonald, TAPPI Publications.
3. Handbook of Physical and Mechanical Testing of Paper & Board, Vol. 1 & 2 by Mark, Dekker Publications.
4. Pulp & Paper Manufacture by Kocurek, TAPPI Publications.

Unit-I

Introduction: Demand and supply in India, Overview of Sugar Industry in India, Development of various sugar rates.

Sugar Raw Materials: Introduction of variety of canes, canes preparation, extraction of cane juice from canes.

(10 Hrs)

Unit-II

Purification Processes: Classification of juice, settling process, filtration, preparation of thick juice, bleaching process, crystallization of thick juice, separation of crystal from mother liquor, drying of sugar crystals, conveying of sugar, bagging of sugar.

(12 Hrs)

Unit-III

Chemical Control: Chemical Control for sugarcane juice, syrup and molasses, Preparation of Ethyl alcohol, Preparation of molasses, fermentation of molasses, distillation of molasses.

(10 Hrs)

Unit-IV

Baggase as a raw material for paper production.

Power Generation: Steam generation by baggasse, generation of power from stream.

(10 Hrs)

Recommended Books:**Text Books:**

Sugar Technology by Peter Honing.

Reference Books:

1. Sugarcane Handbook by Miade and Chen
2. Cane Sugar Engineering by E. Hugot.
3. Sugarcane by product Utilization by Paterau.

CH-4203 D ALTERNATE ENERGY SOURCES

L T P
3 1 0

Sessional Marks: 25
End Term Examination Marks: 75

Unit-I

Introduction: Importance of alternate sources of energy, present scenario, future prospects, economic criteria.

Hydro Energy: Hydro-Electric power plants..

(10 Hrs)

Unit-II

Solar Energy: Photovoltaic cell, electricity generation, solar water heaters, solar furnaces, solar cookers, solar skills.

Wind Energy: Wind mills, electricity generation from wind.

(11 Hrs)

Unit-III

Geothermal and Tidal Energy: Steam generation and electricity generation.

Bio-Energy: Biomass, Power Generation by using gasifiers.

(11 Hrs)

Unit-IV

Biogas Plants, Smokeless Chulhas.

(10 Hrs)

Recommended Books:

Text Books:

Reviews of Renewable Energy Sources, Vol. 3 Ed. By M.S. Sodha, S.S. Mathur, M.A.S. Malik, T.C. Kandpal, Wiley Eastern Limited, New Delhi.

Reference Books:

1. Solar Energy – Principles of Thermal collection and storage by S.P. Sukhatme, Tata McGraw Hill Publications.
2. Solar Energy Utilization by G.D. Rai, Khann Publishers, New Delhi.
3. Energy Today and Tomorrow by Maheshwar Dayal, Publications Division, Ministry of Information and Broadcasting, Govt. of India, New Delhi.

CH-4204 PROCESS EQUIPMENT DRAWING AND DESIGN

L T P
3 1 0

Sessional Marks: 25
End Term Examination Marks: 75

Unit-I

Process Equipment Drawing: Diagrammatic preparation & drawing of chemical processing equipments – driers, reboilers, heat exchangers, distillation columns, evaporators. (10 Hrs)

Unit-II

Symbols & Line Diagrams: Symbols and line diagrams of process instruments used to chemical process industry, color codes in chemical process industry. (10 Hrs)

Unit-III

Process Equipment Design: Thickness calculations of low and high pressure vessel, design of vessels under vacuum, calculation of economical pipe diameter for liquids and gases. (12 Hrs)

Unit-IV

Design calculations of heat exchangers, evaporators and distillation column. (10 Hrs)

Recommended Books:

Text Books:

1. Chemical Equipment Design by Bhattacharya, CBS Publishers and distributors.
2. Outlines of Chemical Technology by Dryden, East-West Press (P).

Reference Books:

1. Applied Process Design for Chemical and Petrochemical Plants (Vol. 1,2 and 3) by Ludwig, Gulf Publications.
2. Process Equipment Design by Joshi, McMillar India Ltd.
3. Process Equipment Design by Brownell and Young, John Wiley Publications.
4. Plant Design and Economics for Chemical Engineers by Peter M.S. and Timmerhaus K.D., McGraw Hill Publications.

CS-3101 INTERNET AND ITS APPLICATIONS

L T P
3 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 75

UNIT- I

Concept and evolution of Internet, Working of Internet, Specification and technical details for establishing Internet, ISPs, domain name, DNS and introduction to DNS server

(10 Hrs)

UNIT- II

Introduction to IP addressing, TCP/IP, HTTP, FTP, SMTP, Telnet, Usenet, IRC, e-mail, snail mail, spam, freeware, shareware, adware, malware, spyware, blog, web bot, Formation of virtual community on internet , Security threats: viruses, worms and trojan, phishing, firewalls and gateways

(15 Hrs)

UNIT-III

Concept of world wide web and its evolution, web page, web browser, web hosting and web server, web portals, hypertext, hyperlinks and hypermedia, address formation on internet, URL, using search engines

(15 Hrs)

UNIT- IV

Internet in education, banking, reservation etc.

E-commerce: introduction to B2B and B2C, shopping cart, online shopping, selling products and services, Introduction to Video Conferencing and E-governance

(08 Hrs)

Recommended Books:

Title	Author(s)	Publishers
Text		
Internet 6-in-1	Kraynak and Habraken,	PHI, New Delhi
Using the Internet IV edition	Kasser	PHI, New Delhi
References		
Internet fundamentals	Curt Robbins	DDC
Using the World Wide Web	Wall,	PHI, New Delhi
HTML – 4 for WWW	Castro Addison	Wesley (Singapore) PVT. LTD.

CS-3102 PROGRAMMING METHODOLOGY

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

UNIT- I

Algorithms and Program Development : Steps in development of a program, Flow Chart, Algorithm Development, Program debugging.

Program Structure : I/O statements, assignment statements; variables; arithmetic logical and relational operators – their precedence. Data types, logical and relational operators, standard I/O functions, formatted I/O.

Control Statements : For statement, if-then-else, while, do-while, break, switch statements.

(12 Hrs)

UNIT-II

Functions and Arrays : Function declaration, parameters, parameter passing, call-by-value, call-by- reference, storage classes (local, global and static variables), function prototype, Single and multi-dimensional arrays, character arrays.

(12 Hrs)

UNIT-III

Pointers : Introduction to Pointers and Pointers to various data types.

(12 Hrs)

UNIT-IV

Introduction to Structures : Definition of a structure, pointers to structures, union, arrays of structures.

(12 Hrs)

Recommended Books

Text

Title

Programming in C

Author(s)

R Subburaj

Publishers

Vikas Publishing, New Delhi

Reference

Programming with
C Language

Balaguruswami

TMH, New Dehli

Let Us C

Yashwant Kanetkar

BPB Publication, New Delhi

CS-3103 INTRODUCTION TO OPERATING SYSTEMS

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

UNIT- I

Introduction : A brief history of Operating system, definition, Operating system classification; single user, multi-user, Batch Processing, Time-sharing, Real time and Multi-processing Operating systems.

(12 Hrs)

UNIT- II

MS-DOS structure, boot sequence: Os files, Command Processor, booting from floppy and Hard Disk (HD), warm and cold reboot, Introduction to Windows, history, creation and running of application, saving, moving, copying of files and folders.

(12 Hrs)

UNIT- III

Internal and external DOS Commands, Config, Batch and Autoexec.bat Files. Introduction to Unix/ Linux, Basic shell commands of Unix/Linux.

(12 Hrs)

UNIT- IV

Introduction to Assembler, Linker, Loader, Macroprocessor, Interpreter, Compiler.

(12 Hrs)

Recommended Books

Text

Title

Ms DOS

Author(s)

Petret Norton

Publishers

BPB Publications

Reference

Operating System

Silberschatz and Galvin

Wiley

CS-3201 COMPUTER PROGRAMMING

L T P

Sessional Marks : 25

2 0 0

End Term Examination Marks: 25

UNIT- I

(12)

Algorithms and Program Development

Steps in development of a program, Flow Chart, Algorithm Development, Program debugging.

Program Structure

I/O statements, assignment statements; variables; arithmetic logical and relational operators – their precedence. Data types, logical and relational operators, standard I/O functions, formatted I/O.

Control Statements

For statement, if-then-else, while, do-while, break, switch statements.

UNIT-II

(12)

Functions and Arrays

Function declaration, parameters, parameter passing, call-by-value, call-by- reference, storage classes (local, global and static variables), function prototype, Single and multi-dimensional arrays, character arrays.

UNIT-III

(12)

Pointers

Introduction to Pointers and Pointers to various data types.

UNIT-IV

(12)

Introduction to Structures

Definition of a structure, pointers to structures, union, arrays of structures.

Recommended Books

<i>Title</i>	<i>Author(s)</i>	<i>Publishers</i>
Programming in C	Text R Subburaj	Vikas Publishing, New Delhi
Programming with C Language	Reference Balaguruswami	TMH, New Dehli
Let Us C	Yashwant Kanetkar	BPB Publication New Delhi

CS-3202 INTRODUCTION TO DATABASES

L T P
3 0 0

Sessional Marks : 25
End Term Examination Marks: 50

UNIT – I

Basic Concepts : Need for data storage and retrieval, Architecture and Structure of Database Management Systems (DBMS). Data independence, Architecture of a Database system, entities, attributes relationships and their functionality.

(12 Hrs)

UNIT – II

Data Models : Relational Data Model, Network Data Model, Hierarchical Model, Relational Model. Relations, domains, attributes, keys, integrity principles.

(12 Hrs)

UNIT – III

Data Organization : Objectives of data organization, logical and physical organization, schema, sub-schema.

(12 Hrs)

UNIT –IV

Introduction to PL/SQL, Introduction to Normalization, forms, views, reports, types queries.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publishers
Text Introduction to Database Systems	CJ Date	Addison Wesley (Singapore) Pvt. Ltd., New Delhi
Reference Data Base Management Systems	Bipin C Desai	Galgotia Publications, Daryaganj, New Delhi

CS-3203 NETWORK OPERATING SYSTEMS

L T P
3 1 0

Sessional Marks : 25
End Term Examination Marks: 75

UNIT – I

Introduction to Linux Operating System : History of Linux and Unix, Linux overview, Linux releases, Open Linux. Installing Linux, Hardware, software and information requirements; opening disk space for Linux partitions; creating the open Linux install disks; installing Linux; installing and configuring X-windows; installing sound drivers. Linux Startup and Setup : User accounts; accessing the Linux system; Linux commands; online manual; online documentation; installing software packages.

(12 Hrs)

UNIT – II

Shell : The command line: special characters and file arguments; standard input/ output and redirection; pipes; redirecting and piping with standard errors; shell scripts; jobs. Linux file Structure : Linux files; file structure; listing, displaying and printing files; managing directories; file and directory operations.

(12 Hrs)

UNIT – III

v i editor : vi editing commands; advanced vi editing commands; line editing commands; options in v i
System Administration : Management, managing users; installing and managing devices

(12 Hrs)

UNIT – IV

Introduction to Windows Network Operating System : Windows network server, its features and capabilities; comparison with other servers, hardware requirements, Installing server.

(12 Hrs)

Recommended Books :

Title	Author(s)	Publishers
Text Books Linux The Complete Reference	Richard Peterson	TMH, New Delhi.
Reference Books CISCO Network Design Handbook	Michal Salvagno	IDG books, Delhi

CS-3204 SYSTEM ANALYSIS AND DESIGN

L T P
3 1 0

Sessional Marks : 25
End Term Examination Marks: 75

UNIT – I

Introduction : Concept of System, role of system analyst, system life-cycle, approaches to system development, system investigation, system analysis, analysis tools, and feasibility study.

(12 Hrs)

UNIT – II

Structured System Analysis Tools : Context diagram, DFD, data dictionary and decision tree.

(12 Hrs)

UNIT – III

System Design : Database design, input, output form design, security issues, report design.
System Testing : Concepts, issues involved in system testing and Types of testing.

(12 Hrs)

UNIT – IV

System Implementation and Maintenance, Project planning, design and control.

(12 Hrs)

Recommended Books :

Title

Author(s)

Publishers

Text Books

System Analysis and Design
Publications

EM Awad

Galgotia

Reference Books

Introduction to System
Analysis and Design

Hawryskiewicz

Prentice Pvt. Ltd.
New Delhi

CS-3207 DATA COMMUNICATIONS

L T P
3 1 0

Sessional Marks : 25
End Term Examination Marks: 75

UNIT- I

Data Communication Principles : Transmission of binary data, concepts of simplex, half duplex and full duplex modes, two and four line systems, Bit level data transfer, rate of data transfer, Byte level data communication, Synchronous communication data transfer efficiency , Synchronous communication, start-stop bits, data transfer efficiency, relative advantages and disadvantages with synchronous communication, Frame level communication, data packets, address encoding and decoding of data packets, data encryption and decryption, Serial and parallel data communications, comparison in terms of speed of data transfer

(12 Hrs)

UNIT- II

Modulation : Need for a modulation in communication systems. Concepts of AM, FM, PM, PAM, FSK, PSK, and PAM (No mathematical treatment), Concepts of bandwidth, noise and channel capacity of different communication system such as radio, microwave, different types of electrical communication lines, optical fiber systems and issues like line characteristics and impedance matching

(12 Hrs)

UNIT- III

Error Detection : Sources of errors in data communication. Effect of errors, data error rate and its dependency on data transfer rates. Error detection through parity bit, block parity to detect double errors and correct single errors, General principles of error detection and correction.

(12 Hrs)

UNIT- IV

Communication Methods and Standards : One-to-one connection, multidrop lines. Methods of implementation, channel capacities, Multiplexed lines, time division, multiplexing and de-multiplexing Concept of synchronization, synchronization methods.

(12 Hrs)

Recommended Books :

Title	Author(s)	Publishers
Text Data Communication & Networking	Behrouz A. Forouzan	Tata McGraw Hills New Delhi.
Reference Data Communications	Tenanbaum	Prentice Hall of India
Data Communications	Keshav	Addison Wesley

CS-3208 COMPUTER PERIPHERALS AND INTERFACING

L T P
3 0 0

Sessional Marks : 25
End Term Examination Marks: 50

UNIT- I

Display Devices : Video display EGA/VGA/SVGA/PCI adapters and their architecture, Overview of Raster scan, vector graphic, their main difference and relative advantages, Concept of resolution and bandwidth of monitors refreshing of screen, Explanation of working of monochrome and color monitors.

(12 Hrs)

UNIT- II

Printers : Types of printers: impact and non-impact printer; specifications and characteristics, Construction and working principles of ; Dot matrix printer, Laser Printer, DeskJet printer & Plotter.

(12 Hrs)

UNIT- III

Secondary Memories : Types of secondary memories, Online/offline memories, Online: Hard Disk drives (HDD), Drive parameters (heads, sectors cylinders), seek/latency time, access time, HDD Controller, Off Line: Magnetic tape drive; floppy disk drive (FDD); principle of operation of magnetic tape drive, access time; type of FDD, working principle of FDD, floppy disk controllers.

Other Devices : Optical Storage Media: CD Drives; Principle of operation and working; CD writer, Working principle of various input devices such as keyboards, mouse, Scanner, Tablets, touch screen, light pen, digitizers and joystick.

(12 Hrs)

UNIT- IV

Power Supply Controllers : Constant Voltage Transformer (CVT); Uninterrupted Power Supply (UPS) – Online / offline/line interactive, principle of working and maintenance, troubleshooting.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publishers
Text Fundamental of Computers	Sukhvir Singh	Khanna Publishers
Reference Inside the PC (8th Edition) Computer Today	Peter Norton Suresh K. Basandara	Tech media Publication Galgotia Publication

CS-4101 OBJECT ORIENTED PROGRAMMING

L T P
3 1 0

Sessional Marks : 25
End Term Examination Marks: 75

UNIT-I

Introduction: Need for object-oriented programming; characteristics of object-oriented languages.

C++ Programming Basics: Basic program construction, Pre-processor directives, variables, Operators, Library functions, manipulators.

Decision-making: Relational operators: loops; decisions; logical operators; other control Statements

(12 Hrs)

UNIT-II

Structures and Functions : Structure enumerated data types; functions; passing arguments to functions and returning values from functions.

Objects and Classes: C++ objects as physical objects and data types; constructor's data; strings.

Arrays: Arrays fundamentals; arrays of objects; arrays as class member data, Strings.

(12 Hrs)

UNIT-III

Inheritance and Polymorphism : Derived class and base class; derived class constructors, overriding member functions; class hierarchies; public and private inheritance; levels of inheritance; multiple inheritance

(12 Hrs)

UNIT-IV

Pointers: Addresses and pointers; pointers and arrays; pointers and functions; pointers and strings; memory management, pointers to objects

Introduction to Streams: Streams, Error Handling.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publishers
Text C++ Primer	SB Lippman	Addison Wesley and J Lajoie New Delhi
Reference Mastering C++	KR Venugopal	TMH Publishing

CS-4102 COMPUTER SYSTEM ARCHITECTURE

L T P
3 0 0

Sessional Marks : 25
End Term Examination Marks: 50

UNIT-I

Data Representation: Binary number, binary codes, fixed point representation floating point representation.

Basic Computer Organization and Design: Instruction codes, computer registers, computer instruction timing and control, instruction cycle, memory reference instructions, input-output and interrupts

(12 Hrs)

UNIT-II

Central Processing Unit: Introduction, general register organization, stack organization, instruction formats, addressing modes

Computer Arithmetic: Introduction, addition, subtraction, multiplication and division algorithms.

(12 Hrs)

UNIT-III

Register transfer and micro-operations: Register Transfer Language, arithmetic, logic and shift micro-operations. Introduction to Hard wired and micro-programmed control unit.

(12 Hrs)

UNIT-IV

Introduction to Various Modes of Data Transfer.

Introduction to Memory Organization: Memory-hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, memory management related hardware

(12 Hrs)

Recommended Books

Title	Author(s)	Publishers
Text Computer System and Architecture	M.Mano	Prentice Hall of India New Delhi
Reference Computer Organization and Architecture	W.Stallings	Prentice Hall of India New Delhi

L T P
3 1 0

Sessional Marks : 25
End Term Examination Marks: 75

UNIT-I

Data Processing: Data, units of representation- Binary number, Hex, Oct, Decimal, Alphanumeric character strings- ASCII and EBCDIC, basic terminology – logical and physical record, extent, dataset.

(12 Hrs)

UNIT-II

File storage: On line storage, offline storage devices, hard disk, removable media , serial devices, magnetic tapes, Access methods, sequential, direct and random access, numerical problems in access time calculation.

(12 Hrs)

UNIT-III

Files Structure and data organization: Objectives of data organization, logical and physical organization, schema, subschema, index sequential organization

(12 Hrs)

UNIT-IV

Introduction to Data Management Techniques: Hashing, pointers, index organization, index-searching techniques, tree structures.

(12 Hrs)

Recommended Books

Title	Author(s)	Publishers
Text Principles of Data Management India New Delhi	James Martin	Prentice Hall of
Reference Computer Data Base Organization	James Martin	PHI New Delhi.

CS- 4104 SYSTEM SOFTWARE

L T P
3 1 0

Sessional Marks : 25
End Term Examination Marks: 75

UNIT-I

Introduction: System software and programming. Basic concepts of machine structure and language, assembly language, single pass and two pass assembler, general design procedure of an assembler.

(12 Hrs)

UNIT-II

Macro-processor and macro language: Features of macro facility, Editor, various types of editors and their features.

(12 Hrs)

UNIT- III

Overview: Compilers, various phases of a Compiler and their functions.

(12 Hrs)

UNIT-IV

Introduction : Linker, Loader.

(12 Hrs)

Recommended Books

Title	Author(s)	Publishers
Text System programming	JJ Donovan	McGraw Hill
Reference Software engineering	R S Pressman	McGraw Hill, New Delhi
System programming	Dhamdhare	Tata McGraw Hill
Operating systems		New Delhi

CS-4105 VISUAL PROGRAMMING

L T P
3 1 0

Sessional Marks : 25
End Term Examination Marks: 75

UNIT- I

Introduction Visual Basic Language: Data-types, Operators, Keywords, Visual Basic Statements, Introduction to Control Structure.

(12 Hrs)

UNIT-II

Introduction to OOPS: Procedures, Functions, Sub-Routines, VB controls, Arrays and Dynamic arrays, Handling Strings.

(12 Hrs)

UNIT-III

Windows Forms: Buttons, Checkboxes, Radio Buttons, Panels, Group Boxes, List Boxes, Checked List Boxes, Combo Boxes, Picture Boxes, Scroll Bars, Menus, Dialog Box.

(12 Hrs)

UNIT-IV

Introduction to ADO,DAO, Database connectivity with MS Access and Printing. Introduction to Windows API Programming.

(12 Hrs)

Recommended Books

Title	Author(s)	Publishers
Text Visual Basic 6.0	Kent Sharkey	Tech Media
Reference Visual Basic 6.0 Programming Bible	A.Smith,Valor Whisler	Wiley Dreamtech-India
Visual Basic 6.0 (Interactive Course)	Mark Spenik,David Jung	Tech Media

CS-4106 COMPUTER PROGRAMMING

L T P

Sessional Marks : 25

2 0 0

End Term Examination Marks: 25

UNIT- I

(12)

Algorithms and Program Development

Steps in development of a program, Flow Chart, Algorithm Development, Program debugging.

Program Structure

I/O statements, assignment statements; variables; arithmetic logical and relational operators – their precedence. Data types, logical and relational operators, standard I/O functions, formatted I/O.

Control Statements

For statement, if-then-else, while, do-while, break, switch statements.

UNIT-II

(12)

Functions and Arrays

Function declaration, parameters, parameter passing, call-by-value, call-by- reference, storage classes (local, global and static variables), function prototype, Single and multi-dimensional arrays, character arrays.

UNIT-III

(12)

Pointers

Introduction to Pointers and Pointers to various data types.

UNIT-IV

(12)

Introduction to Structures

Definition of a structure, pointers to structures, union, arrays of structures.

Recommended Books

<i>Title</i>	<i>Author(s)</i>	<i>Publishers</i>
Programming in C	Text R Subburaj	Vikas Publishing, New Delhi
Programming with C Language	Reference Balaguruswami	TMH, New Dehli
Let Us C	Yashwant Kanetkar	BPB Publication New Delhi

CS-4201 PC ORGANIZATION

L T P
3 1 0

Sessional Marks : 25
End Term Examination Marks: 75

UNIT- I

Introduction: Salient features and block diagram of 486, Pentium MMX and Pentium-II, Pentium-III and Pentium-IV

Hardware Organization of PC: The motherboard of PC; Pentium CPU, memory organization, keyboard interfacing, interfacing of audio speakers, serial and parallel ports
(12 Hrs)

UNIT- II

Bus Standards and architectures: ISA,EISA, VESA, and PCI , USB Firewire.

Interface Standards: RS232,RS-422, RS-423,IDE,EIDE,SCSI-II, fast and wide SCSI, IEEE 488
(12 Hrs)

UNIT-III

The Basic Input Output System: BIOS? Function of BIOS, software interrupts, testing and initialization, configuring the system.

Introduction to RISC Processors: What is RISC technology? Different RISC processors available.
(12 Hrs)

UNIT-IV

Introduction: Bus Architectures and Mini computers, VME and Multi bus, Architectures of multiprocessor system
(12 Hrs)

Recommended Books:

Title	Author(s)	Publishers
Computer Architecture Text	Raffiquzzman	BPB Publication
Reference Hardware and Software of Personal Computers	Bose, SK	Willey

L T P
3 1 0

Sessional Marks : 25

End Term Examination Marks: 75

UNIT- I

Introduction: Data communication, Analog Vs Digital communication, transmission media, transmission errors, error detection and correction, parity check, CRC, hamming code.

(12 Hrs)

UNIT- II

Synchronous and Asynchronous systems: Data rates, serial and parallel communication, concepts of simple, half duplex and full duplex modes.

Interface Standards: Introduction to RS-232, RS-232 voltages, data bits, RS-232 signals, RS-232 interconnection, IEEE 488 interface, UART and USART chips and their working.

(12 Hrs)

UNIT- III

Multiplexing and Modulation techniques: Frequency Division Multiplexing, time division multiplexing, and wavelength division multiplexing, Digital modulation techniques: ASK, FSK, PSK, and QPSK

(12 Hrs)

UNIT- IV

Networks: OSI model, networks topology, basic network protocols and access, media and physical interconnection. Local Area networks (LAN), IEEE 802 standards. Packet switching, message switching and circuit switching. Design issues in data link layers, sliding window protocols.

Inter-networking: Introduction to hubs, routers, bridges, gateways.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publishers
Text Understanding Data Communication	Gilbert Held	
Reference Data Communication & Networks	Frouzen	TataMcGraw Hill
Data and Computer Communications	Stallings	
Computer networks	Tanenbaum	PHI, New Delhi

CS- 4203**SYSTEM SOFTWARE****L T P**
3 1 0**Sessional Marks : 25**
End Term Examination Marks: 75**UNIT-I****Introduction:** System software and programming. Basic concepts of machine structure and language, assembly language, single pass and two pass assembler, general design procedure of an assembler.

(12 Hrs)

UNIT-II**Macro-processor and macro language:** Features of macro facility, Editor, various types of editors and their features.

(12 Hrs)

UNIT- III**Overview:** Compilers, various phases of a Compiler and their functions.

(12 Hrs)

UNIT-IV**Introduction:** Linker, Loader.

(12 Hrs)

Recommended Books

Title	Author(s)	Publishers
Text System programming	JJ Donovan	McGraw Hill
Reference Software engineering System programming Operating systems	R S Pressman Dhamdhare	McGraw Hill, New Delhi Tata McGraw Hill New Delhi

EC-3101 ELECTRONIC DEVICES

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

UNIT-I

SEMICONDUCTORS: Structure of an atom, Atomic and crystal structure of Germanium and Silicon, Energy band diagrams of Silicon and Germanium, Covalent bonds, generation and recombination, Effect of temperature on conductivity of semiconductors, Conductors, semiconductors, insulators, difference between conductors, insulators and semiconductors, Extrinsic semiconductor materials-doping of impurity in P and N type semiconductors and their conductivity, minority and majority carriers, drift and diffusion currents, Continuity Equation.

(12 Hrs)

UNIT-II

SEMICONDUCTR DIODES: P-N junction diode, mechanism of current flow in P-N Junction, drift and diffusion current depletion layer, potential barrier, behaviour of P-N junction characteristics, zener and avalanche breakdown, concept of junction capacitance in forward and reverse bias conditions, semiconductor diode characteristics, static and dynamic resistances and their calculation from diode characteristics, dynamics resistance of diode in terms of diode current. Diode (P-N junction) as rectifier; half wave rectifier; full wave rectifier including bridge rectifier, relationship between DC output voltage and AC input voltage; rectification efficiency and ripple factor for rectifier circuits, filter circuits, shunt capacitor, series inductor, capacitor input filter, bleeder resistance, physical explanations of the working of the filters and typical applications of each type, different types of diodes brief idea and typical applications of power diodes, zener diodes varactor diodes and point contact diodes; important specifications of rectifier diode and zener diode.

(12 Hrs)

UNIT-III

TRANSISTORS: Concept of bipolar transistor as two junction three terminal device having two kinds of current carriers PNP and NPN transistors, their symbols and mechanisms of current flow; explanation of fundamental current relations, Transistor type, Transistor action, Transistor configurations, Characteristics, Different modes of operation and comparison. Transistor as an amplifier in CE configuration; DC load line, its equation and drawing it on collector characteristics; determination of small signal voltage and current gain of a basic transistor amplifier using CE output characteristics and DC load line; concept of power gain as product of voltage gain and current gain. Single stage CE amplifier circuit with proper biasing components, AC load line and its use in: Calculation of current and voltage gain of a single amplifier.circuit, Explanation of phase reversal of the output voltage with respect to input voltage, Transistor hybrid low frequency model in CE configuration, 'h' parameters and their physical significance, typical values of the parameters, Expressions for voltage gain, current gain, input and output impedance for a single stage CE amplifier circuit in 'h' parameters, appropriate approximation.

(12 Hrs)

UNIT-IV

FIELD EFFECT TRANSISTOR (FET): Construction, operation, characteristics and equivalent circuit of JFET and its circuit application, Construction, operation, characteristics

and equivalent circuit of MOSFET in depletion, enhancement modes and its circuit applications, CMOS advantages and applications, Comparison of JFET, MOSFET, BJT ,Simple FET amplifier circuit and its working principles (without analysis).

(12 Hrs)

RECOMMENDED BOOKS

Title	Author	Publisher
Text Book Basic Electronics and Linear Circuitis	N N Bhargava and Kulshreshta	McGraw Hill
Reference Books Electronics Devices and Circuits	Miliman and Halkias	McGraw Hill

EC-3102

**ELECTRONIC MEASUREMENT AND
INSRUMENTATION**

**L T P
3 0 0**

Maximum Sessional Marks: 25

Maximum End Term Examination Marks: 50

UNIT-I

INTRODUCTION: Accuracy precision, sensitivity, static errors, range, span, repeatability linearity, hysteresis, types of errors dynamics response, loading effects

(12 Hrs)

UNIT-II

BASIC INDICATING INSTRUMENTS: Classification of instruments, D-Arsonval moments, construction and principle of moving iron and moving coil instruments, contraction of Dc ammeter, dc voltmeter, ac ammeter, ac voltmeter, ohm meter and analog multimeter.

(12 Hrs)

UNIT-III

CATHODE RAY OSCILLOSCOPE: Cathode ray tube, construction, basic CRO circuit, measurement of voltage, current, phase, frequency, time period. duel track oscilloscope, specification of a CRO and there significance, front panel controls.

(12 Hrs)

UNIT-IV

DIGITAL INSTRUMENTS: Block diagrams, principle of operation and use of LCR meter, frequency meter and digital millimeters.

SIGNAL GENERATORS : Waveforms, block diagram and control.

(12 Hrs)

RECOMMENDED BOOKS

Title

Author

Publisher

Text Book

Electrical and electronic measurement and instrumentation

AK Sawhney

Dhanpat Rai and Co.

Reference Books

Electronic measurement and instrumentation

and HW Cooper

prentice Hall

EC-3103 DIGITAL ELECTRONICS

L T P
3 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 75

UNIT-I

REVIEW OF NUMBER SYSTEM: Decimal, Binary, Octal, and hexadecimal number system and their inter-conversions.

LOGIC FAMILIES AND CIRCUITS: TTL logic family, NAND gates, 7400, 5400 and 4000 series of IC logic families, tri-state logic.

LOGIC GATES AND FLIP FLOPS: Definitions, symbols and truth table of NOT, OR, AND, NAND, NOR, XOR, XNOR gates, De-Morgan's theorems; realization of basic gates using universal gates; realization of simple Boolean equations using universal gates, introduction to k-map (3 variables), Logic diagram, truth table; timing diagram and operation of following latches and flip flops; NOR latch, NAND latch, RS, T, D, JK, Master/ Slave JK flip flops.

(12 Hrs)

UNIT-II

REGISTERS: Shift registers, Serial in serial out, Serial in Parallel out, Parallel in Parallel out Parallel in Serial out, Left shift register, right shift register, universal shift register.

COUNTERS : Synchronous and Asynchronous counters, Modulus counters, decade counter and its application, Ring counter and its application.

(12 Hrs)

UNIT-III

ARITHMETIC CIRCUITS: Half adder and full adder circuit, design and implementation, Half and full subtracter circuit, design and implementation, 4 bit adder/subtracted.

A/D and D/A Converters : Resistor divider D/A converter, Analog to digital conversion, Voltage to time to digital converter, D/A specifications, Dual slope integrator A/D converter, Counter type A/D converter, A/D converter specifications.

(12 Hrs)

UNIT-IV

DECODERS, DISPLAY DEVICES AND ASSOCIATED CIRCUITS : LED, LCD, seven segment display, basic operation of various commonly used types, Four bit decoder circuits for 7-segment display and decoder/driver ICs, Multiplexers and De-multiplexers; basic functions and block diagram of MUX and DEMUX.

(12 Hrs)

RECOMMENDED BOOKS:

Title:	Author	Publishers
Text Book Fundamentals of Digital Electronics	A. Anand Kumar	PHI
Reference Books: Digital Electronics and Applications	Malvino Leach	Mc Graw Hill, New Delhi
Digital Integrated Electronics	Herbert Raub and Donals Sachilling	Prentice Hall of India, New Delhi

EC-3104 Electromagnetic Fields and wave propagation

L T P
3 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 75

Unit-I

1. Introduction to Vector Analysis: Introduction to vectors, addition, subtraction and multiplication of vectors, different co-ordinate systems, Cartesian, cylindrical and spherical systems, transformation between different co-ordinate systems. 5hrs

2. Static Electric Field: Force between point charges, coulombs law, electric field intensity, electric scalar potential, charge density, gradient of potential, electric flux, gauss law, energy in capacitor in energy density, flux density, divergence, Maxwell's divergence equation, and current density. 8hrs

Unit-II

3. Static Magnetic Field: Current density in a conductor, force on moving charge and current element, Biot-savart law, magnetic flux, magnetic flux density, amperes law, Maxwell equations, magneto static potential, Maxwell current equation, vector potential. 8hrs

4. Time Varying Fields: Faraday's law, moving conductor in a magnetic field, stoke's theorem, Maxwell equation from Faraday's law, displacement current, Maxwell's equation from amperes law, Maxwell equation for free space. 9hrs

Unit-III

5. Electromagnetic Waves (Only 20 % Analytical): Propagation of waves, structure of atmosphere, ionosphere structure and its details, ground wave propagation, space wave propagation, sky wave propagation, radio horizon, duct propagation, troposphere scatter propagation. 14hrs

Unit-IV

6. Wave Propagation (Only 20 % Analytical): Propagation of waves, structure of atmosphere, ionosphere structure and its details, ground wave propagation, space wave propagation, sky wave propagation, radio horizon, duct propagation, troposphere scatter propagation. 12hrs

RECOMMENDED BOOKS

Author	Title	Publisher
Hayt	Electromagnetic Engineering	Mcgraw Hill
Gangadhar	Field theory	Khanna
Karus	Electromagnetic	Mcgraw Hill
K.D. Prasad	Electromagnetic Fields and Waves	Satya Prakashan

EC-3201 ELECTRONIC COMPONENTS AND MATERIALS

L T P
2 0 0

Sessional Marks : 25
End Term Examination Marks: 25

UNIT-I

MATERIALS: Classification of materials into conducting, semiconducting, and insulating materials through a brief reference to atomic structure, Conducting Materials, Resistivity and factors affecting resistivity such as temperature, alloying and mechanical stressing, Classification of conducting materials into low resistivity and high resistivity materials. Some examples of each and their typical applications, Insulating Materials, Electrical properties, volume resistance, surface resistance, dielectric loss, dielectric strength(break down voltage) and dielectric constant, Thermal properties Heat resistance, classification according to temperature endurance, thermal conductivity, Plastics, classification into thermo plastic and thermo setting categories: examples of each and their typical applications.

(08 Hrs)

UNIT-II

CHARACTERISTICS OF MATERIALS: Important relevant (electrical, mechanical and thermal) characteristics and applications of the following materials, Mica Paper(dry and impregnated), Asbestos , Rubber, Ceramic ,Silicon ,rubber, Acrylics ,Polystyrene, Silicon grease, Bakelite, Phosphor Bronze alloy 69, Epoxy Glass ,Beryllium copper alloy, Varnish, Soldering Lead alloy, Lacquer Copper, Enamel , Silver, Gold, Magnetic Materials, Different magnetic materials: (Dia, Para, Ferro) their properties, Ferromagnetism, Ferromagnetism, domains, permeability, hysteresis loop (including coercive force and residual magnetism and magnetic saturation), Soft and hard magnetic materials; their examples and typical applications

(08 Hrs)

UNIT-III

CAPACITORS AND RESISTORS: Introduction, equivalent circuit, characteristics and classification of capacitors, Capacitor polyester, metallised polyester ,ceramic, paper, mica and electrolytic type; constructional details and testing, specification, temperature and frequency stability and other limitations, Mutual comparison, Introduction, equivalent circuit, characteristics and classification of resistors, Resistors, carbon film, metal film, carbon composition, wire wound and variable types (presets and potentiometers) constructional details and testing, specification, temperature and frequency dependence and noise considerations, mutual comparison.

(08 Hrs)

UNIT-IV

TRANSFORMERS AND COILS: Transformers, Inductors and RF coils: Methods of manufacture of inductors, RF coils and small transformers (up to 1 KVA) and their testing. Properties of cores. Need and types of shielding, Surface mounted devices, Connectors, relays and switches, Various types of switches, e.g. slide, rotary push, toggle, micro switches etc; their symbols, specifications and applications, Concept of make and break contacts in relays, operating current, Holding current, various types of relays, their symbols specifications and applications, Various types of connectors, their symbols, specifications and applications.

RECOMMENDED BOOKS:**Title****Author****Publisher****Text Book**

Electronic Components and Materials

Grover and Jamwal

Dhanpat Rai and
Company, New Delhi**Reference Books**Electrical and Electronics Engineering
Materials

SK Bhattacharya

Khanna Publishers,
New Delhi

Electrical Engineering Materials

Adrianus J, Dekker.

Prentice Hall of India,
New Delhi

EC-3202 ELECTRONIC CIRCUITS

L T P
3 0 0

Sessional Marks : 25
End Term Examination Marks: 50

UNIT-I

TRANSISTOR BIASING: Need of transistor biasing, different types of biasing and operations, stability factor, factors contributing to thermal instability, transistor dissipation, quiescent point selection, heat sink, condition of thermal stability.

BI- JUNCTION TRANSISTOR (BJT) AMPLIFIERS: Single stage and cascaded amplifiers, Effect of cascading on gain and bandwidth, Circuit operations, Frequency response of RC coupled amplifier; transformed coupled amplifier; direct coupled multistage BJT amplifiers, MOSFET Amplifiers common source, drain, gate amplifiers and their frequency response.

(12 Hrs)

UNIT-II

FEEDBACK AMPLIFIERS: Introduction, General theory, Classification, Types of feedback Effect of negative feedback on gain band width, distortion,. Input and output resistance derivations, Applications of negative feedback current series, current shunt, voltage series, shunt feedback amplifiers, Emitter follower, Darlington connection, Bootstrap follower.

(12 Hrs)

UNIT-III

APPLICATION OF POSITIVE FEEDBACK: Oscillators: Criteria for oscillation, Working and frequency stability of Turned collector oscillator, Colpitts oscillator, Hartley oscillator, RC oscillator, Wein bridge oscillator, Phase shift oscillator, Crystal Oscillator.

(12 Hrs)

UNIT-IV

POWER AMPLIFIERS: Introduction, classification, single ended power amplifier, harmonic distortions in power amplifiers, class A, Class B and class C push-pull amplifiers and their efficiency, tuned voltage amplifier, thermal stability, stability factor.

(12 Hrs)

RECOMMENDED BOOKS:

Title	Author	Publishers
Text Book		
Basic electronics and linear circuits	NN Bhargava and others	Mc Graw Hill New Delhi
Reference Book		
Integrated Electronics	Millman and Halkias	Mc Graw Hill
Electronic Devices and Circuits	Millman and Halkias	Mc Graw Hill New Delhi
Basic Electronics	Grob	Mc Graw Hill New Delhi

EC-3203

**FUNDAMENTALS OF COMMUNICATION
ENGINEERING**

L T P
2 0 0

Sessional Marks : 25
End Term Examination Marks: 25

UNIT-I

INTRODUCTION: Communication, information, Message and Signals, Electromagnetic Spectrum, Classification of signal , Periodic and non-periodic signals Analog and digital signals, Deterministic and random signals, The elements of a communication system , Modulation, Definition, Types of modulation, Need for modulation.

AMPLITUDE MODULATION : Definition, Expression of AM wave, modulation index, frequency, spectrum, bandwidth, power contents of sidebands and carrier, Generation of AM waves, DSB-SC, SSB-SC, ISB and VSB modulation, their comparison and areas of applications, Generation of DSB and SSB signals, Frequency division multiplexing.

(08 Hrs)

UNIT-II

ANGLE MODULATION : Frequency modulation, Modulation index, frequency deviation, frequency spectrum and bandwidth of FM wave, Power contents in FM, Phase modulation , comparison between AM, FM and PM, Need for amplitude limiter, pre- emphasis and de-emphasis, generation of FM waves, Varactor diode modulator, Armstrong method of FM generation.

RADIO TRANSMITTERS AND RECEIVERS : Block diagram of AM and FM transmitter. Working principle with block diagram of AM and FM receivers.(Superhetrodyne)

(08 Hrs)

UNIT-III

DEMODULATION: Definition, AM diode detection, diagonal clipping, FM detection, Foster Seely discriminator, Ratio detector, Phase locked-loop FM demodulator.

(08 Hrs)

UNIT-IV

PULSE MODULATION : Sampling frequency for pulse modulation , Basic ideas about PAM, PWM and PPM and typical application, Reconstruction of message, Generation of PAM, PWM and PPM signals, Demodulation of PAM, PWM and PPM signals, Pulse code modulation, basic scheme of PCK system, PCM encoder and decoder, Quantization, Basic principle of Data modulation (dm), Advantage of DM over PCM system.

(08 Hrs)

RECOMMENDED BOOKS:

Title	Author	Publishers
Text Book		
Electronic communication systems	Kennedy	Mc Graw Hill
Reference Books		
Electronic communications	Roddy and Coolen	Prentice Hall of India
Principles of communication systems	Taub and Schilling	Mc Graw Hill

EC-3204 DIGITAL ELECTRONICS

L T P
3 1 0

Sessional Marks : 25
End Term Examination Marks: 75

UNIT-I

REVIEW OF NUMBER SYSTEM: Decimal, binary, octal and hexadecimal number systems and their Interco versions.

LOGIC FAMILIES AND CIRCUITS: TTL logic family, NAND gates, 7400, 5400 and 4000 series of IC logic families, tri-state logic.

LOGIC GATES AND FLIP FLOPS: Definitions, symbols and truth table of NOT, OR, AND, NAND, NOR, XOR, XNOR gates, De-Morgan's theorems; realization of basic gates using universal gates; realization of simple Boolean equations using universal gates, introduction to k-map(3 variables), Logic diagram, truth table; timing diagram and operation of following latches and flip flops; NOR latch, NAND latch, RS, T, D, JK, Master/ Slave JK flip flops.

(12 Hrs)

UNIT-II

REGISTERS: Shift registers, Serial in serial out, Serial in Parallel out, Parallel in Parallel out Parallel in Serial out, Left shift register, right shift register, universal shift register.

COUNTERS: Synchronous and Asynchronous counters, Modulus counters, decade counter and its application, Ring counter and its application

(12 Hrs)

UNIT-III

ARITHMETIC CIRCUITS: Half adder and full adder circuit, design and implementation, Half and full subtracter circuit, design and implementation, 4 bit adder/subtracted.

A/D and D/A Converters: Resistor divider D/A converter, Analog to digital conversion, Voltage to time to digital converter, D/A specifications, Dual slope integrator A/D converter, Counter type A/D converter, A/D converter specifications.

(12 Hrs)

UNIT-IV

DECODERS, DISPLAY DEVICES AND ASSOCIATED CIRCUITS : LED,LCD, seven segment display, basic operation of various commonly used types, Four bit decoder circuits for 7-segment display and decoder/driver ICs, Multiplexers and De-multiplexers; basic functions and block diagram of MUX and DEMUX.

(12 Hrs)

RECOMMENDED BOOKS

Title	Author	Publishers
Text Book Fundamentals of Digital Electronics	A. Anand Kumar	PHI
Reference Books Digital Electronics and Applications	Malvino Leach	Mc Graw Hill, New Delhi
Digital Integrated Electronics	Herbert Raub and Donalds Sachilling	Prentice Hall of India, New Delhi

EC-4101 MICROPROCESSORS-1

L T P
3 0 0

Sessional Marks : 25
End Term Examination Marks: 50

UNIT-I

INTRODUCTION : Microprocessors, its evolution, function and impact on modern society, Microcomputer systems, Microprocessor architecture and its operations, Memory, Inputs and output devices.

ARCHITECTURE OF A MICROPROCESSOR (WITH REFERENCE TO 8085 MICROPROCESSOR) : Concept of Bus, Bus organization of 8085, Functional block diagram of 8085, and function of each block, Pin details of 8085 and related signals, Demultiplexing of address/data bus(Ado- AD7), Generation of read write control signals, How is stored program executed.

(12 Hrs)

UNIT-II

MEMORIES AND I/O INTERFACING: Memory organization, memory map, portioning of total memory space, address decoding, concept of I/O mapped I/O and memory mapped I/O. Interfacing of memory and I/O devices.

(12 Hrs)

UNIT-III

PROGRAMMING USING 8085 MICROPROCESSORS: 8085 programming model, instruction classification, instruction format, how to write assemble and execute a simple program introduction to 8085 instruction data transfer (copy) operations, Arithmetic operations, Logic operations Branch operations Writing assembly language programs, programming techniques with additional instruction programming techniques: looping counting and indexing additional data transfer and 16 bit arithmetic instruction arithmetic and logical operations related to memory.

(12 Hrs)

UNIT-IV

STACK AND SUB ROUTINES: Stack, Subroutine, Conditional call and return instructions.
PROGRAMMING ASSIGNMENTS: Counters and time delays, Illustrative program hexadecimal counter, Illustrative program: zero to nine(Modulo 10) counter, Illustrative program: Generating pulse wave form.

(12 Hrs)

COMPARATIVE STUDY: Comparative study of 8 bit microprocessors, i.e. 8085, Z80, 6800

RECOMMENDED BOOKS

Title	Author	Publisher
Text Book Microprocessor Architecture, Programming and Applications with the 8085	Ramesh S. Gaonker	Willey eastern Ltd New Delhi
Reference Books Fundamentals of microprocessor and microcomputers	B Ram	Dhanpat Rai
An introduction to microprocessors	A.P. Mathur	Tata Mc Graw Hill, New Delhi

EC-4102 **LINEAR INTEGRATED CIRCUITS AND APPLICATIONS**

L T P
3 0 0

Sessional Marks : 25
End Term Examination Marks: 50

UNIT-I

OPERATIONAL AMPLIFIER : Op-amp symbols, polarity conventions, ideal operational amplifier and its block diagram, virtual ground and summing point, definition of inverting and non inverting inputs, differential voltage gain, input and output voltage, input offset current, input bias current, common mode rejection ratio(CMRR), power supply rejection ratio (PSRR) and slew rate.

(12 Hrs)

UNIT-II

OPERATIONAL AMPLIFIER APPLICATIONS: Op-amp as inverting amplifier, non-inverting amplifier, unity follower, adder, subtractor, integrator, differentiator, comparator, logarithmic amplifier.

(12 Hrs)

UNIT-III

TIMER ICs: Block diagram of I.C. timer (such as 555) and its working. Use of 555 timer as mono-stable and astable and multi- vibrators.

VOLTAGE REGULATOR ICs : Concept of regulation, principal of series and shunt regulator, 723 IC, three terminals voltage regulator ICs (positive, negative and variable voltage) and there applications (78XX and 79XX,317)

(12 Hrs)

UNIT-IV

VOLTAGE CONTROLLED OSCILLATOR: Concept of voltage controlled oscillator, principle of operation of VCC, study of IC 566 and its applications.

PHASE LOCK LOOP: Concept of phase locked loop (PLL), principles of operations, study of IC 567 and its applications.

(12 Hrs)

RECOMMENDED BOOKS:

Title	Author	Publisher
Text Book		
Operational Amplifier and Linear Integrated Circuit	Ramakant A. Gaekwad	Prentice Hall of India Ltd. New Delhi
Reference Books		
A Book on Electronics	Boylstead	Tata McGraw Hill, New Delhi
Integrated Circuits	K. R. Botkar	KhannaPublishers

EC-4103 T.V. ENGINEERING (MONOCHROME AND COLOUR)

L T P
3 0 0

Sessional Marks : 25
End Term Examination Marks: 50

UNIT-I

PRINCIPLES OF MONOCHROME TV COMMUNICATION: Introduction to TV communication: Analogy with radio communication. Basic elements of monochrome TV Transmission and reception.

SCANNING: Progressive scanning, selection criteria for number of lines and frame frequency, aspect ratio, line frequency. Interlaced scanning and its need. Odd and even fields. Concept of kell factor.

CAMERA TUBES: Construction and working of vidicon and CCD camera tubes. Typical voltages at their electrodes. Block diagram of colour TV camera. colour Signal generation.
(12 Hrs)

UNIT-II

PICTURE TUBES: Construction and working of a monochrome picture tube, typical voltage at various electrodes, modulation characteristics, need for earthing strap, and metallic band around the periphery of a CRT, Basic of colour TV picture tube. Types of colures picture tubes. Comparison of electrostatic and electromagnetic system of beam deflection.

COMPOSITE VIDEO SIGNAL: Positive and negative video signal, DC component and its significance black and white levels specifications of sync and blanking pulses. Composite video signal at the end of odd and even fields, equalizing pulses and there need.
(12 Hrs)

UNIT-III

TRANSMITTED SIGNAL: Type of modulation for sound and picture signal, negative and positive modulation, vestigial side band transmission, radiated RF spectrum and channel specifications, trap frequencies, Block diagrams of high level and low level black and white television transmitters, functions of each block.

MONOCHROME TELEVISION RECEIVER: Major specifications of CCIR (B) standard, major international television standard. Block diagram of a black and white television receiver and function of each block, typical signal level and wave forms and various points.
(12 Hrs)

UNIT-IV

COLOUR TELEVISION: Compatibility of colour and black and white signal, natural light and three colors theory. The luminance signal, line saturation, band width requirement, modulation of color deference signal, weighing factors. Introduction to NTSC system, PAL–TV system, PAL–D system, PAL color receivers.

REMOTE CONTROL AND SPECIAL CIRCUITS: Remote control, electromechanical control system, electronic towel tuning, frequency synthesizers, TV tuning (electronic), automatic time tuning.
(12 Hrs)

RECOMMENDED BOOKS:

Title	Author	Publisher
Text Book Monochrome and color TV	RR Gulati	New Age International, New Delhi
Reference Books Basic Television	Bernard Grob	TMH, New Delhi
Color TV theory and practice	SP Bali	TMH, New Delhi

EC-4104 INDUSTRIAL ELECTRONICS

L T P
3 0 0

Sessional Marks : 25
End Term Examination Marks: 50

UNIT-I

THYRISTOR: Thyristor rating and gate ratings turn on methods-DC gate, AC gate and Pulse gate triggering and R-C trigger circuits. turn of methods- natural and forced turn of methods, Internal power dissipation and need for heat sinks in thyristors. definition of following terms and there relationship with the power dissipation of the device(no derivation),heat sink efficiency, heat sink transfer coefficient ,Heat dissipating area of a heat sink. concept of thermal resistance of heat sinks, various types of heat sinks and techniques of mounting devise on heat sinks

(12 Hrs)

UNIT-II

SCRs and TRIACs: Principal of operation and working of the following switching circuits using SCRs and TRIACs, Automatic battery charger, Voltage regulator, Emergency light., Alarm circuit, Time delay relay circuit, Circuit for over voltage and over current protection, Explanation of the working of three phase half wave and full wave bridge rectifier with the help of wave forms , Explanation of working of following controlled rectifier using SCR and resistive and inductive loads with help of wave forms and appropriate mathematical expression (no derivations) Single phase controlled half wave and full wave and bridge rectifier, Three phase controlled half wave, full wave and bridge rectifier.

(12 Hrs)

UNIT-III

AC PHASE CONTROL AND INVERTERS: Principle of working of AC phase control circuit using triac and its applications, Application of phase controlled rectification and AC phase control circuit in: Illumination control , Fan speed control, Temperature control, Speed control of DC and small AC motors, Principles of operation of basic inverters circuit. Basic series and parallel commutated inverters.

(12 Hrs)

UNIT-IV

DIELECTRIC HEATING AND CONVERTERS: Principle of induction and dielectric heating and there typical applications, Converters; principle of operation of converter, input and output characteristics of bridge circuits, effect of source impedance, discontinuous current operation effect of overlap cycle, interphase reactor control.

(12 Hrs)

RECOMMENDED BOOKS

Title	Author	Publisher
Text Book Industrial Electronics and Control	S.K.Bhattacharya and S.Chatterji	Tata McGraw Hill
Reference Book Power electronics	PS Bimbhra	S Chand CO.Khanna
Power electronic	M Rama Murthi	New age

EC-4201 MODERN COMMUNICATION ENGINEERING

L T P
3 0 0

Sessional Marks : 25
End Term Examination Marks: 50

UNIT-I

INTRODUCTION: Basic block diagram of digital and data communication Systems, their comparison with analog communication.

INFORMATION THEORY AND CODING: Concept of information, information measure, probability, entropy and Shannon's Theorem., Introduction to various common codes 5 bit Baudot code, 7 bit ASCII, ARQ, EBCDIC, Error detection and correction coding techniques linear block, codes, Redundancy, Parity, Block Check character (BCC), Vertical Redundancy Check (VRC), Longitudinal Redundancy Check (LRC), and Hamming Code.

(12 Hrs)

UNIT-II

DIGITAL MODULATION TECHNIQUES: Basic block diagram and principle of working of the following, Amplitude shift keying (ASK): Interrupted Continuous Wave (ICW), two tone modulation, Frequency Shift Keying (FSK), Phase Shift Keying (PSK)

UART,USART: Their need and function in communication Systems.

MODEMS: Need and function of modems, mode of modems operation (low speed, medium speed and high speed modems). Modem interconnection, modem data transmission speed, modem modulation method. Modem (RS232 Interface, other interfaces).

(12 Hrs)

UNIT-III

FIBER OPTIC COMMUNICATION : Principle of light , transmission in a fiber, numerical aperture, step index-graded index fiber, single mode and multi mode propagation , losses in fibers, optical source (light emitting diode, semi conductor laser diode, optical detectors (PIN photo diode , Avalanche photo diode) . Fiber optic communication links.

SATELLITE COMMUNICATION : Communication satellite, Kepler's Law , geo-stationary orbit, power systems, limits of visibility , frequency plans and polarization, transponders, TDMA and FDM.

(12 Hrs)

UNIT-IV

NETWORK AND CONTROL CONSIDERATIONS : Protocols and their functions. Data communication network organization, basic idea of various modes of digital switching -circuit switching, message switching, packet switching, Basic concept of integrated services, Digital network (ISDN) its need in modern communication, brief idea of ISDN interfaces, Basic idea of local area network (LAN) and its various topologies.

TELEMETRY: Radio-telemetry and its application, block diagram of TDM and FDM telemetry system.

(12 Hrs)

RECOMMENDED BOOKS:

Title	Author	Publisher
Text Book		

Electronic Communication Systems
(fundamental through advanced)

Reference Books

Communication systems.

Principle of Communication Engineering.

Wayne Tomasi

Kennedy

Taub and Schilling

Pearson
Education

TMH, New Delhi
India

TMH, New Delhi
India

EC-4202 MICRO-CONTROLLERS AND PLCs

L T P
3 0 0

Sessional Marks : 25
End Term Examination Marks: 50

UNIT-I

MICROCONTROLLERS: Comparing micro controllers and micro-processors, MCS -51 Series of controller, architecture of 8051, Hardware, I/O Pins, ports and interfacing circuits, connecting external memory , counters and timers ,serial data I/O , Interrupts, Minimum system using 8051 microcontroller.

(12 Hrs)

UNIT-II

INSTRUCTION SET: Instruction set of 8051, data movement, logical and arithmetic operation, bit manipulation; Internal timer and its applications, Jump and call instructions, interrupts and returns, Feature of 8751 ,89C 51,89C 2051, Typical application examples.

(12 Hrs)

UNIT-III

PROGRAMMABLE LOGIC CONTROLLERS: Introduction to PLC'S, Areas of applications, Basic Design and Structure and architecture of a typical PLC, Programming of PLC's , systematic solution finding, Programming languages, PLC Programmers, PC Interface, Function block diagram ,ladder diagram, Instruction list, structured text.

(12 Hrs)

UNIT-IV

TIMERS AND COUNTERS: Sequential function chart, logic control systems, timers, counters, Commissioning and operational safety of a PLC, data transmission interface and communication in the field area, Guidelines and standards.

(12 Hrs)

RECOMMENDED BOOKS

Title	Author	Publisher
Text Book The 8051 Microcontroller and Embedded System(using Assembly and C)	Mohammed Ali Mazidi & Rolin D.Mc kinlay	PHI
Reference Books Design with Micro-controllers	C Nagaraj Murthy,S Ramgopal,johan	MC Graw Hill
The 8051 Micro-controller Architecture programming and application	Kenneth J.Ayala	Penram intermationl

EC-4203 CONSUMER ELECTRONICS

L T P
2 0 0

Sessional Marks : 25
End Term Examination Marks: 25

UNIT-I

AUDIO SYSTEM : Microphone, Construction, working, principles and application of microphone: carbon, moving coil. velocity, crystal, condenser type, cordless microphone, loud speakers, direct radiating ,horn loaded, woofer, tweeter, mid range, multi-speaker system, baffles and enclosures.

(08 Hrs)

UNIT-II

SOUND RECORDER: Sound Recording on magnetic tape, its principles, block diagram and tape transport mechanism, Digital sound recording on tape and disc, CD system and DVD Format, CD/DVD players and recorders, Hi-Fi system, pre-amplifiers, amplifiers and equalizers, Stereo amplifiers.

(08 Hrs)

UNIT-III

SATELLITE TV AND CABLE TV: Principles of satellite TV system ,Frequency allocation of S,C and KV band ,up link and down link frequencies .Block diagram and working principle of TVRO receiver(TV receiving only), Cable TV networks, master distribution amplifier, line amplifier. Distribution component (Tap-off splitter, Termination etc.)

(08 Hrs)

UNIT-IV

VCR : Principle of video recording on magnetic tape, block diagram of VCR, VHS tape, transport mechanism, Basic block diagram, working principles and application in Digital watch /clock, Calculator, Washing machine, Microwave ovens, Cordless telephones, Mobile handset, Digital camera, DTH, Electronic ignition system for automobiles.

(08 Hrs)

RECOMMENDED BOOKS:

Title	Author	Publisher
Text Book Audio Visual Systems	Sanjay Attri.	BPB Publishers New Delhi.
Reference Book Audio Video Systems	R.G.Gupta	TMH, New Delhi India

EC-4204 MICROPROCESSOR-II

L T P
3 0 0

Sessional Marks : 25
End Term Examination Marks: 50

UNIT-I

REVIEW OF TRI-STATE BUFFERS, DECODER AND ENCODERS: INTERRUPT: Concept of interrupt, maskable and non-mask able .edge triggered and level triggered interrupts software interrupt, restart interrupts and its use ,various hardware interrupts of 8085, servicing interrupts extending interrupt system.

MEMOTY INTERFACING: Details of interfacing of PIC8259, Interfacing of memory chips ROM (2732,2764) and RAM (6116).

(12 Hrs)

UNIT-II

GENERAL PURPOSE PROGRAMMABLE PERIPHERALS INTERFACING CHIPS:

Block concepts control function modes and application peripheral chips -8255, 8279, 8254, 8237.

(12 Hrs)

UNIT-III

SERIAL I/O –DATA COMMUNICATION: Basic concepts in serial communication, asynchronous/ synchronous serial communication ,line drivers , MC 1488, 1489, 8250, 8251(in detail)

INTERFACING DATA CONVERTERS: DAC 0800,ADC 0804,0809.

(12 Hrs)

UNIT-IV

16-BIT MICROPROCESSOR 8086/88 ARCHITECTURE: Block diagram and description of functional units, Memory segmentation, segment overlapping, Addressing mode (direct/indirect).

(12 Hrs)

RECOMMENDED BOOKS:

Title	Author	Publisher
Text Book Microprocessor Architecture ,programming and application with 8080/8085	Ramesh s Gaonker	Willey eastern ltd New Delhi
Reference Books Microprocessor and Peripherals Handbook Microprocessor Applications and Interfacing 8086	Douglass V. Hall	INTEL Tata MC Graw Hill

EE-3101 BASIC ELECTRICAL ENGINEERING

L T P
2 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 25

Unit-I

DC Circuits : Definition and units of electric current, potential and potential difference, Ohms law, resistance, conductance, resistivity and conductivity, their units and dependence on temperature in conductor .Power and energy, heating effect of electric current and conversion of mechanical to electrical units and vice versa .Kirchoff's voltage and current laws and their applications in simple DC circuits .Series and parallel combination of resistors, wattage consideration, simple problems.

(08 Hrs)

Unit-II

Electro Magnetism : Concept of magnetic field production by flow of current ,Oersteds experiment , concept of magneto motive force {MMF} ,flux, reluctance , permeability , Analogy between electric and magnetic circuits. Force on a moving charge and current in a magnetic field, force between two current carrying parallel conductors .Magnetic field around a current carrying straight conductor , circular loop and solenoids. Faradays laws, lenzs law and rules of electromagnetic induction, principals of self and mutual induction, self mutually induced e.m.f; simple numerical problems. Energy stored in magnetic field , concept of current growth decay and time constant in an inductive {RL} circuit. Energy stored in an inductor, series and parallel combinations of inductors. Concept of hysteresis loop.

(08 Hrs)

Unit-III

AC Circuits: Concepts of generation of alternating voltage and current, difference between AC and DC. Terms related to AC waves - instantaneous, average, RMS and peak values. Form factor {definition only}. Equation of sinusoidal waveform, representation of alternating quantities, concept of phase difference. Representation of sinusoidal quantities by phasor diagram of alternating voltage applied to a pure resistance , pure inductance and pure capacitance , phasor diagrams for simple , R, L, C circuits {series and parallel} concept of impedance , impedance triangle, phase angle . Numericals problems, phasor diagram for RL, RC series circuits.

(08 Hrs)

Unit-IV

Network Theorems: Thevenin's theorem, Norton's theorem, superposition theorem, maximum power transfer theorem, application of network theorems in solving DC circuit problems.

(08 Hrs)

RECOMMENDED BOOKS

Title	Author	Publisher
Text Book Electrical Technology	B.L. Theraja	S. Chand
Reference Books Basic Electricity	BR Sharma	Satya Prakashan
Basic Electrical Engineering	PS Dhogal	Tata Mc Graw Hill
Electrical Engineering	JB Gupta	S.K.Kataria

Experiments in basic Electrical engineering	SK Bhattacharya, KM rastogi	New Age
Electrical Technology	Edward Hughes	Longman
Principles of Electrical and Electronics	J.S. Dhillon , Daljinder Singh	Kalyani

EE – 3103 Electrical Circuits and Systems

	L	T	P
	3	0	0
	Sessional Marks		25
	End Semester Examination Marks		50

Unit I

- DC Circuits** **6 hrs**
Concepts of electricity, Definitions & units of the following terms- Potential and Potential Difference, Current, Resistance, Electrical power, Electrical energy. Ohm's law and its practical application, Effect of temperature on resistance, Connection of resistance in series and parallel, Kirchoff's laws & their application to simple circuits
- Classification of Materials** **2 hrs**
Classification of materials conducting, semi conducting, insulating and magnetic materials
- Active and passive components** **4 hrs**
Introduction to active and passive components, fixed and variable resistances, their various types, fixed and variable capacitors, their various types and important specifications and colour codes. Voltage and current sources – concept of constant voltage and constant current sources, symbol and graphical representation.

Unit II

- AC Fundamentals** **8 hrs**
Concept of terms related with AC waves, RMS and average values of sine waves, Concept of phase and phase difference, Alternating voltage applied to pure resistance, Alternating voltage applied to pure inductance, Alternating voltage applied to pure capacitance, Alternating voltage applied to pure capacitance, R-L series circuit, R-C series circuit, Concept of impedance and impedance triangle, Concept of power and p.f. in AC circuits.
- Transformers** **4 hrs**
Overview of electro magnetic induction, self and mutual induction, construction and working, principle of single phase transformer, construction of different types(core and shell type) of transformers, turn ratio , efficiency and rating. Different types of transformers: auto transformers, single winding, double winding, pulse and isolation transformers.

Unit III

- DC Machines** **6 hrs**
Working principle of DC generator, types of DC generation and their applications. Working principle of DC motors, types of DC motor and their applications. Concept of back emf , use of starters for DC motors , three point and four point starters

7. **AC Machines** **6 hrs**
 Working principle of single phase induction motors, their construction and starting(resistance start, capacitor start, capacitor run, capacitor start and run), Introduction to other types of motors(reluctance, hysteresis, universals motors, stepper motor and servo motors)

Unit IV

8. **Semi conductor diode** **4 hrs**
 PN junction, use of a diode in rectifiers, half wave, full wave and bridge rectifiers, zener diode and its applications, light emitting diode (LED), liquid crystal display (LCD)
9. **Transistors** **4 hrs**
 Introduction to a transistor, working of a PNP and NPN transistor, transistor configuration, biasing of a transistor, amplifying action of a transistor, field effect transistor: FET, JFET, MOSFET, their characteristics and applications, uni-junction transistors (UJT)
10. **Power Supplies** **4 hrs**
 Working principles of constant voltage transformers (CVT's) and uninterrupted power supplies (UPS) and their ratings

RECOMMENDED BOOKS

Title	Author	Publisher
Text Books		
1. A text book of electrical technology	B L Theraja	S. Chand
Reference Books		
1. Basic Electrical Engineering	J B Gupta	SK Kataria and sons
2. Experiments in Basic Electrical Engineering	S K Bhattacharya & K M Rastogi	New Age
3. Electrical Machines	S K Bhattacharya	TMH
4. Basic Electronics	S K Bhattacharya	TMH

EE – 3104 Electrical and Electronics Engineering

	L	T	P
	2	0	0
	Sessional Marks		25
	End Semester Examination Marks		25

Unit I

- 1 **General Information** **8 hrs**
Electromagnetic Induction Faradays Law; Lenz Law, Flemings Rules, Principles Of A.C. Circuits, Alternating EMF, Definition Of, Cycle, Frequency Amplitude and Time Period, Instantaneous, Average, RMS and Maximum Value of Sinusoidal Wave, Form Factor and Peak Factor, Concepts of Phase and Phase Difference, Concept of Resistance, Inductance and Capacitance in Simple AC Circuit, Power Factor and Improvement of Power Factor By Use of Capacitors, Concept of three Phase System ; Star And Delta Connections ; Voltage And Current Relationship (No Derivation)

Unit II

- 2 **Measuring Instruments** **4 hrs**
Principle and Construction of Instruments used for Measuring Current, Voltage and Current Voltage, Power and Energy
- 3 **DC Machines** **4 hrs**
Working, principles and construction of d.c. machines (d.c. motors and generator) Performances and characterization of different types of dc machines (speed load, torque load and speed-load characterization), application of dc machines

Unit III

- 4 **Transformers** **4 hrs**
Working Principle and Construction of Single Phase Transformers, Transformer Rating, EMF Equation, Losses and Efficiency, Cooling of Transformers, Isolation of Transformers, CVT, Auto Transformer (Brief Idea), Applications
- 5 **Induction Machines** **4 hrs**
Working Principle And Construction Of 3-Phase Induction Motors, Types Of Induction, Motor-Slip Rings And Squirrel Cage, Slip And Torque-Speed Characteristics Of Induction Motor, Operation Of Induction Machine As Induction Generator, Application Of 3-Phase Induction Machines, Concept Of Single Phase Induction Motor And Applications

Unit IV

- 5 **Synchronous Machines** **4 hrs**
Alternators – Working Principles, Types And Construction Detail Synchronous Motor Working Principle And Its Application As Synchronous Condenser

6 Basic Electronics**4 hrs**

Basic Idea of Semiconductors- P and N Types, Diodes, Zener Diodes and their Applications, Transistors – PNP and NPN; their characteristics and uses, Characteristics and Application of Thyristor, Characteristics and Application of Servo Motors

RECOMMENDED BOOKS

Title	Author	Publisher
Text Books		
1. A text book of electrical technology	B L Theraja	S. Chand
Reference Books		
1. Basic Electrical Engineering	J B Gupta	SK Kataria and sons
2. Experiments in Basic Electrical Engineering	S K Bhattacharya & K M Rastogi	New Age
3. Electrical Machines	S K Bhattacharya	TMH
4. Basic Electronics	S K Bhattacharya	TMH
5. Basic Electronics	V K Mehta	S Chand

EE-3105 Electrical Technology and Electronics

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Basic Concepts: Concept Of Electricity, Definitions and Units Of Potential and Potential Difference, Current, Resistance, Capacitance, Inductance, Electrical Power, Electrical Energy, Ohm's Law and Its Practical Application, Effects Of Temperature On Resistance, Connection Of Resistance In Series And Parallel, Kirchoff's Law And Their Applications To Simple Circuits.

(06 Hrs)

Electrical Safety: Electrical Shock And Precautions Against Shock, Treatment Of Electric Shock, Concept Of Fuses and Their Classification, Selection and Application, Concept Of Earthing and Various Types Of Earthing, Application Of MCBs And ELCBs.

(06 Hrs)

Unit II

AC Fundamentals: Concept Of Alternating Voltage And Alternating Current, Difference Between AC and DC, Concept Of Terms Related With Ac Waves; Rms And Average Values Of Sine Waves, Concept Of Phase And Phase Difference, Concept Of Single Phase And Three Phase Supply, Alternating Voltage Applied To Pure Resistance, Pure Inductance And Pure Capacitance, R-L Series Circuits, Concept Of Power And Power Factor In AC Circuit.

(08 Hrs)

Electromagnetic Induction: Concept Of Magnetic Field, Concept Of Magnetic Flux, Reluctance, Magneto motive Force (MMF), Permeability; Self And Mutual Induction, Effects Of Conductor Moving In A Magnetic Field.

(04 Hrs)

Unit III

Electrical Machine: Principles, Construction and Working Of Single Phase Motors, Three Phase Motors, And Starters.

(08 Hrs)

Transformers : Principles, Construction and Working of a Transformer, Types of Transformers, Applications of Transformers.

(04 Hrs)

Unit IV

Basic Electronics : Basic Idea Of Semiconductors- P and N Types, Diodes, Zener Diodes and Their Applications, Transistors – Pnp And Npn; Their Characteristics and Uses, Characteristics And Application of Thyristor, Characteristics and Application of Servo Motors.

(12 Hrs)

RECOMMENDED BOOKS:

Title	Author	Publisher
Text Book		
Basic Electrical Engineering	P S Dhogal	Tata Mcgraw Hill
Reference Books		
Basic Electronics	V.K. Mehta	S Chand
Electrical Trade Theory	Ghosh,	Tata Mcgraw Hill
Basic Electrical	Br Sharma	Satya Prakashan

EE- 3201 ELECTRICAL MACHINES

L T P
3 0 0

Sessional Marks : 25
End Term Examination Marks: 50

Unit I

Generalized system of electrical machines: Definition of motor and generator, Basic principle of a motor and generator, Torque due to interaction of two magnetic fields and the concept of torque angle, Basic electromagnetic laws, EMF induced in a coil rotating in a magnetic field, Elementary concept of an electrical machine, Common features of rotating electrical machines. (06 Hrs)

Transformer: Principle of operation and constructional details of single phase transformer. Core type and shell type transformers, e.m.f. equation. Working of transformers on no load and on load, losses in transformers efficiency, all day efficiency and condition for maximum efficiency of transformer. Voltage regulation of a transformer (no mathematical treatment). (06 Hrs)

Unit II

DC Machines: Constructional features and principle of working, Function of the commutator for motoring and generating action, Types of armature winding (lap and wave - no detailed diagram), Factors determining induced e.m.f., Factors determining electromagnetic torque, Relationship between terminal voltage and induced e.m.f. for different DC machines, Factors determining speed of DC motors, speed control methods, Performance, characteristics of different DC machines (working as motors and generators), Starting of DC motors and starters, Application of DC motors. (12 Hrs)

UNIT III

AC Machines: Brief introduction about three phase induction motors, its principle of operation, Types of induction motors and constructional feature of squirrel cage and slip ring motors, Starting of three phase induction motors : star Delta and DOL (direct -on - line) starters, Reversal of direction of rotation of three motors. Application of induction motors, Introduction of synchronous machines - alternators and its principle of operation synchronous motors and their applications. (12 Hrs)

Unit IV

Single phase and Fractional Kilowatt motors : Introduction, Principle of operation of single phase motors, Types of single phase induction motors and their constructional details (i.e. split phase capacitor start, capacitor start and run, shaded pole and reluctance start motor), single phase synchronous motors - reluctance motors (hysteresis motors), Commutator type single phase motors - Repulsion induction motor, AC series motor and universal motors. (12 Hrs)

RECOMMENDED BOOKS:

Title	Author	Publisher
Text Book Electrical Engineering	JB Gupta	S.K.Kataria
Reference Books Electrical Engineering	Edward Hughes	TMH
Electrical Machines	SK Sahdev	Unique
Electrical Machines	S.K. Bhattacharya	T.M.H

EE-3202 NETWORK THEORY

	L	T	P
	3	0	0
	Sessional Marks		25
	End Semester Examination Marks		50

Unit I

- 1. Introduction** **4 hrs**
Voltage and current sources, relation between current, voltage, power and energy of DC sources, conversion of voltage sources to current sources and vice versa; formation of branch, node and loop
- 2. Laplace Transformation** **4 hrs**
Important Laplace transform functions, initial and final value theorems, Laplace inverse transform, use of Laplace transform method for series and parallel R-L, R-C, L-C, and R-L-C circuits
- 3. Kirchoff's laws** **4 hrs**
Applications of Kirchoff's Current Law (KCL) by using nodal current method and Kirchoff's Voltage Law (KVL) using loop current method and branch current method for solving network problems

Unit II

- 4. DC Network Analysis** **6 hrs**
Applications of Network theorems and transformations: Star-delta conversion, superposition theorem, Thevenin's theorem, Norton's theorem, reciprocity theorem, maximum power transfer theorem and Tellegen's theorem for the solution of networks with DC.
- 5. AC Network Analysis** **6 hrs**
Applications of Network theorems and transformations: Star-delta conversion, superposition theorem, Thevenin's theorem, Norton's theorem, reciprocity theorem, maximum power transfer theorem and Tellegen's theorem for the solution of networks with AC excitation

Unit III

- 6. Network Function** **6 hrs**
Concept of Poles and Zeros, Impedance, admittance and Immittance function for one port network. Immittance and transfer function for multi-terminal networks

7. **Standard Test Signals** **3 hrs**
 Unit step, ramp, and impulse functions and their Laplace transforms shifted and gate functions. Shifted theorem. Laplace transform of shifted step, impulse and ramp functions; laplace transform of a periodic function
8. **Magnetic Coupled Circuits** **3 hrs**
 Self and mutual inductance, coefficient of coupling, dot conversion of coupled circuits.

Unit IV

9. **Resonance** **6 hrs**
 Q factor of inductance and capacitance series resonance, resonant frequency, band-width, parallel resonance, resonant frequency and band-width
- 10 **Filters** **6 hrs**
 Introduction to high pass, band pass and band elimination filters, prototype LC and RC filters

RECOMMENDED BOOKS

	Title	Author	Publisher
	Text Book		
1.	Network and Circuit Theory	GK Mithal	Khanna Publishers
	Reference Books		
1.	Electrical Circuit Analysis	Soni, Gupta and Bhatnagar,	Dhanpat Rai and Co., New Delhi
2.	Circuit Theory	Chakravorty	Dhanpat Rai and Co., New Delhi
3.	Electrical Engineering	JB Gupta	SK Kataria and Sons, New Delhi
4.	Electrical Technology IV Edition	Edward Hughes	Longman Publishers
5.	Network and Circuit Theory	Van Val Kenberg	Tata McGraw Hill, New Delhi
6.	Introduction to Networks	PV Gupta, PC Dhar	Dhanpat Rai and Sons, New Delhi

EE-4101 MAINTENANCE OF EQUIPMENTS - ELECTRICAL AND ELECTRONICS

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Fundamentals : Electrical shock, Earthing, Circuit breaker, Isolator, Fuses, protection devices, Insulation and Testing, Starter, relay.

(08 Hrs)

Fault Location : Symbols used, study, Analysis, and Fault tracing from circuit diagrams, Equipment failure, causes of failure, nature of faults, fault location and fault finding aids.

(04 Hrs)

Unit II

Electrical systems: General principle, Construction working and maintenance, Batteries, DG sets, pumps, coolers, Motors, transformers, cranes, conveyors.

(08 Hrs)

Test Equipment: Methods and precautions in use of digital multimeters, oscilloscopes, signal generators, logic analyzers, LCR meter, Analog and digital IC tester, logic probe, discrete component tester.

(04 Hrs)

Unit III

Troubleshooting Techniques: Functional area approach, split half method, divergent path, convergent path, feedback path and switching path. Troubleshooting procedures, grounding systems in electronic equipment, systematic troubleshooting checks, corrective action, replacement of circuit boards.

(12 Hrs)

Unit IV

Electronic Component Testing: Location, checking and replacement of different fuses, lamps and lamp holders, switches, cables, cable connectors, electromagnetic relays, passive electronic components, identification and testing of variable components, identification and testing of diodes, transistor identification and testing.

(10 Hrs)

Soldering techniques

(02 Hrs)

RECOMMENDED BOOKS

Title

Author

Publisher

Text Book

Maintenance of Electronic Equipment

K. S. Jamwal

Dhanpat Rai

Reference Books

Maintenance of Electrical Equipments

RP Gupta

Dhanpat Rai

Modern Electronic Equipment

R. S. Khandpur

TMH

Electrical Technology

B.L.Theraja

S.Chand

Basic Electrical Engineering

P S Dhogal

TMH

FT-3101 INTRODUCTION TO FOOD TECHNOLOGY

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit-I

INTRODUCTION: Definition, function and characteristics of foods; Nutrients and their function; composition of common foods; present status of food industry in India (06 Hrs)

MICROBIOLOGY: Microorganisms associated with foods, their classification, characteristics and their relevant properties. (07 Hrs)

Unit-II

FOOD CHEMISTRY: Chemical composition of various foods; classification and properties of major food constituents; a brief review of post harvest and anti-mortem changes in foods and their relevance. (12 Hrs)

Unit-III

FOOD PROCESSING TECHNOLOGY (AN OVERVIEW) : An overview of technology of processing of cereals, pulses, oilseeds, fruit, vegetables, milk and milk products, egg and poultry products, fish and fish products, meat and meat products; food laws and standards; sensory evaluation of foods. (12 Hrs)

Unit-IV

INTRODUCTION TO FOOD PROCESSING AND PRESERVATION: Food spoilage agents; principles and processing of food preservation; effect of processing on the shelf life and food composition. (07 Hrs)

CHEMICAL PRESERVATIVES: Importance of food additives; mechanism of action of class I and II preservatives; factors affecting the choice of preservatives and their uses. (06 Hrs)

RECOMMENDED BOOKS:

Authors	Title	Publishers
Potter	Food science	CBS
W.C. Frazier.	Food microbiology	TMH
Fennema, Kerrel	Principles of food preservation	Marcel Dekkar

FT-3102 FOOD CHEMISTRY

L T P
3 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 75

Unit-I

INTRODUCTION: Food Chemistry, Role of Food Chemists in Food Processing industry. (04 Hrs)

WATER: Structure, properties of liquid water, water as reactant. (07 Hrs)

Unit-II

CARBOHYDRATES: Definition and classification; structure, physical and chemical properties of mono-saccharides and disaccharides. (06 Hrs)

PROTEINS : Definition, classification, structure, functions. of amino acids, proteins and their importance in food, Changes during processing. (06 Hrs)

Unit-III

LIPIDS: Definition, structure, classification, functions, physical and chemical properties, rancidity and reversion, Nutritional Significance. (06 Hrs)

PIGMENTS: Their occurrence, importance, types, changing during processing (05 Hrs)

Unit-IV

VITAMINS AND MINERALS : Structure and properties; deficiency diseases (06 Hrs)

CHEMICAL ADDITIVES: Properties and functions (05 Hrs)

RECOMMENDED BOOKS

Authors	Title	Publishers
A V. V. S Ramarao	A text book of biochemistry	AVI
L. Mayor	Food Chemistry	CBS

FT-3201 UNIT OPERATIONS IN FOOD PROCESSING

L T P
3 0 0

Sessional Marks: 25
End Term Examination Marks: 50

Unit-I

INTRODUCTION: Unit operations – classifications, conservation of mass and energy, numerical on mass and energy balance.

(03 Hrs)

SIZE REDUCTION: Theory of comminution, Rittinger's law, Kick's law, Bond's law and their applications in calculation of energy required in grinding, Crushing efficiency, Size reduction equipment used in food industry

(08 Hrs)

Unit-II

SIEVING: Separation based on size, Effectiveness of screens, Types of screens, Factors affecting the sieving process, Fineness modules and particle size distribution.

(06 Hrs)

MIXING : Theoretical aspects of solid mixing. Mixing index, rate of mixing, Theory of liquid mixing, Equipment for liquid and solid mixing

(05 Hrs)

Unit-III

FILTRATION: Theoretical aspects, Fundamental equation for filtration, Constant rate filtration, Constant pressure filtration, filter cake compressibility, Filtration equipment

(10 Hrs)

Unit-IV

SEDIMENTATION : Theory, Gravitational sedimentation of particles in liquids and gases, Sedimentation equipment.

(05 Hrs)

CENTRIFUGAL SEPARATION: Theory, Basic equation, centrifugal clarification, centrifugal filtration; Equipments- principles, design features and general

(06 Hrs)

RECOMMENDED BOOKS:

Authors	Title	Publishers
P. Fellows	Food Processing Technology	Woodhead Pub
R. L. Earle	Unit operations in food processing	

FT-3202 FOOD MICROBIOLOGY

L T P
3 0 0

Sessional Marks: 25
End Term Examination Marks: 50

Unit-I

INTRODUCTION: Definition; historical developments in food microbiology and their significance; microbial growth study.

(08 Hrs)

Unit-II

MORPHOLOGY OF BACTERIA AND REPRODUCTION: Morphology of Bacteria and Reproduction: cell structure, shapes and types, structure and chemical composition of cell wall; Gram staining: difference between the Gram positive and Gram Negative bacteria; Endospore formation; different methods of reproduction.

(12 Hrs)

Unit-III

MORPHOLOGY OF FUNGI AND REPRODUCTION: Types; cell structure; composition of cell wall; methods of reproduction: asexual and sexual, importance of fungi; comparative physiology of bacteria and fungi.

(11 Hrs)

Unit-IV

MICROBIOLOGY OF FOOD AND FOOD PRODUCTS: Incidence of micro-organisms in foods, factors affecting growth of microbes, microbiology of milk and milk products, fruit and vegetable products, meat, fish, and poultry products, cereals and cereal products.

(12 Hrs)

RECOMMENDED BOOKS:

Authors

Michal J Pleczer
W.C. Frazier
James M. Jay
Casida

Title

Basic Food Microbiology
Food Microbiology
Modern Food Microbiology
Industrial Microbiology

Publishers

Chapman and Hall
Tata McGraw Hill
CBS
Wiley Eastern

FT-3203 HANDLING AND STORAGE OF FOOD AND FOOD PRODUCTS

L T P
3 0 0

Sessional Marks: 25
End Term Examination Marks: 50

Unit-I

INTRODUCTION: Importance of handling and storage of food and food products; Post harvest losses of fruits, vegetables and grains in India; Prevention of losses, storage and its benefits; qualitative and quantitative changes during storage; Public distribution system of grains in India and role of Govt agencies

(12 Hrs)

Unit-II

HANDLING OF FRUITS, VEGETABLES, CEREALS, PULSES & OILSEEDS: Types and operational principles of handling equipment: conveyors (belt, screw and pneumatic), elevators, pumps, fans, Scoops, semi-trucks; weighing, packaging and sealing machines for granular and powdered materials, handling losses and their control.

(12 Hrs)

Unit-III

FRUITS AND VEGETABLE STORAGE: Low temperature storage of fruits and vegetables, storage requirements and types of storages structures, spoilage during storage of fruits and vegetables and their prevention.

(11 Hrs)

Unit-IV

STORAGE OF CEREALS AND OTHER GRAINS: Factors affecting quality of grain during storage; types of storage structures for small, medium and large quantities; Causes of spoilage during storage and their prevention

(11 Hrs)

RECOMMENDED BOOKS

Authors	Title	Publishers
Hall, C.W.	Handling and storage of food grains in tropical and subtropical areas.	Oxford and IBH
Sinha R.N. and W.E. Muir	Grain storage-Part of a System	AVI
Volkind and Roslov	Modern Potato and Vegetable storage	Amerind

FT-3204 FRUITS AND VEGETABLES TECHNOLOGY

L T P
3 0 0

Sessional Marks: 25
End Term Examination Marks: 50

Unit-I

INTRODUCTION : Status and scope of fruits and vegetable industry in India, composition and nutritive value of fruits and vegetable, factor effecting composition and quality of fruits and vegetables.

(06 Hrs)

PHYSIOLOGY: Respiration, transpiration, ripening, senescence, climacteric and non-climacteric fruits and post harvest changes in fruits and vegetables

(05 Hrs)

Unit-II

RECEPTION AND PREPARATION: Equipment, cleaning methods, sorting, grading, peeling and blanching.

(04 Hrs)

PRESERVATION BY SUGAR AND SALT: Ingredients and processes technology for the manufacture of jam, jellies, marmalade, preserve, squashes, pickles and chutneys. tomato ketchup and sauce

(08 Hrs)

Unit-III

THERMAL PROCESSING OF FRUITS AND VEGETABLES: History, definition, various techniques of thermal processing, processing time calculations of selected fruits and vegetables, types of containers and spoilage of canned foods

(06 Hrs)

DRYING AND DEHYDRATION: Drying of selected fruits and vegetables, changes during drying and spoilage of dehydrated fruits and vegetable.

(06 Hrs)

Unit-IV

FREEZING: Freezing principles and methods, freezing process of selected fruits and vegetables, changes during freezing

(06 Hrs)

FPO standards for fruits and vegetable products and utilization of by products of fruits and vegetables industry.

(04 Hrs)

RECOMMENDED BOOKS

Authors	Title	Publishers
Girdhari Lal, Sidappa and Tandon Luh and Wudruf	Fruits and Vegetables preservation Commercial Fruit Processing	ICAR, New Delhi AVI

FT- 3205 PULSE AND OILSEED PROCESSING TECHNOLOGY

L T P
3 0 0

Sessional Marks: 25
End Term Examination Marks: 50

Unit I

Introduction: Structure, chemical and nutritional composition of major oil seeds and pulses
(10 Hrs)

Unit II

Milling of Pulses: Classification of pulses, Traditional milling methods (dry and wet milling); Modern milling methods (CFTRI, Pantnagar, CIAE processes); Byproducts of pulse milling and their utilization
(12 Hrs)

Unit III

Extraction of Oils: Selection and pre-treatment of raw material; Oil extraction methods and equipment involved: Mechanical extraction and Solvent Extraction; Extraction of cottonseed, safflower, coconut, ground nut, sunflower, soybean and palm oil.
(12 Hrs)

Unit IV

Refining and Hydrogenation of Oil: Physical and chemical oil refining process; Winterization and hydrogenation and its importance; Shortening– types, manufacture and use; Production of peanut butter; Byproducts of oil milling and refining and their utilization
(12 Hrs)

Recommended Books

Authors	Title	Publishers
Chakrabarty M M.	Chemistry and Technology of Oils and Fats.	Prentice Hall.
Chakrabarty A.	Post Harvest Tech of Cereals, Pulses & Oilseeds	Oxford & IBH.
Kay DE.	Food Legumes. Tropical Products Inst	
Mathews RH.	Legumes Chemistry, Tech and Human Nutrition	Marcel Dekker.
Swern D.	Bailey's Industrial Oil and Fat Products.	InterSci. Publ.
EIRI Board	Hand Book of Oils, Fats & Derivatives with Refining and Packaging Technology	EIRI

FT-3206 DAIRY TECHNOLOGY

L T P
3 0 0

Sessional Marks: 25
End Term Examination Marks: 50

Unit-I

INTRODUCTION: Status and scope of dairy industry in India; composition of milk, factors affecting composition of milk; energy value of milk; handling, transportation and reception of milk; grading of milk.

(07 Hrs)

PHYSICO-CHEMICAL PROPERTIES OF MILK: Density, boiling and freezing point, refractive index, Acidity and pH, viscosity, surface tension

(04 Hrs)

Unit-II

LIQUID MILK PROCESSING: Filtration and clarification, Cream separation: by gravity, centrifugal and construction of separators; standardization: milk and cream; homogenization: mode of operation, effects of homogenization, efficiency of homogenization; pasteurization: LTLT, HTST pasteurizers (Heating system, cooling system, Flow controller, Regenerator, flow valve) and other pasteurizers

(08 Hrs)

DRY MILK PRODUCTS: Methods of drying milk (Drum, Spray drying), detailed manufacturing process for spray dried milk

(03 Hrs)

Unit-III

FROZEN PRODUCTS: Kulfi, softy, ice cream

(06 Hrs)

BUTTER/GHEE: Butter and ghee: manufacturing and defects

(05 Hrs)

Unit-IV

COAGULATED MILK PRODUCTS: Classification and manufacturing process of cheese, cheese spread, chhanna, paneer

(07 Hrs)

CLEANING AND SANITIZING OF DAIRY EQUIPMENT

(03 Hrs)

RECOMMENDED BOOKS

Authors

Su Kumar De
Lampart

Title

Outlines of Dairy Technology
Dairy products

Publishers

Oxford
Tata McGraw Hill

FT-4101 FOOD PACKAGING TECHNOLOGY

L T P
3 0 0

Sessional Marks: 25
End Term Examination Marks: 50

Unit-I

INTRODUCTION: Definition, origin and types of packaging materials, function of packaging and packaging materials: Paper, plastics, glass, metal, natural materials; Packaging forms. (10 Hrs)

Unit-II

PACKAGE EVALUATION: WVTR, GTR, bursting strength, tensile strength, tearing strength, drop test. (06 Hrs)

PACKAGING REQUIREMENTS: Packaging requirements and their selection for various processes eg. Canning, Dehydration etc. (05 Hrs)

Unit-III

PACKAGING MATERIALS FOR DIFFERENT FOODS: Meat, fish, poultry, eggs, Milk and dairy products, Fruits and Vegetables, Cereal grains and baked foods.

PACKAGING MACHINERY: Bottling, canning, form fills and seal machines, bags, their manufacturing and closing. (12 Hrs)

Unit-IV

PACKAGING ENVIRONMENT: Inert gas, vacuum, aseptic, CAP and MAP. (06 Hrs)

PACKAGE LABELING: Labeling types, functions and regulations (04 Hrs)

Recommended Books:

Title	Author	Publisher
A Handbook of Food Packaging	Frank A. Paine	Blackie Academic
Food Packaging Materials	N.T.Crosby	Applied Science
Plastic Films for Packaging; Technology,	Calvin J. Bening	Technomic

FT-4102 FOOD ANALYSIS AND QUALITY CONTROL

L T P
3 0 0

Sessional Marks: 25
End Term Examination Marks: 50

Unit-I

INTRODUCTION: Concept of quality and quality control; Principles and functions of quality control, quality attributes (qualitative, hidden and sensory), Subjective and objective quality control, HACCP: its benefits and application

(11 Hrs)

Unit-II

FOOD ANALYSIS: Objective and purpose of food analysis; food adulteration; Simple and quick method of adulteration detection

(07 Hrs)

SAMPLING: Definition of sampling, purpose, sampling techniques, requirements and sampling procedures for liquid, powdered and granular material

(05 Hrs)

Unit-III

PHYSICO-CHEMICAL AND MECHANICAL PROPERTIES: Colour, gloss, flavour, consistency, viscosity, texture and their relationship with food quality

(06 Hrs)

SENSORY QUALITY CONTROL: Definition, objectives, panel selection, sensory techniques, Interpretation of sensory results in statistical quality control.

(06 Hrs)

Unit-IV

FOOD REGULATIONS: Objectives, requirements and benefits of food grades and standards (BIS, AGMARK, PFA, FPO, CAS).

(10 Hrs)

RECOMMENDED BOOKS

Title	Authors	Publishers
Food Analysis: Theory and Practices	Pomeranz and Meloan	CBS
Food Analysis and Quality Control	M. Jacob	
Handbook of Analysis of Fruit and Vegetable Products	Ranganna	Tata Mc Graw-Hill

FT-4103 CEREAL PROCESS TECHNOLOGY

L T P
3 0 0

Sessional Marks: 25
End Term Examination Marks: 50

Unit I

Introduction: Structure, chemical and nutritional composition of cereals (03 Hrs)
Wheat: Types of wheat; wheat milling, equipment and machinery used in wheat milling; milling products and byproducts (08 Hrs)

Unit II

Rice: Varieties of rice; classification of rice; parboiling; milling of rice; different equipments involved; rice products and byproducts (08 Hrs)
Maize: Classification of maize; dry & wet milling of maize; different equipments involved; milling products and byproducts (04 Hrs)

Unit III

Barley: Milling; products and malting technology (05 Hrs)
Baking ingredients: Functions and storage; Indian Standards for these ingredients (05 Hrs)

Unit IV

Manufacturing Technology: Technology of bread, biscuits and cakes; Defects and remedies in the bread and cake; quality consideration and parameters in the baked products (08 Hrs)
Bakery Equipments: Working of various equipments like Mixers, proofing chambers, dough dividers, moulder and sheeters, baking ovens, cooling chambers, sealing and packaging machines (04 Hrs)

Recommended Books

Authors	Title	Publishers
RL Kent	Cereal Technology	AVI
A Chakravorty	Post harvest Technology of Cereals Pulses and Oil Seeds	Oxford and IBH
SB Arora	Hand Book of Bakery Products	SIRI

FT-4104 TECHNOLOGY OF MEAT, FISH AND POULTRY

L T P
3 0 0

Sessional Marks: 25
End Term Examination Marks: 50

Unit-I

INTRODUCTION TO MEAT AND ITS COSTITUENTS: Status and scope of meat, fish and poultry industry of India, Structure of muscle, skeletal muscle and connective tissue, chemical composition of muscle, methods of slaughtering and dressing of meat animals, ante and post mortem inspection

(10 Hrs)

Unit-II

POST MORTEM CHANGES: Loss of homeostasis, post mortem glycolysis and pH decline, Rigor mortis.

(05 Hrs)

MEAT AND MEATY PRODUCTS PROCESSING: Basic processing procedure (Comminuting, emulsification. Pre-blending), Cured and smoked meats, sausage products (Classification, processing steps) and canned meat.

(06 Hrs)

Unit-III

POULTRY PROCESSING: Pre-slaughter care, handling, transport, slaughtering techniques; preparation of ready to cook poultry

(06 Hrs)

EGG PROCESSING: Structure, chemical composition and nutritive value, internal quality of eggs its preservation, egg dehydration.

(06 Hrs)

Unit-IV

FISH PROCESSING: Parts of the fish, judging the freshness of fish, fish grading and cooking of fish; smoking pickling, salting, preservation of fish and processed fish products.

(05 Hrs)

BY-PRODUCTS OF MEAT, FISH AND POULTRY INDUSTRY

(06 Hrs)

RECOMMENDED BOOKS:

Authors	Title	Publishers
Lawrie	Meat Science	AVI
Stadelman	Egg Science and Technology	CBS
Herickson	Meat Poultry and Sea Poultry Product Technology	AVI

FT-4201 WASTE MANAGEMENT AND EFFLUENT TREATMENT

L T P
3 0 0

Sessional Marks: 25
End Term Examination Marks: 50

Unit-I

INTRODUCTION: Philosophy of waste management, byproducts and their utilization, magnitude of waste waters, microbiology of waste, other ingredients like insecticide, pesticides and fungicides residues

(12 Hrs)

Unit-II

WASTE CHARACTERIZATION: Temperature, pH, oxygen demands, fat, oil and grease content, metal content, forms of phosphorus and sulphur in waste waters, microbiology of waste, other ingredients like insecticide, pesticides and fungicides residues.

(12 Hrs)

Unit-III

PRE TREATMENTS: Sedimentation, coagulation, flocculation and floatation

(04 Hrs)

SECONDARY TREATMENTS: Biological oxidation-trickling filters, oxidation ditches, activated sludge process, rotating biological contractors, lagoons

(07 Hrs)

Unit-IV

TERTIARY TREATMENTS: Waste water treatment process-sand, coal and activated carbon filters, phosphorus, sulphur, nitrogen and heavy metals removal.

(06 Hrs)

EFFLUENT DISPOSAL: Environmental protection act and specifications for effluent of different food industries; Treatment and disposal of solid waste

(05 Hrs)

RECOMMENDED BOOKS:

Authors	Title	Publishers
K.S. Bilgrami	Essentials of Microbiology	CBS
W.C. Frazier	Food Microbiology by	Tata McGraw Hill
Casida	Industrial Microbiology	Wiley Eastern

FT-4202 ELEMENTS OF FOOD ENGINEERING

L T P
3 0 0

Sessional Marks: 25
End Term Examination Marks: 50

Unit-I

INTRODUCTION TO HEAT TRANSFER: Different methods of Heat transfer, Fourier's law, steady state unidirectional heat transfer through plain and composite slab, cylindrical and spherical bodies, natural and forced convection, radiation heat transfer.
(06 Hrs)

HEAT EXCHANGERS: Concept(without proof) of LMTD, overall heat transfer coefficient and effectiveness of parallel and counter flow heat exchanger, different types of heat exchangers
(06 Hrs)

Unit-II

PSYCHROMETRY: Absolute and relative humidity, humid volume, wet bulb temperature, psychometric charts
(04 Hrs)

DRYING : Bound and unbound water, moisture content on dry and wet basis, equilibrium moisture content, critical moisture content, drying rate, constant and falling rate phase calculations, working of different type of driers used in food industry,
(07 Hrs)

Unit-III

EVAPORATION: Basic principle of evaporation, Concept of overall heat coefficient, single and multiple effect evaporators, calculation of heat transfer area in single effect evaporators, evaporation equipment - open pans, short tube and long tube evaporators, forced circulation evaporators
(07 Hrs)

REFRIGERATION SYSTEMS: Refrigeration cycle: Reverse Carnot cycle and vapour compression cycle, types of refrigerants and components of a refrigerator
(05 Hrs)

Unit-IV

FLUID FLOW OPERATIONS: Physical properties of fluid, classification of fluid flow, continuity equation, Bernoulli's theorem and its application, concept of Reynold's number and its determination, working features of different type of pumps like centrifugal and rotary pumps.
(07 Hrs)

VISCOMETRY: Newtonian and non-Newtonian fluids, Derivation of Poiseuille equation, Working of different types of viscometers like Capillary viscometer, Rotational viscometer and Falling sphere viscometer.
(05 Hrs)

RECOMMENDED BOOKS:

Authors	Title	Publishers
Heldman & Singh	Introduction to Food Engg,	Academic Press
Smith	Introduction to Food Process Engg,	Springer
R.T. Toledo	Fundamentals of Food process Engg,	CBS

FT-4203 FOOD BEVERAGE TECHNOLOGY

L T P
3 0 0

Sessional Marks: 25
End Term Examination Marks: 50

Unit-I

Introduction: Status and scope of beverage industry in India, Classification of beverages and their nutritional significance

(11 Hrs)

Unit-II

Technology of Carbonated and Non-Alcoholic Beverages: Definition of soft drinks, different ingredients for soft drinks and their functions, methods of preparation, related equipments and machinery

(11 Hrs)

Unit-III

Tea and Coffee Processing: Tea types, nutritional significance, methods and processing of tea and coffee, related equipment and machinery

(10 Hrs)

Unit-IV

Alcoholic Beverages: Ingredients and their role in beer and wine preparation, methods of manufacturing of Wine, Beer, scotch, Whiskey, Brandy, Rum, Vodka and Gin; related equipment

(12 Hrs)

RECOMMENDED BOOKS:

Authors

Potter and Hotchkiss
Ashurst

Title

Food Science
Chemistry and Technology of
Soft Drinks and Fruit Juices

Publishers

CBI publication
Sheffield Academic Press

HU 3101 COMMUNICATION SKILLS

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit - I

REPORT WRITING: Reports and their importance, Types of Routine Reports, Structure of Reports, Bibliography & References, Proof-reading Symbols & their Functions, Expressions from Foreign Languages

(10 Hrs)

Unit -II

COMMUNICATION TECHNIQUES: Importance of Communication, One Way and Two Way Communication, Essentials of Good Communication, Barriers to Communication and Techniques to overcoming Barriers, Telephonic Communication

(10 Hrs)

Unit -III

GRAMMAR: Common Errors in writing, Change of Narration, Change of Voice, Use of Idioms & Phrases.

(10 Hrs)

Unit -IV

WRITING SKILLS: Applications for jobs, Essay-writing, Equivalent Terminology (100 to 150 administrative technical terms in English with their equivalent meanings in Hindi or Punjabi)

LIBRARY ACTIVITIES: Collecting Reference materials from Books & Journals

(10 Hrs)

RECOMMENDED BOOKS

Title	Author	Publisher
Oxford Guide to Writing & Speaking	John Seely	Oxford
English Grammar & Composition	Wren & Martin	ELBS
Writing Remedies	Edmond H. Weiss	Univ.Press

HU 4101/HU4201 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

L T P
3 0 0

Sessional Marks : 25
End Term Examination Marks: 50

Unit-I

Entrepreneurship, concept, meaning need, entrepreneurial competencies, characteristics, Small scale industries in developing economies.

(09 Hrs)

Unit-II

Identification of Business opportunities, Role of financial institutions in promoting small scale industries, DIC, commercial banks, SFCS, NSICS, NABARD, etc.

(10 Hrs)

Unit-III

Preparation of Project report, Technical, Economic, Market feasibility, , Market survey, Tasks and Responsibilities of Professional Managers, communication, its importance, process, effectiveness and barriers in effective communication.

(12 Hrs)

Unit-IV

Basics of Marketing Mgt., Basics of Material Management, Motivation-Maslow's Need hierarchy, Leadership-functions, styles, Managerial grid, Human and Industrial relations, Function of HR, Importance and characteristics of IR, Grievance handling procedure, Factories Act 1948, Industrial Dispute Act 1947.

(9 Hrs)

Recommended Books:

Title

Management

Dynamics of entrepreneurial development and Management

Entrepreneurship New venture creation

Entrepreneurship & Small Business Management

Industrial Law

Entrepreneurship development in India

Author/Publisher

Stephen P. Robbins, Mary
(Pearson education Asia)

Vasant Desai/Himalaya
Pub. House

David H. Holt, PHI

Nicholas, Siropholis
Houghton Mifflin company
Boston- Newyork

N.D. Kapoor/Sultan chand &
sons

C.B. Gupta/Sultan Chand &
Sons

IE-3101 Electrical Measurement and Instrumentation

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit-I

Introduction: Elements of generalized measurement system, characteristics of instruments, accuracy, precision, sensitivity, range span. Construction and working of CRT, Block diagram of CRO, measurement of voltage and frequency with CRO

(12 Hrs)

Unit-II

Basic Indicating Instruments: Classification of analog, concept of deflecting, controlling and damping torque, control and damping system, construction and principle of moving iron and moving coil instruments, construction of ammeter and voltmeter and extension of their range and Electro dynamometer instruments, Principles of operation PMMC ohm meters and their types.

(12 Hrs)

Unit-III

Measurement of Resistance: Potentiometers: Basic principles, types of potentiometers, their functions and applications, Classification of resistance, measurement of low, medium and high resistance, ammeter-voltmeter method, wheat-stone bridge, digital LCR meter for measurement of resistance, insulation tester.

(12 Hrs)

Unit-IV

Transducer : Definition of transducer and sensors, classification of transducers, active and passive, primary and secondary transducers, LVDT, strain-gauge, RTD, piezoelectric transducers and their applications.

(12 Hrs)

RECOMMENDED BOOKS:

Title	Author	Publisher
Text Book		
Electrical and Electronics Measurement and Instrumentation	AK Sawhney	Dhanpat Rai
Reference Books		
Electrical Measurement	JB Gupta	SK Kataria
Electronic Measurement and Instrumentation	Dr.Rajendra Prasad	S.Chand
Experiments in Basic Electrical Engineering	S.K. Bhattacharya and KM Rastogi	New Age
Electronic Instrumentation and Measurement Techniques	WD Cooper & AD Helfrick	PHI

IE-3102 HUMAN PHYSIOLOGY

	L	T	P
	3	1	0
	Sessional Marks		25
	End Semester Examination Marks		75

Unit – I

- 1 Introduction** **4 hrs**
Human body, cells, Tissues, blood compositions, blood group RBC, WBC, DNA, GENES
- 2 Digestive system** **8 hrs**
Organs for digestive system, mouth, stomach, small intestine, large intestine, pancreas, liver.

Unit – II

- 3 Respiratory system** **6 hrs**
Lungs, types of respiration, measurement of respiration rate, ventilation, gas exchange, mechanism in lungs, lung volume capacities.
- 4 Urinary System** **6 hrs**
Kidneys, ureters, urinary bladder, uretha.

Unit – III

- 5 Cardiovascular system** **12 hrs**
Introduction to Cardiovascular system, heart structure, electrocardiogram, flow of blood through heart, blood pressure

Unit – IV

- 6 Nervous system** **12 hrs**
Anatomy of nervous system, neurons, neural communication, brain, spinal cord

RECOMMENDED BOOKS

Title	Author	Publisher
Text Book		
1. Anatomy and Physiology	Waugh and Grant	Elsevier
Reference Books		
2. Biomedical (for class XI and XII)	N J Chinoi	NCERT
3. Biomedical instrumentation and measurements	L Cromwell	PHI

IE-3201 TRANSDUCERS AND SIGNAL CONDITIONING

L T P
2 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 25

Unit-I

Basic Concepts: Definition of the terms: accuracy, precision, sensitivity, linearity, hysteresis, gauge factor etc, Definition and classification of transducers, Selection criteria of transducers. Variable Resistance Transducers Construction, working principles and applications of potentiometers, strain gauge, load cell, Hot wire anemometers, photo resistors, humidity sensor, Resistive temperature transducers, Thermistors, Carbon microphones.

(08 Hrs)

Unit-II

Variable Inductance Transducers: Basic principles, Electromagnetic pick up, Induction potentiometer, Linear variable differential transformer (LVDT) Variable reluctance transducers. Variable Capacitance Transducers, Basic principles, Capacitance pick up, Condenser microphones, Differential capacitor pick up.

(08 Hrs)

Unit-III

Piezoelectric Transducers, Basic principle of piezoelectric transducers, Piezoelectric crystals and their properties, General forms of piezoelectric transducers, Seismic pick up. Magnetostrictive Transducers, Magneto-elastic property of nickel and perm alloy, Construction of magnetostrictive transducers.

(08 Hrs)

Unit-IV

Principles of Analog Signal Conditioning, Linearization, Various types of conversions (from V to f, from f to V, A to D and D to A), Filtering and impedance matching, Telemetry, Basic concept of telemetry, Basic concept of modulation, Basic concept of demodulation.

(08 Hrs)

RECOMMENDED BOOKS:

Title	Author	Publisher
Text Book		
Electrical and Electronic Measurement and Instrumentation	AK Sawhney	Dhanpat Rai and Co
Reference Books		
Instrumentation Measurement and Analysis	BC Nakra, KK Choudhary	TMH
Mechanical and Industrial Measurement	RK Jain	Khanna Publisher
Mechatronics	Bolton	Prentice Hall of India

IE- 3202 FUNDAMENTALS OF INSTRUMENTATION ENGINEERING

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit-I

Generalized Instrumentation Systems: Scope and necessity of instrumentation, Names of important process variables and their units, Building blocks of instrumentation system, Various test signals, Errors, Sources and classification of errors, the remedial action, Grounding and shielding.

(12 Hrs)

Unit-II

Performance characteristics of Instruments: Static and dynamic characteristics of instruments, Concept of time and frequency response specifications, time constant, response time, natural frequency, damping coefficient, time response of first order systems.

(12 Hrs)

Unit-III

Display and Recording Devices: Operating mechanism in indicators – PMMC instruments, Moving iron instruments, Multi-meter, Dynamometer instruments, Strip chart recorders, Circular chart recorders, X-Y recorder, Basics of printing devices, Scanning and data logging.

(12 Hrs)

Unit-IV

Instrument Selection: Factors affecting instrument selection, accuracy, precision, linearity, resolution, sensitivity, hysteresis, reliability, serviceability, Static and dynamic response, Environmental effects, Calibration of instruments.

(12 Hrs)

RECOMMENDED BOOKS:

Title	Author	Publisher
Text Book		
Electronic Measurement and Instrumentation	Dr.Rajendra Prasad	S.Chand
Reference Books		
Instrumentation Measurement and Analysis	BC Nakra, KK Choudhary	TMH
Electrical and Electronics Measurement and Instrumentation	AK Sawhney	Dhanpat Rai
Electronic Instrumentation and Measurement Techniques	WD Cooper, AD Helfrick	PHI

IE-4101 CONTROL ENGINEERING

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit-I

Introduction: Basic elements of a feedback control system, open loop, feedback and feed-forward, linear and non-linear, continuous and sampled-data control systems, digital control, practical examples of the above. Control system components, DC & AC Servo motors, techo-generator, potentiometer, synchros, stepper motor, AC position control system, Elements of generalized measurement system, characteristics of instruments, accuracy, precision, sensitivity, range span. Construction and working of CRT, Block diagram of CRO, measurement of voltage and frequency with CRO.

(12 Hrs)

Unit-II

Mathematical models for Physical Systems: Differential equations of simple mechanical, electrical, thermal, linearization of a non-linear mathematical model, transfer function derivation of physical systems, Block diagram, Signal flow graphs.

(12 Hrs)

Unit-III

Time Response Analysis: Standard test signals, time response of first and second-order systems, time response specifications, steady-state errors and error constants, error performance indices. Stability of Systems, Concept of stability, condition for stability, Routh's Hurwitz's ability criteria.

(12 Hrs)

Unit-IV

Frequency Response Analysis: Co-relations between time and frequency response, frequency response specification.

(12 Hrs)

RECOMMENDED BOOKS

Title	Author	Publisher
Text Book		
Control System Engineering	Nagrath, I.J.,and Gopal	Wiley Eastern
Reference Books		
Theory and Problems of Feedback Control Systems	Schaum Series	TMH
Theory and Problems of Feedback Control Systems	Bakshi and Goyal	TMH
Automatic Control Systems	Kuo	PHI
Modern Control Engineering	Ogata	PHI

IE-4102 PROCESS INSTRUMENTATION

L T P
3 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 75

Unit-I

Introduction: Trends in process control, Safety aspects in Instrumentation and control system, economics of process Instrumentation, selection of key variables for process control; pneumatic and electronic instrumentation, Flow Measurement, flow measurement with orifices; magnetic, ultrasonic Rotometer and vortex flow-meters.

(14 Hrs)

Unit-II

Level Measurements: Level detectors float level devices, level gauges, optical level devices, radiation level sensors and thermal level sensors. Temperature Measurement, Temperature sensor – thermocouples, RTDs, thermistors, radiation thermo-meter, IR detectors; fiber-optic temperature sensor; acoustic pyrometer.

(14 Hrs)

Unit-III

Pressure Measurement: Pressure sensors – Bellows, diaphragm, bourdon and helical types, electronic pressure sensor, manometers, pressure gauges, vacuum sensors, high pressure sensors, pressure repeaters.

(14 Hrs)

Unit-IV

Transducer: Measurement Systems for Density, pH, humidity, moisture and viscosity measurement. Instrumentation and Safety Alarm and shutdown devices, safety interlock systems.

(14 Hrs)

RECOMMENDED BOOKS:

Title	Author	Publisher
Text book		
Industrial instrumentation and control	S.K. Singh	TMH
Reference Books		
Practical Process Instrumentation and Control	McGraw Hill	New York
Instrumentation in Process Control	E.J	Prentice Hall
Handbook of Controls and Instrumentation	Lenk, John D	Prentice Hall
Process Control Instrumentation Technology	Curtis D Johnson	John Wiley
Process Measurement and Analysis	Bela G' Liptak	Butterworth Heinemann

IE-4103 MICRO PROCESSORS

L T P
3 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 75

Unit-I

Introduction: Typical organization of microcomputer system its Functions with block diagram, microprocessor evolution on modern society. Architecture, Concept of Bus, Bus organization of 8085, functional block diagram of 8085 and function of each block, internal operation of 8085 timing diagram, memory read/write and I/O read/write addressing modes, flags in 8085.

(12 Hrs)

Unit-II

Instruction Cycle and Timing Diagram : Instruction cycle, machine cycle T-State, fetch and execute cycle (with diagram), Memory Organization, Memory mapping, decoding memory interfacing (RAM/ROM), concept of I/O mapped and memory mapped I/O.

(12 Hrs)

Unit-III

Programming 8085 Microprocessor: Brief idea of assembly language and machine language, memory codes, instruction format, instruction set of 8085, data transfer group, arithmetic group, logic group, STACK Branch operation and machine control group, programming exercise in assembly language. **Interrupts**, Concept of interrupts, maskable and non-maskable interrupts, software interrupts, various hardware interrupts of 8085, Masking of interrupts.

(12 Hrs)

Unit-IV

Data Transfer Techniques: Synchronous data, synchronous data transfer, USART hand shakable interrupt driven data transfer, DMA and its operation and serial data transfer. Brief idea of interfacing chips 8255, 8259, 8279, 8251, Comparison between 8085 – 8080, 8086.

(12 Hrs)

RECOMMENDED BOOKS

Title	Author	Publisher
Text Book Microprocessor Architecture Programming and Applications with the 8085	Ramesh S Gaonker.	New Age
Reference Books Microprocessors and Interfacing	Douglas hall	PHI
Microprocessor and 8085 and Hardware	B Ram	Dhanpat Rai
Microprocessors Theory and applications	M. Rafiquzzuman	PHI

IE-4104 ANALYTICAL AND BIOMEDICAL INSTRUMENTS

L T P
3 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 75

Unit-I

Introduction: Physiological electrodes and transducers, origin of bioelectric signals; electrodes for ECG, EEG, EMG, electrocardiograph, phonon-cardiograph, electroencephalograph and electro-myograph, skin contact Impedance, conducting of electrode jellies and creams; sensors for measurement of pressure, temperature, pulse, respiration.

(08 Hrs)

Recording/Display Systems : Basic recording system, preamplifiers, electric noise and its reduction, driver stage; direct writing, inkjet, magnetic tape, thermal array. Oscilloscope for bio-medical measurements; multi-channel display.

(06 Hrs)

Unit-II

Patient Monitory Systems: System concept; measurement of blood pressure, temperature, respiration rate; aponea detectors; ambulatory monitoring instruments, Application of computers in patient monitoring system, **Foetal Monitoring**, Cardio-tocograph, foetal heart rate monitoring, use of computers for processing cardio-topographic data.

(14 Hrs)

Unit-III

Biomedical Telemetry: Concept of Telemetry, Advantages of Telemetry, Wireless Telemetry, single channel; analog physiological signals over telephone lines.

(08 Hrs)

Patient Safety: Electric shock hazards, leakage currents, test instruments, patient isolation, safety measures.

(06 Hrs)

Unit-IV

Analytical Instruments: Blood Flow-meters – Electromagnetic ultrasonic. Pulmonary function Analyzer – measurement, spirometry analysis, respiratory gas analyzer. Blood Gas analyzers – Blood pH, Oxygen, PCO₂, PO₂ measurement complete blood gas analyzer, cell counter. Audiometers – basic audiometer, speech audiometer.

(14 Hrs)

RECOMMENDED BOOKS:

Title	Author	Publisher
Text Book		
Handbook of Biomedical Instrumentation	RS Khandpur	TMH
Reference Books		
Biomedical Instrumentation	Chromwell	Prentice Hall
Physiological measurement	Peter Strong	Prentice Hall
Principles of Applied Biomedical Instrumentation	Geddes and Baker	Wiley

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit-I

Basic Control Loops and Characteristics: Introduction, R,L,C elements in pneumatic, hydraulic and electrical system; Simple Processes like: Single capacity pressure system, Single capacity temperature system, Single capacity level system, Single flow loop system, Computer control systems – Introduction to SDC and DDC and their applications in process industries.

(12 Hrs)

Unit-II

Basic Controller Modes and Characteristics: Study of process characteristics; controller operating models, on-off, proportional, integral, derivative, proportional-integral, proportional-derivative, proportional-integral-derivative; relative merits of the above control modes; suitability of various control actions for different application.

(12 Hrs)

Unit-III

Multi-loop Controls: Ratio, cascade, feed-forward control, Feedback Control, Controllers, Transmitters and Converters, Various types of controllers – pneumatic, hydraulic, electrical, electronic, electro-hydraulic, digital. Study of transmitters-pneumatic, electronic, signal converters.

(12 Hrs)

Unit-IV

Annunciators: Annunciators, Concept of sequencing, annunciation and interlocking applicable to process control systems.

(06 Hrs)

Control valves: Globe, Ball, Butterfly, Single seated and double seated.

(06 Hrs)

RECOMMENDED BOOKS:

Title	Author	Publisher
Text Book		
Automatic Process Control	Eckman DP	TMH
Reference Books		
Process Control Instrumentation Technology	Johnson Curtis	Prentice Hall
Principles of Industrial Process Control	Eckman, Donal P	John Wiley
Process Control	Harrist P	Prentice Hall
Instrument Engineers Handbook	Liptak	Wiley

IE 4202 MICRO CONTROLLERS & PLCs

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Introduction : Introduction to microcontroller & embedded processor, overview of 8051 family. (04 Hrs)

Assembly Language Programming: 8051 assembly language programming, assembling introduction to 8051 assembling and running an 8051 program counter & Ram space in 8051, data type & directive, 8051 flag bits & PSW register, register bank and stack, jump, loop and introduction, pin description of 8051, I/O programming & bit manipulation. (08 Hrs)

Unit II

8051 Addressing mode: Immediate & register addressing mode, accessing mode, accessing memory using various modes. (04 Hrs)

Arithmetic introduction & programme: Unsigned Addition & subtraction, multiplication & division. Signed number concepts & arithmetic operation. (04 Hrs)

Logic Instruction & programs: Logic compare, rotate, swap instruction, BCD & ASCII application program. (04 Hrs)

Unit III

Single bit instruction & program: Single bit instruction, programming, Single bit operation with CY, reading input pins v/s port latch. (04 Hrs)

Timer/counter: Programming 8051 timers, counter programming. (04 Hrs)

8051 serial communication: Basics of serial communication, 8051 connection to RS232, 8051 serial communication programming. (04 Hrs)

Unit IV

Interrupt: 8051 interrupts, programming, timer interrupts, programming external hardware interrupts, programming the serial communication interrupts, interrupt priority in the 8051. (06 Hrs)

Interfacing: Interfacing 8051 with LCD, ADC, Temp. sensor, stepper motor, keyboard and interfacing DAC, Programmable Logic Controller- Introduction, Functional diagram, application, Programming and Ladder diagram. (06 Hrs)

RECOMMENDED BOOKS

Title	Author	Publisher
Text book The 8051 Microcontroller architecture programming and applications	Kenneth J. Ayala	Penram
Reference Books The 8051 Microcontroller and embedded systems	Mazidi and Mazidi	Pearson
Programmable logic Controller Design with Microcontroller	Job Dan Otter C Nagaraj Murty , S. Ramgopal	PH I McGraw Hill

IE-4203

**HYDRAULICS AND PNEUMATIC
INSTRUMENTS**

**L T P
3 0 0**

**Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50**

Unit-I

Introduction: Scope of pneumatics and hydraulics in instrumentation and control. amentals of air, fluid flow and their behavior, flow through orifices and restrictions.

(03 Hrs)

Hydraulic system: Hydraulic system elements, devices and their modeling e.g. valves, actuators, hydraulic pumps, Screw type, Vane type, Lobe type, Turbine type & Centrifugal type, electro-hydraulic actuators

(09 Hrs)

Unit-II

Pneumatic system: Pneumatic system elements, devices and their modeling e.g. sources, regulated sources, valves actuators- diaphragm type, spring & diaphragm type, springless, rotary, electro-pneumatic, pneumatic compressors e.g. positive displacement – piston type, screw type, vane type, lobe type, Dynamic compressors- centrifugal, axial type.

(12 Hrs)

Unit-III

Controllers: Feedback and its application to development of hydraulic controllers, Pneumatic controllers, control schemes and control circuits.

(12 Hrs)

Unit-IV

Transmitters: Hydraulic power transmission, control schemes and control circuits. Electro hydraulic characteristics.

(08 Hrs)

Maintenance: Compressed air system, pneumatic system and hydraulic system

(04 Hrs)

RECOMMENDED BOOKS:

Title	Author	Publisher
Text Book		
Hydraulics and Pneumatics	Andrew Parr	Jaico Books.
Reference Books		
Process Control Instrumentation Technology	Curtis D. Johnson	Pearson Education
Automatic Process Control	Donald P. Ackman	Wiley Eastern
Principles of Process Control	D. Patranabis	TMH
Process System Analysis Control	R Coughanowr Donald	TMH

IT-3101 FUNDAMENTALS OF INFORMATION TECHNOLOGY

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

UNIT- I

Information Technology : Concepts, application in home, education, training, entertainment and engineering.

Basics of Computer : Block diagram of computer, generation and classification of computer, booting process, introduction to concepts-bit, byte, word, hardware, software, operating system, system software, application software, machine language, assembly language, high level language, compilers, assemblers, loader and linker.

Computer architecture : CPU, memory, internal memory, Instruction format, Instruction set, Computer programme, Computer languages.

(12 Hrs)

UNIT-II

Input Devices: Working of various input devices such as keyboard, mouse, digital camera, scanner and pointing devices.

Output Devices : Working of various output devices such as monitor (CGA, EGA, VGA, SVGA), different types of printers and plotters, projectors, audio output terminal.

Memory: Primary and secondary memory, RAM, Types of RAM,ROM & types of ROM, cache, extended and expanded memory, magnetic tape, optical disk.

(12 Hrs)

UNIT-III

Programming Languages : Classification of programming languages, Generation of programming languages, Features of good programming language, Scripting languages.

(12 Hrs)

UNIT-IV

Internet Basics : Evolution of Internet, Basic Internet terms, getting connected to internet, internet application, e-mail, search engine and its working, internet languages, virus, worms etc.

(12 Hrs)

Recommended Books

Title	Author(s)	Publishers
Text Fundamentals of Computer	Rajaraman	PHI, New Delhi
Reference Fundamentals of Information Technology	Leon and Leon	Vikas Publishing, New Delhi
Computer Fundamentals	P K Sinha	BPB Publications, New Delhi

IT- 3201 COMPUTER COMMUNICATION

L T P
3 0 0

Sessional Marks : 25
End Term Examination Marks: 50

UNIT- I

Data Communication: Introduction to data communication, Analog Vs Digital communication, transmission media, OSI and TCP Model, Network Topology. (12 Hrs)

UNIT- II

Synchronous and Asynchronous systems: Data rates, serial and parallel communication, concepts of simple, half duplex and full duplex modes.
Interface Standards : Introduction to RS-232, RS-232 voltages, data bits, RS-232 signals, RS-232 interconnection. (12 Hrs)

UNIT- III

Multiplexing and Modulation techniques: Frequency Division Multiplexing, time division multiplexing, and wavelength division multiplexing, Digital modulation techniques: ASK, FSK, PSK, and QPSK (12 Hrs)

UNIT- IV

Networks: Basic network protocols and access, media and physical interconnection. Local Area networks (LAN), IEEE 802 standards. Packet switching, message switching and circuit switching. Design issues in data link layers, Inter-networking, Introduction to hubs, routers, bridges, gateways. (12 Hrs)

Recommended Books

Title	Author(s)	Publishers
Text Books		
Understanding Data Communication	Gilbert Held	
Reference Books		
Data Communication & Networks	Frouzen	TataMcGraw Hill
Computer networks	Tanenbaum	PHI, New Delhi

IT-4101 WEB TECHNOLOGIES

L T P
3 1 0

Sessional Marks : 25
End Term Examination Marks: 75

UNIT- I

Internet Basics: Types and functions of modems, IP addressing, Internet domains, domain name service, TCP/IP protocols, Internet Service Providers, Intranets

Internet Connectivity: Telephone Line, Cable, Leased line, ISDN, VSAT, RF link

(12 Hrs)

UNIT-II

Internet Applications : E-mail, Telnet, FTP, IRC, NNTP, Video Conferencing, e-commerce.

Developing Portals Using HTML: HTML tags, hyperlinks, adding graphics and images, image maps, image files, using tables, forms, style sheets and frames, Front-page editor, Front-page explorer.

(12 Hrs)

UNIT-III

Introduction to Adobe Photoshop. Introduction to Macro-Media Flash.

(12 Hrs)

UNIT-IV

Web Publishing : Testing websites, publicizing websites

World Wide Web : Hypertext, hyperlinks and hyper media, universal resource locator, URL registration, browsers, search engines, proxy servers.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publishers
Text Internet 6 in 1	Kraynak and Habraken	PHI, New Delhi
Reference Internet for Everyone	Alexis Leon	Vikas, New Delhi.
Using the Internet IV edition	Kasser	PHI, New Delhi

IT- 4102 **BASICS OF NETWORKING**

L T P
3 0 0

Sessional Marks : 25
End Term Examination Marks: 50

UNIT- I

Networking Basics : What is Network, Concept of Networking, data communication, Why use a Network (Network Services), Network models (LAN/MAN/WAN), Network Topologies (Star, Bus, Ring, Mesh), Protocols and standards, Reference Models, OSI Reference Model, TCP/IP model, Comparison of OSI and TCP/IP model, Functioning of each layer, IEEE 802 standards

(12 Hrs)

UNIT- II

Network Compounds: Signal transmission, Digital Signaling, Analog Signaling, Bit synchronization, transmission modes, Base band and broadband transmission, Multiplexing -TDM,FDM,WDM, Transmission Media, Cable media (twisted, coaxial, fiber optics), Wireless media (Radio wave, microwave, in-tracer), Real world Networks, Ethernet, Token ring, ATM, Frame relay, ISDN

(12 Hrs)

UNIT- III

Protocols Suits: Model and protocol, Network IPX/SPX, Exploring Networks (Network connectivity), HUBS, Repeaters, Bridges, Multiplexers, Routers/ Brouters, Gateways

(12 Hrs)

UNIT- IV

Wide Area Networks: Overview, Switching (circuit, message, packet), Lines (Dial up lines, Analog, Digital).

(12 Hrs)

Recommended Books

Title	Author(s)	Publishers
Text Computer networks (2 nd edition)	Tanenbaum	Prentice Hall of India
Reference Data Communication Local Area networks (5 th edition)	Frouzen S K Basandra	TataMcGraw Hill Galgotia Publications

IT- 4201 NETWORK SECURITY

L T P
3 1 0

Sessional Marks : 25
End Term Examination Marks: 75

UNIT- I

Why secure network, Attackers Vs Hackers, Attack from internal and external network, How much Security, Performing Risk analysis, Developing security policy, Accessibility, Defining security units, Justify the policy, Level of privacy, Virus, Trojans and Worms, What is virus, replication, concealment, bomb, social engineering viruses, Worms, Trojan horses, Preventive measures, access central, checksum verification, process monitoring, virus scanner.

(12 Hrs)

UNIT-II

Firewalls: Defining and access central policy, Definition of firewalls and types, Firewalls (Unix/ NT), Address translation, Firewall logging, Firewall Development, Intrusion detection system, IDS introduction, IDS limitations, Teardrops attack, Host based IDS setup.

(12 Hrs)

UNIT-III

Authentication and Encryption: a) Authentication: Clear text transmission, Session hijacking b) Encryption: Methods, Weaknesses, Government intervention, c) Solutions: Data encryption standards, Digital certificate servers, IP Security, Secure Socket Layer (SSL)

(12 Hrs)

UNIT-IV

Introduction to VPN (Virtual Private Network), Disaster, Prevention and Recovery, Disaster categories, Network disasters.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publishers
Text Mastering network Security	Chris Breton	BPB Publications
Reference Network firewalls	Kiranjeet Syan	New Rider Publications
Internet Security		New rider publication

IT- 4202 INTERNET PROGRAMMING

L T P
3 1 0

Sessional Marks : 25
End Term Examination Marks: 75

UNIT- I

Introduction to Java: A brief history, how java works, JVM, Java features, using Java with other tools, native code, Working with Java Objects, Data types, Inheritance, encapsulation and polymorphism, constructors and finalizers, garbage collection.

Arrays and Interfaces: using arrays creating and copying arrays, Wrapper class, string class, casting, using this and super, using java interface.

Introduction to Applet Application and JDK: Java applets Vs Java Applications, Building application with JDK, building applets with JDK, HTML for Java Applets.

(12 Hrs)

UNIT- II

Exception Handling and Stream: Overview of exception handling, method to use exception handling, methods available to exceptions (The throw statement), creating your own exception classes, input stream, output stream

(12 Hrs)

UNIT-III

Introduction to Threads and Multi-threading: Overview, Thread basics, creating and running a thread, the thread control methods, the thread life cycle.

Animation and images: Java basic drawing tools, drawing lines and rectangles, drawing polygons, ovals, arcs, rendering text, animation basics, Java images, Image processing-color models.

(12 Hrs)

UNIT-IV

Introduction: Event Driven Programming, Java event types, JDBC.

(12 Hrs)

Recommended Books

Title	Author(s)	Publishers
Text Java Programming	E. Balagurusamy	TMH, New Delhi.
Reference JDBC and Java Beans Programming Black Book	Steven	Dream-Tech, India
Set of books on Java Programming in Java 5.0	James P Cohoon	Sun Microsystems TMH, New Delhi.

ME-3102 APPLIED MECHANICS

L T P
3 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 75

Unit-1

Fundamentals of Mechanics: Fundamental concept of mechanics and applied mechanics, idealization of mechanics, Basic dimensions and units of measurements, concept of rigid bodies, Laws of Mechanics

Laws for Forces: Scalars and Vectors, Vector operations, Vector addition of forces, Force and its effects, characteristics of force vector, Bow's notation

Force systems: Coplanar and space force systems. Coplanar concurrent and non-concurrent forces. Free body diagrams, Resultant and components of forces, concept of equilibrium; parallelogram law of forces, equilibrium of two forces; super position and transmissibility of forces, Newton's third law, triangle law of forces, different cases of concurrent, coplanar two forces systems, extension of parallelogram law and triangle law to many forces acting at one point - polygon law of forces, method of resolution into orthogonal components for finding the resultant, graphical methods, special case of three concurrent, coplanar forces, Lami's theorem.

(12 Hrs)

Unit-II

Moments & Couples: Concept of moment, Varignon's theorem, Principle of moments, Moment of forces about a specified axis, concept of couple - properties and effect, Moment of couple, Movement of force on rigid body, Resultant of force and couple system, Reduction of force and couple system, Parallel forces - like and unlike parallel forces, calculation of their resultant

Trusses: Simple trusses, analysis of simple truss, Method of Joints, Method of sections

(12 Hrs)

Unit-III

Friction: Concept of friction, Characteristics of Dry friction, Laws of Coulomb friction, limiting friction, coefficient of friction; sliding friction and rolling friction, Belt friction, Ladder friction

Centre of Gravity : Concept of gravity, gravitational force, centroid and centre of gravity, centroid for regular lamina and centre of gravity for regular solids. Position of centre of gravity of compound bodies and centroid of composite area. CG of bodies with portions removed.

Simple Lifting Machines: Concept of machine, mechanical advantage, velocity ratio and efficiency of a machine, their relationship, law of machine, Simple machines : lever, wheel and axle, differential wheel & axle, pulley systems, simple screw jacks, winch crab (single & double).

(12 Hrs)

Unit-IV

Kinematics of particle : Types of motion, linear motion with uniform velocity, uniform & varying acceleration, motion under gravity, motion of projectiles, relative motion of a particle

Kinetics of particle: Newton's laws of motion, equation of motion, equation of motion for system of particles, D' Alembet's Principle, Motion of connecting bodies. Concept of momentum, Impulse momentum principle, Conservation of momentum, Principle of work and energy.

(12 Hrs)

Recommended Books

Title	Author(s) Text	Publisher
Engineering Mechanics	R.K. Rajput	Dhanpat Rai Pub

Reference

Engineering Mechanics (Static & Dynamics)	J. L. Mariam & L. G. Kraige	John Wiley & Sons
Engineering Mechanics (Static & Dynamics)	R. C. Hibbeler	Prentice Hall
Engineering Mechanics (Static & Dynamics)	Beer & Johnston	McGraw Hill
Engineering Mechanics (Static & Dynamics)	Boresi & Schmidt	Cengage Learning
Engineering Mechanics	S. Rajshekharan	Vikas Publishing House

ME- 3103 MANUFACTURING PROCESSES-I

L T P
4 1 0

Maximum Sessional Marks: 50
Maximum End Term Examination Marks: 75

Unit-I

Foundry: Introduction to casting, advantages & limitations. Introduction to moulding processes. Sand moulding- materials, properties of moulding sand, sand moulding procedure, Pattern- types & materials, Pattern allowances, core prints, cores, Elementary & brief description of various melting furnaces.

Welding: Welding processes - classification of welding processes. Gas welding, tools & equipment, types of flames, filler rods, flux. Arc welding, procedures, equipment, application, type of electrodes, specification of electrode, selection of electrode, flux, welding parameters & equipments. Introduction to SMAW, GTAW, GMAW & submerged arc Welding. Introduction to Resistance welding, Spot, Seam, Projection & Percussion, Pressure, friction welding. Introduction to Soldering and Brazing.

(16 Hrs)

Unit-II

Turning, Shaping & Planning: Principle, description & functions of lathe, specifications, work holding devices, tools & operations. Working principle of shaper, planer and slotter, Specification of shaper, planer and slotting machine Quick return mechanism, types of tools Speed and feed used in above processes. Commonly used cutting tool materials.

(16 Hrs)

Unit-III

Milling & Drilling : Milling; principle, types of milling machines, specifications of milling machine, Introduction to indexing, Multipoint cutting tool, Types of milling cutters. Principles, Classification of drilling machine, Different operations on drilling machine, Speed and feed in drilling.

(16 Hrs)

Unit-IV

Boring: Principle of boring, classification of boring machine Specification of boring machine, boring tools, boring bars & boring heads, alignment of bores & its importance.

Broaching: Broach, Nomenclature, cutting action of broach, Broaching operations and applications.

(16 Hrs)

Recommended Books

Title	Author(s)	Publisher
Text		
Workshop Technology Vol. I & II	Hazra Chowdhry	Media Promotors
References		
Manufacturing materials & process	Lindberg	Prentice Hall
Manufacturing processes	Begeman	John Wiley
Workshop Technology	S.K. Garg	Laxmi Publications

ME- 3104 FUNDAMENTALS OF MECHANICAL ENGINEERING

L T P
2 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit-I

I.C Engine

12

Types& classification of CI and SI engines. Working principal of two stroke petrol engine and diesel engine, four stroke petrol and diesel engines, valve timing diagrams, ignition system in petrol engine, carburetor, cooling &lubrication in IC engines.

Unit-II

Simple Stresses and Strains

12

Normal stress and strain, shear stress and strain, Hooke's law and Poission's ratio, Modulus of elasticity in tension, compression, shear. Bulk modulus. Stress-strain diagrams for ductile and brittle materials.

Unit-III

Fundamentals of Mechanics

12

Fundamental concept of mechanics and applied mechanics, parallelogram law of forces, triangle law of forces, Lami's theorem.

Unit-IV

Transmission of power

12

Transmission of power through belt, rope, pulleys, gears and chains drive. Different types of pulleys and their applications. Different types of gears and their application.

Recommended Books

<i>Title</i>	<i>Author(s)</i>	<i>Publisher</i>
I.C.Engine	Ganesan	McGraw Hill
R.K.Rajput	Strength of Materials	Laxmi publication
R.K.Rajput	Engineering Mechanics	Dhanpat Rai
Jagdish Lal	Theory of Machines	Standard Publishers

**Unit-I
Mechanical Engineering**

08

Transmission of power

Transmission of power through belt, rope drives and pulleys, gears and chains. Different types of pulleys and their applications. Chain drives and its comparison with belt drive. Gear drives, types of gears, simple gear trains and velocity ratio.

Internal Combustion Engines

Classification and application of IC Engines. Spark ignition and compression ignition engines. Working principle of two stroke and four stroke petrol and diesel engines. Ignition system in petrol engines i. e spark ignition, Magneto ignition, spark plug & Carburetor. Cooling system of IC engines. Lubrication of IC Engines. General Maintenance of engines

Unit-II**Air Conditioning system**

08

Basic principle of refrigeration and air conditioning. Working of centralized air conditioner. Concept of split air conditioner and its applications. Types & classification of CI and SI engines. Working principle of two stroke petrol engine and diesel engine, four stroke petrol and diesel engines, valve timing diagrams, ignition system in petrol engine, carburetor, cooling & lubrication in IC engines.

Unit-III**Application and Advantages of Electricity**

08

Difference between AC and DC. Various applications of electricity. Advantages of electrical energy over types of energy

Basic Quantities of Electricity

Definition of voltage, current, power and energy with their units. Name of the instruments used for measurement of quantities given in Unit III. Connection of the instruments in 2.2 in electric circuit.

Unit-IV**Various Types of Power Plants**

08

Elementary block diagrams of thermal. Hydro power station. Brief explanation of the principle of power generation in above power stations

Electric Motors and Pumps

Definitions and various application of single phase and three phase motors. Connection and starting of three phase motors by star delta starter. Conversion of horse power in watts or kilowatts'. Type of pumps and working of centrifugal pumps

Recommended Books

Title	Author(s)	Publisher
Thermal Engineering	S.S. Thethi	IPH
Elements of Mech. Engg	Sadhu Singh	Khanna Publisher

ME- 3131

**FOUNDRY, FORMING AND WELDING
PROCESSES**

**L T P
3 0 0**

**Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50**

Unit-I

Foundry: Pattern Making, Types of patterns, Pattern materials, Pattern allowances, Colouring of patterns, introduction to cores, Core materials and types of cores, Moulding, Introduction to moulding, Types of moulding sand and their properties, Sand mixing and mould preparation, Moulding defects, Melting and pouring, Types of melting furnaces (pit, lifting, cupola) used Closing and pouring of mould 1 4 Special Casting Methods, Introduction to die casting, investment, and centrifugal casting

(12 Hrs)

Unit-II

Welding, Soldering and Brazing: Gas Welding, Brief description of gas welding ,as welding foos and, equipment, Different types of flame, Selection of filler rods, flux and torch, Electric Arc Welding, Introduction to arc welding with procedures, applications, Types of arc, Types of electrode used, Specifications of electrodes, Selection of electrode, flux. Current and equipment Resistance Welding, spot welding, Seam welding, Projection welding, Percussion welding, Principle of soldering and brazing, Types of solders and soldering fluxes and their uses, Brazing process, Description of brazing tools and equipment, Brazing filler alloys and fluxes, Advantages, limitations and applications of soldering and brazing.

(12 Hrs)

Unit-III

Advanced Welding : Working principle, process details, equipment details, limitations and applications of the following welding processes; Thermit welding, MIG welding, TIG welding, Atomic hydrogen welding, Electron beam welding, Laser beam welding.

(12 Hrs)

Unit-IV

Forming: Forming, General idea of stress and plastic deformation, Hot working and cold working. Details and applications of lopping processes: Die stamping, Drawing, Spinning, Rolling, Extruding, Forging, Tube drawing

Presses and Press Tools : Types of presses, their applications, Types of dies, Types of die sets, Punches, Pads, Die clearance, Stripper plates, Stops, Pilots, MO Stock layout.

(12 Hrs)

Recommended Books

Title	Author(s)	Publisher
Text Foundry, Forming and Welding	P.N. Rao	Tata McGraw Hill
References Foundry Technology	KP Sinha, D B Goel	Roorkee Publishing House. Roorkee
A Text Book of Welding Technology Welding Engineering	OP Khanna PL Aggarwal and T Manghnani	Dhanpat Rai and Sons Khanna Publishers, Delhi

ME-3201 MANUFACTURING PROCESSES - II

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Metal Forming: Metal forming Processes. Die Stamping, Drawing, Spinning and Tube drawing. Rolling, extruding and forging.

Press Working: Types of presses, press working operations; shearing, blanking, piercing, coining, swaging, embossing and upsetting. Types of dies. punches. punch holders & strip Layout.

(12 Hrs)

Unit II

Grinding: Types of grinding machines. Shapes of grinding wheels. Various elements of grinding wheel. Codification and selection of grinding wheel. Balancing of wheel. Wheel dressing, loading and truing.

Metal Finishing and Coating: Purpose of super finishing, surface roughness. Introduction of Honing, Lapping Polishing, Buffing and super-finishing. Metal Spraying. Metal Coating; galvanizing, electro-plating and anodizing.

(12 Hrs)

Unit III

Powder Metallurgy : Principle. Methods of making powder from metal. Processes involved; Compacting, Sintering and finishing operations. Advantages and Disadvantages of powder metallurgy.

Jigs and Fixtures: Considerations in Jigs and Fixtures design. Main elements of jigs and fixture. Principle of location, Locating and clamping devices. Jig bushes.

(12 Hrs)

Unit IV

Non-Conventional Machining : Concept of non-conventional machining. Principle and Working of EDM, wire cut EDM. Introduction to other non-conventional machining methods; ECM, LBM and explosive forming.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Production Technology Text	R.K. Jain	Khanna Publishers.
Reference		
Workshop Technology	Hazara Chaoudhary	East-West Publications.
Manufacturing Processes	Bageman	John Wiley Publications.
Manufacturing Materials & Processes	Lindberg	Prentice Hall of India.

ME-3202 STRENGTH OF MATERIALS

L T P
3 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 75

Unit I

Stress and Strain: Normal stress and strain, shear stress and strain, concept of bearing stress, Hooke's law and Poisson's ratio, Modulus of elasticity in tension, compression, shear. Bulk modulus. Stress-strain diagrams for ductile and brittle materials, Extension of axial loaded members : uniform and non uniform bars, Extension of tapered bar, Extension due to self weight, Composites section, Concept of temperature stress, Derivation of relation between elastic constant E, G, and K, Concept of strain energy.

Principal Stresses: Stresses in two perpendicular planes. Determination of normal and shear stress components on any plane passing through a point. Concept of principal stresses and principal planes and their importance. Derivation of equations for principal stresses and determination of normal and shear stress components on a plane with Mohr's construction. Concept of pure shear and complementary shear.

(12 Hrs)

Unit II

Bending Moment and Shear force: Types of beams, Loads and reactions, Concept of Bending moment and shear force, Bending moment and shear force diagrams for determinate beams and different loads, Concept of point of contraflexure, Relation between loads, shear forces and bending moments. Loading and bending moment diagrams from shear force diagrams. Simple cases

Bending Stresses in Beams: Concept of pure bending, derivation of straight beam formula, section modulus, determination of bending stresses under different loads for different section of beams, Shear stress.

(12 Hrs)

Unit III

Torsion: Torsion of circular solid straight shafts, hollow circular shafts, derivation of torsion equation, Power transmitted by solid and hollow shaft, comparison of solid and hollow shaft

Springs: Helical springs, Close coiled helical spring subjected with axial load and axial twist, Determination of spring stiffness for series and parallel combinations.

(12 Hrs)

Unit IV

Columns and Struts: Concept of column & Stability End condition, Equivalent length, Euler's theory for long columns and its limitations, Euler's formula and Rankine Gordon formula for different end conditions, Slenderness ratio, factors effecting strength of a column, Columns subjected to eccentric loading: Rankine's method, Euler's method.

(12 Hrs)

Recommended Books

Title	Author(s)	Publisher
Strength of Materials Text	R.K. Rajput	S. Chand
Reference		
Mechanics of Materials	R.C. Hibbeler	Pearsons Education
Mechanics of Materials	Fardinard P. Beer and E. Russell	McGraw Hill
Mechanics of Materials	James M. Gere	Cengage Learning

ME-3203 THERMAL ENGINEERING

L T P
3 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 75

Unit I

Introduction: Boyle's Law, Charles's Law, characteristics gas equation, universal gas constant Properties; intrinsic and extrinsic, system; open, closed and isolated.

Laws of thermodynamics: Thermodynamic equilibrium, Zero th law of thermodynamics, first law of thermodynamics, concepts of enthalpy, internal energy, specific heat, work and heat, concept of entropy, caluses and Kelvin plank statement of second law of thermodynamics, Equivalence of Kelvin plank and clausius statements. Throttling and free expansion, non-flow work done under isothermal, polytropic, adiabatic, isobaric, isochoric processes, simple problems steady flow energy and its applications.

(12 Hrs)

Unit II

Formation of Steam and Steam Boilers: Steam formation, wet steam, dry steam and saturated steam, dryness fraction, superheated steam; degree of superheat, latent heat of vaporization, Enthalpy of steam, entropy; entropy increase during evaporation, temperature entropy diagram mollier diagram (H-S diagram) Steam generator, Classifications, comparison of fire tube and water tube boilers, construction and features of Lancashire boiler, locomotive and Babcock and Wilcox Boilers, Introduction to modern boilers. Rankine cycle.

(12 Hrs)

Unit III

I.C Engine and Cycles : Types, classification, CI and SI engines, Mechanical constructional details of two stroke petrol engine and diesel engine, four stroke petrol and diesel engines, valve timing diagrams, Carnot cycle, Otto Cycle, diesel and dual cycle, derivation of efficiency and comparison of these cycles.

(12 Hrs)

Unit IV

Performance of IC engines: Brake, indicated, frictional powers, brake mean effective pressure ,indicated map, engine efficiencies, air standard, brake, indicated, mechanical, volumetric ,scavenging, efficiency, characteristics of power, fuel consumption with engine speed, calculation of powers, efficiency and SFC for two and four stroke engine. LCV, HCV

(12 Hrs)

Recommended Books

Title	Author(s)	Publisher
Thermal Engg	R.K.Rajput	Laxmi publication
Heat and Thermodynamics	PL Ballany;	Khanna Publisher
Thermal Science	Domkundwar	S.Chand Publishers
Heat Engineering	Kumar and Vasandani	S.ChandPublications
I.C.Engine	Ganesan	McGraw Hill

ME 3204 PRINCIPALS OF METAL CASTING

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

PATTERNS: Patterns, types, materials, allowances, coreprints, color coding, master pattern, life of pattern, handling and storage of patterns: Precautions, expandable patterns, slurry and coatings

CORES : Function & type of cores, core boxes, core prints, requirements of good core, core reinforcement, core venting, core gum, , core baking.

MOULDING: Moulding & core sand, characteristics, properties, preparation of moulding & core sands, ingredients, sand preparation machinery, mullers, gyratory sieves, moulding methods: mould drying and skin drying; mould properties: Green Compact Strength, compactibility, mould hardness, core hardness, hand moulding, and use of pneumatic rammers

(12 Hrs)

Unit II

MELTING AND POURING: Melting of metals/alloys, cast iron, aluminium, gun metal, bronze, brass, zinc alloy, lead and tin alloys. Melting characteristics, properties, furnaces (pit, cupola, air reverberatory/rotary and muffle) use of fluxes, use of pouring basin, provision and placement of sprue well, runners, gates and risers, basic design considerations in gating systems, fluidity, pouring of metal, use of strainer cores, consideration in solidification of casting, effect of mold and metal properties shrinkage, need of riser, basic shape and size of riser

(12 Hrs)

Unit III

FITTING AND CLEANING: Shake out, cleaning of sand from casting, shot blasting, burnishing, trimming of gates and risers, control of fins.

CASTING DEFECTS: Various possible casting defects, defects due to pattern and temperature of molten metal, defect remedies.

(12 Hrs)

Unit IV

INSPECTION of castings: Visual inspection, dimensional inspection, non-destructive inspection, casting soundness, pressure testing, sectioning, radiographic inspection, inspection and repair of cracks and blow holes by use of fillers and welding.

CASTING DESIGN CONSIDERATIONS: Function design-mechanical strength, columnar solidification. Dimensional design factors-minimum section thickness, surface finish, flanges, ribs and junctions.

(12 Hrs)

Recommended Books

Title	Author(s) Text	Publisher
Principle of Foundry Technology	PL Jain	S. Chand & Co, New Delhi
Workshop Technology	Reference Chapman	Pitman Publishers, London
Foundry Technology	Srivastava	SK Kataria and Sons
Foundry Technology	Gupta	Charotar Publishing

ME 3205 FOUNDRY MATERIALS

L T P
2 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 25

Unit I

Moulding Materials: Green & dry sand moulding, Role of moisture clay & various organic & inorganic additives; their testing & evaluation, Types & properties of sand & preparation. AFS number, Cores & core sand requirement, mould washes & coatings (Graphite) special sands like Zircon sand, Chaplets, etc

(08 Hrs)

Unit II

Pattern Materials: Wood, Plastics, Cast Iron, Aluminum, wax, polymethane arakite, epoxy-O-Seals – their use as pattern materials, behaviour, life ; manufacturing of patterns.

(08 Hrs)

Unit III

Fuels: Coal, coke, liquid fuel, light diesel Oil (LDO), HSD, LPG, Natural gas, Principles of efficient combustion, liquid and gas fuel burners.

Refractories: Crucibles, hot tops, APC; Insulators and refractory bricks, Refractoriness, Determination of refractoriness, effect of binders on refractoriness, properties and functions of refractories and insulation in furnaces, RUL (refractoriness under load) and control of dimension PLC (permanent linear change), Acid, basic & neutral refractories shapes & monolithic refractories, ceramic fibers.

(08 Hrs)

Unit IV

Metals & Alloys: Castable metal like cast iron, steel, aluminum, copper, brass, gun metal & bronze with respect to melting ease, applications, handling, fluidity, castability.

(08 Hrs)

Recommended Books

Title	Author(s)	Publisher
Foundry technology	D M Goyal & Sinha	Standard Publisher
Foundry technology	Srinivasan	Khanna Publisher
Foundry technology	B. D. Gupta	Satyam Prakashan
Engineering Chemistry	Jain & Jain	Laxmi publication
Refractories	A. Chistar	McGraw Hill
General Metallurgy	Swaroop	New Age Publisher

ME 3211 THEORY OF MACHINES

L T P
3 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 75

Unit I

Simple mechanism: Link, kinematic Pair, Kinematic chain, structure, mechanism, machine, inversion, simple example of mechanism with lower pairs four bar chains, slider crank chains, double slider crank chain example of mechanism with higher pairs.

Velocity and acceleration in mechanism: Velocity diagrams of four bar and single slider crank mechanism by relative velocity method and instantaneous center method. Acceleration diagram of four bar chain and reciprocating engine mechanism.

(12 Hrs)

Unit II

Dynamics of reciprocating parts: Analytical method for velocity and acceleration of piston, piston effort, crank pin effort, turning moment diagram, fluctuation of energy and speed, energy of a flywheel, calculation of weight of flywheel.

Friction and lubrication: Friction of collars and pivots, friction clutches; plate clutch, conical clutch and Centrifugal clutch, friction in journal bearings, film lubrication, rolling friction, ball and roller bearings, prony brake, rope brake and froud's hydraulic dynamometer.

(12 Hrs)

Unit III

Transmission of power: Flat and V-belt drives, velocity ratio of belt drives, slip in belt, creep in belt, length of open and cross belt drives, power transmitted by a belt, ratio of driving tension, centrifugal tension. Condition for the transmission of maximum power. Initial tension in belt. Chain drives-type of chain drives, roller chain and inverted tooth chain. Gear drivers; types of gear wheels. Proportions of gear tooth, gear trains-simple gear trains, compound gear trains; reverted gear train and simple epicyclic gear train (velocity ratio by tabular method)

Cams: Cam –followers mechanism, different types of cams and followers, displacement diagrams of SI simple harmonic motion, uniform velocity motion, uniform acceleration and retardation motion, cycloidal motion.

(12 Hrs)

Unit IV

Governors: Types of governors-dead weight; watt and porter governor, spring loaded governors; hartnell and Wilson hartnell governor(simple problems), governors with gravity and spring control, concept of sensitiveness, ,stability, isochronisms and hunting.

Balancing: Static and dynamic balancing. balancing of single rotating mass by a single mass in the same plane, by two masses rotating in different planes, balancing of several masses rotating in the same plane, balancing of several masses rotating in different parallel planes, partial primary balancing of a single cylinder reciprocating engine.

Vibrations: Causes of vibration in machine, their effect and method of reducing them, important terminology-time period, cycle, frequency, free vibration, forced vibration, damped vibration(elementary concept only).

(12 Hrs)

Recommended Books:

Title	Author(s)	Publisher
R K Bansal	Theory of Machines	Laxmi
	Text	
	Reference	

S.S.Rattan
Jagdish Lal
Beven
Ballaney P L

Theory of Machines
Theory of Machines
Theory of Machines
Theory of Machines &mechanism

TMH.
Standard.
TMH
Khanna

ME 3212 FLUID MECHANICS & MACHINERY

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Fluid Mechanics & Fluid Properties: Concept of fluid, fluid mechanics and hydraulics, properties of fluid i.e. viscosity, specific weight, specific volume, specific gravity and their measurement

Static Pressure: Pascal's law, concept of static pressure, intensity of pressure and pressure head, total pressure on a plane surface and centre of pressure.

(12 Hrs)

Unit II

Measurement of pressure: Concept of atmospheric pressure, gauge pressure, absolute pressure, vacuum, Measurement of pressure, Gauges: Piezometer, simple manometer, differential manometer, U-tube manometer, inverted U-tube manometer, micro manometer and Bourdon pressure gauge.

Flow of fluids: Types of flow, laminar and turbulent, rate of discharge, law of continuity, energy of fluid - potential, pressure and kinetic, Bernoulli's theorem and its applications, discharge measurement by venturimeter and orifices, pitot tube and pitot static tube.

(12 Hrs)

Unit III

Impact of jet: Impact of jet, Impulse momentum principle, Force exerted on fixed and moving flat plate and curved vanes under different orientation of jet.

Hydraulic turbines: Classification of turbines, Impulse & Reaction turbines; Constructional details, working principle, Power, efficiency of Pelton wheel, Francis and Kaplan turbines.

(12 Hrs)

Unit IV

Pumps: Classification of pumps, Working principle, Discharge, work done and power requirement of reciprocating & Centrifugal pump, Effect of air vessels, Cavitation

Hydraulic Machines: Working principles, description and application of hydraulic accumulator, hydraulic intensifier, hydraulic lift, hydraulic jack, hydraulic ram, hydraulic press, hydraulic crane.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Fluid Mechanics & Hydraulic Machines	R.K.Bansal	Laxmi Publications
Hydraulics & Fluid Mechanics Hydraulic Machines	Modi & Seth	Standard Publishers
Fluid Mechanics & Hydraulic Machines	R.K Rajput	S.Chand & Company
Fluid Mechanics & Fluid Machinery	D. S. Kumar	S.K Kataria & Sons
Hydraulics & Hydraulic Machines	Jagadish Lal	Metropolitan
Fluid Mechanics	A.K Jain	Khanna Publishers
Theory & problems of Fluid Mechanics	K Subramanya	Tata McGrawHill

ME 3213 ENGINEERING MATERIALS

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Introduction : Introduction to engineering materials, classification, various properties like thermal, chemical, electrical, mechanical properties, selection criteria.

Ferrous materials: Classification, ores, manufacture of pig iron, wrought iron, cast iron and steel (flow diagrams only), types of cast iron: white, malleable, grey, mottled, modular and alloy and their usage

Steels and alloy steel: different manufacturing methods; open hearth, Bessemer, electric arc. Availability, properties and usage of steels, specification as per BIS and equivalent standards, effect of various alloying element like Cr, Ni, Co, V, Mo, Si, Mn, S on mechanical properties of steel, use of alloy steels; high speed steel, stainless steel, spring steel, silicon steel.

(12 Hrs)

Unit II

Non ferrous materials: Important ores and properties of aluminium, copper, zinc, tin & lead and their alloys along with their respective uses.

Engineering plastics and fibers: Important sources of plastics, classification-thermoplastic and thermosetting, various trade names of engineering plastics, plastic coating, fibers and their classification: inorganic and organic fibers, usage of fibers.

(12 Hrs)

Unit III

Insulating materials: Various heat insulating material and their usage like asbestos, glass wool, cork, puf, china clay, thermocole, various electrical insulating material and their use like china clay, leather, bakelite, ebonite, glass wool, rubber felt.

Composite materials: Introduction, properties and application.

(12 Hrs)

Unit IV

Fundamentals of heat treatment : Purpose of heat treatment, various heat treatment processes hardening, tempering, annealing, normalizing, case hardening(elementary idea), types of heat treatment furnaces

Tools and steels alloys : Carbon and alloy steels for cutting tools, HSS, Die steels, cemented carbides, oxides.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Engineering materials	O P Khanna	Dhanpat Rai
	Text	
Production Technology	JN Gupta	S. Chand
Material science	Raghavan	PHI
Materials in industry	WJ Rattan	PHI
Introduction to Engg. Materials	Aggarwal	TMH
	Reference	

ME 3214 MAINTENANCE ENGINEERING

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Introduction: Objectives of maintenance; function and scope of maintenance, Maintenance, maintainability, reliability, availability, mean time to repair, mean time to failure, redundancy, bath-tub curve, Planned and unplanned maintenance, break down and preventive maintenance, calendar and periodic maintenance, corrective and preventive maintenance, opportunity maintenance.

(12 Hrs)

Unit II

Planning and types of maintenance: Need and advantages, elements of preventive maintenance, simple example of preventive maintenance, Maintenance organization, principles of planning, maintenance policy, training of maintenance personnel.

(12 Hrs)

Unit III

Maintenance plans: Tools and spares required, listing, procurement and storage, Maintenance plans, check lists, machine schedules and maintenance manuals, history-sheet, equipment log-book, breakdown intimation slip, job order ,work order.

(12 Hrs)

Unit IV

Maintenance records: Need for maintaining records, responsibility of preparing and storing records, time-frames for maintaining records, Importance in keeping the plant running, Effective maintenance and cost savings, Motivation factors in timely maintenance.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Industrial Engineering and Production Management	M Mahajan	Dhanpat Rai and Co.
Management of Systems	RN Nauhria, R Prakash	Dhanpat Rai and Co.
Industrial Maintenance	HP Garg	S Chand and Sons
Industrial Maintenance Management	Sushil Srivastava	S Chand and Co

ME-3221 MATERIALS AND METALLURGY

L T P
2 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 25

Unit I

Ferrous metals and non ferrous metals: Physical and mechanical properties viz. strength, elasticity, ductility, toughness, malleability, brittleness, hardness, stiffness, fatigue, Classification of iron and steel; pig iron, cast iron, wrought iron, steel, alloy steel, stainless steel and carbon steels, Non-ferrous metals, Introduction to aluminium and its alloys; copper and its alloys; zinc and its alloys; lead and its alloys; tin and its alloys; nickel and its alloys; magnesium and its alloys; their physical and mechanical properties of all the above alloys, Plastics; Introduction, types of plastics, properties, composition and their applications Types of Tool steels.

(08 Hrs)

Unit II

Metallurgy: Crystalline nature of solids, Structure of atom, types of solids, space lattice arrangement of atoms in BCC, FCC and HCP crystals, Plastic deformation of metals, Mechanism of slipping and twinning, hot and cold working of metals and their effect on mechanical properties.

(08 Hrs)

Unit III

Phase diagrams: Phases in metal system, solid solution, Hume-Rothery rules, solidification of pure metals and alloys, phase rule, equilibrium diagram, Iron-carbon equilibrium diagram, Effect of carbon on properties of steel.

(08 Hrs)

Unit IV

Heat treatment processes: Principle of heat treatment of steels, TTT curves, Annealing, Normalizing, Hardening, Case hardening, tempering, Austempering, Martempering, Flame hardening, Induction hardening, Carburizing, Nitriding, cyaniding of steels, Precipitation hardening with reference to Copper and Aluminum.

(08 Hrs)

Recommended Books

Title	Author(s)	Publisher
Materials and metallurgy	OP Khanna	Dhanpat rai
Mechanical metallurgy	Dieter	McGraw Hill
Manufacturing processes	V. Raghvan	Prentice Hall
Introduction to physical metallurgy	Sidney H Avner	Tata McGraw-Hill

ME-3222 METROLOGY

L T P
2 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 25

Unit I

Introduction: Metrology and its objectives, need of inspection, physical measurement, precision and accuracy, accuracy and cost, trace- ability, selection of instruments, sources of errors, calibration, sensitivity, and readability, classification of methods of measurements.

Standards of measurements: Introduction, standards and line standard, yard, meter, end standards, end bars, transfer from line standard to end standards..

(08 Hrs)

Unit II

Linear measurements: Introduction, non- precision measurements, steel rule, calipers, outside inside, surface plate, angle plate, V-block, straight edges, combination set, precision linear measurements, vernier instruments, micrometer, depth and height gauge, thread micrometer, caliper, slip gauges and their uses.

(08 Hrs)

Unit III

Limits, fits and tolerances: Introduction, tolerances, concept of inter change ability, limits of sizes, Indian standard tolerance zone shaft, hole, basic shaft, basic hole, clearance, interference, commonly used fits, Taylor's principle, " Go " and " No Go " gauges, plug gauges, ring gauges, snap gauges, limit gauges, gauges for tapers, Measurements of work properties, Straightness, flatness, squareness, parallelism, circularity, surface finish, their tests and measurements.

Comparators: Introduction, mechanical and electrical comparator, their uses, advantages and disadvantages.

(08 Hrs)

Unit IV

Metrology of screw thread: Introduction , screw terminology, pitch errors in screw threads, aggressive pitch error, measurement of elements of screw threads, major diameter, minor diameter, thread micrometer, two wire method, three wire method.

Measurement of gears: Introduction, terminology of gear tooth, concentricity of teeth, good alignment of each tooth, measurement of profile, spacing pitch, thickness of tooth, backlash.

(08 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Metrology	Mahajan	Dhanpat Rai
ENGINEERING METROLOGY	MACDONALD	TECHINICAL AND SCIENTIFIC
METROLOGY FOR ENGINEERS	JFW and ACASSELL	TECHANICAL BOOK
ENGINEERING METROLOGY	Jain RK	KHANNA PUBLISHERS.

ME-3223 WELDING TECHNOLOGY- I

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Introduction: Introduction to various fabrication processes, definition of welding, importance of welding as compared to other fabrication techniques, classification of welding and allied processes

Types of welded joints: Concept of edge preparation & different types of groove design, role of thickness in edge preparation, types of welds and welded joints for various welding processes, welding positions.

(12 Hrs)

Unit II

Arc welding power sources: Basic principle of arc welding, requirements of a welding power source, classification of power source, VI characteristics and specifications of a power source, constructional features of transformers, rectifiers, generators and invertors.

(12 Hrs)

Unit III

Shielded metal arc welding: Principle of SMAW, welding arc and its initiation, static arc characteristics, power sources for SMAW, equipment and accessories required for SMAW process, welding parameters and their effect on weld bead geometry, classification of electrodes and electrode coatings, AWS and BIS codes for the electrodes.

(12 Hrs)

Unit IV

Gas welding: Principle of gas welding, types of the fuel gases and their properties, equipment detail, cylinders torches and regulators, their constructional features and operational details, types of flames and their characteristics, gas welding techniques, filler material and fluxes.

Soldering and brazing: Basic principle of soldering & brazing, types of solders, soldering and brazing techniques, role of flux and the types of fluxes, applications of soldering and brazing, braze welding. Advantages and limitations of each.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Welding technology	OP KHANNA	Dhanpat Rai
Welding processes & technology	RS PARMAR	Khanna Publishers
Welding technology	R Little	TMH
Modern arc welding	SV NADKARNI	Oxford & IPH

ME-3231 MANUFACTURING MATERIALS

L T P
2 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 25

Unit I

General: Introduction and classification of manufacturing materials, Thermal, chemical, electrical, mechanical properties of steels, cast iron, aluminum and its alloys, Selection criteria of material

(08 Hrs)

Unit II

Ferrous Materials: Classification of iron and steel, Sources of iron ore and its availability, Manufacture of pig iron, wrought iron, cast iron and steel (flow diagrams only), Types of cast iron: white, malleable, grey, mottled, modular and alloy and their usage, Steels and alloy steels, Classification of steel, Different manufacturing methods of steels, Availability, properties and usage of steels, Specifications as per BIS and equivalent standards, Effect of various alloying element like Cr, Ni, Co, V, W, Mo, Si, Mn, S on mechanical properties of steels, Use of alloy steels – stainless steel, spring steel, silicon steel Cutting tool material (HSS, Carbide, Ceramics, Cast alloys, Diamond).

(08 Hrs)

Unit III

Non ferrous material: Important ores and properties of aluminum, copper, zinc, tin, lead, Properties and uses of al alloys, copper alloys, bearing material, solders

Engineering plastics and fiber: Important sources of plastics, Classification – thermoplastic and thermosetting, Various trade names of engineering plastics, Fiber and their classification: Inorganic and organic fibers, Usage of fiber.

(08 Hrs)

Unit IV

Insulating materials: Various heat insulating materials like asbestos, glass wool, thermocol, cork, PUF, china clay, their usage, Various electrical insulating materials like china clay, leather, bakelite, ebonite, glass wool, rubber, felt and their use

Testing of metals and alloys: Identification tests : appearance, sound, spark, hardness tests

Fundamental of heat treatment: Purpose of heat treatment, Iron – carbon equilibrium diagram, Time Temperature Transformation” curve in steels and its importance, Various heat treatment processes – hardening, tempering, annealing, normalizing, case hardening (elementary idea), composites

(08 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Material science	RK Rajput, Text	SK Kataria and sons, Ludhiana
Material science and engineering	Raghavan Reference	Prentice Hall of India, Delhi
Material science and engineering	Srivastava	New age international (P) Ltd.

ME-3232 MACHINE TOOLS AND METAL CUTTING

L T P
2 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 25

Unit I

Introduction to Machining: Basic Concepts: machining, mechanics of chip formation. Application of coolants, cutting forces during machining, machinability and tool life.

Turning: Principle; lathe, description, function, specifications, work holding tools, cutting tools. Operations - plain and step turning, facing, parting off, taper turning, eccentric turning, drilling, reaming, boring, threading and knurling, cutting fluid-its purpose and types, lathe accessories (steady rest, taper turning attachment, tool post grinder), types of lathes, brief description of capstan and turret lathes.

(12 Hrs)

Unit II

Drilling: Principle, classification description, operations of drilling machines reaming, counter boring, counter sinking, hole milling, tapping, types of drills and their features, drill holding devices.

Boring: Principles, classification, description & specification of boring machine, tools, alignment of bores and its importance.

(12 Hrs)

Unit III

Shaping, Planing and Slotting: Working principle of shaper, planer and slotter, quick return mechanism, tools & specifications

Milling: Introduction, types, constructional features, specifications of knee type milling machine, milling operations, milling cutters types, cutting speed and feeds, indexing simple, job handling devices, introduction to machining centre

(12 Hrs)

Unit IV

Grinding: Types and working of cylindrical, surface, centreless grinding. Tool and cutter grinder, various elements of grinding wheel abrasive, grade, structure, bond, codification of grinding wheel, selection of grinding wheel, dressing,.

Broaching: Introduction, types of broaching machines, types of broaches and their use.

Jigs and Fixtures: Importance and use of jigs and fixtures, principles of location, locating devices, purpose of clamping elements, types of clamping elements, types of drilling jigs, turning, milling and welding fixtures, fixture design consideration (elementary).

(12 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Elements of workshop Technology	SK Chaudhry and Hajra	Asia Publishing House.
Workshop Technology	M. Adithan and AB Gupta	Dhanpat Rai and Sons
Workshop Technology Production Engineering	Chapman PC Sharma	CBS S Chand and Company

ME-3233 PRODUCTION MANAGEMENT

L T P
2 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 25

Unit I

Introduction: Types of production, necessity of production planning and control, Process Planning, procedures of process planning, process planning sheet, uses of process sheet Importance of forecasting, techniques for forecasting.

(08 Hrs)

Unit II

Production Control: Routing purpose, route sheet, loading and scheduling purpose, types of schedules, and techniques of scheduling. Despatching purpose and function. Follow up purpose and functions.

(08 Hrs)

Unit III

Materials Management: Introduction, Need and aims of materials management, material procurement, make or buy decision, sources of material, purchase, procedures. Store keeping- principles of storage, location and layout of stores, methods of storing, store procedures, physical verification of stores, inventory control-importance and function, various stock levels, EOQ, physical control of inventory, inventory control techniques.

(08 Hrs)

Unit IV

Value Engineering: Concept of value engineering and value analysis.

PERT/CPM: Introduction to PERT/CPM, practice on drawing simple network.

(08 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Production Management	Text AP Verma	SK Kataria
Production, Planning, control and industrial management	Reference KC Jain and NL Aggarwal	Khanna Publishers
Management of Systems	RN Nauhria and R Parkash	Wheeler Publishers.

ME 4101 COMPUTER APPLICATIONS

L T P
2 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 25

Unit I

Programming in C: Basic structure of C programs, Executing a C Programs, Constants, variables and data types. Operators & expressions, Managing input-output operations like reading a character, writing a character, formatted input, formatted output through printf, scanf, getch, putchar statement.

(08 Hrs)

Unit II

Looping & arrays: Decision making and branching using If –else, switch, goto statements. Decision making & looping using do-while and for statements. Arrays: one dimensional and two dimensional, Introduction to object oriented programming.

(08 Hrs)

Unit III

Computer Aided Drafting: Basics of AutoCAD: drawing area, units, entity, line type, templates, title blocks, grid and snap. Drawing commands: line, circle, rectangle, polygon, donuts, splines, ellipse, hatch, additional commands like end of, mid of, tan to, perpendicular to, intersection of, center of text, M text. Editing commands: erase, copy, trim, extend, lengthen chamfer, fillet, offset, rotate, stretch, OOPs, undo, redo, change properties.

(08 Hrs)

Unit IV

Computer Aided Drafting II: Dimensioning: types of dimensioning (linear, angular, radius, diameter, continuous, base line), editing a dimension. Layers: Setting a new layer, marking layer on/off/current. Assigning colour and line type to a layer. Blocks: Make, store and insert a block.

(08 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Programming in C	E. Balaguruwamy	S. Chand & Co
AutoCAD	RW Leigh	Galgotia Publications
Auto CAD 2000 in Easy Steps	Paul Whelari	Dreamtech Press
Programming in C	Stephen C. Kochan	

ME 4102

MOULDING TECHNOLOGY

L T P
2 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 25

Unit I

Conventional Sand moulding: Hand moulding with green sand using natural binders like clay, use of mechanical ramming aids & mould manipulation dry sand process, loam sand moulding, use of cow dung, Bentonites dextrin core oils & molasses as binder, mould washers Skin drying of moulds.

(08 Hrs)

Unit II

Moulding Machine: Use of moulding machines, jolt squeeze, jolt squeeze & slinger, insertion of cores, power computation, type of flask equipment, preparation of sand cycle, mulling of the sand, flow charting special moulding/core making process, Use of plaster of Paris & cement as a moulding material carbon dioxide process, shell moulding & metal moulds, gravity & pressure die casting, V moulding processes.

(08 Hrs)

Unit III

Mould Quality : Role of quality & packaging of sand. Mould hardness variation, Strength of mould & core enforcement, core floatation, use of chaplets for supporting cores, use of chills, mass hardness & hard spots. Defects like scabs & rat tails, storage of mould & moisture pick up.

(08 Hrs)

Unit IV

Functions& design of mould: Function of cavity, components of mould, gating system & risers, Directional solidification of metals, streamlined pouring of mould, maintenance of metal purity, Rigging and shake out, recycling of sand, reclamation of sand.

(08 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Foundry technology	O.P. Khanna	S. Chand & Co
Manufacturing Processes	Ghosh & Malik	Pitman Publishers
Workshop Practice II	Hazra Chaudhary	Khanna Publisher

ME-4103 MELTING TECHNOLOGY

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Melting of primary and secondary metals: Basics of melting scrap and smelting, handling and characterization of scrap, cleaning and bailing charge preparation control and charge balance, general methods of charging in furnaces, changes for SG cast iron.

(12 Hrs)

Unit II

Melting technology: Role of flux; Reducing agents; Air reductants and chemical additives, in the furnaces; types and, selection of furnaces suitable for specific metals; cupola, induction, rotary, pit furnaces-their operation and nature\characteristics of product there from; role of temperature and superheat; acid, basic and neutral operations; post melting treatment and air furnaces; melting of various types of cast iron, steel, aluminum, brass, SG cast iron.

(12 Hrs)

Unit III

Composition control and melt quality: Importance of metal cleanliness; endogenous and exogenous inclusions; need of formation of right quality and nature of slag; oxygen, chlorine or argon blowing to improve melt quality; role of temperature and super heat.

Efficient Operation: Control of fuel consumption, quality of fuel coke in context to sulphur and ash, use of hot blast cupola; method of producing hot blast. Use of recuperators and regenerators, regulation control of power input into the furnaces, comparison of power input into different furnaces.

(12 Hrs)

Unit IV

Handling of liquid metal: Different methods to consume liquid metal, ingot, pigging, power production, casting etc. economical output, management of liquid metal; handing devices, preheating of laddles; use of vacuum assisted equipment for degasification, killing and rimming of steels, inoculation in SG cast iron and its control.

(12 Hrs)

Recommended Books:

Title	Author(s) Text Reference	Publisher
Foundary technology	DB Goel and Sinha.	S. Chand & Co, New Delhi
Steel making	Tupkary RH	Khanna Publication
Steel melting		Mir Publishers.
Foundry technology	Heme Loper Rosenthal	Tata McGraw Hill.

ME-4104 FOUNDRY LAYOUT AND AUTOMATION

L T P
2 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 25

Unit I

Layout facility design and planning (macro perspective): Importance of foundry location, Planning of foundry location, Factors affecting selection of plant, Quantitative techniques form comparison of possible locations.

(08 Hrs)

Unit II

Plant layout: Basic principles of plant layout, Factors influencing plant layout, Basic types of layout, Plant layout procedures, Case studies with critical analysis of some specific layouts; Time and motion study in relation to foundry process, Material movement basics in various types of foundries, Layout problems.

(08 Hrs)

Unit III

Safety productivity features in material handling: Systematic layout and planning, Line balancing safety and productivity considerations dependent on layout material handling. Considerations for high safety and productivity, safety with reference to foundry industry, industrial safety standards

Foundry layout: Constituents and various operations in foundry, Specific constraints relevant to foundry industry, Process mapping and layout examples, layouts of various types of foundries, small scale, modern and automated foundries.

(08 Hrs)

Unit IV

Foundry equipment: Molding lines, mould and metal handling equipment, mullers, pollution control equipment, Ladles, furnaces

Foundry automation: Automated equipment like Intensive sand mixtures, Metal charging devises like skip hoist, EOT, Bucket charging, Metal pouring from ladles, Monorails and cranes etc.

(08 Hrs)

Recommended Books

Title	Author(s)	Publisher
Foundry technology	Text P L Jain	TMH
Principles of metal casting	Reference Rosenthal	Pitman Publishers
Foundry technology	OP Khanna	Dhanpat rai

ME 4105 INSPECTION TESTING AND QUALITY CONTROL

L T P
2 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 25

Unit I

Inspection: Introduction, Types of Inspection, Macro and Micro Inspection, Charting the Inspection Program

Dimensional Metrology: Measuring Instruments such as Vernier caliper, Micrometer, Vernier height gauge, Dial indicator their principles and working, Least count etc.

(08 Hrs)

Unit II

Destructive Testing: Tensile Test, Hardness test and Impact test, casting defects their causes and remedies. Comparison between Destructive and non destructive testing.

(08 Hrs)

Unit III

Non Destructive Testing: Ultrasonic testing, radiographic testing, dye penetrate test, Magnetic particle testing their principles and working

Limits Fits and Tolerance: System of limits and fits, Tolerances, Deviations and Fits, Basic hole and Basic shaft.

(08 Hrs)

Unit IV

Quality control and Assurance: Quality Control, statistical quality control, their objectives, Control Charts; Objectives of control chart Variable and Attribute types X, R, p and np, Acceptance Sampling; single sampling, double and multiple sampling plan, Operating Characteristics curve.

(08 Hrs)

Recommended Books:

Title	Author(s)	Publisher
SQC	M S Mahajan	Dhanpat Rai and Company
Industrial Engg. and Management Metrology	O P Khanna RK Jain	Dhanpat Rai Publication PHI

ME 4112 MACHINE DESIGN

L T P
3 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 75

Note: Design data handbook is allowed in examination.

Unit I

Introduction to Design : Basic requirement for machine elements, General design process, Mechanical Properties, General design considerations like fatigue, creep, fabrication methods, economic considerations, material selection and ergonomics.

Riveted and Welded Joints: Type of riveted joints, possible failure of riveted joints, Strength and efficiency of Butt (Single plate & double cover plate) and Lap riveted joints, Common types of welded joints. Simple design for V-butt welded joints, Transverse fillet and parallel fillet welded joint for simple loading

(12 Hrs)

Unit II

Screwed Joints: Introduction to term screw and various definitions of screw threads, Advantages and Disadvantages of screwed joints, Form of screw threads, Common types of screw fastening; through bolt, tap bolt, stud, cap screw, machine screw and set screw, Designation of screw threads, Stresses in screw fastening, Design of bolts for cylindrical cover.

(12 Hrs)

Unit III

Shafts: Various types of Shafts. Stresses in shafts (Solid and Hollow) subjected to torque and bending moment on the basis of strength only.

Keys and Couplings: Definition of term "key" & its various types, Splines. Forces acting on sunk keys, Shaft couplings and its various types (introduction and concept only) Design of Flange coupling.

(12 Hrs)

Unit IV

Cotter Joint for round rod: Design of cotter. Design of Socket. Design of Spigot (for circular rod only)

Knuckle Joint: Design of knuckle joint; Design of rod. Design of Pin.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Machine Design	Sharma & Agarwal	S.K. Kataria & Sons
Design data book	PSG	
A text book of Machine design	Khurmi and Gupta	S. Chand
Mechanical Engg. Design	Shigley	TMH

ME 4113 MAINTENANCE OF EQUIPMENT (MECHANICAL)

L T P
2 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 25

Unit I

Maintenance Stages: Check/inspection, minor repair, medium repair, complete overhaul, content of work in each stage of maintenance for different metal cutting and metal working machines, case studies for each type.

Restoration of Machine Parts: General restoration of parts like bed ways, saddle ways of lathes and guideways of plain milling machine, clamping plates and wedges, worn out key ways and splines, restoration technique like welding, plating etc

(08 Hrs)

Unit II

Maintenance of Mechanical Devices : Elementary knowledge of working, general features and types of bearings, clutch, brakes, couplings, bolts and chains, gear drives, care and maintenance of these elements, troubleshooting: causes and remedies

(08 Hrs)

Unit III

Pneumatic System: Basic principle, a typical system, components: Instruments, accessories and control elements, common troubles and repair techniques

Hydraulic System: Basic principle; a typical system, components, common trouble and repair techniques, bleeding of system.

(08 Hrs)

Unit IV

Fuel Systems: Basic principles, a typical system, components, common defect and repair techniques

Lubrication and Coolant System for Machine: Principle and function of lubrication, coolant systems

(08 Hrs)

Recommended Books

Title	Author(s)	Publisher
Maintenance Engineering	H. P. Garg	S. Chand
Maintenance Engineering Handbook (IV and V Edition)	Undley and Higgen	McGraw Hill
Maintenance of Spare parts	Gopal Krishna	PHI

ME 4114 METROLOGY AND EQUIPMENTS

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Introduction: Definition of metrology, precision and accuracy, inter changeability.

Linear Measurements: Working principle and constructional details of engineering scale, vernier caliper, micrometer, height gauge, depth gauge, radius gauge, feeler gauge, dial indicator, slip gauges, comparators (in general use only)

(12 Hrs)

Unit II

Angular Measurements: Working principles and constructional details of combination set, vernier bevel protractor, and sine bar. Taper measurement by rollers.

Surface Measurements: Straight edge, try square, surface plate (use and specifications).

Limit Gauges: GO and NO Go gauges.

(12 Hrs)

Unit III

Thread Measurements: Measurement of thread elements of external and internal threads. Screw pitch gauge, screw thread micrometer, thread limit gauges.

Gear Tooth Vernier: Terminology in gears, Introduction of gear-tooth vernier caliper and base tangent comparator.

(12 Hrs)

Unit IV

Surface Finish Measurements: Roughness and waviness, various roughness values: CLA value, RMS value, Mean value. Working principle of surface roughness measuring instruments.

Miscellaneous Instruments: Auto collimator, tool maker's microscope, profile projector, coordinate measuring machine (Brief Introduction only).

(12 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Metrology and Instruments	Mahajan	Dhanpat Rai
Metrology and interchangeability	RK Jain	Khanna Publishers
Metrology	IC Gupta	New Age
Production Engineering	P.C. Sharma	S. Chand

ME 4115 REFRIGERATION & AIR CONDITION EQUIPMENT REPAIR AND MAINTENANCE

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Carnot cycle, simple vapor compression cycle, vapor absorption cycle, Meaning, refrigeration methods, units of refrigeration, heat pump, coefficient of performance, rating of refrigeration machines, Important properties of refrigeration, properties and applications of commonly used refrigerants such as R-11, R-12, R-22, NH₃, other refrigerants like R-134, R-512.

(12 Hrs)

Unit II

Compressors: types, reciprocating compressor, constructional details, general maintenance, fault diagnosis and trouble shooting, Rotary compressor, centrifugal compressor (elementary knowledge of constructional details only).

Condensers: types of condensers, mechanical details, general maintenance fault diagnosis and trouble shooting.

(12 Hrs)

Unit III

Capillary tube, matching of compressor and capillary tube, thermostatic expansion valve, automatic expansion valve, float valve, high pressure valve, general maintenance and fault diagnosis, Types, constructional details, general maintenance, Tools, installation, operation, execution and dehydration, removing the air, dehydration testing for leaks, charging the system, charging through suction valve, charging through discharge valve, adding oil.

(12 Hrs)

Unit IV

Various terms, dry and wet bulb, saturation, dew point, adiabatic saturation temperatures, relative humidity, absolute humidity, humidity ratio, sensible heating and cooling, Description of room air conditioning, central air conditioning, round the year air conditioning system, common fault diagnosis and remedies in window, split package and central air conditioning system.

(12 Hrs)

Recommended Books:

Title	Author(s) Text	Publisher
RAC maintenance		TTTI, Chandigarh
Refrigeration and air conditioning A Course in Refrigeration and Air Conditioning	Reference PL Ballaney Arora and Domkundwar	Khanna Publisher Dhanpat Rai

ME-4121 WELDING TECHNOLOGY- II

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Gas Tungsten Arc Welding: Introduction of the process, basic principle of operation, consumables for the process, equipment study and the working procedure of the equipment, electrodes used for GTAW process, variants of the process, application and scope of the GTAW process.

Plasma Arc Welding: Principle of plasma arc welding, difference between transferred and non transferred arc, comparison of plasma arc welding with GTAW process, application and scope of the plasma arc welding.

(12 Hrs)

Unit II

Gas Metal Arc Welding: Introduction of the process, basic principle of operation, consumables for the process, equipment study and the working procedure of the equipment, selection of shielding gases for various materials, edge preparations, metal transfer in GMAW process, working parameters for dip, globular and spray modes of metal transfer, variants of the GMAW process, application and scope of the process.

(12 Hrs)

Unit III

Submerged Arc Welding: Power sources used for SAW, principle of the submerged arc welding, electrode wires used in SAW, types of fluxes and their respective applications, edge preparations and for welded joints, scope and application of the process.

(12 Hrs)

Unit IV

Electro Slag Welding & Electro gas Welding: Introduction of the electro slag and electro gas welding process, comparison between the two, study of the equipment and working procedure for the electro slag and electro gas welding processes, applications and scope.

Welding of plastics: Types of plastics, use of plastic in the fabrication industry, introduction to various techniques used for welding the plastics.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Welding processes & technology	RS PARMAR	Khanna Publishers
Principles of welding technology	LM GOURD	Edward Arnol
Welding technology	OP KHANNA	Dhanpat Rai
Modern arc welding	SV NADKARNI	Oxford & IBH

ME-4122 INSPECTION AND TESTING OF WELDMENTS

L T P
2 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 25

Unit I

Welding Symbols: Location of weld on drawing as per BIS codes.

Requirement for Welding Inspectors: Ethical and essential requirement for welding inspector.

(08 Hrs)

Unit II

Weld and Weld Related Discontinuities: Discontinuities and their classification, reasons of weld related discontinuities and their remedy

Welding Procedure Specifications: Description and details of WPS, WPS form, and qualification of welding procedure specifications.

(08 Hrs)

Unit III

Qualification of Welders and Welding Operators: Weld performance qualification requirement, testing of qualification weld, qualification records

Destructive Testing of Welds: Mechanical tests and standard test specimen as per BIS codes, tensile bend tests, impact tests, hardness tests.

(08 Hrs)

Unit IV

Non Destructive Testing of Welds: Brief description and scope of application of various NDT techniques, visual inspections, die penetrate testing, magnetic particle testing, ultrasonic and radiographic testing techniques.

(08 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Non destructive testing	Baldev raj	Narosa
	Text	
Welding processes & technology	RS PARMAR	Khanna Publishers
Principles of welding technology	LM GOURD	Edward Arnol
Welding processes	Hopldocolt	
Welding and Welding Technology	Little	Tata McGraw Hill

ME-4123 MACHINE DESIGN & DRAWING

L T P
2 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 25

Note: Design data hand book is allowed in the examination

Unit I

Introduction to Design: Basic requirements for machine elements, General design process, Mechanical properties, General design considerations like fatigue, creep, fabrication methods, economic considerations, material selection ergonomic etc, Designing for strength.

(08 Hrs)

Unit II

Riveted and Welded Joints: Types of riveted joints, Possible failure of riveted joints, Strength and efficiency of riveted joints, Common types of welded joints, Simple design for V butt welded joints, Transverse fillet and parallel fillet welded joint.

(08 Hrs)

Unit III

Screwed Joints: Introduction to term screw and various definitions of screw threads, Advantages and disadvantages of screwed joints, Form of screw threads, Common types of screw fastening; through bolt, tap bolt, stud, cap screw, machine screw and set screws, Designing of screw threads, Stresses in screw threads, Stresses in screw fastening, Design of bolts for cylinder cover

Keys and Couplings: Definition of term key; its various types, Splines, Forces acting on sunk keys, Shaft couplings and its various types, Design of flange coupling.

(08 Hrs)

Unit IV

Drawing: Drawing exercises on fixtures, vices, joints and coupling (at least two sheets on each topic). Assembly and disassembly of: - Joints: Cotter, socket, spigot, - Coupling: Flange couplings: Protected, unprotected; Oldhan couplings; claw coupling; flexible coupling - Vices: bench vices, pipe vices clamps: Blacksmith clamp, hand screw clamps - Fixtures: welding fixtures, machine fixtures, In addition to this, drawing of other machine components may be given for practice.

(16 Hrs)

Recommended Books

Title	Author(s)	Publisher
Machine Drawing		
Design data book	P. S. Gill	Kataria & Sons
Machine Design	Sharma & Aggarwal	PSG Katsons
Machine Drawing	R.K.Dhawan	S. Chand
Machine Design	Shigley	TMH

ME-4124 MAINTENANCE ENGINEERING

L T P
2 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 25

Unit I

Introduction to maintenance: Introduction to maintenance, maintenance activities, objectives of maintenance, types of maintenance, benefits of planned maintenance, preventive maintenance, corrective maintenance, predictive maintenance, break down maintenance.

(08 Hrs)

Unit II

Preventive maintenance: Elements of preventive maintenance, procedures, simple examples of preventive maintenance, programs and maintenance schedules, organization and administration of the maintenance forces, principles, policies and procedure of maintenance management.

(08 Hrs)

Unit III

Trouble Shooting: Brief description of trouble shooting procedure in welding and allied equipment, common defects and their remedies In power sources used for welding, welding transformer and rectifier.

(08 Hrs)

Unit IV

Repair & Maintenance : Repair and maintenance of rectifiers, transformers, gas cutting torches, pressure regulators and periodic/ preventive maintenance of welding equipments.

(08 Hrs)

Recommended Books:

Title	Author(s)	Publisher
INDUSTRIAL MAINTENANCE	HP GARG Text	S Chand
INDUSTRIAL MAINTENANCE MAINENANCE ENGG	SRIVASTAVA BKMishra Reference	S Chand PHI

ME-4131 MODERN MANUFACTURING PROCESSES

L T P
4 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 75

Unit I

Gear Cutting and Finishing Processes : Gear tooth elements, Gear milling, Introduction to gear shaping, Working principle of gear shaping machine Gear shaping cutters, Working principle of gear hobbing machine Introduction to gear finishing operations.

(16 Hrs)

Unit II

Unconventional Machining Processes: Principles of working, advantages, limitations and applications of the following processes, Electro die & charge machining, Wire cut EDM, Electric chemical machining, Chemical machining, Ultrasonic machining, Laser beam machining, Plasma arc machining.

(16 Hrs)

Unit III

Processing of Plastic and Rubber, Powder Metallurgy: Industrial uses of plastics and rubber; Situation where for Machining and forming plastics, Potential and limitations in the use of plastics and rubber, Introduction to powder metallurgy.

(16 Hrs)

Unit IV

Surface finishing & roughness: Purpose of finishing surfaces, Surface roughness, Honing process; its applications, Description of hones, Brief idea of honing machines, Lapping process; its application, Description of lapping compounds and tools Brief idea of lapping ,machines, Super finishing process; its applications, Use of super finishing attachment on centre lathe Polishing, Buffing, Metal coating processes – types, Metal spraying, Galvanizing, Electro-plating, Anodizing.

(16 Hrs)

Recommended Books

Title	Author(s)	Publisher
Production Technology	PCSharma	S Chand
Production Technology	RK Jain	S. Chand
Manufacturing Technology	M. Adithan and A.B. Gupta	New Age International

ME-4132 INDUSTRIAL METROLOGY AND QUALITY CONTROL

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

METROLOGY AND MEASUREMENT: Introduction, objectives of Metrology, Types of measuring instruments, merits and demerits, factors influencing measurements, Basic principles used in measurement and gauging- mechanical, optical, sonic, electrical and electronics.

Limit Gauges: plug, ring, snap, taper, thread, height, depth, form, feeler, plate, wire and their applications for linear, angular, surface, thread and gear measurements and gauge tolerances.

(12 Hrs)

Unit II

MAINTENANCE & CALIBRATION OF MEASURING INSTRUMENTS: Introduction, study of procedure for alignment tests on lathes, drilling machine and milling machine, calibration of measuring instruments, objectives of calibration, testing and maintenance of measuring instruments, inspection of instruments; Introduction, Units of measurement, standard of measurement and interchangeability, accuracy & precision, International and national standards, line and wave length standards, Inspection needs and strategies, types of inspection.

(12 Hrs)

Unit III

STATISTICAL QUALITY CONTROL: Introduction, Quality concept, and importance of SQC, TQM, sources of variations, Data interpretation, basic SQC concepts: mean, mode, median, standard deviation, types of distributions, types of control charts: x, x-bar, R, sigma chart, control charts for attributes: p, np, C, and U charts and applications, Sampling plans, Process capability study and acceptance sampling.

(12 Hrs)

Unit IV

STANDARDS AND CODES: Introduction, National and international codes, Needs for codification, ISO9000-concepts and applications, ISO-14000-concepts and applications, Total Quality Management concept, implementation, procedure and case studies.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Industrial Quality Control	Text E.L.Grant and Leavenworth	McGraw Hill
Statistical Quality Control	Mahajan	Dhanpat Rai
Industrial Metrology	Reference R.K.Jain	Khanna

ME 4201 CNC MACHINES AND CAD/CAM

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Introduction: Computer applications in manufacturing-introductory concepts of control and support applications. Basic design process and application of computer at different stages in the design process, Basic concepts of NC, CNC, DNC and adaptive control, advantages of CNC machines, application of NC in industry.

(12 Hrs)

Unit II

CNC machines: Components of CNC system, machine control unit, machine tool, different types of NC control systems and their applications, classification of NC control system, Special constructional requirements of CNC machines, machine bed, slide ways, bolt, screw and nut assembly, lubrication and cooling system, spindle, spindle motors and axis drive motors, automatic tool changes, multiple pallets, swarf, removal mechanism, safety provisions.

(12 Hrs)

Unit III

Part programming: Part programming and basic concepts of part programming, NC words, part programming formats, simple programming for rotational and pneumatic components, part programming using canned cycles, sub routines and do loops, tool off-sets, cutter radius compensation and wear compensations.

(12 Hrs)

Unit IV

Sensors and feed back mechanisms: Sensors, relays, cut outs and feedback mechanism used in CNC machines, Common problems in mechanical, electrical, electronic and PC components of CNC machines, diagnosis of common problems and remedies, use of on-line fault diagnosis tools in CNC Machine.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publisher
CNC Machines	Pabla BS and Adithan Text	New Age Publishers
CAD/CAM	Grover and Zimmers Reference	Prentice Hall of India
Mechatronics	HMT	TMH

ME-4202 ESTIMATION AND COSTING

L T P
2 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Introduction: Definition of estimation, cost accounting, purpose of estimating and costing, advantages of costing, difference between costing and cost accounting, methods of costing, functions of cost estimating, estimating procedures.

(08 Hrs)

Unit II

Elements of costing: Cost structure, Components of cost, overheads, types of overheads, methods of computing overheads, depreciation, methods of computing depreciation.

(08 Hrs)

Unit III

Estimation of Material cost: Review of basic formulae for computation of area and volume of standard 3-d objects, Estimation of volume, weight and cost of materials for various products.

(08 Hrs)

Unit IV

Estimation of Machine Shop: Set up time, operation time, handling time, machining time, tear down time, allowances: personal, fatigue, tool checking/sharpening/changing, unit operation time, cutting speed for various operations for different tool materials and product materials, feed, depth of cut, estimation of time for various machining operations- turning, milling, drilling, boring, tapping, shaping, grinding, planning.

Estimation of other shops: Estimation of cost of different products produced in foundry, forging and welding shops.

(08 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Mechanical Estimating and Costing	B P Sinha	TMH
Mechanical estimating and Costing	TTTTI, Madras	TMT
Production Engineering, Estimating and Costing	M Adithan and B S Pabla	Konark Publishers

ME-4203 FOUNDRY METALLURGY

L T P
2 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 25

Unit I

Metal Properties: Allotropic modification of metals, physical properties and metallurgical structure, Linear and volumetric contraction of metals, Latent heat of metals, Effect of fluidity and castability, Mechanical properties.

(08 Hrs)

Unit II

Solidification of metals: Cooling curve, solidification of metals and alloys, development of binary phase diagrams, iron-carbon diagram, effect of alloying elements to aluminium, steel and copper alloys, coring, super cooling and under cooling, critical size of nuclei, homogeneous and Heterogeneous nucleation, growth, Ingot solidification, Defects in ingots-segregation, ingot structure, development of dendrites, constitutional super cooling.

(08 Hrs)

Unit III

Microstructure: Grain size and shape, poly-crystallization, stalling materials, effect of grain size on micro structure, Metallographic study of steel, cast iron, aluminium and copper alloys, Inclusion- indigenous and exogenous, strengthening mechanism, work, dispersion, aging and precipitation hardening.

(08 Hrs)

Unit IV

Heat Treatment: Objective of heat treatment and manipulation of properties by alloying and heat treatment, annealing, normalizing, hardening, induction hardening, case hardening, tempering, flame hardening, carburising, nitriding, cyaniding of steels, carbonating, Heat treatment (HT) furnace atmosphere, precipitation hardening and strengthening of aluminium alloys.

(08 Hrs)

Recommended Books

Title	Author(s) Text Reference	Publisher
Foundry technology	O P Khanna	Dhanpat Rai
Elements of Physical Metallurgy	Dulbod Cerry, Addison.	S. Chand & Co
Metallurgy for engineer Principals of Metal casting	Rollason, Edward Ornd. Rosenthal,	Pitman Publishers Tata-Mcgraw Hill.

ME-4204 FOUNDRY EQUIPMENT, REPAIR & MAINTENANCE

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Introduction: Basic Objectives of repair & maintenance, Introduction to prevention productivity Break Down maintenance Basic idea of total productive maintenance, moulding equipment, type of flasks, components, dowel pins their functions, care & upkeeping design & selection of size of mould boxes, foundry tools & their applications, sand handling, sand preparation machines like mullers & sand mixtures, moulding machines jolts, squeezing slinger moulding machines their construction working & operations, Shell moulding machines.

(12 Hrs)

Unit II

Furnaces: Types & their classification based on energy, resources & construction, lining of furnaces their repair & maintenance temperature control devices their repair & maintenance.

(12 Hrs)

Unit III

Moulding line function: Material handling, moulds raw material & casting their repair & maintenance, permanent moulding, permanent die (PD) & gravity die (GD) Casting machines & their maintenance.

(12 Hrs)

Unit IV

Fettling & short/ sand blasting equipment: Construction & operation of short & sand blasting machines.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Foundry technology	O.P. Khanna	S. Chand & Co
Manufacturing Processes	Ghosh & Malik	Pitman Publishers
Workshop Practice II	Hazra Chaudhary	Khanna Publisher

ME-4205 ENERGY AND ENVIRONMENT MANAGEMENT

L T P
3 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 75

Unit I

Introduction: Relevance of energy as an Engineering raw material, production methods & infrastructural attributes, use of various fuels, oils, gas & non conventional sources such as use of hydel (mini & micro) wind & solar power in local condition solar heating & drying avenues, cost of energy in foundry operations, trends of energy use & abuse, role of efficient development of energy, impact of energy misuse on environment, energy quality & its role, Impact of efficient operation of energy equipment like burners, thermocouples, refractories, instruments on energy consumption.

(12 Hrs)

Unit II

Energy saving and pollution: Temperature control & temperature regulation, energy saving measures & devices, energy conservation/ saving in foundry, recuperators & regenerators, furnace insulation, types & role, heat treatment according to their energy uses, equipment, furnaces, motors energy & environmental management Concept of neat & clean environment, different types of effluents from industries, techniques for measurements of different types of pollutants.

(12 Hrs)

Unit III

Air Pollution: Toxic gases from industries like foundry, chemical etc. threshold limit values, hazards from gases and symptoms, Different parameters, different treatments for combating air pollution, various techniques and equipment for controlling air pollution, basic principles, mechanical details, installation of important equipment like ESP.

(12 Hrs)

Unit IV

Liquid Pollution: Parameters and testing liquid effluents, different treatments, different types of equipment used for treatment of liquid effluents and their mechanical detail and applications.

Noise pollution: Sound waste like slag, refractories, sand, salts from salt bath, particulate matters collected in APCD, their disposal and reusability.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Foundry technology	Text P L Jain	TMH
Fundamentals of Air Pollution	Reference Williamson	Charotar Publishing House, Anand
Liquid Wastes	Addison Wesley	

ME 4211 INDUSTRIAL AUTOMATION AND CONTROL

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Basic Concepts: Definition, need of Automation, Automation strategies, advantages of automation.

Robotics: Basic configurations, basic characteristics, end-effectors, sensors, applications. (12 Hrs)

Unit II

Programmable Logic Controller (PLC): Function of PLC, Architecture, Components of PLC, selection of PLC, applications, introduction to Ladder Logic diagram.

Microprocessors: Structure: buses, CPU, Memory, Input/output, application of microprocessors in manufacturing industry. (12 Hrs)

Unit III

Pneumatics and Hydraulics: Hydraulics and Pneumatic power supplies, Direction control valves, their symbols, pumps, compressors, basic circuits. (12 Hrs)

Unit IV

Computer based process control: Characteristics of manufacturing process data, process data input/output, interface hardware,, computer process monitoring, types of computer process control, Direct Digital control, supervisory computer control

Conveyor System: Components of conveyor systems, types of conveyor systems, quantitative relationship and analysis of conveyor systems. (12 Hrs)

Recommended Books:

Title	Author(s) Text	Publisher
Automation, Production Systems and Computer Integrated Manufacturing	Groover	PHI
Mechatronics	W. Bolten	Pearson education
Pneumatic system	Majumdar	TMH
Hydraulics and Pneumatics	Andrew Parr	TMH

ME 4212 ADVANCED TRENDS IN MAINTENANCE

L T P
4 1 0

Maximum Sessional Marks: 50
Maximum End Term Examination Marks: 75

Unit I

Specialized Maintenance Techniques: Condition based maintenance principle & its advantages, performance behavior, recording and monitoring, monitoring like oil consumption, run down time parameters, data collection, plotting and analysis.

(16 Hrs)

Unit II

Vibration Monitoring: Machinery signatures, transducers selection, analysis techniques, vibration severity criterion, vibration frequency analysis, practical applications.

Tools For Maintenance Analysis: Fundamentals of Non-destructive testing, radiography, ultrasound, Acoustic emission, Thermography, Magnaflux.

(16 Hrs)

Unit III

Computer Managed Maintenance: Selection & scope of computerization, codification of materials & facilities, control of maintenance plans, recording, categorization, analysis breakdown.

(16 Hrs)

Unit IV

Quality Management: Introduction , concept of quality & emerging trends TPM, TQM, SQC, Quality control methods quality control tools(charts, diagrams, tree analysis), Introduction, quality standards(ISO-9001/14000 family).

(16 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Maintenance engg	RC Mishra	PHI
Management & Systems	Nauhria & Prakash	Dhanpat Rai & Co
Industrial Maintenance	HP Garg	S Chand & Co
Maintenance Planning & Control	Anthony Kelly	East-West Publication
Corrosion	Rottwell & Tullmin	East-West Publication

ME 4213 PLANT ENGINEERING AND MANAGEMENT

L T P
4 1 0

Maximum Sessional Marks: 50
Maximum End Term Examination Marks: 75

Unit I

Plant Layout: Introduction, objectives of plant layout, Types of plant layout, merits and demerits, factors influencing layout, flow pattern, line balancing, work station design, plant cleanliness and effect on health of machining, 5 'S' principles.

(16 Hrs)

Unit II

Material Handling Equipments: Introduction, types of materials handling and housing equipments, general characteristics for surface and overhead transporting facilities, application and maintenance of these equipments.

(16 Hrs)

Unit III

Computerized layout planning: Introduction, information in layout planning, computerized layout evaluation, computerized lay out generation, trends in computerized layout.

Storage System layout: Introduction, dedicated storage location policy, randomized storage location policy, class based dedicated storage location policy, shared storage location policy, continuous warehouse layout.

(16 Hrs)

Unit IV

Industrial safety And waste control: Introduction, objectives of safety, effect of safety on productivity, study of safety equipments, safety training and management, accident analysis, investigation, prevention and case studies, Objectives of waste control, reprocessing of industrial waste and management, ISO-14000 certification.

(16 Hrs)

Recommended Books:

Title	Author(s) Text	Publisher
Industrial Engineering and management Science	Banga, Agarwal and sharma	Khanna Publishers
Facility layout and location	Francis, Leon and white	PHI
Industrial and business management	Telsang	S.Chand

ME-4221 WELDING TECHNOLOGY-III

L T P
3 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 75

Unit I

Resistance Welding: Principle and operation of resistance welding, spot welding, seam welding, projection welding, butt welding, stud welding and high frequency resistance welding.

(12 Hrs)

Unit II

Thermit Welding: Principle of operation and scope of application of the thermit welding.
Solid State Welding Processes: Introduction to friction welding, ultrasonic welding, forge welding and explosive welding techniques and their scope of applications.

(12 Hrs)

Unit III

Thermal Cutting of Metals: Oxygen cutting, oxy-acetylene cutting, oxygen-arc cutting, arc cutting, metallic arc cutting, plasma cutting advantages and disadvantages, gouging.

(12 Hrs)

Unit IV

Metal surfacing: Introduction, applications, classification of thermal spraying processes, surface preparation, flame spraying and equipment, electric arc spraying and equipment, plasma arc spraying and equipment, detonation gun spraying, introduction to welding surfacing.

High Energy Welding process: Introduction to electron beam and Laser beam welding processes.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Welding processes & technology	RS PARMAR	Khanna Publishers
Principles of welding technology	LM GOURD	Edward Arnol
Welding	AC Davies	Cambridge university press

ME-4222 WELDING METALLURGY

L T P
2 1 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Weldability: Definition, variables affecting weldability of a material and introduction to weldability tests.

(08 Hrs)

Unit II

Metallurgical Changes in Weldments: Various zones of a weldment & their mechanical properties, slag metal/gas metal reactions, gas absorption and their influence on mechanical properties of weldments Weld metal solidification and influence of welding parameters on solidification rate and on mechanical properties of weldments.

(08 Hrs)

Unit III

Welding of Different Materials: Weldability and welding procedure of steel, cast iron, aluminium, stainless steel, copper and brass.

(08 Hrs)

Unit IV

Residual Stresses and Distortion: Definition, development of residual stresses and distortion during welding, methods of correcting distortion & removal of residual stresses.

(08 Hrs)

Recommended Books:

Title	Author(s) Text Reference	Publisher
Welding Engg	RS PARMAR	Khanna Publishers
Principles of welding technology Welding processes	LM GOURD Houldcraft	Edward Arnol PT

ME-4231 Maintenance Engineering and Management

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Introduction: Objectives and characteristics of maintenance function. importance of maintenance function, Organization of The maintenance system, operating practice in maintenance, maintenance record keeping, Types of maintenance, areas of maintenance function (civil, electrical and mechanical maintenance).

(12 Hrs)

Unit II

Reliability of Engineering Systems: Concept of reliability, maintainability, availability, Mean time to failure (MTTF), Mean time between failures (MTBF), Failures characteristic curve, Quantitative evaluation of reliability, Basic characteristics of reliability of product operating up to first failure and product being renewed, Accuracy and confidence level of reliability estimation.

(12 Hrs)

Unit III

Planning and Scheduling of Maintenance Activities: Evaluation of alternate maintenance policies - corrective, preventive and predictive, Simulation of alternative practices, Development of preventive maintenance schedule, Replacement policies and models, Maintenance manpower planning, Concepts of total productive maintenance, technology, condition monitoring, applied, maintainability, productive maintenance and design out maintenance.

(12 Hrs)

Unit IV

Cost Aspects of Maintenance: Cost of machine breakdown, estimation of life cycle costs, Application of work measurement in maintenance, incentive payments for maintenance.

Maintenance Requirements: Maintenance requirement of mechanical, electrical and service equipment, Aspects of lubrication, Chemical control of corrosion, Computerized maintenance information system, Safety at work place.

(12 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Management of Systems	Nauhria and Parkash	Dhanpat Rai
Principles of Planned Maintenance	R.H. Clifton	McGraw Hill
Maintenance Engineering	Handbook by Higgen LR	McGraw Hill

ME-4232 INDUSTRIAL ENGINEERING

L T P
3 0 0

Maximum Sessional Marks: 25
Maximum End Term Examination Marks: 50

Unit I

Introduction: Definition, applications, history and development, techniques of Industrial Engineering. Production and productivity, its importance, waste management, work method design, ergonomics.

(08 Hrs)

Unit II

Work Study: Definition and scope of work study, role of work study in improving productivity, Objectives and procedure for method study, human aspects of work study. Objectives and procedures to conduct work measurement. Principles to design work place layout. Calculation of normal time and standard time, cycle graph and chrono-cycle graph.

(12 Hrs)

Unit III

Inventory control and material handling: Introduction, types, inventory models, economic order quantity. Functions and principles of material handling, types and maintenance of material handling equipment.

Plant layout: Concept of plant layout, types of layout: process, product & combination.

(10 Hrs)

Unit IV

Value engineering and analysis: Definitions, meaning, origin of value engineering, value analysis, difference between value engineering and cost reduction.

Environment pollution : Factors causing the pollution, effects, air-pollution and control, solid waste management.

(10 Hrs)

Recommended Books:

Title	Author(s)	Publisher
Industrial engineering	S. K Sharma	Kataria
Industrial Engineering and Production Management	Martand Telsang	S Chand
Motion and Time Study	A. Barnes	John Wiley & sons
Work Study and Ergonomics	Dalela and Sourabh	Standard Publishers