Sri Satya Sai University of Technology & Medical Sciences, Sehore (M.P.)

Syllabus for Ph. D. Entrance Test

(Engineering & Technology, Pharmacy, Management, Education, Physical Education, Science, Commerce, Social Sciences & Humanities)
**Chemical Engineering**

Process Calculations and Thermodynamics: Laws of conservation of mass and energy; use of tie components; recycle, bypass and purge calculations; degree of freedom analysis. First and Second laws of thermodynamics. First law application to close and open systems. Second law and Entropy Thermodynamic properties of pure substances: equation of state and departure function, properties of mixtures: partial molar properties, fugacity, excess properties and activity coefficients; phase equilibria: predicting VLE of systems; chemical reaction equilibria.

Fluid Mechanics and Mechanical Operations: Fluid statics, Newtonian and non-Newtonian fluids, Bernoulli equation, Macroscopic friction factors, energy balance, dimensional analysis, shell balances, flow through pipeline systems, flow meters, pumps and compressors, packed and fluidized beds, elementary boundary layer theory, size reduction and size separation; free and hindered settling; centrifuge and cyclones; thickening and classification, filtration, mixing and agitation; conveying of solids.

Heat Transfer: Conduction, convection and radiation, heat transfer coefficients, steady and unsteady heat conduction, boiling, condensation and evaporation; types of heat exchangers and evaporators and their design.

Mass Transfer: Fick's laws, molecular diffusion in fluids, mass transfer coefficients, film, penetration and surface renewal theories; momentum, heat and mass transfer analogies; stagewise and continuous contacting and stage efficiencies; HTU & NTU concepts design and operation of equipment for distillation, absorption, leaching, liquid-liquid extraction, drying, humidification, dehumidification and adsorption.

Chemical Reaction Engineering: Theories of reaction rates; kinetics of homogeneous reactions, interpretation of kinetic data, single and multiple reactions in ideal reactors, non-ideal reactors; residence time distribution, single parameter model; non-isothermal reactors; kinetics of heterogeneous catalytic reactions; diffusion effects in catalysis.

Instrumentation and Process Control: Measurement of process variables; sensors, transducers and their dynamics, transfer functions and dynamic responses of simple systems, process reaction curve, controller modes (P, PI, and PID); control valves; analysis of closed loop systems including stability, frequency response and controller tuning, cascade, feed forward control.
Plant Design and Economics: Process design and sizing of chemical engineering equipment such as compressors, heat exchangers, multistage contactors; principles of process economics and cost estimation including total annualized cost, cost indexes, rate of return, payback period, discounted cash flow, optimization in design. Chemical Technology: Inorganic chemical industries; sulfuric acid, NaOH, fertilizers (Ammonia, Urea, SSP and TSP); natural products industries (Pulp and Paper, Sugar, Oil, and Fats); petroleum refining and petrochemicals; polymerization industries; polyethylene, polypropylene, PVC and polyester synthetic fibers.
CIVIL ENGINEERING
Stiffness Method: Transformation of axes system, Representing the imposed loads as nodal loads, Elastic supports, Support displacements, Application to various type of structures e.g. Continuous beams, Trusses, Frames and grids, Temperature effects.

Flexibility Method: Particular solution, Complimentary solution, Compatibility equations, Flexibility coefficients, Application to various type of structures, Elastics supports.


Design of Slender Columns: Concentrically loaded slender columns, Eccentrically loaded slender columns, Slender columns subjected to axial and transverse loads, Structural behaviour of columns in braced and unbraced frames.

Flat Slabs: Elements of flat slabs, Behaviour of flat slab in shear, Opening in flat slabs, Effect of pattern loading in flat slabs.

Deep Beams: Flexural bending and shear stresses in deep beams.

Concept of Plastic Design: Redistribution of moments, Computation of plastic moment, Shape factor, Overload factor.

Plastic Design of Steel Frames: General design procedure, Design of continuous beams, Design of industrial building frames.

Shallow Foundations – Types and choice of type. Design considerations of including location and depth, Bearing capacity – General bearing capacity equation, Meyerhof’s Hnnsen’s and Vesic’s bearing capacity factors; Bearing capacity of stratified soils; Bearing capacity based on penetration resistance, safe bearing capacity and allowable bearing pressure.
Proportioning of shallow foundations- isolated and combined footings and mats, Design procedure for mats; floating foundation, fundamentals of beam on Elastic foundations.

Pile foundations – Classification methods – Factors influencing their choice – Load carrying Capacity of piles by static pile formulae in clays and granular soils methods for piles in clays; Meyerhof’s, Vesic’s equations and Coyle and Castello correlations for piles in sands; (Elastic settlement of piles)- Pull out resistance of piles – Load carrying capacity using Dynamic pile formula – Pile load tests – cyclic pile load tests.

Laterally loaded vertical piles Modulus of sub – grade reaction – Pile in granular solsand cohesive soils subjected t lateral loading, Matlock & Reese analysis, Davisson &Gill analysis, Broms’ Analysis.


Highway planning: Planning Service, Saturation System, Policies and goals of different road development plans, Salient features of Vision-2021 as per IRC recommendations.

Geometric design standards of Highways: Controls and Criteria for geometric design, basic requirements, Design vehicle, Design of capacity, level of service, design of camber, design methods used in field, design of cross-section elements, design and analysis of different sight distances IRC specifications for design. 8

Design of Horizontal Alignment: Design and analysis of super elevation, methods for eliminating camber and super elevation in the field, design of extra widening, methods for providing extra widening in the field, design of transition, design of combined curve, IRC specifications for design. 6

Design of Vertical Alignment: Design of gradients, basic criteria and methods for designing summit and & valley vertical curves, IRC specification for design. 4

Geometric Design of Inter-sections:
Design of parking areas: Design of Bus terminals, loading and unloading zones

Geometric design of high speed corridors: Concept and requirement of high speed corridors and design of high speed corridors.

Building Construction: Orientation of buildings, planning of Hi-rise buildings, design of staircases/lifts & escalators, principles of planning, building planning (all types of buildings), inventories, Advance construction materials.

Structural Mechanics: Bending moment and shear force in statically determinate beams. Simple stress and strain relationship: stress and strain in two dimensions, principal stresses, simple bending theory, flexural and shear stresses, unsymmetrical bending, shear centre. Uniform torsion, buckling of columns, combined and direct bending stresses.
Computer Sciences & Engineering

Digital Logic: Logic functions, Minimization, Design and synthesis of combinational and sequential circuits; Number representation and computer arithmetic (fixed and floating point).

Computer Organization and Architecture: Machine instructions and addressing modes, ALU and data-path, CPU control design, Memory interface, I/O interface (Interrupt and DMA mode), Instruction pipelining, Cache and main memory, Secondary storage.

Programming and Data Structures: Programming in C; Functions, Recursion, Parameter passing, Scope, Binding; Abstract data types, Arrays, Stacks, Queues, Linked Lists, Trees, Binary search trees, Binary heaps.

Algorithms: Analysis, Asymptotic notation, Notions of space and time complexity, Worst and average case analysis; Design: Greedy approach, Dynamic programming, Divide-and-conquer; Tree and graph traversals, Connected components, Spanning trees, Shortest paths; Hashing, Sorting, Searching. Asymptotic analysis (best, worst, average cases) of time and space, upper and lower bounds, Basic concepts of complexity classes P, NP, NP-hard, NP-complete.

Theory of Computation: Regular languages and finite automata, Context free languages and Push-down automata, Recursively enumerable sets and Turing machines, Undecidability.

Compiler Design: Lexical analysis, Parsing, Syntax directed translation, Runtime environments, Intermediate and target code generation, Basics of code optimization.

Operating System: Processes, Threads, Inter-process communication, Concurrency, Synchronization, Deadlock, CPU scheduling, Memory management and virtual memory, File systems, I/O systems, Protection and security.

Databases: ER-model, Relational model (relational algebra, tuple calculus), Database design (integrity constraints, normal forms), Query languages (SQL), File structures (sequential files, indexing, B and B+ trees), Transactions and concurrency control.

Information Systems and Software Engineering: information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project, design, coding, testing, implementation, maintenance.

Computer Networks: ISO/OSI stack, LAN technologies (Ethernet, Token ring), Flow and error control techniques, Routing algorithms, Congestion control, TCP/UDP and sockets, IP(v4), Application layer protocols (icmp, dns, smtp, pop, ftp, http); Basic
concepts of hubs, switches, gateways, and routers. Network security basic concepts of public key and private key cryptography, digital signature, firewalls.

Web Technologies: HTML, XML, basic concepts of client-server computing
Electronics and Communications

Analog and Digital Electronics: Characteristics of diodes, BJT, FET; amplifiers - biasing, equivalent circuit and frequency response; oscillators and feedback amplifiers; operational amplifiers - characteristics and applications;


Electromagnetic Theory, Microwave Techniques and Antenna: Maxwell’s Equitation and their Applications. Poynting Theorem, plane-wave propagation, polarization, reflection and refraction.


**Electrical Engineering**

Electric Circuits and Fields: Network graph, KCL, KVL, node and mesh analysis, transient response of dc and ac networks; sinusoidal steady-state analysis, resonance, basic filter concepts; ideal current and voltage sources, Thevenin's, Norton's and Superposition and Maximum Power Transfer theorems

Signals and Systems: Representation of continuous and discrete-time signals; shifting and scaling operations; linear, time-invariant and causal systems; Fourier series representation of continuous periodic signals; sampling theorem; Fourier, Laplace and Z transforms.

Electrical Machines: Single phase transformer - equivalent circuit, phasor diagram, tests, regulation and efficiency; three phase transformers - connections, parallel operation; auto-transformer; energy conversion principles;

Power Systems: Basic power generation concepts; transmission line models and performance; cable performance, insulation; corona and radio interference; distribution systems; per-unit quantities; bus impedance and admittance matrices; load flow; voltage control; power factor correction; economic operation; symmetrical components; fault analysis;

Control Systems: Principles of feedback; transfer function; block diagrams; steady-state errors; Routh and Niquist techniques; Bode plots; root loci; lag, lead and lead-lag compensation

Electrical and Electronic Measurements: Bridges and potentiometers; PMMC, moving iron, dynamometer and induction type instruments; measurement of voltage, current, power, energy and power factor; instrument transformers;

Analog Electronics: Characteristics of diode, BJT, JFET and MOSFET. Diode circuits. Transistors at low and high frequencies, Amplifiers, single and multi-stage. Feedback amplifiers. Operational amplifiers,

Power Electronics and Drives: Semiconductor power diodes, transistors, thyristors, triacs, GTOs, MOSFETs and IGBTs - static characteristics and principles of operation; triggering circuits; phase control rectifiers;
Instrumentation Engineering


Electrical and Electronic Measurements: Bridges and potentiometers, measurement of R,L and C. Measurements of voltage, current, power, power factor and energy. Transducers, Mechanical Measurement and Industrial Instrumentation: Resistive, Capacitive, Inductive and piezoelectric transducers and their signal conditioning.


Digital Electronics: Combinational logic circuits, minimization of Boolean functions. IC families, TTL, MOS and CMOS. Arithmetic circuits. Comparators, Schmitt trigger, timers and mono-stable multi-vibrator. Sequential circuits, flip-flops, counters, shift registers. Multiplexer,


**Mechanical Engineering**

Engineering Mechanics: Free body diagrams and equilibrium; trusses and frames; virtual work; kinematics and dynamics of particles and of rigid bodies in plane motion, including impulse and momentum (linear and angular) and energy formulations; impact.

Strength of Materials: Stress and strain, stress-strain relationship and elastic constants, Mohr's circle for plane stress and plane strain, thin cylinders; shear force and bending moment diagrams; bending and shear stresses; deflection of beams; torsion of circular shafts.

Theory of Machines: Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of slider-crank mechanism; gear trains; flywheels.

Vibrations: Free and forced vibration of single degree of freedom systems; effect of damping; vibration isolation; resonance, critical speeds of shafts.

Design: Design for static and dynamic loading; failure theories; principles of the design of machine elements such as bolted, riveted and welded joints, spur gears, rolling and sliding contact bearings.

Fluid Mechanics: Fluid properties; fluid statics, manometry, buoyancy; control-volume analysis of mass, momentum and energy; fluid acceleration; differential equations of continuity and momentum; Bernoulli's equation;


Thermodynamics: Zeroth, First and Second laws of thermodynamics; thermodynamic system and processes; Carnot cycle.

Power Engineering: Steam Tables, Rankine, Brayton cycles with regeneration and reheat.

I.C. Engines: Combustion in S.I. & C.I. Engines, Gas Turbines

Refrigeration and air-conditioning: Vapour refrigeration cycle, heat pumps, gas refrigeration, Reverse Brayton cycle; moist air: psychrometric chart, basic psychrometric processes.

Turbomachinery: Peltonwheel, Francis and Kaplan turbines - impulse and reaction principles, velocity diagrams.

Metal Cutting: Mechanics of machining, single and multi-point cutting tools, tool geometry and materials, tool life and wear.
Pharmacy

Pharmaceutics: Designing of dosage forms, Kinetics & Drug Stability; Accelerated stability study, expiration dating. Pre-formulation studies, Study of physical properties of drug like physical form, particle size, shape, density, wetting, dielectric constant. Stability studies, Protocols for Stability testing of various pharmaceutical products.

Pharmaceutical Microbiology and Biotechnology: Nutrition, cultivation, isolation of bacteria, fungi, and viruses; Stains & types of staining techniques; electron microscopy; Sterilization; Sterility testing of pharmaceutical products. Microbial assays of antibiotics, vitamins & amino acids; Immunology & Immunological Preparations; Enzyme immobilization: Techniques and applications.


Medicinal Chemistry: Basic Principles: Physico-chemical & stereoisomeric (Optical, geometrical) aspects of drug molecules & biological action, Bioisosterism, Drug-receptor interactions; Concept of Prodrugs; Principles of Drug Design (Theoretical Aspects)

Synthetic Procedures, Mode of Action, Uses, Structure Activity Relationships including Physicochemical Properties of the Following Classes of Drugs: Local Anesthetics, General Anesthetics, Hypnotics & Sedatives, Anticonvulsants, Opioid analgesics, CNS stimulants, Diuretics; Cardiovascular drugs, Insulin & oral hypoglycemic agents: Chemotherapeutic Agents: Antibiotics- β-Lactam, macrolides, tetracyclines; Anti-metabolites (including sulfonamides); Anti-neoplastic agents; Anti-viral agents (including anti-HIV); Immunosuppressives & immunostimulants.

Pharmaceutical Analysis: The Theoretical Aspects, Basic Instrumentation, Elements of Interpretation of Spectra, & Applications (quantitative & qualitative) of the Following Analytical Techniques: Ultraviolet & visible spectrophotometry, Fluorimetry, Infrared spectrophotometry, Nuclear Magnetic Resonance spectroscopy [proton technique only], Mass Spectrometry, Radioimmunoassay.

Chromatography: Theory of chromatography. The following chromatographic techniques (including instrumentation) with relevant examples of products official in pharmacopoeia: TLC, HPLC, GLC, HPTLC, Paper Chromatography & Column Chromatography.

Quality assurance: GLP, ISO 9000, TQM, Quality Review & Quality documentation.

Pharmacology: Dosage forms & routes of administration, mechanism of action, combined effect of drugs, factors modifying drug action, Absorption, Distribution, Metabolism & Excretion of drugs, Adverse Drug Reactions.
Pharmacology of Cardiovascular System: Drugs used in the management of congestive cardiac failure, Antihypertensive drugs, Anti-anginal & Vasodilator drugs, including calcium channel blockers & beta adrenergic antagonists, Antiarrhythmic drugs, Anti-hyperlipidemic drugs.

Chemotherapy: General Principles of Chemotherapy, Bacterial resistance; Sulfonamides & cotrimoxazole, Antibiotics; Chemotherapy of tuberculosis, fungal diseases, viral diseases, HIV & AIDS.

Management
Fundamentals of Management: Concept of Management:- Introduction to management & Organizations, Functions and Responsibilities of Managers, Fayol’s Principles of Management, Management Thought; the Classical School, The Human Relations School and systems theory.

Controlling: - Concept and Process of Control, Control Techniques. Human Aspects of Control. Control as a feedback system, types of control, IT as a control tool.

Human Resource Management: Concepts and perspectives in HRM; HRM in changing environment Human resource planning-Objectives, Process and Techniques Job analysis-Job description selecting human resources induction, training and development exit policy and implications performance appraisal and evaluation potential assessment job evaluation Wage determination industrial relations and trade unions dispute resolution and trade unions dispute resolution and grievance management labour welfare and social security measures

Marketing Management: Marketing environment and Environment scanning; Marketing Information systems and marketing research; Understanding consumer and industrial markets; Demand measurement and Forecasting; market segmentation-targeting and positioning; product decisions, product mix, product life cycle; new product development; Branding and packaging; pricing methods and strategies. Promotion decisions- Promotion mix; Advertising; personal selling; channel management; Vertical marketing systems; Evaluation and control of marketing effort; marketing of services; customer relation management; Uses of internet as a marketing medium-other related issues like branding market development advertising and retailing on the net. New issues in marketing.

Production Management: Role and scope of production management; Facility location; layout planning and analysis; production planning and control- production process analysis; demand forecasting for operations; Determinants of product mix; production scheduling; work measurement; time and motion study; statistical; quality control. Role and scope of operations research; linear programming; sensitivity Duality; transportation model; inventory control; queuing theory; decision theory; Markova analysis; PERT/CPM.

Quantitative Techniques: Probability theory; probability distributions-Binomial, Poisson, normal and Exponential; correlation and regression analysis; sampling theory; sampling distributions; tests of hypothesis; large and small samples; t,z,F, chi-square tests. Use of computers in managerial applications; technology issues and data processing in organizations; information systems; MIS and decision making; System analysis and design; trends in information technology; internet and internet based applications.
**Education**

UNIT-I

Philosophical Foundation of Education: - Relationship of Education and Philosophy

Western Schools of Philosophy: - Idealism, Realism, Pragmatism and Naturalism

Indian Schools of Philosophy: - Vedanta, Buddhism, Jainism. Contributions of Philosophy of Vivekananda, Tagore, Gandhi, and Aurobindo to educational thinking

UNIT-II

Sociological Foundations of Education: - Relationship of Sociology and Education

Meaning and nature of Education sociology and Sociology of education.

Education and modernization, Education and democracy, Socialization of the child

Meaning and nature of social change, Education as related to social equity and equality of educational opportunities Constraints on social change in India (caste, ethnicity, class, language, religion, regionalism)

UNIT-III

Psychological Foundations of Education: - Relationship of education and Psychology

Process of Growth and Development v Physical, social, emotional and intellectual

v Individual differences- determinants: role of heredity and environment: implications of individual differences for organizing educational programmes Intelligence – its theories and measurement Learning and Motivation

Theories of learning- Thorndike is connectionism, Pavlov’s classical and Skinner’s operant conditioning Psychology and education of exceptional children- creative, gifted, backward, learning disables and mentally retarded Personality- type and trait theories- measurement of personality Mental health and hygiene- process of adjustment, conflicts and deference mechanism, mental hygiene and mental health. Sex Education Guidance

UNIT-IV

Methodology of Education Research: - Nature and Scope of Education Research

Meaning and Nature Need and Purpose Fundamental- Applied and Action Research

Collection of Data Concept of population and sample Various methods of sampling

Tools and Techniques Characteristics of a good research tool Types of research tools and techniques and their uses Questionnaire- Interviews- Observations
Physical Education

Brief Course Outline:

- General Physical Education
- Sports Psychology
- Exercise Physiology
- Sports Drugs
- Sports Management
- Sports Measurements
- Human Kinematics
Zoology

Unit – 1
Biology and system physiology of non chordates: Organization of Coelom, Locomation, Evolution and adaptive radiation, Economic Importance of fishes, birds and reptiles. Blood and circulation, Cardiovascular system, Respiratory system, Nervous system, Sense Organs, Excretory system, Thermoregulation Digestive system, Endocrinology and reproduction.

Unit – 2
Developmental biology: Basic concept of development, Gometogenesis Fertilization an early development, Morphogenesis and orgononesis in animals.

Unit – 3
Inheritance Biology: Mendelion Principles and their Extensions, Concept of gene, Extra chromosomal inheritance, Microbial genetics, Human genetics, Quantitative genetics, Mutation, Structural and numerical alteration of chromosomes, Recombination.

Unit – 4

Unit – 5
Evolution & Behavior: Origin of cell and unicellular evolution; Emergence of evolutionary thoughts, Paleontology and evolutionary history, Molecular evolution, Brain behavior and evolution,

Unit – 6
Ecological principles & biodiversity and taxonomy: The Environment, Types of Eco system, Population ecology, Community ecology, Biogeography, Consecration biology, Sustainable development
CHEMISTRY

Physical Chemistry

Introduction to Quantum Mechanics: Schrödinger equation and postulates of quantum mechanics. Discussion of solution of the Schrödinger equation to some model system viz., particle in a box, the harmonic oscillator, the rigid rotator, the hydrogen atom and helium atom.

Molecular orbital theory: Hückel theory of conjugated system bond and charge density calculation. Application to ethylene, butadiene, cyclopropenyl radical cyclobutadiene etc. Introduction to extended Hückel theory.

Thermodynamics: First law of thermodynamics, second law of thermodynamics, entropy, Gibbs-Helmholtz equation, relation between Cp and Cv, enthalpies of physical and chemical changes; temperature dependence of enthalpy. Third law of thermodynamics and calculation of entropy. Statistical thermodynamics; Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics.

Non equilibrium Thermodynamics: Postulates and methodologies, linear law, Gibbs equation, Onsager reciprocal theory.


Ideal and Non ideal reaction: Excess function, concept of hydration number: activity in electrolytic solution; mean ionic activity coefficient; Debye-Hückel treatment of dilute electrolyte solution.
Inorganic Chemistry

Chemical sciences: Concept of hybridization. Molecular orbitals and electronic configuration of homo and heteronuclear molecules. VSEPR theory and Bent rule. Types of chemical bond (weak and strong) intermolecular forces. Bond lengths, Bond angles, Bond order, Bond energies, lattice energy.


Chemistry of transition elements: Bonding theories, spectral and magnetic properties, reaction mechanisms. Transitional metal catalyzed reaction; oxidation, elimination reaction

Inner transition elements – spectral and magnetic properties, analytical applications. Organometallic chemistry of transition elements.

Acids and Bases: Classification of acids and bases, Bronsted and Lewis acids and bases, pH and pKa, acid-base concept in non aqueous media. Buffer solution. HSAB concept and application.


Photochemistry: Cis-trans Isomerisation, Paterno-Buchi reaction, Norrish type 1 and 2 reaction, photoreaction of ketones, photochemistry of arenes.


Inorganic rings, Cages, Clusters, polymers: Phosphazenes, Cyclophosphazenes, Polyphosphazenes, metal clusters and the polymers derived from them. polysilanes.
Organic chemistry

Stereochemistry: Configuration, concept of chirality, optical isomerism, enantiomers, diastereoisomerism in cyclic and acyclic system; E-Z isomerisms. Methods of resolution, conformational analysis of simple cyclic and acyclic system. Interconversion of fischer, Newman and Sawhorse projections.


Addition to carbon-carbon Multiple bonds: Mechanism, direction and stereochemistry, addition to alkenes, alkynes, transitional metal organometallics.

Addition to carbon-heetro bonds: Mechanism of metal hydrides, reduction of saturated and unsaturated carbonyl compounds, acids, esters, nitriles, addition to Grignard reagents.

Name Reaction: Aldol condensation, Beckmann rearrangement, Cannizzaro reaction, Mannich reaction, Claisen condensation reaction, Birch reduction, Reamer Tiemann reaction, Fries reaction, Allylic rearrangement, Hofmann rearrangement, Oppenauer oxidation, Reformatsky reaction. Wittg reaction, hydroboration reaction. Diels-Alder reaction. Friedel-Crafts reaction.

Pericyclic Reaction: Introduction, electrocyclic reaction, theoretical explanation, molecular orbital symmetry, frontier orbitals of ethylene, 1,3-butadiene, 1,3,5-hexatriene and allyl system, cycloaddition, antrafacial,suprafacial addition,4n and 4n+2 system, 2+2 addition of ketenes, 1,3 dipolar cycloaddition and chelotropic reaction. Sigmatropic rearrangements-suprafacial shift of hydrogen,sigmatropic involving carbon moieties, 3,3 and 5,5 sigmatropic rearrangement. Claisen,cope and aza cope rearrangement.


Mechanism of Organic Reaction: Labelling and kinetic isotope effects, Hammet equation, (sigma-rho) relationship, non classical carbonium ions, neighbouring group participation.

Special Organic Reaction: Favorskii reaction, Michael addition, Sharpless asymmetric epoxidation, Barton reaction Baeyer-Villiger reaction.
PHYSICS

MATHEMATICAL PHYSICS: Vector algebra and vector calculus, linear algebra, matrices, linear differential equations of first and second order, Fourier series, Fourier and Laplace transforms, elements of complex analysis, analytic functions, elementary probability theory, elementary idea about tensors.

CLASSICAL MECHANICS: Elementary principles, Mechanics of system of particles, Central forces, Kepler’s problem and planetary motion, Collision and scattering in laboratory and center of mass frames, rigid body dynamics, noninertial frames of reference, variational principle, Lagrange’s and Hamilton’s formalisms, small oscillations, normal modes, special theory of relativity – Lorentz transformations, relativistic kinetic and mass energy equivalence.

QUANTUM MECHANICS: Physical basis of quantum mechanics, uncertainty principle, Schrödinger equations; one, two and three dimensional potential problems, particle in a box, harmonic oscillator, hydrogen atom linear vector and Hilbert space, angular momenta and spin, time dependent perturbation theory, WKB approximations penetration through a potential, α-decay, Stark effect, Fermi’s golden rule, interaction of an atom with electromagnetic radiation, the Einstein’s A & B coefficients.


Magnetostatics:-Biot-Savart law, Ampere’s law, Maxwell’s equations scalar and vector potential, diffraction and, coulombs and Lorentz gauges; electromagnetic waves and their reflection, refraction, interference, diffraction and polarization, pointing vector.


ATOMIC & MOLECULAR PHYSICS: Spectra of one and many electron atoms, LS and JJ coupling, hyperfine structure, Zeman and stark effects, electric dipole transition and selection rules, X-ray spectra of diatomic molecules; electronic transition in diatomic molecules, Frank-Condon principle, Raman effect, NMR and ESR lasers.

CONDENSED MATTER PHYSICS: Bravais lattices, reciprocal lattice, bonding of solids, elastic properties, phonons, Hall effect, band theory of solids, metals,
insulator and semiconductor, superconductivity, I & II types of superconductors, defect and dislocations, nano particles and its properties.

NUCLEAR & PARTICLE PHYSICS: Basic nuclear properties: size, shape and change distribution, binding energy, liquid drop model-semi empirical mass formula, nuclear shell model, nuclear force and two nucleon problems; α-decay, β-decay, Rutherford scattering nuclear reactions conservation law, fission and fusion, particle accelerators and detectors, elementary idea about photons, baryons, mesons and heptons; quark model.

ELECTRONICS: Semiconductor devices (diodes, junctions, transistors, field effect device, homo-and hetero-junction devices), device characteristics, frequency dependence and applications. Opto-electronic device (Solar cells, photo-detectors, LEDs). Operational amplifiers and their applications. Digital techniques and application (registers, counters, comparators, and similar circuits). A/D and D/A converters. Microprocessor and microcontroller basics
Mathematics

Algebra & Graph theory: Groups, homomorphism, Sylow theorems. Rings and fields. Vector spaces, Subspaces, Linear dependence, Basis and dimension. Linear transformation, Range space, null space, rank and nullity. Matrix representation of a linear transformation. Change of basis. Eigenvalues and eigenvectors. Inner product, orthogonality, Gram-Schmidt process, orthogonal expansion. Quadratic forms, reduction to normal form graph, subgraph, binary tree, spanning tree cut-set, degree of vertex, Euler's formula for connected graph, minimal spanning tree planner graph & theirs properties, connectivity, complete regular and bipartite graph.


**Commerce**

Unit 1: Business Environment:-
Economic Environment of Business in India, Consumer Protection and Environmental protection, policy environment, liberalization, privatization and globalization, New Industrial policy and its implementation, foreign exchange management Act (FEMA), patent law, foreign capital investment in India, World Trade Organization (WTO), International monetary fund (IMF)

Unit 2: Cost and Management Accounting:-
Marginal costing & Break-even Analysis, Standard costing & Budgetary control, costing for decision making, Ratio Analysis, cash flow & Fund flow Analysis.

Unit 3: Business Statistics & Data Analysis:-

Unit 4: Accounting:-

Unit 5: Business Management:-
Functions & Principles of Business Management, Planning, Organizing, controlling, Motivation and Interpersonal behavior.

Unit 6: Business Economics:-
Unit 7: Income Tax & Tax Planning: -
Basic concepts, Tax free Income, Computation of Income from various Heads, computation of Taxable Income of individual & firms, Types of Tax Assessment, Appeal & Revision, Tax planning - Concept, Definition, Importance & problems, Methods of Tax planning.

Unit 8: - Entrepreneurship: -

Unit 9: Financial Management: -

Unit 10: Indian Financial System: -
Money & Capital Market, functions of stock Exchange in India, Stock Holding Corporation of India, Mutual fund, SEBI, Credit Rating, Reserve Bank of India, NABARD & Rural Bank, Reforms of Banking Sector in India, NPA in Indian Banking System.
Economics

1) Micro Economics & Macro Economics: Demand analysis Marshallian, and Hicksian and Revealed preference approaches, Elasticity of demand, Theory of production and costs, pricing and output under different forms of market structure and factor pricing analysis.
National income meaning, measurement and relationship with economic welfare determination hypotheses, Determination of money supply high powered money, Money multiplier.

2) Statically Methods: Measures of central tendency, Dispersion and skewness, simple correlation and regression analysis, index Number and time series analysis, Sampling theory concepts methods of sampling and non sampling errors.


4) International Economics: Balance of payments – Composition and significance, causes and approaches for adjustment in BOP, foreign trade multiplier, Theory of international trade under imperfect competition terms of trade economics growth secular Deterioration of terms of trade hypothesis.

Sociology

1. Contribution of Sociologist: Karl Marx, Emile Durkheim, M.N. Srinivas, Robert K Merton
2. Sociological concept: Social Group, Social Structure, Community, Association, Culture, Social Institution- family, Marriage, Kinship, Religion, Magic and Totem
3. Social stratification: Castes, Class, Gender, Leadership and Politics, Crime
4. Scope of urban sociology: its importance, characteristics of urban society and changes, types of cities, components of town planning, town and city stem, urban Environmental problems
5. Importance of census policy in India, family welfare program, Demographic role in India
6. Research Methodology: Survey, Questionnaire, Interview, Data Collection
Psychology

1. Nature of psychology and development of human behavior: Perception biological and psychological factors, role of nature and nurture, exceptional children types, characteristics including with learning disabilities, application of psychology to queietan problems

2. Learning and motivation: concept, process and factors of learning, Learning process, theories of Akinner, Paulau, Jean piaget’s and Throndike, motivation factor affecting, kind, process and Marlow’s theory

3. Intelligence: Nature of changing characteristics of intelligence, I Q and multifactory theory SI-model of intelligence, measurement of test of intelligence, creativity, nature, process and development of creativity

4. Personality and perspectives in modern contemporary psychology: Personality theories, determinations method of personality assessment psychological testing, problems solving strategies, psycho cybernetics

5. Memory and Research: Stages of memory, STM, LTM, attitude seales and insert inventories, major steps in psychology research, application of statistical techniques, methods of data collection, carrier guidance, operant conditioning, schedule of reinforcement.
**Political Science**

Unit-1  Indian Political Thought


Unit-2  Comparative Government and Politics

Salient feature of the British Constitution, Convention of the British constitution, the British party system, the king and crown.

Unit-3  Types of Government

Dictatorship, Parliament and president system, Unitary and rederal system, party system, Pressure groups.

Unit-4  Indian Government and Politics

The Supreme Court, centre-state relation, the election commission in India, electoral reforms in India, state legislature, political parties in India, national and regional parties.

Unit-5  Brief History of the Indian National Movement

Making of the Indian constitution and its sources, fundamental right and fundamental duties, directive principles of state policy, public administration, development, planning and administration in India, Administration culture, administration corruption and Administration Reforms.
**Home Science**

1. **Physiology & Biochemistry, Food Processing and Technology:**
   - Reproduction and development, Cardio-Vascular, digestive, respiratory, excretory and nervous system, carbohydrates, lipids, proteins, principles in food processing operation, Refrigeration, Processing Technology of food and nutritional implication for cereals & pules, fruits, vegetables and good additives.

2. **Advance food science & nutrition:** Maternal and child nutrition, Therapies nutrition, food standards & lows, food adulteration, body composition, Detoxification, water soluble vitamins, metabolism & antagonists.

3. **Human development:** Concept and principle of human development early language development, motive and intellectual development learning & motivation, Trends Psychologist theory, Physical changes.

4. **House world equipments:** Their working & theories of management, decision making family resources, method of teaching, new techniques, woman empowerment- communication recent trends in furniture decorative accessories wall and floor coverings.
English

A. Literary Ages
   - The age of Chaucer
   - The Elizabethan age
   - The Neo-Classical Age (1701-1770)
   - The Romantic Age (1798-1830)
   - The Victorian Age (1837-1901)
   - The Modern Age (1901 …)
Main trends of each age, Representative poets, Books, and other literary moments.

B. The Literary Movements
   - The Renaissance
   - Renaissance and The Reformation
   - Classicism
   - Neo-Classicism
   - Romanticism
   - Realism
   - Romantic movement
   - Pre-Raphaelite Movement
   - The Aesthetic Movement
   - Naturalism
   - Symbolism
   - Imagism

C. Literary Forms
   - Poetry - Its Literary Forms – Ballad, Elegy, Epic, etc.
   - Prose - Its Nature
   - Drama - Its Nature – Comedy, Tragedy, Problem Play, One Act Play Etc.

D. Literary Terms
   - Catharsis, Hamartra, Negative Capability, Objective Correlative, Satire, Image, Conceit etc.

E. Prosody
   - Stanza forms of English poetry
F. English Literature: English literature as a whole.

G. Indians writing in English: Dr. Ravindra Nath Tagore, Sarojini Naidu, Raja Rao, Mulk Raj Anand, Manohar Mulgaonkar, Arundhati Roy, etc.

Main trends - Social commitment, liberty, fraternity, etc.

इंकाई - (१)
भारतीय और पाश्चात्य काव्यशास्त्र:
काव्य की परिभाषा, स्वरूप हेतु प्रयोजन, प्रमुख सिद्धांत रस और रस निष्ठूति, अलंकार, मीति, ध्वनि और शब्द शक्ति, हिंदी काव्य का इतिहास।

इंकाई - (२)
प्राचीन और मध्यकालीन काव्य एवं उसका इतिहास:
भक्ति काव्य का स्वरूप - निगुण और सगुण काव्यवाद, संत काव्य और कबीर, सूफ़ी काव्य और जामी, कृष्ण काव्यवाणी और पुरुष कहावत और तुलसी, भक्तिकाव्य की प्रमुख प्रवृत्तियाँ, भक्तिकाव्य की वास्तविक अवधारणाएँ, रौठकाव्य की प्रमुख प्रवृत्तियाँ, रौठविक एवं विहारी रौठमुक्त काव्य और धनानंद भक्ति तथा मीति काव्य की भावा।

इंकाई - (३)
आधुनिक हिंदी काव्य और उसका इतिहास:
कविता में आधुनिकता का आरंभ और खड़ी बोली का प्रयोग। मैथिलीवर गुल का काव्य और उसका रचना विवाह। पंत के काव्य में प्रकृति चित्रण कल्पनाभीलाल, सीरेरवेनताना। महादेवी के काव्य में रहस्यवाद और वेदान्तवाद। प्रगतिवादी और प्रयोगवादी काव्यवाद। आधुनिक का संक्षिप्त इतिहास।

इंकाई - (४)
हिंदी साहित्य की गद्य विवाह:
हिंदी उपन्यास: प्रेमचंद के प्रमुख उपन्यास और उनकी विचारार्थ, प्रेमचंदपुरुष उपन्यास और उनकी विचारार्थ, प्रेमचंदपुरुष उपन्यास और उनकी प्रकृतियाँ, जैनेट्र, अहोव, हजारीप्रसाद ढिवेदी, बाहाल, अमृतलाल नागर, फणीयवर्नाथ रेणु के उपन्यास और प्रवृत्तियाँ। हिंदी कहानी: बीसवीं सदी की हिंदी कहानी और प्रमुख कहानी आदिलान।
हिंदी नाटक: हिंदी नाटक और रंगमंच, विकास के चरण और प्रमुख नाटककृतियाँ - अंधेर, नगर, चंद्रगुलु, आँधे-अध्ये, आड़वा सभ्य।
हिंदी नवन्याचर: हिंदी नवन्याचर के प्रकार और प्रमुख नवन्याचरर्र - रामचंद्र शुक्ल, हजारी प्रसाद ढिवेदी, विज्ञानवाचर मिश्र
हिंदी आलोचना: हिंदी, आलोचना का विकास और प्रमुख आलोचक - रामचंद्र शुक्ल, हजारी प्रसाद ढिवेदी, रामविलास शर्मा
हिंदी गद्य की अन्य विवाहएँ - रेखाविचर, संस्मरण, आलमकथा, जीवनी

इंकाई - (५)
भाषा विज्ञान:
भाषा विज्ञान - परिभाषा, स्वरूप, हिंदी भाषा और संक्षिप्त इतिहास स्वर और अंजन हिंदी की ध्वनियाँ, पद और वाक्य विज्ञान, देवनागरी लिपि और उसकी विशेषताएँ।