

MEWAR UNIVERSITY

Detailed Syllabus of Ph.D. & M.Phil. Entrance Examination

1. Computer Science
2. Mechanical Engineering
3. Electrical Engineering
4. Civil Engineering
5. Environmental
6. Electronics
7. Management
8. Commerce
9. Physics
10. Chemistry
11. Mathematics
12. Bio & Life Sciences
13. Education
14. Law
15. English
16. Sanskrit
17. Visual Arts
18. Library Science
19. Hindi
20. Psychology
21. Public Administration
22. Geography
23. History
24. Political Science

1. Computer Science

Discrete Structures

Sets, Relations, Functions. Pigeonhole Principle, inclusion-Exclusion Principle, Equivalence and Partial Orderings, Elementary counting techniques, Probability Measures for information and Mutual information.

Computability: Model of computation-Finite Automata, Pushdown Automata, Non-determinism and NFA, DPDA and PDAs and language accepted by these structures, Grammar, Languages, non-compatibility and Example of non-Computable problems.

Graph: Definition, walks, paths, trails, connected graphs, regular and bipartite graphs, cycles and circuits. Tree and rooted tree. Spanning trees. Eccentricity of a vertex radius and diameter of a graph, Central Graphs, Center(s) of a tree Hamiltonian and Eulerian

Computer Arithmetic

Propositional (Boolean) Logic, Predicate Logic, Well-formed formulae (WFF)

Satisfiability and tautology.

Logic Families: TTL, ECL and C-MOS gates. Boolean algebra and minimization of Boolean functions. Flip-flops-types, race condition and comparison. Design of combinational and sequential circuits.

Representation of Integers: Octal, Hex. Decimal and Binary. 2's complement and 1's complement arithmetic. Floating-point representation.

Programming in C and C++

Programming in C: Elements of C- Tokens, identifiers, data types in C. Control structures in C. Sequence, selection and iteration(s). Structured data types, arrays, structure, union, string, and pointers.

OO Programming Concepts: Class, Object, Instantiation, Inheritance, Polymorphism and Overloading.

Relational Database Design and SQL

E-R Diagrams and their transformation to relational design, Normalization-NF, 2NF, 3NF, BCNF and 4NF. Limitations of 4NF and BCNE.

SQL: Data Definition Language (DDL). Data Manipulation Language (DML), Data Control Language (DCL) commands. Database object like-Views, indexes, sequences, synonyms, data dictionary.

Computer Networks

Networks Fundamentals: Local Area Networks (LAN), Metropolitan Area Network (MAN), Wide Area Networks (WAN), Wireless Networks, Inter Networks.

Reference Models: The OSI model, TCP/IP model.

Data Communication: Channel capacity, Transmission media-twisted pair, coaxial cables, fiber -optic cables, wireless transmission-radio, microwave, infrared and millimeter waves, Light wave transmission. Telephones-Local loop, trunks, multiplexing, switching, narrowband ISDN, broadband ISDN, ATM, High speed LANS. Cellular Radio. Communication satellites, Geosynchronous and low-orbit.

UNIX

The Unix System: File system, process management, bourne shell, shell variables, command line programming.

Filters and Commands: Pr, head, tail, cut, paste, sort, uniq, tr, join, etc, grep, egrep, fgrep, etc., sed, awk, etc.

System Calls (like): Create, open, close, read,write, lseek, link, Unlink, stat, fstat, umask, chmod, exec, fork, wait, system.

Software Engineering

System Development Life Cycles (SDLC): Steps. Water fall model, Prototypes, Spiral model.

Software Metrics: Software Project Management

Software Design: System design, detailed design, function oriented design, object oriented design, user interface design, design level metrics.

Coding and Testing: Testing level metrics. Software quality and reliability, Clean room approach, software reengineering.

Current Trends and Technologies

The topics of current interest in Computer Science and Computer Applications shall be covered. The experts shall use their judgment from time to time to include the topics of popular interest, which are expected to be known for an application development software professional, currently, they include:

2 Mechanical Engineering

1. Thermodynamics

Cycles and IC Engines, Basic concepts, Open and Closed systems. Heat and work. Zeroth, First and Second Law, Application to non-Flow and Flow processes. Entropy, Availability, Irreversibility and Tds relations. Claperyron and real gas equations, Properties of ideal gases and vapours. Standard vapour, Gas power and Refrigeration cycles. Two stage compressor. C-I and S.I. Engines. Pre-ignition, Detonation and Diesel-knock, Fuel injection and Carburation, Supercharging.

2. Heat Transfer and Refrigeration and Air-conditioning.

Modes of heat transfer. One dimensional steady and unsteady conduction. Composite slab and Equivalent Resistance. Heat dissipation from extended surfaces, Heat exchangers, Overall heat transfer coefficient, Empirical correlations for heat transfer in laminar and turbulent flows and for free and forced Convection, Thermal boundary layer over a flat plate. Fundamentals of diffusive and connective mass transfer, Black body and basic concepts in Radiation, Enclosure theory, Shape factor, Net work analysis. Heat pump and Refrigeration cycles and systems, Refrigerants. Condensers, Evaporates and Expansion devices, Psychometric, Charts and application to air conditioning, Sensible heating and cooling, Effective temperature, comfort indices, Load calculations, Solar refrigeration, controls, Duct design.

3. Fluid Mechanics:

Properties and classification of fluids, Manometry, forces on immersed surfaces, Center of pressure, Buoyancy, Elements of stability of floating bodies. Kinematics and Dynamics.

Irrotational and incompressible. Inviscid flow. Velocity potential, Pressure field and Forces on immersed bodies. Bernoulli's equation, Fully developed flow through pipes, Pressure drop calculations, Measurement of flow rate and Pressure drop. Elements of boundary layer theory, Integral approach, Laminar and tubulent flows, Separations. Flow over weirs and notches. Open channel flow, Hydraulic jump. Dimensionless numbers, Dimensional analysis, Similitude and modelling. One-dimensional isentropic flow, Normal shock wave, Flow through convergent – divergent ducts, Oblique shock-wave, Rayleigh and Fanno lines.

4. Fluid Machinery and Steam Generators:

Performance, Operation and control of hydraulic Pump and impulse and reaction Turbines, Specific speed, Classification. Energy transfer, Coupling, Power transmission, Steam generators Fire-tube and water-tube boilers. Flow of steam through Nozzles and Diffusers, Wetness and condensation. Various types of steam and gas Turbines, Velocity diagrams. Partial admission. Reciprocating, Centrifugal and axial flow Compressors, Multistage compression, role of Mach Number, Reheat, Regeneration, Efficiency, Governance.

5. THEORY OF MACHINES:

Kinematic and dynamic analysis of planer mechanisms. Cams. Gears and gear trains. Flywheels. Governors. Balancing of rigid rotors and field balancing. Balancing of single and multicylinder engines, Linear vibration analysis of mechanical systems. Critical speeds and whirling of shafts Automatic controls.

6. MACHINE DESIGN:

Design of Joints : cotters, keys, splines, welded joints, threaded fasteners, joints formed by interference fits. Design of friction drives : couplings and clutches, belt and chain drives, power screws.

Design of Power transmission systems : gears and gear drives shaft and axle, wire ropes.

Design of bearings : hydrodynamics bearings and rolling element bearings.

7. STRENGTH OF MATERIALS:

Stress and strain in two dimensions, Principal stresses and strains, Mohr's construction, linear elastic materials, isotropy and anisotropy, stress-strain relations, uniaxial loading, thermal stresses.

8. ENGINEERING MATERIALS:

Basic concepts on structure of solids. Crystalline materials. Defects in crystalline materials. Alloys and binary phase diagrams. Structure and properties of common engineering materials. Heat treatment of steels. Plastics, Ceramics and composite materials. Common applications of various materials.

9. PRODUCTION ENGINEERING:

Metal Forming : Basic Principles of forging, drawing and extrusion; High energy rate forming; Powder metallurgy.

Fabrication Processes : Principles of Gas, Arc, Shielded arc Welding; Advanced Welding Processes, Weldability: Metallurgy of Welding.

Metal Cutting : Turning, Methods of Screw Production, Drilling, Boring, Milling, Gear Manufacturing, Production of flat surfaces, Grinding & Finishing Processes. Computer Controlled Manufacturing Systems-CNC, DNC, FMS, Automation and Robotics.

10. INDUSTRIAL ENGINEERING:

Production Planning and Control : Forecasting – Moving average, exponential smoothing, Operations, scheduling; assembly line balancing, Product development, Break-even analysis, Capacity planning, PERT and CPM.

11. ELEMENTS OF COMPUTATION:

Computer Organization, Flow charting, Features of Common computer Languages – FORTRAN, d Base III, Lotus 1-2-3, C and elementary Programming.

3 Electrical Engineering

Group-I: POWER SYSTEM

Transmission line parameters; Representation of short, medium, and long transmission lines – ABCD parameters; Circle Diagram; Per Unit representation; 3- Φ system; Short Circuit Studies; Sequence Networks; Load-flow Studies – Gauss Seidel method, Newton-Raphson Method; Automatic Generation Control; Load-Frequency Control; Automatic Voltage Regulator;

Group-II: POWER ELECTRONICS AND DRIVES Group

Characteristics and ratings of different thyristor family devices, their turn on and turn off methods with their protection, series and parallel connection of SCRs and their derating, controlled single phase and three phase rectifiers for different types of load viz. R, R-L, R-L-E, single phase and three phase voltage source and current source inverter,

Group-III: COMPUTER TECHNOLOGY Group

Soft Computing (Basics of neural network, fuzzy logic, genetic algorithm, wavelets).

Digital Electronics: Adder/Subtractor, Multiplexer/Demultiplexer, Serial and parallel operations; Computer and its Applications: Fundamentals of Computer Architecture (representation of information, control unit, bus organisation, memory, I/O devices),

ObjectOriented programming(classes and objects, inheritance, polymorphism), Fundamentals of Operating Systems (Operating System Structure, management of resources), Fundamentals of Data Communication and Networks.

Group-IV: CONTROL AND INSTRUMENTATION Group

Mathematical Modeling of physical systems, Transfer function of linear systems, Steady state errors and error constants, static error coefficients Time domain analysis, Stability of control system, Routh-Hurwitz's stability criterion. Root locus plots, analysis of control system by root loci. Relationship between time and frequency response, Polar plot,

Bode's Plot, Nyquist plot and Nyquist stability criterion, Relative Stability, Phase and Gain Margins, Constant M and N circle. Design of Feedback Controllers: Design of

Group-V: ELECTRONICS AND COMMUNICATION Group

Biassing and bias stability of transistor and FET amplifiers. Amplifiers: single-and multi-stage, differential and operational, feedback, and power. Frequency response of amplifiers. Simple op-amp circuits. Filters. Function generators and wave-shaping circuits, 555 Timers. Power supplies. Logic gates; digital IC families (DTL, TTL, ECL, MOS, CMOS). Combinatorial circuits: arithmetic circuits, code converters, multiplexers, decoders, PROMs and PLAs. Sequential circuits: latches and flip-flops, counters and shift-registers. Sample and hold circuits, ADCs, DACs. Operational Amplifiers and other analog ICs., Semiconductor memories. Microprocessor(8085): architecture, programming and I/O interfacing.

4 Civil Engineering

Advanced Structural Mechanics, Finite Element Analysis, Advanced Theory and Design of Concrete Structures, Structural Dynamics, Theory and Design of Plates and Shells, Prestressed Concrete Design, Stability of Structures, Earthquake Engg

Advanced and Applied Soil Mechanics, Advanced Foundation Engineering, Geosynthetics, Soil Dynamics, FEM and constitutive Modeling in Geomechanics, Reinforced Soil Structures, Soil Exploration and Field Testing, Earthquake Geotechnical Engineering, Ground Improvement Techniques

Applied Hydraulic Engineering, Surface Water Hydrology, Groundwater Engineering, Water Resources Planning and Management, Irrigation Technology, Unsteady Open-Channel Flows

Analysis and Design of Pavements, Urban Transportation Planning, Traffic Engineering and Management, Pavement Materials and Evaluation, Airport Planning and Design, Geometric Design of Highways, GIS and Remote Sensing

Environmental Chemistry and Microbiology, Physico-Chemical Process for Water and Wastewater Treatment, Biological Process Design for Wastewater Treatment, Air Quality Management, Environmental Impact Assessment, Solid Waste

Management

5 Environmental

- 1. Definition, principles and scope of environmental science.**
- 2. Ancient agenda for Environment as reflected in Sanskrit.**
- 3. Environmental ethics, education and awareness role of youth, communities, professional, planners, decision makers and implementers.**
- 4. Basic of Atmospheric Science and Biosphere:
(A) ATMOSPHERE (B) INTRODUCTION TO OCEAN**
- 5. Basics of lithosphere, hydrosphere and biosphere.**
- 6. Fundamentals of Ecology, Definition, Subdivisions.**
- 7. Biogeochemical cycles, food chain and food web.**
- 8. Habitat : Freshwater, marine, estuarine and terrestrial ecosystems.**
- 9. Geographical classification and zones natural resources, conservation and sustainable development.**
- 10. Concept and Scope of Environmental Chemistry :
Definition and explanation for various terms, segments of environment.
26 principles and cyclic pathways in the environments.**
- 11. Chemistry of Biologically Important Molecules :
Chemistry of Water : Unusual physical properties, hydrogen bonding in biological systems, unusual solvent properties, changes in water properties by addition of solute. Protein structure and biological functions, enzymes, enzyme metabolism, biosynthesis of DNA and RNA, mutations and Gene control during embryogenesis.**
- 12. Soil Chemistry : Formation, constituents and properties of soils, adsorption of contaminants in soil.**
- 13. Environmental Microbiology : Microbes – classification and their applications in the environmental sciences. Cultivation and growth of microorganisms. Microorganisms and their association with man, animals and plants. Microbes as anti-microbial agents, Extremophilic microorganisms, Microbial metabolism.**

14. **Biomes and Habitat Diversity : Classification of biomes, major biotic elements of each biome and their characteristics.**
15. **Biological diversity of India : Definition and nature, India's biogeographically history, physiography, climate and its impact on biodiversity. Indian forest and vegetation types and diversity of flora and fauna.**
16. **Population and Community Ecology.**
17. **Wetlands Forests and Semi-arid Habitats of India : Definition and types of wetlands, important wetlands of India and their conservation issues. Forests and semi-arid habitats of India : their distribution in India, ecological status of forests and arid lands, and their conservation.**

The Earth Systems and Biosphere : Conservation of matter in various geo-spheres – lithosphere, hydrosphere, atmosphere and biosphere. Energy budget of the earth. Earth's thermal environment and seasons. Ecosystem flow of energy and matter. Coexistence in communities – food webs. Earth's major ecosystem-terrestrial and aquatic. General relationship between landscape, biomes and climate. Climates of India, Indian Monsoon, El Nino. Tropical Cyclones and Western Disturbances.

18. **Noise Pollution : Types, sources and consequences. Sampling Methods.**
 19. **Radio-active Pollution : Types, sources and consequences. Sampling methods.**
- s for different type of projects.**

Review of methodologies of EIA. Introduction to Check list, Matrix & Network methods for EIA.

Prediction of short & long term Impacts on environment (physical, biological & socio culture).

****20. Current Developments in the Subject.**

6 Electronics

Unit-I

Electronic Transport in semiconductor, PN Junction, Diode equation and diode equivalent circuit. Breakdown in diodes, Zener diodes, Tunnel diode, Semiconductor diodes, characteristics and equivalent circuits of BJT, JFET, MOSFET, IC fabrication—crystal growth, epitaxy, oxidation, lithography, doping, etching, isolation methods, metalization, bonding, Thin film active and passive devices.

Unit-II

Superposition, Thevenin, Norton and Maximum Power Transfer Theorems, Network elements, Network graphs, Nodal and Mesh analysis, Zero and Poles, Bode Plots, Laplace, Fourier and Z-transforms. Time and frequency domain responses. Image impedance and passive filters. Two-port Network Parameters. Transfer functions, Signal representation. State variable method of circuit analysis, AC circuit analysis, Transient analysis.

Unit-III

Rectifiers, Voltage regulated ICs and regulated power supply, Biasing of Bipolar junction transistors and JFET. Single stage amplifiers, Multistage amplifiers, Feedback in amplifiers, oscillators, function generators, multivibrators, Operational Amplifiers (OPAMP)—characteristics and Applications, Computational Applications, Integrator, Differentiator, Wave shaping circuits, F to V and V to F converters. Active filters, Schmitt trigger, Phase locked loop.

Unit-IV

Logic families, flip-flops, Gates, Boolean algebra and minimization techniques, Multivibrators and clock circuits, Counters—Ring, Ripple. Synchronous, Asynchronous, Up and down shift registers, multiplexers and demultiplexers, Arithmetic circuits, Memories, A/D and D/A converters.

Unit-V

Architecture of 8085 and 8086 Microprocessors, Addressing modes, 8085 instruction set, 8085 interrupts, Programming, Memory and I/O interfacing, Interfacing 8155, 8255, 8279, 8253, 8257, 8259, 8251 with 8085 Microprocessors, Serial communication protocols, Introduction of Microcontrollers (8 bit)—8031/8051 and 8048.

7 Management

Unit—I

Managerial Economics-Demand Analysis
Production Function
Cost-output relations
Market structures
Pricing theories
Advertising
Macro-economics
National Income concepts
Infrastructure—Management and Policy
Business Environment
Capital Budgeting

Unit—II

The concept and significance of organisational behaviour—Skills and roles in an organisation—Classical, Neo-classical and modern theories of organisational structure—Organisational design—Understanding and Managing individual behaviour personality—Perception—Values—Attitudes—Learning—Motivation. Understanding and managing group behaviour, Processes—Inter-personal and group dynamics—Communication—Leadership—Managing change—Managing conflicts.
Organisational development

Unit—III

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 Grievance management
Labour Welfare and Social security measures

Unit—IV

Financial management—Nature and Scope
Valuation concepts and valuation of securities
Capital budgeting decisions—Risk analysis
Capital structure and Cost of capital
Dividend policy—Determinants
Long-term and short-term financing instruments
Mergers and Acquisitions

Unit—V

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,

8 Commerce

Unit—I

Business Environment

Meaning and Elements of Business Environment

Economic environment, Economic Policies, Economic Planning

Legal environment of Business in India, Competition policy, Consumer protection, Environment protection

Policy Environment : Liberalization, Privatisation and globalisation, Second generation reforms, Industrial policy and implementation. Industrial growth and structural changes

Unit—II

Financial & Management Accounting

Basic Accounting concepts, Capital and Revenue, Financial statements

Partnership Accounts : Admission, Retirement, Death, Dissolution and Cash Distribution

Unit—III

Business Economics

Nature and uses of Business Economics, Concept of Profit and Wealth maximization, Demand Analysis and Elasticity of Demand, Indifference Curve Analysis, Law

Utility Analysis and Laws of Returns and Law of variable proportions

Cost, Revenue, Price determination in different market situations : Perfect competition, Monopolistic competition, Monopoly, Price discrimination and Oligopoly, Pricing strategies

Unit—IV

Business Statistics & Data Processing

Data types, Data collection and analysis, sampling, need, errors and methods of sampling, Normal distribution, Hypothesis testing, Analysis and Interpretation of Data

Correlation and Regression, small sample tests—t-test, F-test and chi-square test

Data processing—Elements, Data entry, Data processing and Computer applications

Computer Application to Functional Areas—Accounting, Inventory control, Marketing

Unit—V

Business Management

Principles of Management

Planning—Objectives, Strategies, Planning process, Decision-making

Organising, Organisational structure, Formal and Informal organisations, Organisational culture

Staffing

Leading : Motivation, Leadership, Committees, Communication

Controlling

9. Physics

I. Mathematical Methods of Physics

Dimensional analysis; Vector algebra and vector calculus; Linear algebra, matrices, Cayley Hamilton theorem, eigenvalue problems; Linear differential equations; Special functions (Hermite, Bessel, Laguerre and Legendre); Fourier series, Fourier and Laplace transforms; Elements of complex analysis: Laurent series-poles, residues and evaluation of integrals.

II. Classical Mechanics

Newton's laws; Phase space dynamics, stability analysis; Central-force motion; Two-body collisions, scattering in laboratory and centre-of-mass frames; Rigid body dynamics, moment of inertia tensor, non-inertial frames and pseudoforces; Variational principle, Lagrangian and Hamiltonian formalisms and equations of motion; Poisson brackets and canonical Transformations.

III. Electromagnetic Theory

Electrostatics: Gauss' Law and its applications; Laplace and Poisson equations, boundary value problems; Magnetostatics: Biot-Savart law, Ampere's theorem, electromagnetic induction; Maxwell's equations in free space and linear isotropic media; boundary conditions on fields at interfaces; Scalar and vector potentials; Gauge invariance; Electromagnetic waves in free space, dielectrics, and conductors.

IV. Quantum Mechanics

Wave-particle duality; Wave functions in coordinate and momentum representations; Commutators and Heisenberg's uncertainty principle; Matrix representation; Dirac's bra and ket notation; Schroedinger equation (time-dependent and time-independent); Eigenvalue problems such as particle-in-a-box, harmonic oscillator, etc.; Tunneling through a barrier; Motion in a central potential; Orbital angular momentum.

V. Electronics

Semiconductor device physics, including diodes, junctions, transistors, field effect devices, homo and heterojunction devices, device structure, device characteristics, frequency dependence and applications; Optoelectronic devices, including solar cells, photodetectors, and LEDs; High-frequency devices, including generators and detectors; Operational amplifiers and their applications; Digital techniques and applications (registers, counters, comparators and similar circuits); A/D and D/A converters; Microprocessor and microcontroller basics.

10 Chemistry

Physical Chemistry:

1. Basic principles and applications of quantum mechanics – hydrogen atom, angular momentum.
2. Variational and perturbational methods.
3. Basics of atomic structure, electronic configuration, shapes of orbitals, hydrogen atom spectra.
4. Theoretical treatment of atomic structures and chemical bonding.
5. Chemical applications of group theory.
6. Basic principles and application of spectroscopy – rotational, vibrational, electronic, Raman, ESR, NMR.
7. Chemical thermodynamics.
8. Phase equilibria.

Inorganic Chemistry

1. Chemical periodicity
2. Structure and bonding in homo- and heteronuclear molecules, including shapes of molecules.
3. Concepts of acids and bases.
4. Chemistry of the main group elements and their compounds. Allotropy, synthesis, bonding and structure.
5. Chemistry of transition elements and coordination compounds – bonding theories, spectral and magnetic properties, reaction mechanisms.
6. Inner transition elements – spectral and magnetic properties, analytical applications.

Organic Chemistry

- 1. IUPAC nomenclature of organic compounds.**
- 2. Principles of stereochemistry, conformational analysis, isomerism and chirality.**
- 3. Reactive intermediates and organic reaction mechanisms.**
- 4. Concepts of aromaticity.**
- 5. Pericyclic reactions.**
- 6. Named reactions.**
- 7. Transformations and rearrangements.**
- 8. Principles and applications of organic photochemistry. Free radical reactions.**

Interdisciplinary topics

- 1. Chemistry in nanoscience and technology.**
- 2. Catalysis and green chemistry.**
- 3. Medicinal chemistry.**
- 4. Supramolecular chemistry.**
- 5. Environmental chemistry.**

11 Mathematics

UNIT – 1

Analysis: Elementary set theory, finite, countable and uncountable sets, Real number system as a complete ordered field, Archimedean property, supremum, infimum.

Sequences and series, convergence, limsup, liminf. Bolzano Weierstrass theorem, Heine Borel theorem. Continuity, uniform continuity, differentiability, mean value theorem.

Sequences and series of functions, uniform convergence.

Linear Algebra: Vector spaces, subspaces, linear dependence, basis, dimension, algebra of linear transformations.

Algebra of matrices, rank and determinant of matrices, linear equations. Eigenvalues and eigenvectors, Cayley-Hamilton theorem. Matrix representation of linear transformations. Change of basis, canonical forms, diagonal forms, triangular forms, Jordan forms.

UNIT – 2

Complex Analysis: Algebra of complex numbers, the complex plane, polynomials,

Power series, transcendental functions such as exponential, trigonometric and hyperbolic functions. Analytic functions, Cauchy-Riemann equations. Contour integral, Cauchy's theorem, Cauchy's integral formula, Liouville's theorem, Maximum modulus principle, Schwarz lemma, Open mapping theorem. Taylor series, Laurent series, calculus of residues.

UNIT – 3

Ordinary Differential Equations (ODEs):

Existence and Uniqueness of solutions of initial value problems for first order ordinary differential equations, singular solutions of first order ODEs, system of first order ODEs.

General theory of homogenous and non-homogeneous linear ODEs, variation of parameters, Sturm-Liouville boundary value problem, Green's function.

Partial Differential Equations (PDEs):

Lagrange and Charpit methods for solving first order PDEs, Cauchy problem for first order PDEs. Classification of second order PDEs, General solution of higher order PDEs with constant coefficients, Method of separation of variables for Laplace, Heat and Wave equations.

UNIT – 4

Descriptive statistics, exploratory data analysis. Sample space, discrete probability, independent events, Bayes theorem. Random variables and distribution functions (univariate and multivariate); expectation and moments. Independent random variables, marginal and conditional distributions. Characteristic functions. Probability inequalities (Tchebyshef, Markov, Jensen). Modes of convergence, weak and strong laws of large numbers, Central Limit theorems (i.i.d. case).

Markov chains with finite and countable state space, classification of states, limiting behaviour of n-step transition probabilities, stationary distribution.

UNIT – 4

Numerical Analysis :

Numerical solutions of algebraic equations, Method of iteration and Newton-Raphson method, Rate of convergence, Solution of systems of linear algebraic equations using Gauss elimination and Gauss-Seidel methods, Finite differences, Lagrange, Hermite and spline interpolation, Numerical differentiation and integration, Numerical solutions of ODEs using Picard, Euler, modified Euler and Runge-Kutta methods.

12 Bio & Life Sciences

1. MOLECULES AND THEIR INTERACTION RELEVANT TO BIOLOGY

- A. Structure of atoms, molecules and chemical bonds.
- B. Composition, structure and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids and vitamins).
- C. Stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.).
- D. Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties).
- E. Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers.

2. CELLULAR ORGANIZATION

- A. Membrane structure and function: Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, ion pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes.
- B. Structural organization and function of intracellular organelles: Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast, structure & function of cytoskeleton and its role in motility.
- C. Organization of genes and chromosomes: Operon, interrupted genes, gene families, structure of chromatin and chromosomes, unique and repetitive DNA, heterochromatin, euchromatin, transposons.
- D. Cell division and cell cycle: Mitosis and meiosis, their regulation, steps in cell cycle, and control of cell cycle.
- E. Microbial Physiology: Growth, yield and characteristics, strategies of cell division, stress response.

3. FUNDAMENTAL PROCESSES

- A. DNA replication, repair and recombination: Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms.**
- B. RNA synthesis and processing: Transcription factors and machinery, formation of initiation complex, transcription activators and repressors, RNA polymerases, capping, elongation and termination, RNA processing, RNA editing, splicing, polyadenylation, structure and function of different types of RNA, RNA transport.**
- C. Protein synthesis and processing: Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, translational proof-reading, translational inhibitors, post- translational modification of proteins.**

4. CELL COMMUNICATION AND CELL SIGNALING

- A. Host parasite interaction: Recognition and entry processes of different pathogens like bacteria, viruses into animal and plant host cells, alteration of host cell behavior by pathogens, virus-induced cell transformation, pathogen-induced diseases in animals and plants, cell-cell fusion in both normal and abnormal cells.**
- B. Cell signaling: Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two-component signaling systems, bacterial chemotaxis and quorum sensing.**
- C. Cellular communication: Regulation of hematopoiesis, general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation.**

5. DEVELOPMENTAL BIOLOGY

- A. Basic concepts of development: Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development.**
- B. Gametogenesis, fertilization and early development: Production of gametes, cell surface molecules in sperm-egg recognition in animals; embryo sac development and double fertilization in plants; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals; embryogenesis, establishment of symmetry in plants; seed formation and germination.**
- C. Morphogenesis and organogenesis in animals: Cell aggregation and differentiation in Dictyostelium; axes and pattern formation in Drosophila, amphibia and chick; organogenesis – vulva formation in Caenorhabditis elegans; eye lens induction, limb development and regeneration in vertebrates; differentiation of neurons, post embryonic development-larval formation, metamorphosis; environmental regulation of normal development; sex determination.**
- D. Morphogenesis and organogenesis in plants: Organization of shoot and root apical meristem; shoot and root development; leaf development and phyllotaxy; transition to flowering, floral meristems and floral development in Arabidopsis and Antirrhinum.**

13 Education

1. Philosophical Foundation of Education

Relationship of Education and Philosophy

Western Schools of Philosophy :

Idealism, Realism, Naturalism, Pragmatism, Existentialism, Marxism with special reference to the concepts of knowledge, reality and values their educational implications for aims, contents and methods of education.

Indian Schools of Philosophy (Sankhya, Vedanta, Buddhism, Jainism, Islamic traditions) with special reference to the concept of knowledge, reality and values and their educational implications

Contributions of Vivekananda, Tagore, Gandhi and Aurobindo to educational thinking

National values as enshrined in the Indian Constitution, and their educational implications

Modern concept of Philosophy : Analysis—Logical analysis, Logical empiricism and Positive relativism—(Morris L. Prigge)

2. Sociological Foundations of Education

Relationship of Sociology and Education

Meaning and nature of Educational sociology and Sociology of education

Education—as a social sub-system—specific characteristics

Education and the home

Education and the community with special reference to Indian society

Education and modernization

Education and politics

Education and religion

Education and culture

Education and democracy

3. Psychological Foundations of Education

Relationship of Education and Psychology

Process of Growth and Development

— physical, social, emotional and intellectual

— development of concept formation, logical reasoning, problem solving and creative thinking; language development

— individual differences—determinants; role of heredity and environment; implications of individual differences for organising educational programmes

Intelligence—its theories and measurement

Learning and Motivation

Theories of learning—Thorndike is connectionism; Pavlov's classical and Skinner's operant conditioning; Learning by insight; Hull's reinforcement

14 Law

1. **Constitutional Law of India**

Preamble

Fundamental Rights and Duties

Directive Principles of State Policy

Judiciary

Executive

Union State Legislative Relations

Emergency Provisions

Amendment of the Constitution

Writ Jurisdiction

2. **Legal Theory**

Nature and Sources of Law

Positivism, Natural Law Theory, Sociological Jurisprudence

Theories of Punishment

Rights and Duties

Concepts of Possession and Ownership

3. **Public International Law**

Nature of International Law and its relationship with Municipal Law

Sources of International Law

Recognition of States and Governments

United Nations

Settlement of International Disputes

Human Rights

4. **Family Law**

Concepts in Family Law

Sources of Family Law in India

Marriage and Dissolution of Marriage

5. Law of Contracts—General Principles

Essentials of a valid contract

Offer, acceptance and consideration

Capacity to Contract—Minor's contract

Elements vitiating contract—mistake, fraud, misrepresentation, public policy, coercion, undue influence, frustration of contract

Remedies for breach of contract—Damages.

6. Law of Torts

Foundation of Tortious Liability

General Defences to an action of Tort

Vicarious Liability

Remoteness of Damages

Contributory Negligence

Absolute and Strict Liability

7. Law of Crimes—General Principles

Nature and Definition of Offence

General Exceptions

Common Intention and Common Object

Criminal Attempt, Conspiracy and Abetment

Offences against Women

8. Labour Law

Concepts—Industry, Industrial Dispute and Workman

Trade Unions-Rights and Immunities of Registered Trade Union; Registration and its advantages

Methods for Settlement of Industrial Disputes under Industrial Disputes Act, 1947

Strike and Lockout as Instruments of Collective Bargaining

15 English

1. British Literature from Chaucer to the present day
2. Criticism and Literary Theory.

- Unit - I** : Literary Comprehension (with internal choice of poetry stanza and prose passage ; four comprehension questions will be asked carrying 4 marks each).
- Unit - II** : Up to the Renaissance
- Unit - III** : Jacobean to Restoration Periods
- Unit - IV** : Augustan Age : 18th Century Literature
- Unit - V** : Romantic Period
- Unit - VI** : Victorian and Pre-Raphaelites
- Unit - VII** : Modern British Literature
- Unit - VIII** : Contemporary British Literature
- Unit - IX** : Literary Theory and Criticism up to T. S. Eliot
- Unit - X** : Contemporary Theory

16 Sanskrit

1. वैदिक साहित्य

देवता :

अग्नि ; सवितृ ; विष्णु ; इन्द्र ; रुद्र ; बृहस्पति ; अश्विनी ; वरुण ; उषस् ; सोम

विषय-वस्तु :

संहिताएँ ; ब्राह्मण एवं आरण्यक ; उपनिषद्

सम्बाद सूक्त :

पुरुरवा—उर्वशी ; यम—यमी ; सर्मा—पणि ; विश्वामित्र—नदी

2. दर्शन

ईश्वरकृष्ण की सांख्यकारिका :

सत्कार्यवाद ; पुरुष-स्वरूप ; प्रकृति-स्वरूप ; सृष्टिक्रम ; प्रत्ययसर्ग ; कैवल्य

सदानन्द का वेदान्तसार :

अनुबन्ध-चतुष्टय ; अज्ञान ; अध्यारोप-अपवाद ; लिंगशरीरोत्पत्ति ; पंजीकरण ; विवर्त ; जीवनमुक्ति

केशवमिश्र की तर्कभाषा/अग्रंभट्ट का तर्कसंग्रह :

पदार्थ ; कारण ; प्रमाण—प्रत्यक्ष ; अनुमान ; उपमान ; शब्द

3. व्याकरण एवं भाषाविज्ञान

व्याकरण :

परिभाषाएँ—संहिता ; गुण ; वृद्धि ; प्रातिपदिक ; नदी ; धि ; उपधा ; अपृक्त ; गति ; पद ; विभाषा ; सवर्ण ; टि ; प्रगुह्य ; सर्वनाम-स्थान ; निष्ठा

कारक : सिद्धान्तकौमुदी के अनुसार

समास : लघुसिद्धान्तकौमुदी के अनुसार

4. संस्कृत साहित्य एवं काव्यशास्त्र

निम्नलिखित ग्रन्थों का सामान्य अध्ययन :

पद्य : रघुवंश ; मेघदूत ; किरातार्जुनीय ; शिशुपालवध ; नैषधीयचरित ; बुद्धचरित

गद्य : दशकुमारचरित ; हर्षचरित ; कादम्बरी

नाटक : स्वप्नवासवदत्ता ; अभिज्ञानशाकुन्तल ; मृच्छकटिक ; उत्तररामचरित ; मुद्राराक्षस ; रत्नावली ; वेणीसंहार

काव्यशास्त्र :

साहित्यदर्पण :

काव्य की परिभाषा

काव्य की अन्य परिभाषाओं का खण्डन

शब्दशक्ति—संकेतग्रह ; अभिधा ; लक्षणा ; व्यञ्जना

17 Visual Arts

Unit—I

General characteristics of Visual art/Fundamentals of visual art : Space, form, size, shape, line, colour, texture, tonal values, perspective, design and aesthetic organization of visual elements in art object (composition). The uses of two and three dimensions in visual art. Tactile quality in art. Environment and art. Perceptual and conceptual aspects in art.

Unit—II

Interrelationship of various arts : Rhythm, structure, use of space, visual properties, materials, techniques (traditional and modern), ideas, themes (narrative and non-narrative) conceptual, abstract elements between performing, cinematic, literary and plastic art.

Unit—III

Traditional and Modern mediums and materials in making visual arts : Painting, sculpture, print-making, mural, graphic design and multimedia art. Inventions, adaptations and development of these mediums and materials from the pre-historic period to present-day all over the world.

Unit—IV

Traditional and Modern techniques, processes and procedures, used in making painting, sculpture, print-making, mural, graphic design and multimedia art, such as modeling, carving, building, casting, different way of handling of colour pigment (like impasto, glazing, burnishing, drip), etching, relief, surface printing, fresco buono, fresco secco, etc. Printing processes including computer graphic, etc.

Unit—V

Relevance of the study of the history of world art (including history of advertising and marketing) for the students of Visual Arts in general and Art History as an area of specialization.

18 Library Science

Unit—I

Information, Information Science, Information Society
Information as a Resource/Commodity
Information Transfer Cycle—Generation, Collection, Storage and Dissemination
Role of information in Planning, Management, Socio-economic Development,
Technology transfer
Communication—Channels, barriers
Intellectual Property Rights—Concept, Copyright, Censorship—Print and Non-
print Media
Library and Information Policy at the National Level

Unit—II

Laws of Library Science
Library Resource Sharing and Networking
Library Movement and Library Legislation in India
Library Extension Services
Library and Information Science Education in India
Library and Information Profession

Unit—III

Sources of Information—Primary, Secondary and Tertiary—Documentary and
Non-documentary
Reference Sources—Encyclopaedias, Dictionaries, Geographical Sources,
Biographical Sources, Year-books/Almanacs, Directories, and Handbooks,
Statistical (salient features and evaluation)
Bibliographical Sources—Bibliographies, Union Catalogues, Indexing and
Abstracting Journals (salient features and evaluation)
E-documents, E-books, E-Journals

Unit—IV

Reference and Information services, Referral Service
Bibliographic Service, Indexing and Abstracting Service, CAS, SDI, Digest
Service, Trend Report
Online Services
Translation Services
Reprographic Services

Unit—V

Organisation of knowledge/information
Modes of formation of subjects
Library Classification—Canons and Principles
Library Classification Schemes—DDC, UDC and CC
Library Cataloguing—Canons and Principles
Library Cataloguing Codes—CCC and AACR-II
Bibliographic Records—International standards—ISBDs, MARC and CCF
Indexing—Pre-coordinate, Post-coordinate
Vocabulary Control—Thesaurus, Lists of Subject Headings
Databases—Search Strategies, Boolean Operators
Knowledge Management

19 Hindi

1. हिन्दी भाषा और उसका विकास

अपभ्रंश (अवहट्ट सहित) और पुरानी हिन्दी का सम्बन्ध, काव्यभाषा के रूप में अवधी का उदय और विकास, काव्यभाषा के रूप में ब्रजभाषा का उदय और विकास, साहित्यिक हिन्दी के रूप में खड़ी बोली का उदय और विकास, मानक हिन्दी का भाषा वैज्ञानिक विवरण (रूपगत), हिन्दी की बोलियाँ — वर्गीकरण तथा क्षेत्र, नागरी लिपि का विकास और उसका मानकीकरण ।

हिन्दी प्रसार के आन्दोलन, प्रमुख व्यक्तियों तथा संस्थाओं का योगदान, राजभाषा के रूप में हिन्दी ।

हिन्दी भाषा-प्रयोग के विविध रूप — बोली, मानकभाषा, सम्पर्कभाषा, राजभाषा और राष्ट्रभाषा, संचार माध्यम और हिन्दी ।

2. हिन्दी साहित्य का इतिहास

हिन्दी साहित्य का इतिहास-दर्शन, हिन्दी साहित्य के इतिहास-लेखन की पद्धतियाँ ।

हिन्दी साहित्य के प्रमुख इतिहास ग्रन्थ, हिन्दी के प्रमुख साहित्यिक केन्द्र, संस्थाएँ एवं पत्र-पत्रिकाएँ, हिन्दी साहित्य के इतिहास का काल-विभाजन और नामकरण ।

आदिकाल : हिन्दी साहित्य का आरम्भ कब और कैसे ? रासो-साहित्य, आदिकालीन हिन्दी का जैन साहित्य, सिद्ध और नाथ साहित्य, अमीर खुसरो की हिन्दी कविता, विद्यापति और उनकी पदावली, आरम्भिक गद्य तथा लौकिक साहित्य ।

मध्यकाल : भक्ति-आन्दोलन के उदय के सामाजिक-सांस्कृतिक कारण, प्रमुख निर्गुण एवं सगुण सम्प्रदाय, वैष्णव भक्ति की सामाजिक-सांस्कृतिक पृष्ठभूमि, आलवार सन्त, प्रमुख सम्प्रदाय और आचार्य, भक्ति आन्दोलन का अखिल भारतीय स्वरूप और उसका अन्तःप्रादेशिक वैशिष्ट्य ।

3. हिन्दी साहित्य की गद्य विधाएँ

हिन्दी उपन्यास : प्रेमचन्द पूर्व उपन्यास, प्रेमचन्द और उनका युग, प्रेमचन्द के परवर्ती प्रमुख उपन्यासकार : जैनेन्द्र, अज्ञेय, हजारी प्रसाद द्विवेदी, यशपाल, अमृतलाल नागर, फणीश्वरनाथ रेणु, भीष्म साहनी, कृष्णा सोबती, निर्मल वर्मा, नरेश मेहता, श्रीलाल शुक्ल, राही मासूम रजा, रांगेय राघव, मञ्जू भण्डारी ।

हिन्दी कहानी : बीसवीं सदी की हिन्दी कहानी और प्रमुख कहानी आन्दोलन ।

हिन्दी नाटक : हिन्दी नाटक और रंगमंच, विकास के चरण और प्रमुख नाट्यकृतियाँ : अंधेर नगरी, चन्द्रगुप्त, अंधायुग, आधे-अधूरे, आठवाँ सर्ग, हिन्दी एकांकी ।

हिन्दी निबन्ध : हिन्दी निबन्ध के प्रकार और प्रमुख निबन्धकार — रामचन्द्र शुक्ल, हजारीप्रसाद द्विवेदी, कुबेरनाथ राय, विद्यानिवास मिश्र, हरिशंकर परसाई ।

हिन्दी आलोचना : हिन्दी आलोचना का विकास और प्रमुख आलोचक : रामचन्द्र शुक्ल, नन्ददुलारे वाजपेयी, हजारी प्रसाद द्विवेदी, रामविलास शर्मा, डॉ० नगेन्द्र, डॉ० नामवर सिंह, विजयदेव नारायण साही ।

हिन्दी की अन्य गद्य विधाएँ : रेखाचित्र, संस्मरण, यात्रा-साहित्य, आत्मकथा, जीवनी और रिपोर्ताज ।

4. काव्यशास्त्र और आलोचना

भरत मुनि का रस सूत्र और उसके प्रमुख व्याख्याकार ।

रस के अवयव ।

साधारणीकरण ।

शब्द शक्तियाँ और ध्वनि का स्वरूप ।

अलंकार — यमक, श्लेष, चक्रोक्ति, उपमा, रूपक, उत्प्रेक्षा, संदेह, भ्रान्तिमान, अतिशयोक्ति, अन्योक्ति, समासोक्ति, अत्युक्ति, विशेषोक्ति, दृष्टान्त, उदाहरण, प्रतिवस्तूपमा, निदर्शना, अर्थान्तरन्यास, विभावना, असंगति तथा विरोधाभास ।

रीति, गुण, दोष ।

20 Psychology

1. **Perceptual Processes**

Approaches to the Study of Perception : Gestalt and physiological approaches

Perceptual Organization : Gestalt, Figure and Ground, Laws of Organization

Perceptual Constancy : Size, Shape and Brightness, Illusion; Perception of Depth and Movements.

Role of motivation and learning in perception

2. **Learning Process**

Classical conditioning : Procedure, Phenomena and related issues

Instrumental learning : Phenomena, Paradigms and theoretical issues

Reinforcement : Basic variables and schedules

Verbal learning : Methods and materials. organizational processes

3. **Memory and forgetting**

Memory processes : Encoding, Storage, Retrieval

Stages of memory : Sensory memory, Short-term Memory (STM) and Long-term Memory (LTM)

Episodic and Semantic memory

Theories of Forgetting : Interference, decay, retrieval

4. **Thinking and Problem Solving**

Theories of thought processes : Associationism, Gestalt, Information processing

Concept formation : Rules and strategies

Reasoning : Deductive and inductive

Problem-solving : Type and strategies

Role of concepts in thinking

5. **Motivation and Emotion**

Basic motivational concepts : Instincts, needs, drives, incentives, motivational cycle

Approaches to the study of motivation : Psychoanalytical, ethological, S-R Cognitive, humanistic

Biological Motives : Hunger, thirst, sleep and sex

Social Motives : Achievement, affiliation, approval

Exploratory behaviour and curiosity

Physiological correlates of emotions

Theories of emotions : James-Lange, Canon-Bard, Schachter and Singer

Conflicts : Sources and types

21 Public Administration

1. **Theory of Public Administration**

Public Administration — Meaning, Nature and Scope, Public and Private Administration, New Public Administration, New Public Management.

Administrative Thinkers — Kautilya, Woodrow Wilson, Gulick and Urwick, Max Weber, F. W. Taylor, Henri Fayol, M. P. Follet, Elton Mayo, C.I. Barnard, Herbert Simon, D. H. McGregor, Abraham Maslow, Herzberg, Chris Argyris and Fred Riggs.

Theories — Classical, Human Relations, Bureaucratic, Public Choice and Principal Agent relationship.

2. **Comparative Public Administration**

Comparative Public Administration — Nature and Scope.

Theories and Models of Comparative Public Administration — Contributions of Fred Riggs, Montgomery and Ferrel Heady.

A comparative Study of the Administration, Institutions and Processes in U.K., U.S.A., and India.

Various Control Mechanisms over Administration in U.K. U.S.A. and India.

Citizen and Administration — Machinery for redressal of citizen's grievances in U.K., U.S.A. and India.

3. **Development Administration**

Development Administration — Meaning, Nature and Scope, Concept of Development Administration ; Development Administration and Traditional Administration ; Characteristics of Administration in Developed and Developing Countries.

4. **Indian Administration**

Administrative Legacies at the time of Independence — Civil Services ; District and Revenue Administration.

Organisation of Government at the Central level — Organisation of Secretariat, Ministries and Departments, Cabinet Secretariat, P.M.O.

Organisation of Government at the State level — Secretariat, Role of Chief Secretary, Organisation of Ministries, Departments and Directorates.

5. **Research Methodology**

Types of Research

Identification of Problem and Preparation of Research Design.

Research Methods in Social Sciences.

Hypothesis.

22 Geography

1. **Geomorphology** : Fundamental concepts; Endogenetic and Exogenetic forces; Denudation and weathering; Geosynclines, continental drift and plate tectonics; Concept of geomorphic cycle; Landforms associated with fluvial, glacial, arid, coastal and karst cycles.
2. **Climatology** : Composition and structure of the atmosphere; Heat budget of the earth; Distribution of temperature; Atmospheric pressure and general circulation of winds; Monsoon and jet stream; Tropical and temperate cyclones; Classification of world climates; Koppen's and Thornthwaite's schemes.
3. **Oceanography** : Ocean deposits; Coral reefs; Temperature and salinity of the oceans; Density of sea water; Tides and ocean currents.
Bio-Geography : World distribution of plants and animals; Forms and functions of ecosystem; Conservation and management of ecosystems; Problems of pollution.
4. **Geographic Thought** : General character of Geographic knowledge during the ancient and medieval period; Foundations of Modern Geography; Determinism and possibilism; Areal differentiation and spatial organisation.
5. **Population Geography** : Patterns of world distribution; Growth and density of population; Patterns and processes of migration; Demographic transition.
Settlement Geography : Site, situation, types, size, spacing and internal morphology of rural and urban settlements; City-region; Primate city; Rank-size rule; Settlement hierarchy; Christaller's Central Place theory; August Lösch's theory of market centres.

23 History

1. CONCEPTS, IDEAS AND TERMS

Bharatvarsha	Kara / Vishti
Sabha and Samiti	Stridhana
Varnasrama	Memorial stones
Purusharthas	Agraharas
Rina	Khilafat
Samskaras	Sulah-i-kul
Yajna	Maharashtra-dharma
Doctrine of Karma	Turkan-i-Chahighani
Dandaniti / Arthasastra	Watan
Saptanga	Baluta
Dharmavijaya	Iqta
Stupa / Chaitya	Jizyah
Nagara / Dravida / Vesara	Madad-i-maash
Bodhisattva / Tirthankara	Amaram
Alvars / Nayanars	Raya-Rekho
Sreni	Jangama

2. ANCIENT INDIAN HISTORY

Sources :

Archaeological Sources

Exploration, excavation, epigraphy, numismatics, monuments

Literary Sources

Indigenous : Primary and Secondary — problems of dating, myths, legends, poetry, scientific literature, literature in regional languages, religious literature.

Foreign accounts : Greek, Chinese and Arab writers.

Pre-history and Proto-history

Man and Environment — geographical factors. Hunting and gathering (Paleolithic and Mesolithic) ; Beginning of agriculture (Neolithic and Chalcolithic).

Indus Valley Civilization — origin, date, extent, characteristics, decline, survival and significance.

Iron age : Second urbanisation.

3. MEDIEVAL INDIAN HISTORY

Sources

Archaeological, epigraphic and numismatic materials and monuments.

Chronicles.

Literary sources — Persian, Sanskrit and Regional languages.

Archival materials.

Foreign travellers' accounts.

Political Developments

The Sultanate — the Ghoriids, the Turks, the Khaljis, the Tughlaqs, the Sayyids and the Lodis.

Foundation of the Mughal Empire — Babur, Humayun and the Suris ; expansion from Akbar to Aurangzeb.

Decline of the Mughal empire — political, administrative and economic causes.

Later Mughals and disintegration of the Mughal empire.

The Vijayanagara and the Bahmanis — rise, expansion and disintegration.

The Maratha movement, the foundation of Swaraj by Shivaji ; its expansion under the Peshwas ; Maratha Confederacy — causes of decline.

24 Political Science

1. Political Theory and Thought

Ancient Indian Political Thought : Kautilya and Shanti Parva.

Greek Political Thought : Plato and Aristotle.

European Thought – I : Machiavelli, Hobbes, Locke, Rousseau.

European Thought – II : Bentham, J. S. Mill, Hegel, Marx and Green.

Contemporary Political Thought – I : Lenin, Mao, Gramsci.

Contemporary Political Thought – II : Rawls, Nozic and Communitarians.

2. Comparative Politics and Political Analysis

Evolution of Comparative Politics as a discipline; nature and scope.

Approaches to the study of comparative politics : Traditional, Structural-Functional, Systems and Marxist.

Constitutionalism : Concepts, Problems and Limitations.

Forms of Government : Unitary – Federal, Parliamentary – Presidential.

Organs of Government : Executive, Legislature, Judiciary – their interrelationship in comparative perspective.

3. Indian Government and Politics

National Movement, Constitutional Developments and the Making of Indian Constitution.

Ideological Bases of the Indian Constitution, Preamble, Fundamental Rights and Duties and Directive Principles.

Constitution as Instrument of Socio-Economic Change, Constitutional Amendments and Review.

Structure and Process – I : President, Prime Minister, Council of Ministers, Working of the Parliamentary System.

4. Public Administration

Development of Public Administration as a discipline; Approaches to the study of Public Administration : Decision-making, Ecological and Systems; Development Administration.

Theories of organization.

5. International Relations

Contending Theories and Approaches to the study of International Relations; Idealist, Realist, Systems, Game, Communication and Decision-making.

Power, Interest and Ideology in International Relations; Elements of Power : Acquisition, use and limitations of power, Perception, Formulation and Promotion of National Interest, Meaning, Role and Relevance of Ideology in International Relations.