

## PhD Entrance Exam Syllabus

S.NO	COURSE	PAGE NO
1	RESEARCH AND METHODOLOGY	2
2	PHARMACY	2
3	BIOTECHNOLOGY	3
4	BOTANY	3
5	CHEMISTRY	4
6	COMMERCE	5
7	COMPUTER SCIENCE AND ENGINEERING	6
8	DESIGN	6
9	HINDI	7
10	PSYCHOLOGY	10
11	ELECTRONICS AND COMMUNICATION	11
12	ENGLISH	12
13	MANAGEMENT	13
14	JOURNALISM & MASS COMMUNICATIONS	14
15	MATHEMATICS	16
16	MECHNICAL ENGINEERING	16
17	MICROBIOLOGY	18
18	PHYSICS	19
19	ZOOLOGY	20
20	CIVIL ENGINEERING	21
21	POLITICAL SCIENCE	22
22	SOCIOLOGY	23
23	HISTORY	26
24	LAW	26
25	AQUACULTURE	28
26	FORENSIC SCIENCE	29
27	PERFORMING ARTS	31

## Section A

### RESEARCH AND METHODOLOGY

- 1) **Basic Concept of Research Problem:** Rationale of research, Identification of research problem, Research objective and Types of research- fundamental/ applied/ action/ quantitative/ qualitative.
- 2) **Review of literatures:** Primary source, Secondary source, Searching e- resources, using search engines, Searching data base and writing literature review.
- 3) **Methods of Research:** Concept and formulation of hypothesis, Survey method, Experimental method (variable, designs), Historical methods and Content analysis
- 4) **Sampling of Data:** Concept of sampling, Probability sampling techniques, Non probability sampling techniques and sampling error
- 5) **Collection of Data:** Primary data generation, Secondary data collection, Methods of data generation/ collection – by experiments, questionnaire, interview schedule, focus groups etc
- 6) **Analysis of Data:** Statistical analysis techniques, Qualitative analysis techniques Application of computer in research data analysis
- 7) **Report Preparation:** Structure and component of research report, Organization of data, Indexing of journal and research output, Citation, references, bibliography Copyright, plagiarism and originality of research work
- 8) **Research Ethics:** Ethics in research, National and International regulations/ laws/ ethics related to research on Human, Animals and Environments.

## Section B

### PHARMACY

- 1) **Medicinal Chemistry:** Structure, nomenclature, classification, synthesis, SAR and metabolism of the following category of drugs, which are official in Indian Pharmacopoeia and British Pharmacopoeia. Introduction to drug design. Stereochemistry of drug molecules. Hypnotics and Sedatives, Analgesics, NSAIDS, Neuroleptics, Antidepressants, Anxiolytics, Anticonvulsants, Antihistaminic, Local Anesthetics, Cardio Vascular drugs - Antinatal agents Vasodilators, Adrenergic & Cholinergic drugs, Cardio tonic agents, Diuretics, Antihypertensive drugs, Hypoglycemic agents, Antilipemic agents, Coagulants, Anticoagulants, Antiplatelet agents. Chemotherapeutic agents - Antibiotics, Antibacterial, Sulphadugs. Antiprotozoal drugs, Antiviral, Antitubercular, Antimalarial, Anticancer, Antamoebic drugs. Diagnostic agents. Vitamins and Hormones.
- 2) **Pharmaceutics:** Development, manufacturing standards Q.C. limits, labeling, as per the pharmacopoeal requirements. Storage of different dosage forms and new drug delivery systems. Bio pharmaceutics and Pharmacokinetics and their importance in formulation. Formulation and evaluation of tablets, capsules, parenteral, liquid dosage forms and cosmetics like lipstick, shampoo, creams, nail preparations and dentifrices, tablet defects and tablet coating defects, Pharmaceutical calculations. Various dissolution test apparatus. Biopharmaceutical classification of drugs. Method of preparation, evaluation and application of Novel drug delivery systems like liposomes, twosomes, neosomes, nano particles, micro emulsions, nano emulsions.
- 3) **Pharmacognosy and Biotechnology:** General methods of extraction, isolation, purification and characterization of natural products. Various separation techniques used for isolation of natural products. Biosynthetic pathways of various metabolites (e.g. Alkaloids, glycosides, tannins, lignans, saponins, lipids, flavonoids, coumarins, anthocyanidines etc.). Quality control of crude drugs, phytochemical screening methods, plant tissue culture. Recombinant DNA technique, Fermentation, Immunology and vaccines. Enzyme immobilization, Genetics and gene therapy, Fundamentals of cell and molecular biology.

- 4) **Pharmacology:** General pharmacological principles including Toxicology. Pharmacokinetics and pharmacodynamics, Drug interaction. Pharmacology of drugs acting on Central nervous system, Cardiovascular system, Autonomic nervous system, Gastro intestinal system and Respiratory system. Pharmacology of Auto coids, Hormones, Hormone antagonists, chemotherapeutic agents including anticancer drugs. Bio assays, Immuno Pharmacology. Drugs acting on the blood & blood forming organs. Drugs acting on the renal system.
- 5) **Pharmaceutical Jurisprudence:** Drugs and cosmetics Act and rules with respect to manufacture, sales and storage. Pharmacy Act. Pharmaceutical ethics.
- 6) **Pharmaceutical Analysis:** Fundamental principles, basic instrumentation, and pharmaceutical applications of UV Visible spectroscopy, Infrared spectroscopy, PMR, C13 NMR spectroscopy, HPLC, HPTLC, Gel chromatography, Electrophoresis and ion-pair chromatography. Introductory principle, instrumentation and application of GC-Mass. Theory, methods and applications of enzyme and radioimmunoassay techniques, Differential scanning calorimetry (DSC), X-ray diffract tome try (XRD), Validation and Calibration.
- 7) **Microbiology:** Principles and methods of microbiological assays of the Pharmacopoeia. Methods of preparation of official sera and vaccines. Serological and diagnostics tests. Applications of microorganisms in Bio Conversions and in Pharmaceutical industries.

## **BIOTECHNOLOGY**

- 1) **Molecular Biology, Genomics, Proteomics, & Metabolic Engineering:** Structure and regulation of prokaryotes and eukaryotes genes, post-transcriptional and translational modifications, phylogenetic, molecular markers, genetic and physical mapping, cloning and expression vectors, rDNA technology, gene cloning approaches, whole genome sequencing & annotation, high throughput gene expression and function elucidation technologies, protein-protein interactions, MALDI-TOF MS, LC-MS, high throughput identification of biomarkers, Signal transduction pathways and their elucidation, primary and secondary metabolic pathways, systems biology frameworks for metabolic engineering, bioinformatics and statistics, Biodiversity, IPR, Biosafety & Bioethics
- 2) **Microbiology, Immunology and Diagnostics:** Biology of microbes, infectious diseases, immunology, molecular virology, cancer biology, cell & developmental biology, immune technology, antibody engineering, vaccines and the associated manufacturing processes, molecular diagnostics and their applications, cell culture technologies, regenerative medicine & transplantation technology, animal biotechnology.
- 3) **Bioprocess Engineering, Fermentation Technology & Downstream Processing:** Bioprocessing vs. chemical processing, Substrates for bioconversion processes, Inoculum development, Process technology for production of primary metabolites, such as baker's yeast, ethanol, citric acid, amino acids, polysaccharides and plastics, Microbial production of industrial enzymes, Production of secondary metabolites, Operation Batch, Fed-batch, CSTR, packed bed reactor, Immobilization, Aeration and agitation, Recovery and purification of fermentation products: removal of insoluble, concentration and purification, effluent treatment, principle and large scale instrumentation requirement for downstream processing.

## **BOTANY**

- 1) **Microbiology** - Viruses and Bacteria Structure, classification and reproduction. General Account of infection, immunity and serology: Microbes in industry and agriculture.
- 2) **Pathology** - Knowledge of important plant disease in India caused by fungi. Modes of infection and methods of control.
- 3) **Plant Groups** - Structure, reproduction, life- history, classification, evolution, ecology and economic importance of algae, fungi, bryophytes, pteridophytes and gymnosperms.
- 4) **Morphology, anatomy and embryology of Angiosperms** - Tissues and tissue systems. Morphology and anatomy of stem, root and leaf (including development aspects and anomalous growth), Morphology of flower Structure of anther and ovule, fertilization and Development of seed.

- 5) **Taxonomy** - Principles of nomenclature and classification of angiosperms. Modern trends in Taxonomy. A general knowledge of the more important families of angiosperms.
- 6) **Cell Biology** - Cell as unit of structure and functions. Ultra structure function and interrelationships of plasma membranes endoplasmic reticulum, mitochondria, ribosomes chloroplasts and nucleus, Chromosomes- chemical and physical nature behaviour during mitosis and meiosis.
- 7) **Genetics and Evolution** - Mendelian concept of genetics. Development of the gene concept Nucleic acids their structure and role in reproduction and protein synthesis. Genetic code and regulation. Mechanism of microbial recombination. Organic evolution evidences, mechanism and theories.
- 8) **Physiology** - Photosynthesis history, factors, mechanism and importance. Absorption and conduction of water and salts. Transpiration, Major and minor essential elements and their role in nutrition, Nitrogen fixation and nitrate reduction Enzymes, Respiration and fermentation. General account of growth. Plant hormones and their functions. Photoperiodism. Seed dormancy and germination.
- 9) **Ecology** - Scope of ecology, structure, function and dynamics of ecosystems, Plant communities and succession. Ecological factors. Applied aspects of ecology including conservation and control of pollution.
- 10) **Economic Botany** - General account of important sources of food fiber, wood and drugs.

## **CHEMISTRY**

### **INORGANIC CHEMISTRY**

- 1) **Main Group Elements** : S-N compounds Sulphure-phosphorus compounds: Molecular sulphides such as
- 2) P<sub>4</sub>S<sub>3</sub>, P<sub>4</sub>S<sub>7</sub>, P<sub>4</sub>S<sub>9</sub> and P<sub>4</sub>S<sub>10</sub>. Phosphorus-nitrogen compounds: Phosphatides. Other P-N compounds.
- 3) Boron-nitrogen compounds:
- 4) **Metal Complexes**: Valence bond theory and its limitations. Ligand field theory: Splitting of d orbitals in different ligand fields Jahn-Teller effect MO diagrams of complexes with and without n bonds. Spectral & Magnetic properties of complexes.
- 5) **Nuclear Chemistry**: . Nuclear reactions: . Types of nuclear reactions. Spontaneous and induced fission.
- 6) Principles of working of the reactors of nuclear power plants. Breeder reactor. Nuclear fusion reaction.
- 7) **Analytical Principles**: Volumetric methods: Theories of indicators: Acid-base, redox, metallochromic, indicators. Complexion Precipitation Redox titrations. Gravimetric methods: Mechanism of precipitate formation. Aging of precipitates. Precipitation from homogeneous solutions. Precipitation and post precipitation. Contamination of precipitates. Washing, drying and ignition of precipitates.
- 8) **Water treatment**: Hardness, Alkalinity, Domestic water treatment Chemical analysis of water, D.O., B.O.D, C.O.D., T.D.S.

### **PHYSICAL CHEMISTRY**

- 1) **Quantum Mechanics**: Introduction to Classical Mechanics: The blackbody radiation, photoelectric effect, Compton Effect and atomic spectra. Failure of classical mechanics to explain these phenomena. Quantum mechanical explanations.
- 2) **Chemical Kinetics**: Theories of reaction rate: Influence of temperature on reaction rate. Arrhenius equation and its limitations, activation energy. Collision theory and absolute reaction rate theory. Free energy of activation and volume of activation. Thermodynamic formulation of reaction rate. Effects of pressure and volume on the velocity of gas reaction.
- 3) **Surface Chemistry**: The colloidal state: Multimolecular, macromolecular and associated colloids. Stability of colloids. The zeta potential. Kinetic, optical and electrical properties of colloids: Electrophoresis, electroosmosis, sedimentation potential and streaming potential Catalysis: Mechanism and theories of homogeneous and heterogeneous catalysis. Acid-base and enzyme catalysis.

- 4) **Thermodynamics:** Intensive and extensive properties. Exact differentials. Intrinsic energy, enthalpy, entropy, free energy and their relations and significances. . Maxwell relations. Thermodynamic equations of state. Joule-Thomson effect. Joule-Thomson coefficient for van der Waals' gas. The third law of thermodynamics. .
- 5) **Spectroscopy:** Energy levels in molecules, rotational, vibrational, electronic NMR and ESR spectroscopy.

### **ORGANIC CHEMISTRY**

- 1) **Principles of organic chemistry:** Inductive, mesomeric, electrometric effect. Carbocation's, car anions, carbons. Addition, Elimination, Substitution reactions
- 2) **Chemistry of Polymers:** Types and mechanism of polymerization reactions. Step-growth, free radical, addition, ionic polymerizations. Copolymers. Characterization of polymers. Manufacture and applications of polyolefin, thermoplastics, polyamides, polyesters, polyurethanes, epoxies and industrial polymers.
- 3) Chemistry of natural products- Biosynthesis of terpenes and alkaloids. Carbohydrate protein and nucleic acid.
- 4) **Organic Photochemistry:** Photochemical processes. Energy transfer, sensitization and quenching. Singlet and triplet states and their reactivity. Photoreactions of carbonyl compounds, enes, dienes, and arenes. Norrish reactions of acyclic ketones. Applications of photoreactions in laboratory and industrial synthesis.
- 5) **Separation Techniques:** Chromatographic methods: Classification of chromatographic separations. Theory of chromatography. Applications of chromatographic methods: Adsorption and partition chromatography. Paper, thinlayer and column chromatographic methods.

### **COMMERCE**

- 1) **Business Environment:** Meaning and Elements of Business Environment, Economic Environment, Economic Policies, Economic Planning. Competition policy, Consumer protection, Environment protection Liberalization, Privatization and globalization, Second generation reforms , Industrial policy and implementation, Industrial growth and structural changes.
- 2) **Financial & Management Accounting:** Basic Accounting concepts, Capital & Revenue, Financial statements. Partnership Accounts: Admission, Retirement, Death, Dissolution and cash Distribution. Advanced Company Accounts: Issue, Forfeitures, Purchase of Business, Liquidation, Valuation of shares, Amalgamation, Absorption and Reconstruction, Holding company accounts. Cost Management Accounting: Ratio Analysis, Funds Flow Analysis , Cash Flow Analysis, Marginal costing & Break-even analysis, Standard costing, Budgetary control, Costing for decision making, Responsibility accounting.
- 3) **Business Economics:** Nature & uses of Business Economics, Concept of Profit & Wealth maximization. Demand Analysis & Elasticity of Demand, Curve Analysis Law Utility Analysis & Indifference Curve analysis, Laws of Returns and Law of Variable proportions.
- 4) **Business Statistics & Data Processing:** Data types, Data collection and analysis, Sampling, need, errors, & method 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
- 5) **Business Management:** Concept of management Planning: Objectives, Strategies, Planning process, Decision-making. Staffing: Leading, Motivation, Leadership, Committees, Communication, Controlling: Corporate Governance and Business Ethics.
- 6) **Marketing Management:** The evolution of marketing concepts, Concepts of Marketing, Marketing mix, Marketing environment, Product decision, pricing decision, Distribution decision.
- 7) **Financial Management:** Capital Structure, Financial & Operating leverage Cost of capital, Capital budgeting, working capital management. Dividend Policy.
- 8) **Human Resources Management:** Concepts, Role and Functions of Human Resource management, Human Resource planning, Recruitment & Selection. Training & Development, Succession planning. Compensation: Wage & Salary Administration

- 9) **Banking & Financial Institutions:** Importance of Banking to Business, Types of Banks & Their functions. Development Banking: IDBI, IFCI, SFCs, UTI, SIDBI.
- 10) **International Business:** World Trade Organization: Its function & policies.

## **COMPUTER SCIENCE AND ENGINEERING**

- 1) **High Performance Computer Architecture:** Basic Computer architecture. Performance Analysis, Architectural classification schemes, Memory models, Pipelining, RISC CISC, VLIW architectures, data dependency and interconnection network. Fault Tolerance and Scalability. Modeling Performance. Pipelined Systems. Interconnection Networks. Processor Array. Multi- computers. Multiprocessors. Systolic Array. Vector Processors. Structured Memory Design for Parallel Systems - Symmetric Shared, Distributed Shared and Synchronization. Grid computing.
- 2) **Software Systems:** Data structures and Algorithms: the notion of abstract data types, stack, queue, list, set, string, tree, binary search tree, heap, graph, tree and graph traversals, connected components, spanning trees, shortest paths, hashing, sorting, searching, design techniques (greedy, dynamic, divide and conquer, Algorithm design by induction), 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.
- 3) **Concepts of object-oriented programming** - Basic Concept of OOP Benefit of OOP Object Oriented language Structure of C++ Program Compiling and Linking Operators and expressions Looping Concepts Arrays and Structure, Functions Class Object Constructor and Destructors Polymorphism Functions Overloading Operators Overloading Inheritance pointer and Virtual Function File I/O and Templates
- 4) **Operating Systems:** Synchronization Mechanisms. Process Deadlocks. Resource Models. Local and Global states. Distributed Operating Systems. Event Ordering. Timestamps. Distributed Mutual Exclusion. Token and Non-token based Algorithms. Comparative Performance Analysis. Concurrency Control. Shared Memory. File Systems. Agreement Protocols for handling Processor Failures. Coordination of Processes and related Algorithms. Failure Handling and Recovery Mechanisms. Multiprocessor Operating Systems and related Thread Handlings.
- 5) **Software Engineering:** SDLC, planning and managing the project, design, coding, testing, implementation, maintenance. Personal Software Process. Team Software Process. Usability. Agile Methods. Process Models- Iterative, Scrum, XP, and Evo. Requirements Engineering. Advanced UML, Petri net. Domain specific modeling. Systems Modeling Language. Meta modeling. Software architecture and design patterns. Software metrics. Software reliability. Advanced testing techniques.
- 6) **Database Systems:** Review of Database Systems. Web-enabled Database Systems. Storage and File Structures. Indexing and Hashing. Concurrency. Recovery. Query Processing. Query Optimization. Object Oriented DBMS. Extended Relational Model. Spatial databases. Multimedia Databases. Distributed Databases. Active Databases. Temporal Databases. Deductive Databases. Mobile Databases.
- 7) **Data Communication and Computer Networks:** Seven Layer OSI Model. TCP/IP details. IPv4 and IPv6 Protocols and its Applications. Real Time Communication Protocols. High speed local and wide area networks. Virtual networks. Network security. Broadband networks. Introduction to intelligent networking. Performance analysis of networks. Transmission media, data encoding, Multiplexing, Flow and error control, Network devices switches, Gateways, Routers, Network security cryptography, Digital signature, Firewalls, Routing concepts, ATM, Poisson and other distributions.

## **DESIGN**

- 1) **Design** - An Introduction
- 2) **Visual Design** - Principles and Applications
- 3) **Design Methods** - Concept, Meaning, Nature and Importance
- 4) **Graphic Design** – Introduction and applications
- 5) **Brands/Designers**
- 6) **Quality Assurance** - Concept of Quality, managing quality through inspection and testing, seven tools of quality. Inspection: Inspection and its significance.

## HINDI

### इकाई - I

#### हिन्दी भाषा और उसका विकास।

हिन्दी की ऐतिहासिक पृष्ठभूमि : प्राचीन भारतीय आर्य भाषाएं, मध्यकालीन भारतीय आर्य भाषाएं—पालि, प्राकृत – शौरसेनी, अर्द्धमागधी, मागधी, अपभ्रंश और उनकी विशेषताएं, अपभ्रंश अवहट्ट, और पुरानी हिन्दी का संबंध, आधुनिक भारतीय आर्य भाषाएं और उनका वर्गीकरण। हिन्दी का भौगोलिक विस्तार : हिन्दी की उपभाषाएं, पश्चिमी हिन्दी, पूर्वी हिन्दी, राजस्थानी, बिहारी तथा पहाड़ी वर्ग और उनकी बोलियां। खड़ीबोली, ब्रज और अवधी की विशेषताएं। हिन्दी के विविध रूप : हिन्दी, उर्दू, दक्खिनी, हिन्दुस्तानी। हिन्दी का भाषिक स्वरूप : हिन्दी की स्वनिम व्यवस्था – खंड्य और खंड्येतर, हिन्दी ध्वनियों के वर्गीकरण का आधार, हिन्दी शब्द रचना –उपसर्ग, प्रत्यय, समास, हिन्दी की रूप रचना – लिंग, वचन और कारक व्यवस्था के सन्दर्भ में संज्ञा, सर्वनाम, विशेषण और क्रिया रूप, हिन्दी – वाक्य – रचना। हिन्दी भाषा – प्रयोग के विविध रूप : बोली, मानक भाषा, राजभाषा, राष्ट्रभाषा और सम्पर्क भाषा। संचार माध्यम और हिन्दी, कम्प्यूटर और हिन्दी, हिन्दी की संवैधानिक स्थिति। देवानागरी लिपि : विशेषताएं और मानकीकरण।

### इकाई – II

#### हिन्दी साहित्य का इतिहास

हिन्दी साहित्येतिहास दर्शन

हिन्दी साहित्य के इतिहास लेखन की पद्धतियां

हिन्दी साहित्य का कालविभाजन और नामकरण, आदिकाल की विशेषताएं एवं साहित्यिक प्रवृत्तियां, रामो-साहित्य, आदिकालीन हिन्दी का जैन साहित्य, सिद्ध और नाथ साहित्य, अमीर खुसरो की हिन्दी कविता, विद्यापति और उनकी पदावली तथा लौकिक साहित्य

भक्तिकाल

भक्ति-आंदोलन के उदय के सामाजिक-सांस्कृतिक कारण, भक्ति-आंदोलन का अखिल भारतीय स्वरूप और उसका अन्तःप्रादेशिक वैशिष्ट्य।

भक्ति काव्य की सामाजिक-सांस्कृतिक पृष्ठभूमि, आलवार सन्त। भक्ति काव्य के प्रमुख सम्प्रदाय और उनका वैचारिक आधार। निर्गुण-सुगुण कवि और उनका काव्य।

रीतिकाल

सामाजिक-सांस्कृतिक पृष्ठभूमि, रीतिकाल की प्रमुख प्रवृत्तियां (रीतिबद्ध, रीतिसिद्ध, रीतिमुक्त)

रीतिकवियों का आचार्यत्व।

रीतिकाल के प्रमुख कवि और उनका काव्य

आधुनिक काल

हिन्दी गद्य का उद्भव और विकास। भारतेन्दु पूर्व हिन्दी गद्य, 1857 की क्रान्ति और सांस्कृतिक पुनर्जागरण, भारतेन्दु और उनका युग, पत्रकारिता का आरम्भ और 19वीं शताब्दी की हिन्दी पत्रकारिता, आधुनिकता की अवधारणा।

द्विवेदी युग : महावीर प्रसाद द्विवेदी और उनका युग, हिन्दी नवजागरण और सरस्वती, राष्ट्रीय काव्य धारा के प्रमुख कवि, स्वच्छन्दतावाद और उसके प्रमुख कवि।

छायावाद : छायावादी काव्य की प्रमुख विशेषताएं, छायावाद के प्रमुख कवि, प्रगतिवाद की अवधारणा, प्रगतिवादी काव्य और उसके प्रमुख कवि, प्रयोगवाद और नई कविता, नई कविता के कवि, समकालीन कविता (वर्ष 2000 तक) समकालीन साहित्यिक पत्रकारिता।

### इकाई – III

#### साहित्यशास्त्र

काव्य के लक्षण, काव्य हेतु और काव्य प्रयोजन।

प्रमुख सम्प्रदाय और सिद्धान्त – रस, अलंकार, रीति, ध्वनि, वक्रोक्ति और औचित्य।

रस निष्पत्ति, साधारणीकरण।

शब्दशक्ति, काव्यगुण, काव्य दोष

प्लेटो के काव्य सिद्धान्त।

अरस्तू : अनुकरण सिद्धान्त, त्रासदी विवेचन, विरेचन सिद्धान्त।

वर्ल्सवर्थ का काव्यभाषा सिद्धान्त।

कॉलरिज : कल्पना और फैंटेसी।

टी.एस.इलियट : निर्वैयक्तिकता का सिद्धान्त, परम्परा की अवधारणा।

आर्च.ए.रिचर्ड्स : मूल्य सिद्धान्त, संप्रेषण सिद्धान्त तथा काव्य-भाषा सिद्धान्त। रूसी रूपवाद। नयी समीक्षा। मिथक, फन्तासी, कल्पना, प्रतीक, विम्ब।

## इकाई – IV

### वैचारिक पृष्ठभूमि

भारतीय नवजागरण और स्वाधीनता आन्दोलन की वैचारिक पृष्ठभूमि  
हिन्दी नवजागरण । खड़ीबोली आन्दोलन। फोर्ट विलियम कॉलेज  
भारतेन्दु और हिन्दी नवजागरण,  
महावीर प्रसाद द्विवेदी और हिन्दी नवजागरण  
गांधीवादी दर्शन  
अम्बेडकर दर्शन  
लोहिया दर्शन  
मार्क्सवाद, मनोविक्षेपणवाद, अस्तित्ववाद, उत्तर आधुनिकतावाद, अस्मितामूलक विमर्श  
(दलित, स्त्री, आदिवासी एवं अल्पसंख्यक)

## इकाई – V

### हिन्दी कविता

पृथ्वीराज रासो – रेवा तट  
अमीरखुसरो – खुसरों की पहेलियाँ और मुकरियाँ  
विद्यापति की पदावली (संपादक – डॉ. नरेन्द्र झा) – पद संख्या 1 - 25  
कबीर – (सं.- हजारी प्रसाद द्विवेदी) – पद संख्या – 160 - 209  
जायसी ग्रंथावली – (सं. राम चन्द्र शुक्ल) – नागमती वियोग खण्ड  
सूरदास – भ्रमरगीत सार – (सं.- राम चन्द्र शुक्ल) – पद संख्या 21 से 70  
तुलसीदास – रामचरितमानस, उत्तर काण्ड  
बिहारी सतसई – (सं.- जगन्नाथ दास रत्नाकर) – दोहा संख्या 1 – 50  
घनानन्द कवित्त – (सं.- विश्वनाथ मिश्र) – कवित्त संख्या 1 – 30  
मीरा – (सं.- विश्वनाथ त्रिपाठी) – प्रारम्भ से 20 पद  
अयोध्या सिंह उपाध्याय हरिऔध – प्रियप्रवास  
मैथिलीशरण गुप्त – भारत भारती, साकेत (नवम् सर्ग)  
जयशंकर प्रसाद – आँसू, कामायनी (श्रद्धा, लज्जा, इडा)  
निराला – जुहू की कली, जागो फिर एक बार, सरोजस्मृति, राम की शक्तिपूजा, कुकरमुत्ता,  
बाँधो न नाव इस ठाँव बंधु।  
सुमित्रानन्दन पंत – परिवर्तन, प्रथम रश्मि  
महादेवी वर्मा – बीन भी हूँ मैं तुम्हारी रागिनी भी हूँ, मैं नीरु भरी दुख की बदली, फिर विकल है  
प्राण मेरे, यह मन्दिर का दीप इसे नीरव जलने दो, द्रुत झरो जगत के जीर्ण पत्र  
रामधारी सिंह दिनकर – उर्वशी (तृतीय अंक), रश्मिरथी  
नागार्जुन – कालिदास, बादल को घिरते देखा है, अकाल और उसके बाद, खुरदरे पैर, शासन की  
बंदूक, मनुष्य हूँ।  
सच्चिदानंद हीरानन्द वात्स्यायन अज्ञेय – कलगी बाजरे की, यह दीप अकेला, हरी घास पर क्षण  
भर, असाध्यवीणा, कितनी नावों में कितनी बार  
भवानीप्रसाद मिश्र – गीत फरोश, सतपुड़ा के जगल  
मुक्तिबोध – भूल गलती, ब्रह्मराक्षस, अंधेरे में  
धूमिल – नक्सलवाड़ी, मोचीराम, अकाल दर्शन, रोटी और संसद  
फणीश्वर नाथ रेणु – मैला आंचल  
यशपाल – झूठा सच  
अमृत लाल नागर – मानस का हंस  
भीष्म साहनी – तमस  
श्रीलाल शुक्ल – राग दरबारी  
कृष्णा सोबती – जिन्दगी नामा  
मन्नू भंडारी – आपका बंटी  
जगदीश चन्द्र – धरती धन न अपना



## इकाई –VII

### हिन्दी कहानी

राजेन्द्र बाला घोष (बंग महिला) - चन्द्रदेव से मेरी बातें, दुलाईवाली  
माधवराव सप्रे - एक टोकरी भर मिट्टी  
सुभद्रा कुमारी चौहान - राही  
प्रेमचंद - ईदगाह, दुनिया का अनमोल रतन  
राजा राधिकारमण प्रसाद सिंह - कानों में कंगना  
चन्द्रधर शर्मा गुलेरी - उसने कहा था  
जयशंकर प्रसाद - आकाशदीप  
जैनेन्द्र - अपना-अपना भाग्य  
फणीश्वरनाथ रेणु - तीसरी कसम, लाल पान की बेगम  
अज्ञेय - गैंग्रीन  
शेखर जोशी - कोसी का घटवार  
भीष्म साहनी - अमृतसर आ गया है, चीफ की दावत  
कृष्णा सोबती - सिद्धा बदल गया  
हरिशंकर परसाई - इस्पेक्टर मातादीन चांद पर  
जानरंजन - पिता  
कमलेश्वर - राजा निरबंसिया  
निर्मल वर्मा - परिदे

## इकाई –VIII

### हिन्दी नाटक

भारतेन्दु - अंधेर नगरी, भारत दुर्दशा  
जयशंकर प्रसाद - चन्द्रगुप्त, स्कंदगुप्त, ध्रुवस्वामिनी  
धर्मवीरभारती - अंधायुग  
लक्ष्मीनारायण लाल - सिंदूर की होली  
मोहन राकेश - आधे-अधूरे, आषाढ़ का एक दिन  
हवीव तनवीर - आगरा बाज़ार  
सर्वेश्वरदयाल सक्सेना - बकरी  
शंकरशेष - एक और द्रोणाचार्य  
उपेन्द्रनाथ अशक - अंजो दीदी  
मन्नू भंडारी - महाभोज

## इकाई –IX

### हिन्दी निबंध

भारतेन्दु - दिल्ली दरबार दर्पण, भारतवर्षोन्नति कैसे हो सकती है  
प्रताप नारायण मिश्र - शिवमूर्ति  
बाल कृष्ण भट्ट - शिवशंभु के चिट्ठे  
रामचन्द्र शुक्ल - कविता क्या है  
हजारी प्रसाद द्विवेदी - नाखून क्यों बढ़ते हैं  
विद्यानिवास मिश्र - मेरे राम का मुकुट भीग रहा है  
अध्यापक पूर्ण सिंह - मजदूरी और प्रेम  
कुबेरनाथ राय - उत्तराफाल्गुनी के आस-पास  
विवेकी राय - उठ जाग मुसाफिर  
नामवर सिंह - संस्कृति और सौंदर्य

## इकाई -X

### आत्मकथा, जीवनी तथा अन्य गद्य विधाएं

रामबृक्ष बेनीपुरी – माटी की मूर्तें

महादेवी वर्मा – ठकुरी बाबा

तुलसीराम – मुर्दहिया

शिवरानी देवी – प्रेमचन्द घर में

मधू भंडारी – एक कहानी यह भी

विष्णु प्रभाकर – आबारा मसीहा

हरिवंशराय वसुन – क्या धूँ का गाढ़ कस

रमणिका गुप्ता – आपहुँदरी

हरिशंकर परसाई – भोलाराम का जीव

कृष्ण चन्दर – जागुन का पेड़

विनाकर – संस्कृति के चार अध्याप

सुतिबोध – एक लेखक की डायरी

राहुल सांकृत्यायन – मेरी सिखन यात्रा

अनेक – अरे बाबावर रहेगा बाद

## PSYCHOLOGY

- 1) **Emergence of Psychology** Psychological thought in some major Eastern Systems: Bhagavad Gita, Buddhism, Sufism and Integral Yoga. Academic psychology in India: 2000s: Emergence of Indian psychology in academia. Issues: The colonial encounter; Post colonialism and psychology; Lack of distinct disciplinary identity. Western: Structuralism, Functionalism, Psychoanalytical, Gestalt, Behaviorism, Humanistic-Existential, Transpersonal, Cognitive revolution, Multiculturalism. Four founding paths of academic psychology – Wundt, Freud, James, Dilthey. Essential aspects of knowledge paradigms: Ontology, epistemology, and methodology.
- 2) **Psychological testing**  
Types of tests. Test construction: Item writing, item analysis Test standardization: Reliability, validity and Norms  
Areas of testing: Intelligence, creativity, neuropsychological tests, aptitude, Personality assessment, interest inventories. Attitude scales – Semantic differential, Staples, Likert scale.
- 3) **Biological basis of behavior**  
Sensory systems: General and specific sensations, receptors and processes  
Neurons: Structure, functions, types, neural impulse, synaptic transmission. Neurotransmitters. The Central and Peripheral Nervous Systems – Structure and functions. Neuroplasticity. Biological basis of Motivation: Hunger, Thirst, Sleep and Sex. Biological basis of emotion: The Limbic system, Hormonal regulation of behavior.
- 4) **Attention, Perception, Learning, Memory and Forgetting**  
Attention: Forms of attention, Models of attention  
Perception: Approaches to the Study of Perception: Gestalt and physiological approaches  
Perceptual Organization: Gestalt, Figure and Ground, Law of Organization  
Perceptual Constancy: Size, Shape, and Color; Illusions  
Perception of Form, Depth and Movement  
Role of motivation and learning in perception  
Learning Process: Fundamental theories: Thorndike, Guthrie, Hull Classical Conditioning: Procedure, phenomena and related issues Instrumental learning: Phenomena, Paradigms and theoretical issues; Reinforcement: Basic variables and schedules; behavior modification and its applications. Theories of Forgetting: Interference, Retrieval Failure, Decay, Motivated forgetting
- 5) **Personality, Motivation, emotion, stress and coping**

Approaches to the study of personality: Psychoanalytical, Neo-Freudian, Social learning, Trait and Type, Cognitive, Humanistic, Existential, Transpersonal psychology.

Approaches to the study of motivation: Psychoanalytical, Ethological, S-R Cognitive, Humanistic Exploratory behavior and curiosity, Self-regulation and Flow.

Emotions: Physiological correlates Theories of emotions: James-Lange, Canon-Bard, Schachter and Singer, Lazarus, Lindley.

**6) Social Psychology**

Traditional theoretical perspectives: Field theory, Cognitive Dissonance, Sociobiology, Psychodynamic Approaches, Social Cognition.

**7) Human Development and Interventions**

Theories of development: Psychoanalytical, Behavioristic, and Cognitive Various aspects of development: Sensory-motor, cognitive, language, emotional, social and moral.

Psychopathology: Concept, Mental Status Examination, Classification, Causes

Psychotherapies: Psychoanalysis, Person-centered, Gestalt, Existential, Acceptance Commitment Therapy, Behavior therapy, REBT, CBT, MBCT, Play therapy, Positive psychotherapy, Transactional Analysis, Dialectic behavior therapy, Art therapy, Performing Art Therapy, Family therapy.

**8) Emerging Areas**

Wellbeing and self-growth: Types of wellbeing [Hedonic and Eudemonic], Character strengths, Resilience and Post-Traumatic Growth.

Health: Health promoting and health compromising behaviors, Life style and Chronic diseases [Diabetes, Hypertension, Coronary Heart Disease], Psycho-neuro-immunology [Cancer, HIV/AIDS].

## **ELECTRONICS AND COMMUNICATION**

- 1) **NETWORKS:** Network graphs: matrices associated with graphs; incidence, fundamental cut set and fundamental circuit matrices. Solution methods: nodal and mesh analysis. Network theorems: superposition, thevenin and Norton's maximum power transfer, Wye-Delta transformation. Steady state sinusoidal analysis using phasors. Linear constant coefficient differential equations; time domain analysis of simple RLC circuits, Solution of network equations using Laplace transform: frequency domain analysis of RLC circuits. 2-port network parameters: driving point and transfer functions. State equations for networks
- 2) **ELECTRONIC DEVICES:** Energy bands in silicon, intrinsic and extrinsic silicon. Carrier transport in silicon: diffusion current, drift current, mobility, and resistivity. Generation and recombination of carriers. p-n junction diode, Zener diode, tunnel diode, BJT, JFET, MOS capacitor, MOSFET, LED, p-i-n and avalanche photo diode, Basics of LASERS. Device technology: integrated circuits fabrication process, oxidation, diffusion, ion implantation, photolithography, n-tub, p-tub and twin-tub CMOS process
- 3) **ANALOG CIRCUITS:** Small Signal Equivalent circuits of diodes, BJTs, MOSFETs and analog CMOS. Simple diode circuits, clipping, clamping, rectifier. Biasing 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. Sinusoidal oscillators; criterion for oscillation; single-transistor and op-amp configurations. Function generators and wave-shaping circuits, 555 Timers. Power supplies
- 4) **DIGITAL CIRCUITS:** Boolean algebra, minimization of Boolean functions; 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. Semiconductor, Microprocessor (8085): architecture, programming, memory and I/O interfacing.
- 5) **SIGNALS AND SYSTEMS:** Definitions and properties of Laplace transform, continuous-time and discrete-time Fourier series, continuous-time and discrete-time Fourier Transform, DFT and FFT, z transform. Sampling theorem. Linear Time-Invariant (LTI) Systems: definitions and properties; causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay. Signal transmission through LTI systems
- 6) **CONTROL SYSTEMS:** Basic control system components; block diagrammatic description, reduction of block diagrams. Open loop and closed loop (feedback) systems and stability analysis of these systems. Signal flow graphs and their use in determining transfer functions of systems; transient and steady state analysis of LTI control systems and

frequency response. Tools and techniques for LTI control system analysis: root loci, Routh-Hurwitz criterion, and Bode and Nyquist plots. Control system compensators: elements of lead and lag compensation, elements of Proportional-Integral-Derivative (PID) control. State variable representation and solution of state equation of LTI control systems

- 7) **COMMUNICATIONS:** Random signals and noise: probability, random variables, probability density function, autocorrelation, power spectral density. Analog communication systems: amplitude and angle modulation and demodulation systems, spectral analysis of these operations, super heterodyne receivers; elements of hardware, realizations of analog communication systems; signal-to-noise ratio (SNR) calculations for amplitude modulation (AM) and frequency modulation (FM) for low noise conditions. Fundamentals of information theory and channel capacity theorem. Digital communication systems: pulse code modulation (PCM), differential pulse code modulation (DPCM), digital modulation schemes: amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK), matched filter receivers, bandwidth consideration and probability of error calculations for these schemes. Basics of TDMA, FDMA and CDMA and GSM.
- 8) **COMPUTER NETWORKS:** ISO/OSI stack, LAN technologies (Ethernet, Token ring, etc), Flow and error control techniques, Routing algorithms, Congestion control, TCP/UDP and sockets, IP(v4), Application layer protocols (dns, smtp, pop, ftp, http); Basic concepts of hubs, switches, gateways, and routers.
- 9) **OPTICAL FIBRE COMMUNICATION:** Introduction, propagation of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model. Different types of optical fibers, Modal Analysis of a step index fiber. Optical channel Modeling – Signal degradation on optical fiber due to dispersion and attenuation. Fabrication of fibers measurement techniques like OTDR, Optical sources – LEDs and Lasers, Photo-detectors – Pin-detectors, detector responsively noise, Optical link design – BER calculation, quantum limit, and power penalties.
- 10) **ELECTROMAGNETICS:** Elements of vector calculus: divergence and curl; Gauss' and Stokes' theorems, Maxwell's equations: differential and integral forms. Wave equation, Poynting vector. Plane waves: propagation through various media; reflection and refraction; phase and group velocity; skin depth. Transmission lines: characteristic impedance; impedance transformation; Smith chart; impedance matching; S parameters, pulse excitation. Waveguides: modes in rectangular waveguides; boundary conditions; cut-off frequencies; dispersion relations. Basics of propagation in dielectric waveguide and optical fibers. Basics of Antennas: Dipole antennas; radiation pattern; antenna gain.

## ENGLISH

Unit –I: Drama

Unit –II: Poetry

Unit –III: Fiction, short story

Unit –IV: Non-Fictional Prose

NOTE: The first four units are from 14<sup>th</sup> Century to the 21<sup>st</sup> Century and must also be tested through comprehension passages to assess critical reading, critical thinking and writing skills. These four units will cover all literatures in English.

Unit –V: Language: Basic concepts, theories and pedagogy. English in Use.

Unit –VI: English in India: history, evolution and futures

Unit –VII: Cultural Studies

Unit –VIII: Literary Criticism

Unit –IX: Literary Theory post World War II

Unit –X: Research Methods and Materials in English.

## MANAGEMENT

- 1) **Management Process & Organizational Behavior-Overview:** Functions and Principles of management; Management Thought and Concepts; Management Decision Making Processes and Types. Overview of Organizational Behaviour;

Understanding and managing Individual Behavior-personality, Perception, Values, Attitudes, Learning and Motivation; Group Dynamics and Team Work. Leadership; Overview of Organizational Development: Organizational structure; Organizational design; OD Interventions & Change Management.

- 2) **Managerial Economics-Overview of Micro-Economics** : Basic Concepts of Demand and Supply; Demand Analysis; Production Function; Cost-Output Relations; market Structures; Pricing theories; Overview of macro-Economics; National Income Concepts; Budgeting.
- 3) **Quantitative Techniques Overview of Probability**: Types of Probability distributions (e.g. Binomial, Poisson, Normal and Exponential). Co-relation & Regression Analysis; Overview of Sampling: Sampling distributions; Tests of Hypothesis; Large and small samples. Univariate and Bivariate Data Analysis: t-test, z-test, Chi-square tests; ANOVA.
- 4) **Strategic Management- Overview of Strategic Management**: Concept of Corporate Strategy; BCG Model; GE-9 Cell Model ; Value Chain Analysis; SWOT & TOWS Analysis; Porter's Generic Strategies; Competitor Analysis. Overview of Strategy Formulation and Implementation at Corporate and Business level. Strategic Control.
- 5) **Ethics in Business Overview of Ethical issues in Business**: Value Based Organizations; Ethical Issues on Individual in Organizations; Gender Issues; Ecological Consciousness; Environmental Ethics; Social Responsibilities of Business; Corporate Governance and Ethics; Benefits of Corporate Social Responsibility.
- 6) **Human Resource management Overview of HRM**: Concepts and Perspectives in HRM; HRM in Changing Environment, Overview of HR Planning: Objectives Process and Techniques; Job Analysis; Recruitment and Selection, Induction; Training and Development; Performance & Potential Appraisal, Overview of Industrial Relations: Wage Policy and Determination; Trade Unions; Dispute Resolution and Grievance Management; Labour Welfare .Overview of e- HRM.
- 7) **Finance- Overview of Financial Accounting**; Analysis of Balance Sheet Statement, Overview of Cost Accounting: Costing Methods and Techniques, Overview of Financial Management: Fund Flow Analysis; Management of Working Capital, Overview of Capital Budgeting: Capital Budgeting Decisions; Capital Structure and Cost of Capital. Overview of Dividend Policy: Determinants; Long-term and Short-term Financing Instruments; Mergers and Acquisitions.
- 8) **Marketing Management**: Overview of Marketing: Marketing Mix, Market Segmentation, Targeting and Positioning; Overview of Product Management; Product Mix Decisions; Product Life Cycle, New Product Development, Branding; Pricing Methods and Strategies. Overview of Promotional Management: Promotion Mix; Advertising; Personal selling; Supply Chain Management; Viral & Niche Marketing; Customer Relation management. Overview of e-Marketing: Uses of Internet as Marketing Medium; Issues in Branding, Market Development, advertising and Retailing on Internet.
- 9) **Production Management**: Overview of Production management: Demand Forecasting for Operations; Production Scheduling; Work Measurement; time and Motion Study; Statistical Quality Control; Facility Location; Layout Planning. Overview of Operations Research: Linear programming; Transportation model; Inventory control; Queuing theory; Decision theory; PERT/CPM.
- 10) **Information System-Overview of MIS**: Application of Information Systems in management; MIS and Decision Making; System Analysis and Design. Overview of Database Management System; Overview of E-Commerce.

## **JOURNALISM & MASS COMMUNICATIONS**

- 1) **Introduction to Journalism and Mass Communication**  
Concept of Journalism and mass communication, mass communication in India. History, growth and development of print and electronic media. Major landmarks in print and electronic media in Indian languages. Media's role in formulation of states of India. Media criticism and media literacy, Press Council and Press Commissions of India, status of journalism and media education in India. Media policies of the Government of India since Independence. Models and theories of mass communication, normative theories, administrative and critical traditions in communication, media and journalism studies, communication and theories of socio-cultural, educational and agricultural change. Technological

determinism, critique of Marshall McLuhan's views on media and communication and Marxist approaches. Information and knowledge societies.

Indian traditions and approaches to communication from the Vedic era to the 21st century. Western and Eastern philosophical, ethical and aesthetic perceptions of communication - Aristotle and Plato, Hindu, Buddhist, and Islamic traditions.

Media and culture - framework for understanding culture in a globalised world. Globalisation with respect to politico-economic & socio-cultural developments in India.

## **2) Communication for Development and Social Change**

Concept and definition of development communication, role of media and journalism in society, characteristics of Indian society – demographic and sociological impact of communication, media and journalism. Media and specific audiences. Development and social change. Issues and post-colonial conceptions. Deconstruction of dominant paradigm of communication and development. Responses and critique of dominant models.

Corporatisation of development - Corporate Social Responsibility, non-state actors in development, mass campaigns by NGOs, Government of India, international agencies and corporates. Paradigms and discourse of development communication.

Emergence of global civil societies, public sphere, global communication system - nation state-universal, national communication policies.

Leading influencers of social reform in India - Raja Ram mohan Roy, Pandit Madan mohan Malviya, Bal Gangadhar Tilak, Mahatma Jyotiba Phule, Mahatma Gandhi, Acharya Vinoba Bhave, Dr B. R. Ambedkar, Deendayal Upadhyay, Dr Ram Manohar Lohia etc.

## **3) Reporting and Editing**

News-concepts, determinants (values), structure and perspectives. Reporting for print, radio, television and digital media. Types of reporting. National and international news agencies and feature syndicates, functions and role.

Writing for print, electronic and digital news media. Translation and transcreation. Editing and presentation techniques for print, television and digital media. Journalism as profession, reportage of contemporary issues, ethics of reporting. Critique of western news values, effect of new technology on global communication flows. Niche Reporting.

## **4) Advertising and Marketing Communication**

Definition, concept, functions, types, evolution of advertising, standards and ethics in advertising. theories and models of communication in advertising. Brand management. Advertising management - agency-role, structure and function, client-agency relationship, media planning and budgeting. Advertising and creativity, language and translation. Advertising campaign and marketing. Advertising and marketing research.

## **5) Public Relations and Corporate Communication**

Public Relations and Corporate Communication - definition, concept and scope. Structure of PR in State, Public, Private and non-government sectors. Tools and techniques of PR and Corporate Communication. Crisis communication and crisis communication management. Ethics of Public Relations. International Public Relations, communication audit.

## **6) Media Laws and Ethics**

Concept of law and ethics in India and rest of the world. The Constitution of India, historical evolution, relevance. Concept of freedom of speech and expression in Indian Constitution. Defamation, Libel, Slander-IPC 499-502, Sedition IPC 124(A), Contempt of Courts Act 1971, Official Secrets Act 1923, Press and Registration of Books Act 1867, Working Journalists and other Newspaper Employees (Conditions of Service) and Miscellaneous Provisions Act 1955, Wage Boards, Law of Obscenity (Section 292-294 of IPC); the Miller test, the Hicklin test, Indecent Representation of Women (Prohibition) Act 1986, Scheduled Castes and Tribes (Prevention of Atrocities) Act, 1989, Parliamentary Privileges. Famous cases involving journalists and news media organisations.

Right to Information Act 2005, Copyright Act 1957, Intellectual Property Rights, Cable Television Network (Regulation) Act 1995, Information Technology Act (relevant) 2000 and cyber laws, Cinematograph Act 1952, Film Censorship, Press Council Act as amended from time to time, IPR, ASCI, Drugs and Magic Remedies (Objectionable Advertisements) Act, 1954, Various regulatory bodies for print, TV, Advertising, PR, and Internet. Rules, regulations and guidelines for the media as recommended by Press Council of India, Information and Broadcasting ministry and other professional organisations, adversarial role of the media, human rights and media.

**7) Media Management and Production**

Definition, concept of media management. Grammar of electronic media. Communication design theories and practice. Media production techniques – print and electronic. Digital media production techniques. Economics and commerce of mass media in India. Principles and management in media industry post liberalisation.

**8) ICT and Media**

ICT and media - definition, characteristics and role. Effect of computer mediated communication. Impact of ICT on mass media. Digitisation. Social networking. Economics and commerce of web enabled media. Mobile adaption and new generation telephony by media, ethics and new media. ICT in education and development in India, online media and e-governance. Animation - concepts and techniques.

**9) Film and Visual Communication**

Film and television theory. Film and identity in Indian film studies, leading film directors of India before and after Independence. Indian cinema in the 21st century. Approaches to analysis of Indian television. Visual Communication. Visual analysis. Basics of film language and aesthetics, the dominant film paradigm, evolution of Indian cinema-commercial and 'non-commercial' genres, the Hindi film song, Indian aesthetics and poetics (the theory of Rasa and Dhvani).

National cinema movements: Soviet Montage cinema, German Expressionistic cinema, Italian Neo-Realistic cinema, French New Wave cinema, British New Wave cinema, Indian New Wave cinema, Period cinema. Cinema in the new millennium.

**10) Communication Research**

Definition, concept, constructs and approaches to communication research process.

Research Designs - types, structure, components, classical, experimental and quasi experimental, variables and hypotheses; types and methods of research; basic, applied, descriptive, analytical, historical, case study, longitudinal studies. Research in journalism, Public Relations, advertising, cinema, animation and graphics, television, Internet, social media practices, magazines, children's media. Communication, journalism and media research in India.

Levels of measurement: sampling-probability and non-probability, tests of validity and reliability, scaling techniques. Methods and tools of data collection-interviews, surveys, case studies, obtrusive and non-obtrusive techniques, ethnography, schedule, questionnaire, diary, and internet based tools, media specific methods such as exit polls, opinion polls, telephone, SMS surveys and voting with regard to GEC (general entertainment content). Data analysis, testing, interpretation, application of statistical tests-parametric and non-parametric, tests of variance-univariate, bivariate and multivariate, tests of significance, computer mediated research. Ethical considerations in communication, media and journalism research, writing research reports, plagiarism.

## **MATHEMATICS**

- 1) **Linear Algebra** : Finite dimensional vector spaces; Linear transformations and their matrix representations, rank; systems of linear equations, eigen values and eigen vectors, minimal polynomial, Cayley-Hamilton Theorem, diagonalisation, Hermitian, Skew-Hermitian and unitary matrices; Finite dimensional inner product spaces, Gram-Schmidt orthonormalization process, self-adjoint operators.
- 2) **Complex Analysis** : Analytic functions, conformal mappings, bilinear transformations; complex integration; Cauchy's integral theorem and formula; Liouville's theorem, maximum modulus principle; Taylor and Laurent's series; residue theorem and applications for evaluating real integrals.

- 3) **Real Analysis** : Sequences and series of functions, uniform convergence, power series, Fourier series, functions of several variables, maxima, minima; Riemann integration, multiple integrals, line, surface and volume integrals, theorems of Green, Stokes and Gauss; metric spaces, completeness, Weierstrass approximation theorem, compactness; Lebesgue integral, Fatou's lemma, dominated convergence theorem.
- 4) **Ordinary Differential Equations** : First order ordinary differential equations, existence and uniqueness theorems, systems of linear first order ordinary differential equations, linear ordinary differential equations of higher order with constant coefficients; linear second order ordinary differential equations with variable coefficients; method of Laplace transforms for solving ordinary differential equations, series solutions; Legendre and Bessel functions and their orthogonality.
- 5) **Algebra** : Normal subgroups and homomorphism theorems, automorphisms; Group actions, Sylow's theorems and their applications; Euclidean domains, Principal ideal domains and unique factorization domains. Prime ideals and maximal ideals in commutative rings; Fields, finite fields.
- 6) **Functional Analysis** : Banach spaces, Hahn-Banach extension theorem, open mapping and closed graph theorems, principle of uniform boundedness; Hilbert spaces, orthonormal bases, Riesz representation theorem, bounded linear operators.
- 7) **Probability and Statistics** : Probability space, conditional probability, Bayes theorem, independence, Random variables, joint and conditional distributions, standard probability distributions and their properties, expectation, conditional expectation, moments; weak and strong law of large numbers, central limit theorem; Sampling distributions; Testing of hypothesis, standard parametric tests based on normal, Chi-Square, t, F - distributions; Linear regression; Interval estimation.

## **MECHANICAL ENGINEERING**

### **1) Fluid Mechanics**

Basic Concepts and Properties of Fluids, Manometry, Fluid Statics, Buoyancy, Equations of Motion, Bernoulli's equation and applications, Viscous flow of incompressible fluids, Laminar and Turbulent flows, Flow through pipes and head losses in pipes.

### **2) Thermodynamics and Heat Transfer**

Thermodynamic systems and processes; properties of pure substance; Zeroth, First and Second Laws of Thermodynamics; Entropy, Irreversibility and availability; analysis of thermodynamic cycles related to energy conversion: Rankine, Otto, Diesel and Dual Cycles; ideal and real gases; compressibility factor; Gas mixtures. Modes of heat transfer, Steady and unsteady heat conduction, Thermal resistance, Fins, Free and forced convection, Correlations for convective heat transfer, Radiative heat transfer – Radiation heat transfer co-efficient; boiling and condensation, Heat exchanger performance analysis.

### **3) IC Engines, Refrigeration and Air Conditioning**

SI and CI Engines, Engine Systems and Components, Performance characteristics and testing of IC Engines; Fuels; Emissions and Emission Control. Vapour compression refrigeration, Refrigerants and Working cycles, Compressors, Condensers, Evaporators and Expansion devices, Other types of refrigeration systems like Vapour Absorption, Vapour jet, thermo electric and Vortex tube refrigeration. Psychometric properties and processes, Comfort chart, Comfort and industrial air conditioning, Load calculations and Heat pumps.

### **4) Turbo Machinery**

Reciprocating and Rotary pumps, Pelton wheel, Kaplan and Francis Turbines, velocity diagrams, Impulse and Reaction principles, Steam and Gas Turbines, Theory of Jet Propulsion – Pulse jet and Ram Jet Engines, Reciprocating and Rotary Compressors – Theory and Applications

### **5) Power Plant Engineering**



Rankine and Brayton cycles with regeneration and reheat, Fuels and their properties, Flue gas analysis, Boilers, steam turbines and other power plant components like condensers, air ejectors, electrostatic precipitators and cooling towers – their theory and design, types and applications;

#### **6) Renewable Sources of Energy**

Solar Radiation, Solar Thermal Energy collection - Flat Plate and focusing collectors their materials and performance. Solar Thermal Energy Storage, Applications – heating, cooling and Power Generation; Solar Photovoltaic Conversion; Harnessing of Wind Energy, Bio-mass and Tidal Energy – Methods and Applications, Working principles of Fuel Cells.

#### **7) Engineering Mechanics**

Analysis of System of Forces, Friction, Centroid and Centre of Gravity, Dynamics; Stresses and Strains-Compound Stresses and Strains, Bending Moment and Shear Force Diagrams, Theory of Bending Stresses- Slope and deflection-Torsion, Thin and thick Cylinders, Spheres.

#### **8) Engineering Materials**

Basic Crystallography, Alloys and Phase diagrams, Heat Treatment, Ferrous and Non Ferrous Metals, Non metallic materials, Basics of Nano-materials, Mechanical Properties and Testing, Corrosion prevention and control

#### **9) Mechanisms and Machines**

Types of Kinematics Pair, Mobility, Inversions, Kinematic Analysis, Velocity and Acceleration Analysis of Planar Mechanisms, CAMs with uniform acceleration and retardation, cycloidal motion, oscillating followers; Vibrations – Free and forced vibration of undamped and damped SDOF systems, Transmissibility Ratio, Vibration Isolation, Critical Speed of Shafts. Gears – Geometry of tooth profiles, Law of gearing, Involute profile, Interference, Helical, Spiral and Worm Gears, Gear Trains- Simple, compound and Epicyclic; Dynamic Analysis – Slider – crank mechanisms, turning moment computations, balancing of Revolving & Reciprocating masses, Gyroscopes – Effect of Gyroscopic couple on automobiles, ships and aircrafts, Governors.

#### **10) Design of Machine Elements**

Design for static and dynamic loading; failure theories; fatigue strength and the S-N diagram; principles of the design of machine elements such as riveted, welded and bolted joints. Shafts, Spur gears, rolling and sliding contact bearings, Brakes and clutches, flywheels.

#### **11) Manufacturing ,Industrial and Maintenance Engineering**

Metal casting-Metal forming, Metal Joining, Machining and machine tool operations, Limits, fits and tolerances, Metrology and inspection, computer Integrated manufacturing, FMS, Production planning and Control, Inventory control and operations research - CPM/PERT.

Failure concepts and characteristics-Reliability, Failure analysis, Machine Vibration, Data acquisition, Fault Detection, Vibration Monitoring, Field Balancing of Rotors, Noise Monitoring, Wear and Debris Analysis, Signature Analysis, NDT Techniques in Condition Monitoring.

#### **12) Mechatronics and Robotics**

Microprocessors and Microcontrollers: Architecture, programming, I/O, Computer interfacing, Programmable logic controller. Sensors and actuators, Piezoelectric accelerometer, Hall effect sensor, Optical Encoder, Resolver, Inductosyn, Pneumatic and Hydraulic actuators, stepper motor, Control Systems- Mathematical modeling of Physical systems, control signals, controllability and observability. Robotics, Robot Classification, Robot Specification, notation; Direct and Inverse Kinematics; Homogeneous Coordinates and Arm Equation of four Axis SCARA Robot.

## **MICROBIOLOGY**

### **1) Microbial Taxonomy and Diversity**

Microbial World, Concepts and Scope, Classifying and Naming Microorganisms, ICNB Rules, Major Characteristics used to Classify Microorganisms, Importance and Conservation of Microbial Diversity, Metagenomics, In situ Conservation and Ex situ Conservation, Role of Culture collection centers in conservation.

## **2) Microbial Physiology**

Microbial Energetics, Microbial enzymes, Metabolism of Carbohydrate, Alternate pathways of Carbohydrate Metabolism, Gluconeogenesis, Utilization of sugars other than glucose, Lipid metabolism, Nitrogen metabolism, Nucleic acid metabolism, Photosynthetic bacteria, Autotrophic Mechanisms in bacteria, Microbial Stress Responses to different conditions.

## **3) Microbial Genetics**

Generalized reproductive cycles of microbes: Viruses, Bacteria, Neurospora, Saccharomyces, Chlamydomonas and Acetabularia. Viral Genetics: Phage Phenotypes, Phenotypic Mixing, Bacterial Genetics: Bacterial Transformation, Bacterial Conjugation, Hfr conjugation. Transduction: Generalized and specialized transduction, Mutation and mutagenesis, Fungal and algal genetics.

## **4) Immunology**

Immunity, Innate immunity: physical, biochemical and genetic factors involved in governing innate immunity, Acquired immunity, humoral or antibody mediated immunity, cell mediated immunity. Immunological disorders: Hypersensitivity Type I to Type IV, Immunodeficiency diseases; AIDS and other acquired or secondary immunodeficiencies, HIV – 1 and associated opportunistic infections, autoimmune diseases, Antigens and Antibodies, Immunogenicity versus Antigenicity, Factors that influence immunogenicity Antigen processing and presentation, properties of antigen, Super antigen, Hapten; Haptens and the study of antigenicity Microbes as antigen Antigen recognition and MHC molecules. Antibodies – structure and function, clonal selection, antibody diversity, monoclonal antibodies and its clinical applications, Antibody engineering (Construction of monoclonal antibodies Lymphoma and other diseases by genetically engineered antibodies.

## **5) Environmental Microbiology**

Microbiology of air, water and soil, Sources of water pollution, Biological indicators of water pollution, Water and air borne diseases. Determination of potable quality of water, Microbes in extreme environment and their survival mechanisms, Microbes in the degradation of wastes, Microbial degradation of pesticides, Xenobiotics, bioremediation - advantages and disadvantages, Geomicrobiology: Microbes in metal extraction, mineral leaching and mining.

## **6) Food Microbiology**

Concepts and scope, Detection of food-borne microorganisms, Microbial spoilage of foods, Food poisoning and intoxication, Food borne diseases, Food preservation, Microbial indicators of food safety and quality, Food laws and standards.

## **7) Agricultural Microbiology**

Introduction to Agricultural Microbiology, Plant pathology, Diagnosis of plant diseases, Parasitism and disease development, Entry of pathogens to the host, Effect on physiology of host, Plant disease epidemiology, Environment and Plant diseases, Defense Mechanism of Plant Disease, Plant Diseases and their management, Host pathogen interaction, Biofertilizer, PGPR, Biopesticides.

## **8) Medical Microbiology**

Milestones in the development of Medical Microbiology, Microbial Infections, Urinary tract infections, Sexually transmissible infection, Oral cavity and respiratory infection, Gastrointestine infection, Nosocomial infections, General concepts for specimen collection and handling of specimen, Epidemiology, Pathogenesis, Spectrum of disease, Laboratory diagnosis and Prevention. Diseases caused by Viruses, Bacteria, Fungi, Chlamydiae, Protozoa and emerging diseases,

## **9) Industrial Microbiology**

Concepts and Scope of industrial Microbiology, Fermentation, Development of inocula, Fermenters, Batch and Continuous fermentation, Industrially important microorganisms, strain improvement and preservation, Media for industrial fermentation, sterilization, upstream processing, downstream processing, Industrial production of energy fuels (solvents), organic acids, enzymes (amino acids), food additives, Health care products (antibiotics, vitamins), probiotics,

biomass production (SCP), hydrocarbons, recombinant proteins, quality control of fermented products, IPR, Patents, Biosafety and Entrepreneurship.

### **10) Molecular Biology and Genetic Engineering**

Concept and scope of Molecular Biology and Genetic engineering, Microbes in Molecular Biology, DNA as Genetic material, DNA replication, Differences in prokaryotic and eukaryotic DNA replication, Protein synthesis, Gene expression, Regulation of gene expression in prokaryotes, eukaryotes and bacteriophages, Gene silencing, Importance of gene cloning and future perspectives, Enzymes in genetic engineering, Cloning vectors, Applications of Genetic Engineering, Antisense technology, Safety of DNA technology, Restriction and regulation for the release of GMOs into Environment, Ethical, Legal, Social and Environmental Issues related to DNA technology.

## **PHYSICS**

- 1) **Mathematical Physics:** Dimensional analysis, Vector algebra and vector calculus, Linear algebra, Matrices, Linear differential equations, Elementary probability theory, Binomial, Poisson and normal distributions, Fourier series, Fourier and Laplace transforms, Elements of complex analysis.
- 2) **Classical Mechanics:** Newton's law, central forces, Kepler's law and planetary motion, Lagrange and Hamilton's formalisms, Special theory of relativity – Lorentz transformations, time dilation, Length contraction, Relativistic kinematics, Variation of mass with velocity, Mass – Energy equivalence, Relation between energy and momentum.
- 3) **Electromagnetic Theory & Acoustic wave:** Gauss's Law and its applications, Laplace and Poisson equations, Magnetostatics : Bio-Savart's law, Ampere's theorem, Electromagnetic induction, Faraday's law, Maxwell's equations, Scalar and vector potentials, Electromagnetic waves and their reflection , Refraction, Interference, diffraction,polarization,Poynting vector, Energy and momentum ;electromagnetic waves, acoustics, acoustical holography, acoustic radiation, acoustic transmission.
- 4) **Quantum Mechanics:** Physical basis of quantum mechanics, Wave – Particle duality, De-Broglie hypothesis, Wave packet and group velocity, , Heisenberg's uncertainty principle, Schrodinger equation (time dependent and time independent), Eigen value problems such as particle- in- a- box, Harmonic oscillator etc.
- 5) **Thermodynamics and Statistical Physics:** Law of thermodynamics and their consequences, Macro state and microstates, Phase space, Probability ensembles, Partition function, Free energy, Calculation of thermodynamic quantities, Classical and quantum statistics, Degenerate Fermi gas, Black body radiation and Planck's distribution law, Bose- Einstein condensation, First and second order phase transitions.
- 6) **Atomic and Molecular Physics:** Quantum states of an electron in an atom, Electron spin, Spectra of one-and manyelectron atoms, Relativistic corrections for energy levels of hydrogen, Hyperfine structure and isotopic shift, Width of spectral lines, LS & JJ coupling, Zeeman, Paschen Back and Stark effect, X-ray spectroscopy, Electron spin resonance, Nuclear magnetic resonance, lasers.
- 7) **Solid State Physics:** Atomic structure and bonding in materials. Crystal structure of materials, unit cell and space lattices, Miller indices of planes and directions, Concept of amorphous, Single and polycrystalline structures and their effect on properties of materials, Crystal growth techniques, Free electron theory, Band theory of solids; metals, semiconductors and insulators, Hall effect, superconductivity, Fermi level, energy gap.
- 8) **Nuclear and Particle Physics:** Basic nuclear properties, Size, Shape, Charge distribution, Spin and Parity, Mass defect, Binding energy, semi-empirical mass formula, Liquid drop model, Nature of nuclear force, Nuclear shell model, Alpha decay, Beta decay, Gama decay, Laws of radioactivity, Nuclear reactions, Compound nuclei and direct reactions, Controlled and uncontrolled chain reaction, critical mass, fission and fusion, Nuclear reactor, Elementary particles.
- 9) **Electronics:** Semiconductor devices & physics P-N-Jn.depletion region, barrier potential, Transistors, Bipolar junction Transistors, Field effect transistors, UJT,SCR, Rectifier circuits, , Logic gates and symbols, Boolean algebra & Karnaugh map, DeMorgan's theorem, Basic digital logic circuits, Optoelectronic devices including solar cells; photonic devices; Photo detectors and LEDs, Digital techniques and applications (Registers Counters, Comparators and similar circuits); ICs; modulation & demodulation, AM,PM,FM;A/D and D/A convertors; Sensors.

## **ZOOLOGY**

- 1) **Non-Chordata and Chordata** : A general survey, classification and relationship of the various phyla. Protozoa : Study of the structure, bionomics and life history of 'Jerboa' (Amoeba), Paramecium, Monocystic, malarial parasite, Trypanosoma. Protozoa & disease. Perifera : Sycon. Coelenterate: Structure and life history of Obelia and Aurelia. Sea anemones, Corals, Aequorea. Helminths, Structure and life history of planaria. Fasciola. Taenia. Ascaris, Medical importance of Nematodes. Annelida, Nereis, earthworm and leech. Arthropoda, Palaemon, Scorpion, Cockroach, Mollusca. Unio and Pinctada, Pearl Formation. Modifications of nervous system. Echinodermata, Asterias and its larva. General organisation and characters, outline classification and inter-relationships of proto - chordata. Pisces, Amphibia, Reptilia, Aves and Mammalia. Neoteny and retrogressive metamorphosis. A general study of comparative account of the various systems of vertebrates. Locomotion and respiration in fishes, structure and affinities of Dipnoi. Structural peculiarities of Amphibia. Poisonous and non-poisonous snakes of India, Aerial adaptations of birds. Structural peculiarities and affinities distribution relation of prototheria and Metatheria.
- 2) **Ecology and Economic Zoology**: Environment: Abiotic factors and their role; Biotic factors -Inter and Intra-specific relations. Ecosystem, Biogeo-Chemical cycles. Adaptation in fresh water, marine and terrestrial habitats. Pollution in air, water and land. Wild life in India and its conservation.
- 3) **Economic Zoology**: Parasitism, Commensalism and Host parasite relationship. Parasitic protozoan's and helminths of man. Beneficial and harmful insects.
- 4) **Cell Biology** -Structure and function of cell and cytoplasmic constituents : structure of nucleus, plasma membrane, mitochondria, Golgi-bodies, endoplasmic reticulum and ribosomes, cell division, mitosis and meiosis. Gene structure and function: Watson-Crick models of DNA, sex-chromosomes and sex-determination.
- 5) **Genetics** - Mendelian laws of inheritance, linkage and crossing over, mutation and evolution, cytoplasmic inheritance genes and diseases.
- 6) **Evolution and Systematics** - Origin of life, History of evolutionary thought. Lamarck and his works, Darwin and his works, Sources and nature of organic variation. Natural selection, Isolation. Concept of species and sub-species, principles of classification, zoological nomenclature and international code. Fossils, geological eras, distribution of animal's zoogeographical realms of the world.
- 7) **Biochemistry** -Structure of carbohydrates, lipids, amino-acids, proteins and nucleic acids, glycolysis and Krebs cycle, oxidation and reduction. Oxidative phosphorylation, energy conservation and release, ATP, cholesterol. Enzymes and coenzymes, Hormones and their functions.
- 8) **Physiology with special reference to mammals**: Composition of blood, blood groups in man, coagulation, oxygen and carbon dioxide transport, nephron and urine formation, mechanism of conduction along axon and across synapse, neurotransmitters, Vision, Hearing and other receptors, mechanism of contraction of skeletal muscle, role of salivary gland, liver, pancreas and intestinal glands in digestion. Absorption of digested food, roles of pituitary, thyroid, parathyroid, pancreas, adrenal testis, ovary and pineal body.
- 9) **Embryology**: Gametogenesis, fertilization, types of eggs, cleavage, development up to gastrulation in Branchiostoma, frog and chick, Metamorphosis in frog; Formation and fate of extra embryonic membranes in chick; formation of amnion, allantois and classification of placenta in mammals, function, of placenta in mammals.

## **CIVIL ENGINEERING**

### 1) **Structural Engineering**

Mechanics: Bending moment and shear force, simple stress and strain relationship, principal stresses, stress transformation, Mohr's circle. Simple bending theory, bending and shear stresses, combined and direct bending stresses, unsymmetrical bending, shear centre. Construction materials, Analysis of determinate and indeterminate structures, Static and kinematic indeterminacy, Design of concrete and steel structures, Finite element method

## **2) Geotechnical Engineering**

Soil Mechanics: Origin of soils, soil classification, three-phase system, fundamental definitions, relationship and interrelationships, permeability & seepage, effective stress principle, consolidation, compaction, shear strength. Foundation Engineering: Sub-surface investigations- scope, drilling bore holes, sampling, penetration tests, and plate load test. Earth pressure theories, effect of water table, layered soils. Stability of slopes-infinite slopes, finite slopes. Foundation types-foundation design requirements. Shallow foundations-bearing capacity, effect of shape, water table and other factors, stress distribution, settlement analysis in sands & clays. Deep foundations pile types, dynamic & static formulae, load capacity of piles in sands & clays, negative skin friction. Machine foundation

## **3) Environmental Engineering**

Water requirements: Quality standards, basic unit processes and operations for water treatment. Drinking water standards, water requirements, distribution of water. Sewage and sewerage treatment, quantity and characteristics of wastewater. Primary, secondary and tertiary treatment of wastewater, sludge disposal, effluent discharge standards. Domestic wastewater treatment processes, quantity of characteristics of domestic wastewater, primary and secondary treatment, sludge disposal. Air Pollution and Noise Pollution: Types of pollutants, their sources and impacts, air pollution meteorology, air pollution control, air quality standards and limits. Impacts of noise, permissible limits of noise pollution, measurement of noise and control of noise pollution. Municipal Solid Wastes: Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/recycle, energy recovery, treatment and disposal).

## **4) Water Resources Engineering**

Fluid Mechanics and Hydraulics: Properties of fluids, principle of conservation of mass, momentum, energy and corresponding equations, potential flow, applications of momentum and Bernoulli's equation, laminar and turbulent flow, flow in pipes, pipe networks. Concept of boundary layer and its growth. Uniform flow, critical flow and gradually varied flow in channels, specific energy concept, hydraulic jump. Forces on immersed bodies, flow measurements in channels, tanks and pipes. Dimensional analysis and hydraulic modeling. Kinematics of flow, velocity triangles and specific speed of pumps and turbines.

Hydrology: Hydrologic cycle, rainfall, evaporation, infiltration, stage discharge relationships, unit hydrographs, flood estimation, reservoir capacity, reservoir and channel routing. Well hydraulics.

Irrigation: Duty, delta, estimation of evapo-transpiration. Crop water requirements. Design of: lined and unlined canals, waterways, head works, gravity dams and spillways. Design of weirs on permeable foundation. Types of irrigation system, irrigation methods. Water logging and drainage

## **5) Transportation Engineering**

Highway Planning: Geometric design of highways, testing and specifications of paving materials, design of flexible and rigid pavements. Traffic Engineering: Traffic characteristics, theory of traffic flow, intersection design, traffic signs and signal design, highway capacity. Surveying: Importance of surveying, principles and classifications, mapping concepts, coordinate system, map projections, measurements of distance and directions, leveling, theodolite traversing, plane table surveying, Electronic Distance measurement errors and adjustments, curves.

## **6) Construction Engineering & Management**

Fundamentals of Engineering mechanics and solid mechanics. Modern Construction Materials; Concrete Technology, Construction equipment and management, Construction planning, scheduling techniques, Cost and Quality control. Resource Management in Construction; Construction contracts.

# **POLITICAL SCIENCE**

### **1) Political Theory**

Concepts Liberty, Equality, Justice, Rights, Democracy, Power, Citizenship, Political Traditions Liberalism Conservatism Socialism, Marxism Feminism Ecologism

### **2) Political Thought**

Confucius, Plato, Aristotle, Machiavelli, Hobbes, Locke, Rousseau, Hegel, Mary Wollstonecraft, John Stuart Mill, Karl Marx,

### **3) Indian Political Thought**

Dharamshastra, Kautilya, Aggannasutta, Barani, Kabir, Pandita Ramabai, Bal Gangadhar Tilak, Swami Vivekanand, Rabindranath Tagore, M.K Gandhi, Sri Aurobindo, Periyar E. V. Ramasamy, Muhammad Iqbal, M.N.Roy, V D Savarkar, Dr. B.R.Ambedkar, J L Nehru, Ram Manohar Lohia, Jaya Prakash Narayan, Deendayal Upadhyaya

### **4) Comparative Political Analysis**

Approaches: Institutional, Political Culture, Political Economy and New Institutionalism; Comparative Methods

Colonialism and decolonization: forms of colonialism, anti-colonial struggles and decolonization

State theory: debate over the nature of state in capitalist and socialist societies; post-colonial state; welfare state; globalization and nations-states

Political regimes: democratic and non-democratic regimes

Constitutions and Constitutionalism: forms of constitutions, rule of law, judicial independence and liberal constitutionalism; emergency powers and crisis of constitutionalism.

Democratisation: democratic transition and consolidation.

Development: Underdevelopment, Dependency, Modernization, World Systems Theory, development and democracy.

Structures of Power: ruling class, power elites, democratic elitism

### **5) International Relations**

Concepts: State, state system and non-state actors, Power, Sovereignty, Security: traditional and non- traditional.

Conflict and Peace: Changing Nature of Warfare; Weapons of mass destruction; deterrence; conflict resolution, conflict transformation.

Contemporary Challenges: International terrorism, Climate change and Environmental Concerns, Human Rights, Migration and Refugees; Poverty and Development; Role of Religion, Culture and Identity Politics.

### **6) India's Foreign Policy**

Perspectives on India's Foreign Policy: India's Identity as postcolonial, development, rising power and as emerging political economy Continuity and change in India's Foreign Policy: Principles and determinants; Non-Alignment movement: historical background and relevance of Non Aligned Movement; India's Nuclear Policy India's relations with major powers: USA, USSR/Russia, People's Republic of China India's Engagement with multipolar world: India's relations with European Union, BRICS, ASEAN, Shanghai Cooperation Organisation, African Union, Southern African Development Community, Gulf Cooperation Council India's relations with neighbourhood: SAARC, Gujaral doctrine, Look East / Act East, Look West. India's Negotiation Strategies in International Regimes: The United Nations, World Trade Organisation, International Monetary Fund, Intergovernmental Panel on Climate Change

### **7) Political Institutions in India**

Making of the Indian Constitution: Colonialism heritage and the contribution Indian National Movement to the making of the Indian Constitution

Philosophy of the Constitution: Preamble, Fundamental Rights, Directive Principles

Union Executive: President, Prime Minister and Council of Ministers

Union Parliament: Structure, Role and Functioning, Parliamentary Committees

Judiciary: Supreme Court, High Court, Judicial Review, Judicial Activism, Judicial Reform.

Executive and Legislature in the States: Governor, Chief Minister, State Legislature

Electoral Process and Election Commission of India: Conduct of Elections, Rules, Electoral Reforms.

Local Government Institutions: Functioning and reforms.

Constitutional and Statutory Bodies: Comptroller and Auditor General, National Commission for Scheduled Castes, National Commission for Scheduled Tribes, National Commission for Human Rights, National Commission for Women, National Commission for Minorities.

### **8) Political Processes in India**

State, Economy and Development: Nature of Indian State, Development Planning model, New Economic Policy, Growth and Human Development.  
Process of globalisation: social and economic implications. Identity Politics: Religion, Tribe, Caste, Region, Language.  
Social Movements: Dalit, Tribal, Women, Farmers, labour  
Civil Society Groups: Non-Party Social Formations, Non-Governmental Organisations, Social Action Groups.

## **SOCIOLOGY**

### **1) Sociological Theory**

Classical Sociological Traditions

Emile Durkheim  
Max Weber  
Karl Marx

Structure- Functionalism and Structuralism

Talcott Parsons  
Robert K. Merton

Indian Thinkers

M.K. Gandhi  
B.R. Ambedkar  
Radha Kamal Mukherjee  
G. S. Ghurye  
M.N. Srinivas  
Irawati Karve

### **2) Basic Concepts and Institutions**

Sociological Concepts

Social Structure  
Culture  
Status and Role  
Community  
Values, Norms and Rules  
Bureaucracy, Power and Authority

Social Institutions

Marriage, Family and Kinship  
Religion  
Law and Customs

Social Stratification

Social Difference, Hierarchy, Inequality and Marginalization  
Caste and Class  
Gender, Sexuality and Disability  
Race, Tribe and Ethnicity

Social Change and Processes

Evolution and Diffusion  
Modernization and Development  
Social Mobility

### **3) Rural and Urban Transformations**

Caste-Tribe Settlements  
Agrarian Social Structure and Emergent Class Relations  
Land Ownership and Agrarian Relations  
Urbanism, Urbanity and Urbanization  
Neighbourhood, Slums and Ethnic Enclaves

### **4) Economy and Society**

- Mode of Production Debates
- Property and Property Relations
- Models of Economic Development
- Poverty and Exclusion
- Changing Nature of Labour Relations
- Gender and Labour Process
- Digital Economy, E-Commerce
- Global Business and Corporates
- Tourism
- Consumption
- 5) **Environment and Society**
  - Social and Cultural Ecology: Diverse Forms
  - Technological Change, Agriculture and Biodiversity
  - Indigenous Knowledge Systems and Ethno-Medicine
  - Forest Policies, Adivasis and Exclusion
  - Development, Displacement and Rehabilitation
  - Environmental Pollution, Public Health and Disability
- 6) **Science, Technology and Society**
  - History of Technological Development
  - Virtual Community
  - Media: Print and Electronic, Visual and Social Media
  - E-Governance and Surveillance Society
  - Technology and Emerging Political Processes
  - State Policy, Digital Divide and Inclusion
  - Cyber Crime
- 7) **Culture and Symbolic Transformations**
  - Signs and Symbols
  - Rituals, Beliefs and Practices
  - Changing Material Culture
  - Commodification of Rituals
  - Communalism and Secularism
  - Ethics and Morality
  - Religion and Economy
  - Culture and Environment

## **HISTORY**

- 1) **Negotiating the Sources:** Archaeological sources: Exploration, Excavation, Epigraphy and Numismatics. Dating of Archaeological Sites. Literary Sources: Indigenous Literature: Primary and Secondary: problem of dating Religious and Secular Literature, Myths, Legends, etc. Foreign Accounts: Greek, Chinese and Arabic. Indus/Harappa Civilization: Origin, extent, major sites, settlement pattern, craft specialization, religion, society and polity, Decline of Indus Civilization, Internal and external trade, First urbanization in India. Vedic and later Vedic periods; Aryan debates, Political and Social Institutions, State Structure and Theories of State; Emergence of Varna and Social Stratification, Religious and Philosophical Ideas. Introduction of Iron Technology, Megaliths of South India. Expansion of State system: Mahajan pad as, Monarchical and Republican States, Economic and Social Developments and Emergence of Second Urbanization in 6<sup>th</sup> century BCE; Emergence of heterodox sects-Jainism, Buddhism.
- 2) **From State to Empire:** Rise of Magadha, Greek invasion under Alexander and its effects, Mauryan expansion, Mauryan polity, society, economy, Asoka's Dhamma and its Nature, Decline and Disintegration of the Mauryan Empire, Mauryan art and architecture, Asokan edicts: language and script.
- 3) **Dissolution of Empire and Emergence of Regional Powers:** Indo-Greeks, Sungas, Satavahanas, Kushanas and Sakas-Ksatrapas, Sangam literature, polity and society in South India as reflected in Sangam literature. Trade and



commerce from 2<sup>nd</sup> century BCE to 3<sup>rd</sup> century CE, Trade with the Roman World, Gandhara, Mathura and Amaravatischools.

Gupta Vakataka age: Polity and Society, Agrarian Economy, Land Grants, Land Revenue and Land Rights, Gupta Coins, Beginning of Temple Architecture, Emergence of Puranic Hinduism, Development of Sanskrit Language and Literature. Developments in Science Technology, Astronomy, Mathematics and Medicine. Harsha (Pushyabhuti Dynasty)

Emergence of Regional Kingdoms: Kingdoms in Deccan: Chalukyas, Rashtrakutas, Kalyani Chalukyas, Kakatiyas, Hoysalas and Yadavas. Kingdoms in South India: Pallavas, Ceras, Colas and Pandyas, Kingdoms in Eastern India: Palas and Senas of Bengal, Varmans of Kamarupa, Bhaumakaras and Somavamsis of Odisha. Kingdoms in North India: Gurjara-Pratiharas, Kalacuri-Chedis, Gahadavalas and Paramaras. Characteristics of Early Medieval India: Administration and Political Structure Legitimation of Kingship. Tamil Bhakti movement - Shankara, Madhava and Ramanujacharya. Arab contracts: Suleiman Ghaznavid conquests. Alberuni's Accounts.

- 4) **Source of Medieval Indian History:** Archaeological, Epigraphic and Numismatic sources, Material evidences and Monuments; Chronicles; Literary sources – Persian, Sanskrit and Regional languages; Daftar Khannas: Firmans, Bahis / Pothis / Akhbarat; Foreign Travellers' Accounts – Persian and Arabic.  
Political Developments – The Delhi Sultanate – the Ghorids, the Turks, the Khaljis, the Tughlaqs, the Sayyids and the Lodis. Decline of Delhi Sultanate.  
Foundation of the Mughal Empire – Babur, Humayun and the Suris; Expansion and Consolidation from Akbar to Aurangzeb. Decline of the Mughal Empire. Later Mughals and Disintegration of the Mughal Empire. The Vijayanagara and the Bahmanis - Deccan Sultanate; Bijapur, Golkonda, Bidar, Berar and Ahmadnagar – Rise, Expansion and Disintegration; Eastern Gangas and Suryavamsi Gajapatis. Rise of the Marathas & the foundation of Swaraj by Shivaji; its expansion under the Peshwas; Mughal – Maratha relations, Maratha Confederacy, Causes of Decline.
- 5) **Administration & Economy:** Administration under the Sultanate, Nature of State – Theocratic and Theocentric, Central, Provincial and Local Administration, Law of succession.  
Sher Shah's Administrative Reforms; Mughal Administration – Central, Provincial and Local : Mansabdari and Jagirdari Systems.  
Administrative System in the Deccan – The Vijayanagara State & Polity, Bahamani Administrative System; Maratha Administration – Asta Pradhan. Agricultural Production and Irrigation System, Village Economy, Peasantry, Grants and Agricultural Loans, Urbanization and Demographic Structure.
- 6) **The Sufis** – Their Orders, Beliefs and Practices, the leading Sufi Saints, Social Synchronization. Bhakti Movement – Shaivism; Vaishnavism, Shaktism. The Saints of the Medieval Period – North and South – their impact on Socio-Political and Religious Life – Women Saints of Medieval India. The Sikh Movement – Guru Nanak Dev: his teachings and practices, Adi Granth; the Khalsa. Fine Arts – Major Schools of Painting – Mughal, Rajasthani, Pahari, Garhwali; Development of Music. Art and Architecture, Indo-Islamic Architecture, Mughal Architecture, Regional Styles. Indo-Arabic Architecture, Mughal Gardens, Maratha Forts, Shrines and Temples.
- 7) **Sources of Modern Indian History:** Archival Materials, Biographies and Memoirs, Newspapers, Oral Evidence, Creative Literature and Painting, Monuments, Coins.  
Rise of British Power: European Traders in India in the 16<sup>th</sup> to 18<sup>th</sup> Centuries – Portuguese, Dutch, French and the British. Establishment and Expansion of British Dominion in India. British Relations with Principal Indian States – Bengal, Oudh, Hyderabad, Mysore, Carnatic and Punjab. Revolt of 1857, Causes, Nature and Impact. Administration of the Company and the Crown; Evolution of Central and Provincial Structure under East India Company. Local Self-Government. Constitutional Changes, 1909 – 1935.
- 8) **Expansion and Commercialization of Agriculture,** Land Rights, Land Settlements, Rural Indebtedness, Landless Labour, Irrigation and Canal System. Decline of Industries – Changing Socio-Economic Conditions of Artisans; De-urbanisation; Economic Drain; World Wars and Economy. Monetary Policy, Banking, Currency and Exchange, Railways and Road Transport, Communications – Post & Telegraph.  
Indian Renaissance – Socio-Religious Reforms; Emergence of Middle Class; Caste Associations and Caste Mobility.
- 9) **Rise of Indian Nationalism:** Social and Economic basis of Nationalism. Birth of Indian National Congress;

Ideologies and Programmes of the Indian National Congress, 1885-1920: Early Nationalists, Assertive Nationalists and Revolutionaries. Swadeshi and Swaraj. Gandhian Mass Movements; Subas Chandra Bose and INA; Role of Middle Class in National Movement; Women Participation in National Movement.

Left Wing Politics. Depressed Class Movement. Communal Politics; Muslim League and Genesis of Pakistan. Towards Independence and Partition. India after Independence: Challenges of Partition; Integration of the Indian Princely States; Kashmir, Hyderabad & Junagarh.

B.R. Ambedkar – The making of the Indian Constitution, its Features. The Structure of Bureaucracy. New Education Policy. Economic Policies and the Planning process; Development, Displacement and Tribal Issues. Linguistic Reorganisation of States; Centre-State Relations. Foreign Policy Initiatives – Panchsheel; Dynamics of Indian Politics-Emergency; Liberalisation, Privatisation & Globalisation of Indian Economy.

**10) Historical Method, Research, Methodology and Historiography:** Scope and Importance of History

Objectivity and Bias in History Heuristics Operation, Criticism in History, Synthesis and Presentation History and its Auxiliary Sciences History a Science, Arts or a Social Science Causation and Imagination in History Significance of Regional History Recent Trends of Indian History Research Methodology Hypothesis in History Area of Proposed Research Sources – Data Collection, Primary / Secondary, Original and Transit Sources Trends in Historical Research Recent Indian Historiography Selection of Topic in History Notes Taking, References, Footnotes and Bibliography Thesis and Assignment Writing

Plagiarism, Intellectual Dishonesty and History Writing Beginnings of Historical Writings – Greek, Roman and Church Historiography Renaissance and its Impact on History Writing Negative and Positive Schools of Historical Writing Berlin Revolution in History Writing – Von Ranke Marxist Philosophy of History – Scientific Materialism Cyclical Theory of History – Oswald Spengler Challenge and Response Theory – Arnold Joseph Toynbee Post – Modernism in History

## **Law**

- 1) **JURISPRUDENCE:** Nature and sources of law, Schools of jurisprudence, Law and morality  
Concept of rights and duties, Legal personality, Concepts of property, ownership, and possession, Concept of liability.
- 2) **CONSTITUTIONAL AND ADMINISTRATIVE LAW:** Preamble, fundamental rights, and duties, directive principles of state policy, Union and State executive and their interrelationship  
Union and State legislature and distribution of legislative powers, Judiciary, Emergency provisions, Election Commission of India, Nature, scope, and importance of administrative law.
- 3) **PUBLIC INTERNATIONAL LAW AND IHL:** International law – Definition, nature and basis, Sources of International law, Recognition of states and governments, Nationality, immigrants, refugees and internally displaced persons (IDPs), United Nations and its organs, Settlement of international disputes, World Trade Organization (WTO), International humanitarian law (IHL) – Conventions and protocols, Implementation of IHL – Challenges.
- 4) **LAW OF CRIMES:** General principles of criminal liability – Actus reus and men's rea, individual and group liability and constructive liability, Stages of crime and inchoate crimes – Abetment, criminal conspiracy, and attempt, General exceptions, Offenses against the human body, Offenses against state and terrorism, Offenses against property, Offenses against women and children, Drug trafficking and counterfeiting, Offenses against public tranquility, Theories and kinds of punishments.
- 5) **LAW OF TORTS AND CONSUMER PROTECTION:** Nature and definition of tort  
General principles of tortious liability, General defenses, Specific torts – Negligence, nuisance, trespass, and defamation, Remoteness of damages, Strict and absolute liability, The Consumer Protection Act 1986 – Definitions, consumer rights, and redressal mechanism.

- 6) **COMMERCIAL LAW:** Essential elements of contract and e-contract  
Breach of contract, the frustration of contract, void and voidable agreements  
The standard form of contract and quasi-contract, Specific contracts – Bailment, pledge, indemnity, guarantee, and agency, Sale of Goods Act, 1930, Partnership and limited liability partnership, Negotiable Instruments Act, 1881, Company law – Incorporation of a company, prospectus, shares, and debentures, Company law – Directors and meetings, Corporate social responsibility.
- 7) **FAMILY LAW:** Sources and schools, Marriage and dissolution of marriage  
Matrimonial remedies – Divorce and theories of divorce, Changing dimensions of the institution of marriage – Live-in relationship, Maintenance, dower, and stridhan  
Adoption, guardianship, and acknowledgment, Succession and inheritance  
Will, gift, and wakf, Uniform Civil Code.
- 8) **ENVIRONMENT AND HUMAN RIGHTS LAW:** Meaning and concept of ‘environment’ and  
‘environmental pollution, International environmental law and UN Conferences  
Constitutional and legal framework for the protection of the environment in India  
Environmental Impact Assessment and control of hazardous waste in India  
National Green Tribunal, Concept and development of human rights, International Bill of Rights, Group rights – Women, children, persons with disabilities, elderly persons, minorities and weaker sections, Protection and enforcement of human rights in India – National Human Rights, Commission, National Commission for Minorities, National Commission for, Women, National Commission for Scheduled Castes, National Commission for Schedule Tribes and National Commission for Backward Classes.
- 9) **INTELLECTUAL PROPERTY RIGHTS AND INFORMATION TECHNOLOGY LAW:** Concept and meaning of intellectual property  
Theories of intellectual property  
International conventions pertaining to intellectual properties  
Copyright and neighboring rights – Subject matters, limitations and exceptions, infringement and remedies, Law of patent – Patentability, procedure for grant of patent, limitations and exceptions, infringement and remedies  
Law of trademark – Registration of trademarks, kinds of trademarks, infringement and passing off, remedies, Protection of Geographical Indications  
Biodiversity and Traditional Knowledge, Information technology law- digital signature and electronic signature, electronic, governance, electronic records, and duties of subscribers  
Cybercrimes, penalties, and adjudication.
- 10) **COMPARATIVE PUBLIC LAW AND SYSTEMS OF GOVERNANCE:**  
Comparative Law – Relevance, methodology, problems, and concerns in Comparison  
Forms of governments – Presidential and parliamentary, unitary and federal  
Models of federalism – USA, Canada, and India, Rule of Law – ‘Formal’ and ‘substantive’ versions, Separation of powers – India, UK, USA, and France, Independence of judiciary, judicial activism and accountability – India, UK and USA, Systems of constitutional review – India, USA, Switzerland, and France, Amendment of the Constitution – India, USA, and South Africa Ombudsman –Sweden, UK, and India, Open Government and Right to Information – USA, UK, and India

**Reference Books:-**

- Avtar Singh (2021). Law of Contract & Specific Relief, Lucknow: Eastern Book Company.

- R.K. Bangia's (2018) Law of Torts including Compensation under the Motor Vehicles Act and Consumer Protection Laws, Allahabad, Law Agency.
- U.P.D. Kesari (2020) Administrative Law, Allahabad, Central Law Publications.
- Kapoor, S K - Human Rights, CLA.
- Dr. G.B. Reddy's-Intellectual Property Rights and the Law.
- Prof.(Mrs.) Nomita Aggarwal, Jurisprudence (Legal Theory)
- Anantharaman- Lectures on Company Law & Competition Act, Lexix & Nexix
- Environmental Law in India – P. Leelakrishnan
- Ratan Lal and Dhiraj Lal, Indian Penal Code, CLA
- Paras Diwan-Hindu Law, CLA ,Allahabad.
- 

## **AQUACULTURE**

### **1). Freshwater Aquaculture**

Culturalble spices of fish and shellfish. Identification of different developmental states of finfish and shellfish of commercially important species. Methods of carp culture – history, present status and global scenario. Status of carp culture in India. Methods of catfish culture – present status, global scenario and problems and prospects of catfish culture, culture of Magur and Singhi in India. Methods of coldwater fish culture – present status and global scenario of clodwater fish culture, culture of trout and mahaseer in India. Methods of prawn culture – present status and global scenario of Macrobracium rosenbergii and M. malcolmsonii culture.

### **2). Aquaculture Systems**

Culture systems – mono poly and composite, semi-intensive, intensive, superintensive, cage pen and raceway cultures. Integrated fish culgture – trapa/paddy/cattle/ poultry/duck/piggery-cum fish culture etc. and their role in the development of rural economy. Sewage-fed-fish culture – quality of sewage, sewage treatment, fish species, culture methods and constraints. Pearl culture – pearl forming species (Oysters and mussels), natural and artificial pearl formation.

### **3). Inland Fisheries Resources**

Inland fisheries resources of India and scope for their exploitation and production. River systems – major river systems (Ganga, Brahmaputra, Indus, East and West coast rivers ) and their fishes. Lakes-origin, classification, distribution, ecology and fisheries with special reference to Upper and Lower lakes of Bhopal, Dal lake and Bhimtal. Reservoirs – large, medium and small reservoirs of India (Govind Sagar, Hirakund, Mettur, Rehand and Nagarjuna Sagar), their ecology and fisheries. Fish ways, fish passes and fish ladders, measures to increase the production of reservoirs. Recent advancements in reservoir management and present status of reservoirs of M. P. (Gandhi Sagar, Tawa, Bargi, Halali).

### **4). Water Quality Management**

Source of water: river, reservoir and underground water. Aeration: types of aerators, their advantages and disadvantages. Monitoring of water quality for hatchery operation and larval rearing of fish and prawn. Nutritional requirement of fish larvae in relation to water quality. Measures to check diseases in hatcheries.

### **5). Aquatic Pollution**

Waste waters and their treatiment (Primary, Secondary and Tertiary). Determination of biological and chemical oxygen demand (BOD & COD). Biodegradable materials (cellulose, hemicelluloses, lignin,

xenobiotics and recalcitrants) and their degradation. Impact of aquatic pollutants on fish health and fisheries with special reference to Ganga and Narmada rivers and Chilka lake. Types of pollutions and measures for their abatement.

## **Forensic Science**

1. **General forensic science:** Forensic Science: Definition, History & Development, Scope, Ethics in Forensic Science Physical Evidence: Nature, Types, Search methods, Collection, Preservation, Packing & Forwarding of Physical & Trace evidence for forensic analyses, Chain of Custody Crime Scene: Nature, Types, Preservation of Scene of Crime Criminal Investigations: Unnatural deaths, Criminal assaults, Sexual offenses, Poisoning, Vehicular accidents Courts: Types, powers and jurisdiction, Admissibility of evidence in Courts, Definition of Experts, Provisions in Cr.P.C.,1973 & Indian Evidence Act relating to experts & their reports; Court Procedures pertaining to Expert Testimony & Witness Organization of Forensic Science Laboratories of Centre and State, NCRB and NICFS Fundamental Rights: Right of Equality (Articles 14 to 18) and Right of Freedom (Articles 19 to 22) as per Constitution of India Criminal Profiling: Profile of victim and culprit, its role in crime investigation, Lie detection (Polygraphy), Narco analysis, Brain mapping, scope and limitations Concept of quality control management in Forensic institutions
2. **Instrumental analysis:** Microscopy: Polarizing, Comparison, Stereoscopic, Fluorescent and Electron Microscopes Spectrophotometry: UV, Visible, IR, Raman, Atomic absorption, Emission Neutron Activation Analysis X – rays and x-ray based techniques such as XRD, XRF Mass Spectroscopy Chromatographic Techniques: TLC, GLC, HPLC, HPTLC Hyphenated Techniques: GC-MS, LC-MS, IR-MS and ICP-MS Electrophoresis: High and Low voltage electrophoresis, Immunoelectrophoresis Immunoassays: Principle, Types ,Techniques and applications
3. **Forensic Serology and DNA Profiling:** Detection and Identification of Blood stains Determination of Species of Origin Blood Group Systems Techniques of Determination of Blood groups of Blood Stains Detection of Seminal and other body fluids and their Blood Grouping, Red cells Enzymes, Serum Proteins of forensic significance Disputed Paternity & Maternity DNA: Structure, DNA as genetic marker, DNA Extraction and Profiling Techniques DNA Pheno typing and RNA Profiling & their applications Wild life Forensics: Wild life (Protection) Act,1972, Scope, Evidences and Identification
4. **Forensic Toxicology:** Analysis of Ethyl alcohol in beverages , liquors, biological fluids and breath Analysis of Methanol and Denaturants Illicit liquors Analysis of Chemicals in Trap Cases Metabolism and Chemical examination of : Insecticides & Pesticides, Tranquillizers & Sedatives, Hypnotics Stimulants, Narcotics, Opiates, Drugs of abuse; Analyses of above and their Toxicity Plant poisons Metallic Poisons Extraction, Isolation & Clean-up procedures, Identification of common poisons from viscera, tissues and body fluids
5. **Forensic Ballistics:** Fire arms: Types, Classification, Ammunition and their Compositions Forensic examination of Firearms, Ammunition, Firearms' projectiles (Bullets, Shots, Slug etc.), Shell case Gunshot residues analysis Concept of Velocity, Penetration, Dispersion, Ricochet, Accidental Discharge, Determination of Range in firearm cases Examination of Country made firearms Basics of Internal, External and Terminal Ballistics Tool marks: Meaning, Types and Examination Restoration of Erased Markings on Metal Surfaces

6. **Forensic Chemistry and Forensic Photography:** Fire and Arson: Analyses of Petroleum Products and other incendiary materials Explosives: Definition, Types and Analyzes Bombs: Country made bombs, Improvised Explosive Devices ( IEDs ) and their examination Investigation in Explosion and Arson related cases Photography: Types, application in criminal investigation & Forensic evidence examination
7. **Forensic Biology and Cyber Forensics:** Hair & Fibers: Nature, Types, Structure and Examination Pollens and Diatoms: Their application in Forensic investigation Dust & Soil: Nature, Types, Forensic Examination Paint, Lacquer & Varnishes: Nature, composition and forensic examination Glass: Composition, Types, Fractures, Examination Cement, Mortar and Concrete: General Composition, Forensic Analysis Computer Forensics: Introduction, Types of Computer crimes, Digital evidence- Seizure, Acquisition and Forensic examination Mobile Phone Forensics
8. **Biometrics, impression and voice evidence analysis:** Fingerprints: History, Characteristics, Types, Classification, Preservation, Development, Lifting and Comparison, Examination of Chance Prints, Computerization of Fingerprints, AFIS Track Marks: Foot Prints, Shoe Prints, Tire Marks, Their Preservation & Casting, Comparison, Skid marks. Gait pattern Biometric Systems of Identification and its relevance Voice Analysis: Introduction, Significance, Structure of Human Voice apparatus, Voice spectrograph, Voice analysis, Legal aspects and limitations
9. **Forensic document examination:** Documents: Definition, Types, Preliminary examination of documents Reproduction of documents through photographic and mechanical means and their examination of Alterations such as Erasures, Obliterations & Additions Indentations, Secret writings and Charred documents Inks, Papers and their scientific examinations with modern methods Age of documents Examination of Typescripts, Printed matter including currency notes and lottery tickets. Mechanical impressions Hand writings: Class and Individual characteristics of Handwritings, Factors affecting handwritings, Standard samples for comparison, Comparison of hand-written texts Anonymous and disguised writings Identification of hand writings, signatures, detection of forged signature and forgeries Examination of Credit Cards and Similar materials
10. **Forensic medicine and Forensic anthropology:** Modes & Manner of deaths, Sexual offenses and its medico legal importance, Amendments in law related to sexual offenses Post – mortem examination and Post – mortem changes, Estimation of time since death Injuries & Wounds: Types, Medico legal importance, Gunshot wounds Determination of Species of Origin, Sex , Age, Stature, and individual identification through skeletal remains Identification through Skull superimposition and facial reconstruction Human dentition, Type of teeth, determination of Age, Bite marks Forensic Entomology: Introduction, Insects of forensic importance, Insects on Carrion, Forensic applications

## **Performing Arts**

### **(COMMON TO DANCE & DRAMA THEATRE)**

#### **Unit 1. Cultural History of India**

Cultures of India from pre-historic to CE 1200 Evolution of Art in pre-historic and historic periods, as evidenced in cave paintings, sculptures and other visual representations Evolution of dance and drama (Natya), (a) the divine origin theory according to Natyasastra, and, (b) art as a product of society, its rituals and belief systems The Vedas, major epics and puranas (Ramayana, Mahabharata, Cilappadikaram and Bhagavata purana) in terms of their content, character and relevance to dance and theatre Bhakti and various religious movements and their influence on different representative aspects of culture with focus on dance and theatre

#### **Unit 2. Folk and Traditional Theatre Forms of India**

Understanding and defining the terms Tribal, Folk, Traditional and Classical in the context of Indian dance and drama and their interrelation Introduction to the different tribal, folk and traditional dance and theatre forms spread over various regions of India Introduction to regional theatrical practices of Kudiattam, Yakshagana, Bhagavatamela, Tamasha, Ramalila, Rasalila, Bhavai, Nautanki, Jatra, Chhau, Laiharaoba, Therukoothu, Theyyam, Ankia-nat, Pandvani, Chindu Bhagavata, Bhand Jashan and others Awareness of various musical instruments, costumes and make-up used in these forms

#### **Unit 3. The Natyasastra**

Knowledge of Natyasastra and the concept of Natya and Nritta Study of chapters relating to the eleven aspects (ekadash sangraha) such as, Abhinayas, Dharmis, Vrittis, Pravrittis and Aatodyas. Samanya and Chitrabhinayas and their classification Dasarupakas Natyagruha (Playhouse) and Ranga – Construction, types and different elements Poorvarangavidhi and Stage conventions viz. Kakshya vibhag etc.

#### **Unit 4. Art and Aesthetics**

‘Rasasutra’ of Bharata Elaboration of the theory of Rasa by commentators like Bhattalollata, Sri Sankuka, Bhattanayaka and Abhinavagupta. Rasa and its constituent elements, viz., Sthayi, Sanchari and Sattvika bhavas and their corresponding Vibhavas and Anubhavas Definition, purpose and elements of Art A brief introduction to Performance studies and significant western theories on Art : ‘Art as Imitation/Catharsis’ , ‘as Imagination’, ‘as Beauty’, ‘as Communication’ and ‘as Utility’ put forth by various Philosophers

#### **Unit 5. Dance and Theatre forms of East and South Asian Countries**

An overview of dance and theatre forms of East Asian (China, Japan and Korea), South Asian (Bangladesh, Pakistan and Sri Lanka) and South- East Asian (Indonesia, Thailand, Vietnam, Cambodia, Myanmar, Philippines and Laos) countries

History and presentation techniques of various popular theatre and dance forms of the above countries

## **DANCE**

#### **Unit 6. Dance in Sanskrit Literature and Treatises**

A brief study of references to dance in the works of Kalidasa, Bhasa, Sudraka and others General understanding of the concepts relating to dance from texts of ancient and medieval period Natyasastra, Abhinaya Darpana, Sangeeta Ratnakara, Nritta Ratnavali and Nartana Nirnaya. Concepts include Natya, Nritta, Nritya, Lasya, Tandava, Marga, Desi, Baddha, Anibaddha, Nartaki lakshana, Sabha lakshana and the like. Also specific study

of the padas, hastas, caris, mandalas and karanas, and anga, upanga and pratyanga movements Detailed study of Abhinaya Darpana along with introduction to other region/form specific texts like Hasta Lakshana Deepika, Balarama Bharatam, Abhinaya Chandrika, Srihasta Muktaavali and others The various categories and typologies of Nayakas and Nayikas and their avasthas according to Bharata's Natyasastra, Saradatanaya's Bhavaprakasana, Bhanudatta's Rasamanjari and Akbar Shah's Sringaramanjari

#### **Unit 7. India Classical Dance**

Origin and history of Indian classical dance Evolution, technique, costumes, music, Gurus and pioneers of Bharatanatyam, Kathak, Kathakali, Kuchipudi, Manipuri, Mohiniattam, Odissi and Sattriya General understanding of major Talas of Hindustani and Carnatic music traditions A brief study of Composers/Vaggeyakaras and their works including Jayadeva, Narayana Teertha, Surdas, Meera Bai, Tulasidas, Vanamalidas, Kshetrappa, Srivanta Shankar Deva, Govindadas, Vidyapati, and others. Study of the role of Rabindranath Tagore, Rukmini Devi Arundale, Vallathole Narayana Menon, Madame Menaka and others in the revival and reconstruction of classical dance

#### **Unit. 8 Indian Classical Dance in Independent**

India An overview of major Gurus, performers, their works and important institutions in Independent India Institutionalization of dance and its effect on form, pedagogy, repertoire etc. The new wave in Indian dance - Its development through the works of Uday Shanker and Ram Gopal and the later major contemporary artists and their works. eg. Shantibardhan, Narendra Sharma, Sachin Shanker, Mrinalini Sarabhai, Maya Rao, Kumudini Lakhia, Manjusri Chaki Sarkar, Chandralekha, Astad Deboo and others) Indian classical dances in diaspora Patronage to Dance- the role of government and private bodies Awareness of important dance festivals, awardees and current happenings in dance

#### **Unit 9. Dance Education, Pedagogy and Research**

Dance as part of curriculum in school education and Universities Movement Analysis based on kinesthetics and Laban system Eminent scholars and their works, who contributed significantly to the knowledge of Indian dance Key inroads in dance training and research in India from the 1930's to the present like applied areas of dance, therapy, cross- cultural training etc.

#### **Unit 10. International dance and interactions**

Study of the history and development of classical ballet in Europe, Russia and America Emergence of Modern Dance in the west and major personalities involved Influence of the West on Indian dance in terms of production design

### **DRAMA / THEATRE**

#### **Unit 6 Drama and its theories:**

Indian and Western Concept of drama- Indian and Western Elements and structure of drama according to Indian and Western Dramaturgy A brief study of different classifications of Western dramas – Tragedy, comedy, tragic comedy, melodrama and farce A brief introduction to various 'isms' in relation to drama including realism, naturalism, symbolism, expressionism, absurd and epic Playwrights and their contribution: Sanskrit – Kalidasa, Bhasa, Sudraka, Bhavabhuti, Visakhadutta, Bhattanarayana; Ancient Greek and Roman – Aeschylus, Sophocles, Euripides, Aristophanes, Seneca Western – Shakespeare, Moliere, Ibsen, Brecht, Pirandello, Miller, Chekov, Beckett, Ionesco

#### **Unit 7 Modern Indian Theatre**

Origin and development of modern Indian theatre with reference to region, state and personalities A brief study of new trends in theatre since Independence movement both at national and regional level, such as, IPTA movement, Navanatyam movement, Root Theatre movement, Third Theatre, Alternate theatre, Street theatre, Theatre of the Oppressed, Applied theatre, Forum Theatre, Site Specific theatre An overview of major play



wrights, directors and other contributing personalities of various regions, whose plays are widely performed at the national level. Popular Play Houses, Theatre Companies, Institutions and Groups in India and their contribution

### **Unit 8 Acting and Direction**

(A)

Different schools of acting – Western and Eastern 1. Early period- Greek, Roman, Elizabethan, Commedia Dell’ arte 2. Modern Period – Representational, Stanislavsky, Meyerhold, Brecht, Grotowski 3. Eastern – Sanskrit, Peking Opera, Noh, Kabuki Role of Mime, Voice, Speech, Improvisation and Physical Theatre in actor’s training

(B)

Different directorial innovations and methods Role of director in Theatre Fundamentals of play direction: Balance, emphasis, composition, picturisation, movement, tempo and rhythm Process of production: Script to performance

(C)

Ideas on Production

1. Realistic : Duke of Sexe Meiningen, Stanislavsky, Elia Kazan, Antione Syllabus for PhD Admissions Annexure -I Page 34 of 39 2. Non-realistic : Brecht, Meyerhold, Peter Brook, Augusto Boal Impact of above ideas on post independent Indian Theatre movements

### **Unit 9: Theatre Design and techniques**

(A)

Theatre architecture: Greek, Roman, Elizabethan, Thrust Stage, Proscenium, Arena, Open Stage. Sanskrit: Vikrishta – Madhyam Natyagruha Chinese, Japanese play houses of classical era

(B)

Stage craft: Fundamentals and functions of sets, lights, costumes, make-up, sound, props, other arts and theatre music in terms of various kinds of play production Aharya and Nepathya vidhi in classical Indian, Chinese, Japanese and Indian Traditional theatre

(C)

Theatre management and organization

(D)

Children’s theatre, applied theatre, community theatre, theatre in education, theatre of oppressed and feminist theatre

### **Unit 10: Theatre Education, Pedagogy and Research**

Theatre as part of curriculum from primary education and in University system Relevance of traditional theatre training Movement analysis based on kinesthetics, Yoga, Theatre Game, Martial Arts, Folk, Puppetry and other forms Eminent scholars and their works who contributed to the knowledge of Indian Theatre Trends in Indian Theatre research and scholarship in India Patronization to theatre- major institutions, organizations, Government, corporate, private bodies and personalities after independence Awareness of important theatre festivals, Awardees and current affairs in theatre