Appendix - 2

उ0प्र0 राजकीय महाविद्यालयों हेतु ''असिस्टेंट प्रोफेसर परीक्षा''

परीक्षा–योजना

प्रारम्भिक परीक्षा

प्रश्नपत्र का प्रकार	–	वस्तुनिष्ठपरक
प्रश्नपत्र की संख्या	–	(01) एक
प्रश्नों की संख्या	–	120 (सामान्य अध्ययन के 30 प्रश्न तथा प्रत्येक वैकल्पिक विषय के 90 प्रश्न, जबकि वैकल्पिक विषय गणित के 70 प्रश्न)
कुल पूर्णांक	–	150 (एक सौ पचास)
समयावधि	–	02:00 (दो) घण्टा

नोटः– उपर्युक्त प्रथम चरण की प्रारम्भिक परीक्षा में उत्तीर्ण अभ्यर्थी ही नियमानुसार मुख्य (लिखित) परीक्षा में सम्मिलित हो सकेंगे।

मुख्य (लिखित) परीक्षा

प्रश्नपत्र का प्रकार	–	परम्परागत
प्रश्नपत्र की संख्या	–	01 (एक)
प्रश्नों की संख्या	–	20 (10+10)
कुल पूर्णांक	–	200 (80+120) अंक
समयावधि	–	03:00 (तीन) घण्टा

संगत पाठ्यक्रम के आधार पर वैकल्पिक (मुख्य) विषयों के प्रश्नपत्रों की रचना हेतु प्रश्नपत्र का स्वरूप एवं अंकों का विभाजन निम्नवत होगा–

मुख्य परीक्षा के प्रश्नपत्र में सभी प्रश्न अनिवार्य होंगे तथा वे दो खण्डों में विभाजित रहेंगे। प्रश्नों की कुल संख्या खण्डवार निम्नवत होगी–

खण्ड (अ) के अन्तर्गत 10 प्रश्न, लघुउत्तरीय प्रश्न, जिनके उत्तरों की सीमा 125 शब्दों में होगी। यहां प्रत्येक प्रश्न आठ (08) अंक का होगा।

खण्ड (ब) के अन्तर्गत 10 प्रश्न, दीर्घ उत्तरीय प्रश्न, जिनके उत्तरों की सीमा 200 शब्दों में होगी। यहां प्रत्येक प्रश्न बारह (12) अंक का होगा।

ध्यातव्य है कि उक्त प्रारम्भिक परीक्षा एवं मुख्य (लिखित) परीक्षा के पाठ्यक्रम शासन द्वारा अनुमोदित हैं।

साक्षात्कार (अभिव्यक्ति) परीक्षण

25 अंक/यथा शासनादेशानुसार।

नोटः प्रश्नगत मुख्य (लिखित) परीक्षा एवं साक्षात्कार (अभिव्यक्ति) परीक्षण में प्राप्त अंकों के योग के आधार पर अभ्यर्थियों की श्रेष्ठता का निर्धारण सुनिश्चित किया जायेगा।

Appendix - 3

Subject- General Studies

1- General Science.
2- Current Events of National and International Importance.
3- History of India (Including Indian National Movement).
4- Indian Polity and Economy.
5- Geography- Indian and world.
6- Mental ability and Statistical data analysis.

Candidates are expected to have general awareness about the above topics with special reference to Uttar Pradesh.

1. SUBJECT : BOTANY

UNIT I
MOLECULES AND THEIR INTERACTION RELEVANT TO BIOLOGY

A. Structure of atoms, molecules and chemical bonds.
B. Composition, structure and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids and vitamins).
C. Stablizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.).
D. Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties).
E. Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers.
F. Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes
G. Conformation of proteins (Ramachandran plot, secondary structure, domains, and folds).
H. Conformation of nucleic acids (helix (A, B, Z), t-RNA, micro-RNA).
I. Stability of proteins and nucleic acids.
J. Metabolism of carbohydrates, lipids, amino acids nucleotides and vitamins.

UNIT II
CELLULAR ORGANIZATION

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

UNIT III
FUNDAMENTAL PROCESSES

A. DNA replication, repair and recombination (Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms, homologous and site-specific recombination).
B. RNA synthesis and processing (transcription factors and machinery, formation of initiation complex, transcription activator and repressor, RNA polymerases, capping, elongation, and termination, RNA processing, RNA editing, splicing, and polyadenylation, structure and function of different types of RNA, RNA transport).
C. Protein synthesis and processing (Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, and translational proof-reading, translational inhibitors, Post- translational modification of proteins).
D. Control of gene expression at transcription and translation level (regulating the expression of phages, viruses, prokaryotic and eukaryotic genes, role of chromatin in gene expression and gene silencing).

UNIT IV
CELL COMMUNICATION AND CELL SIGNALING

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

UNIT V
PLANT PHYSIOLOGY

A. Photosynthesis - Light harvesting complexes; mechanisms of electron transport; photoprotective mechanisms; CO_2 fixation-C3, C4 and CAM pathways.
B. Respiration and photorespiration – Citric acid cycle; plant mitochondrial electron transport and ATP synthesis; alternate oxidase; photorespiratory pathway.
C. Nitrogen metabolism - Nitrate and ammonium assimilation; amino acid biosynthesis.
D. Plant hormones – Biosynthesis, storage, breakdown and transport; physiological effects and mechanisms of action.
E. Sensory photobiology - Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins; stomatal movement; photoperiodism and biological clocks.
F. Solute transport and photoassimilate translocation – uptake, transport and translocation of water, ions, solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem; transpiration; mechanisms of loading and unloading of photoassimilates.
G. Secondary metabolites - Biosynthesis of terpenes, phenols and nitrogenous compounds and their roles.
H. Stress physiology – Responses of plants to biotic (pathogen and insects) and abiotic (water, temperature and salt) stresses.

UNIT VI
INHERITANCE BIOLOGY

A. Mendelian principles : Dominance, segregation, independent assortment.
B. Concept of gene : Allele, multiple alleles, pseudoallele, complementation tests
C. Extensions of Mendelian principles : Codominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy, linkage and crossing over, sex linkage, sex limited and sex influenced characters.
D. Gene mapping methods : Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population in plants
E. Extra chromosomal inheritance : Inheritance of Mitochondrial and chloroplast genes, maternal inheritance.
F. Microbial genetics : Methods of genetic transfers – transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating, fine structure analysis of genes.
G. Quantitative genetics : Polygenic inheritance, heritability and its measurements, QTL mapping
H. Mutation : Types, causes and detection, mutant types – lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, insertional mutagenesis
I. Structural and numerical alterations of chromosomes : Deletion, duplication, inversion, translocation, ploidy and their genetic implications.
J. Recombination : Homologous and non-homologous recombination including transposition.

UNIT VII
DIVERSITY OF LIFE FORMS

A. Principles & methods of taxonomy: Concepts of species and hierarchical taxa, biological nomenclature, classical & quantititative methods of taxonomy of plants, animals and microorganisms. Levels of structural organization: Unicellular, colonial and multicellular forms.
B. Levels of organization of tissues, organs & systems. Comparative anatomy, adaptive radiation, adaptive modifications.
C. Outline classification of plants & microorganisms: Important criteria used for classification in each taxon. Classification of plants, animals and microorganisms. Evolutionary relationships among taxa.
D. Natural history of Indian subcontinent: Major habitat types of the subcontinent, geographic origins and migrations of species.
E. Organisms of health & agricultural importance: Common parasites and pathogens of crops.
F. Organisms of conservation concern: Rare, endangered species. Conservation strategies.
G. Biology and Biodiversity of Viruses, Bacteria, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.

UNIT VIII
ECOLOGICAL PRINCIPLES

A. The Environment: Physical environment; biotic environment; biotic and abiotic interactions.
B. Habitat and Niche: Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.
C. Population Ecology: Characteristics of a population; population growth curves; population regulation; life history strategies (r and K selection); concept of metapopulation – demes and dispersal, interdemic extinctions, age structured populations.
D. Species Interactions: Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis.
E. Community Ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones.
F. Ecological Succession: Types; mechanisms; changes involved in succession; concept of climax.
G. Ecosystem Ecology: Ecosystem structure; ecosystem function; energy flow and mineral cycling (C,N,P); primary production and decomposition; structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, eustarine).
H. Biogeography: Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.
I. Applied Ecology: Environmental pollution; global environmental change; biodiversity: status, monitoring and documentation; major drivers of biodiversity change; biodiversity management approaches. Geographic information system & Modeling, Environmental legislation and policy, Environmental impact and risk assessment
J. Conservation Biology: Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy, land and soil conservation and management, Green technologies.

UNIT IX
EVOLUTION AND BEHAVIOUR

A. Emergence of evolutionary thoughts – Lamarck, Darwin–concepts of variation, adaptation, struggle, fitness and natural selection; Mendelism; Spontaneity of mutations; The evolutionary synthesis.
B. Origin of cells and unicellular evolution: Origin of basic biological molecules; Abiotic synthesis of organic monomers and polymers; Concept of Oparin and Haldane; Experiement of Miller (1953); The first cell; Evolution of prokaryotes; Origin of eukaryotic cells; Evolution of unicellular eukaryotes; Anaerobic metabolism, photosynthesis and aerobic metabolism.
C. Paleontology and Evolutionary History: The evolutionary time scale; Eras, periods and epoch; Major events in the evolutionary time scale; Origins of unicellular and multi cellular organisms; Major groups of plants; Stages in primate evolution.
D. Molecular Evolution: Concepts of neutral evolution, molecular divergence and molecular clocks; Molecular tools in phylogeny, classification and identification; Protein and nucleotide sequence analysis; origin of new genes and proteins; Gene duplication and divergence.
E. The Mechanisms: Population genetics – Populations, Gene pool, Gene frequency; Hardy-Weinberg Law; concepts and rate of change in gene frequency through natural selection, migration and random genetic drift; Adaptive radiation; Isolating mechanisms; Speciation; Allopatricity and Sympatricity; Convergent evolution; Sexual selection; Co-evolution.

UNIT X
APPLIED BIOLOGY & METHODS IN PLANT SCIENCE

A. Microbial fermentation and production of Primary & Secondary metabolites.
- Tissue and cell culture methods for plants .
- Transgenic plants, molecular approaches to diagnosis and strain identification.
- Genomics and its application in Plants .
- Bioresource and uses of biodiversity.
- Breeding in plants including marker – assisted selection.
- Bioremediation and phytoremediation
- Biosensors

B. Molecular Biology and Recombinant DNA methods:
Isolation and purification of RNA , DNA (genomic and plasmid) and proteins, different separation methods.
Analysis of RNA, DNA and proteins by one and two dimensional gel electrophoresis, Isoelectric focusing gels.
Molecular cloning of DNA or RNA fragments in bacterial and eukaryotic systems. Expression of recombinant proteins using bacterial, animal and plant vectors.
Isolation of specific nucleic acid sequences
Generation of genomic and cDNA libraries in plasmid, phage, cosmid, BAC and YAC vectors.
In vitro mutagenesis and deletion techniques, gene knock out in bacterial and eukaryotic organisms. Protein

sequencing methods, detection of post translation modification of proteins.
DNA sequencing methods, strategies for genome sequencing.
Methods for analysis of gene expression at RNA and protein level, large scale expression, such as micro array based techniques
Isolation, separation and analysis of carbohydrate and lipid molecules RFLP, RAPD and AFLP techniques
C. Biophysical Method: Molecular analysis using UV/ visible, fluorescence, circular dichroism, NMR and ESR spectroscopy Molecular structure determination using X-ray diffraction and NMR, Molecular analysis using light scattering, different types of mass spectrometry and surface plasma resonance methods.
D. Statisitcal Methods: Measures of central tendency and dispersal; probability distributions (Binomial, Poisson and normal); Sampling distribution; Difference between parametric and non-parametric statistics; Confidence Interval; Errors; Levels of significance; Regression and Correlation; t-test; Analysis of variance; X^2 test;; Basic introduction to Multivariate statistics, etc.
E. Radiolabeling techniques: Detection and measurement of different types of radioisotopes normally used in biology, incorporation of radioisotopes in biological tissues and cells, molecular imaging of radioactive material, safety guidelines.
F. Microscopic techniques: Visulization of cells and subcellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and transmission microscopes, different fixation and staining techniques for EM, freeze-etch and freezefracture methods for EM, image processing methods in microscopy.
G. Methods in field biology: Methods of estimating population density of plants, ranging patterns through direct, indirect and remote observations, sampling methods in the study of behavior, habitat characterization: ground and remote sensing methods.

2. SUBJECT : CHEMISTRY

Unit-1
Inorganic Chemistry

1) Structure and bonding in homonuclear molecules, Shapes of molecules (VSEPR Theory).
2) Hard and Soft acids and bases.
3) Main group elements and their compounds.
4) Transition elements and coordination compounds, Isomerism in coordination compounds. Theories of Coordination (VBT, MOT & CFT).
5) Inner Transition elements, Lauthanides & Actinides.
6) Electronic spectroscopy: Orgel diagram and Tanake-Sugano diagram, Electronic spectra of tetrahedral and Octahedral complexes. Charge transfer in transition metal complexes and compounds, Luminescence.
7) Organometallic compounds, Bioinorganic chemistry, metalloenzymes, Metal complexes in medicines, Supramolecular chemistry.
8) Spectroscopy of inorganic compounds: UV, IR, NMR (^{19}F-NMR, ^{31}P- NMR), EPR and Mössbauer.
9) Pollution: Air Pollution and Green House Effect.
10) Nuclear chemistry.

Unit-2
Organic Chemistry

1) Aromaticity of Benzenoid and Non Benzenoid compounds, Antiaromaticity and Homoaromaticity of compounds.
2) Organic reaction intermediates: Generation, stability and reactivity of carbocations, carbanions, free radicals, carbenes including NHC and benzynes.
3) Sterochemistry: R,S and E,Z nomenclature, regioselective, stereospecific, stereoselective and diastereoselective reactions, Crams and Felkin-Anh model in diastereoselective reactions, Enantioselective reactions, Factors responsible for the stability of conformers. Conformational isomerism of acyclic and six membered cyclic compounds.
4) Organic reaction mechanism and their stereochemistry:
I) Electrophilic addition reaction of alkenes with Br_2, BH_3, $KMnO_4$, halolactonisation.
ii) Nucleophilic addition of carbonyl compounds with carbon, nitrogen, oxygen and sulphur nucleophilies.
iii) Conjugate addition given by α,β-unsaturated cyclohexenones and their stereochemistry.
iv) E_1, E_2 and E_1cb reactions, *syn* and *anti* eleminations and their stereo chemistry.
v) Substituition reactions:
a) Aliphatic nucleophilic substitutions (S_N^1, S_N^2, S_N^i), neighbouring group participations.
b) Electrophilic aromatic substitutions.
c) Nucleophilic aromatic substitutions.
5) Common name reactions, rearrangements and their mechanism-Aldol addition, Aldol condensation, Perkin reaction, Reformatsky reaction, Barton reaction, Di-π-methane rearrangement, Mitsunobu reaction, Pinacol-Pinacolone rearrangement, Baeyer-Villiger rearrangement, Beckmann rearrangement, Curtius, Schmidt and Lossen rearrangement.
6) Pericyclic reactions:
i) Electrocyclic reactions
ii) Cycloaddition reactions
a) [2+2], [4+2] cycloadditions
b) [2+2] cycloaddition between alkene and ketene
c) [2+2] cycloaddition between ketene and N-substituted imines
iii) Sigmatropic rearrangement: [1,3], [1,5], [2,3] and [3,3] Sigmatropic rearrangements
7) Photochemistry of carbonyl compounds;
i) α-Cleavage
ii) β-Cleavage
iii) Intramolecular hydrogen abstraction
iv) Photorearrangement given by β,γ-unsaturated ketones
8) Structure determination of organic compounds by use of UV, IR, PMR, ^{13}c NMR and mass spectroscopic techniques.
9) Use of reagents in organic synthesis: $NaBH_4$,DIBAL-H, organo copper, $Na/NH_3(l)$, Collins reagent, PCC and PDC reagents, Me_3SiX, 1,3-dithane, SeO_2, and Pd catalysed cross-coupling reactions (Negishi, Suzuki, Still coupling). Stereochemistry of these reagents in reactions.

Unit-3
Physical Chemistry

1) Basic principles of quantum mechanics, Particle in a box, Harmonic oscillator and hydrogen atom.
2) Atomic structure and Molecular spectroscopy: term symbols.
3) Chemical application of group theory, Symmetry elements, Character table and selection rules.
4) Chemical thermodynamics: Laws, path function and their applications, Maxwell's relation, phase equilibria and phase rule
5) Statisticial thermodynamics, Boltzmann distribution, Kinetic theory of gases, Partition function.
6) Electrochemistry, Nernst equation, redox systems, electrolytic conductance (Kohlrausch's Law and its applications).
7) Chemical kinetics, empirical rate laws and temperature dependence, Steady state approximation, Enzyme kinetics, Homogeneous catalysis.
8) Colloids and surface: stability and properties of colloids, isotherms, Heterogeneous catalysis.
9) Polymer chemistry
10) Photo chemistry
11) Solutions & colligative Property

3. SUBJECT : COMMERCE

Unit-1
Accounting and Finance

Basic accounting principles, concepts and postulates; Nature, scope and objectives of Management Accounting; Corporate Accounting: Issue, forfeiture and reissue of shares, Liquidation of companies, amalgamation and reconstruction of companies; Holding company Accounts; Indian Accounting Standards and IFRS, Green Accounting, Cost Accounting: Marginal costing and Break-even analysis, Standard costing; Budgetary Control, Process costing, Life cycle costing, Target costing, JIT; Ratio Analysis, Fund flow and Cash flow Analysis, Cost-volume profit Analysis.

Unit-2
Statistics and Research Methodology

Measures of Central tendency, Measures of dispersion and skewness, correlation and regression of two variables, Coefficient of Association, Probability: Addition, Multiplication and Bayes' theorem; Probability distributions: Binomial, Poisson and Normal distributions; Research: Concept and types, Research designs; Data: Collection and Classification of data; Sampling and estimation: Concepts, Methods of sampling; standard error; Hypothesis testing; z-test, t-test, ANOVA, SPSS, Chi-square test; Repot writing.

Unit-3
Marketing

Concept and approaches of marketing; Marketing channels; Marketing Mix; Strategic marketing planning; Market segmentation; Product decisions: concept, Product line, Product mix decisions, Product life cycle; New product development; Pricing decisions: Factors affecting price determination, Pricing policies and strategies; Promotion decisions, Promotion methods: Advertising, Personal selling, Publicity, Sales Promotion tools and techniques, Promotions mix; Consumer behaviour: consumer buying process factors influencing consumer buying decisions, CRM, Service marketing; New trends in marketing: Social marketing, Online marketing, GEM Portal, Green marketing, Direct marketing, Rural marketing.

Unit-4
Human Resource Management

Concept, role and functions of HRM; Human resource planning; Recruitment and selection; Training and development, Succession planning, Compensation management: Job evaluation, Incentives and fringe benefits, Performance appraisal methods, Collective bargaining and workers' participation in management, Personality: Perception; Attitudes, Emotions; Group dynamics; Power and politics; Conflict and negotiation; Stress management; Green HRM, Organizational Culture; Organizational Development.

Unit-5
Business Economics

Concept, Nature and significance of Business Economies, Principles of business economics, Demand Analysis, Production Analysis, Pricing Analysis, Price determination under different market forms: Perfect competition; Monopolistic competition; Oligopoly, Monopoly, Price discrimination, Business Cycles, Inflation.

Unit-6
Business Environment

Concept, Nature and significance of Business environment, Elements, Techniques of environmental scanning and monitoring; Economic systems; Government Policies, Socio- cultural environment, Corporate Social Responsibility (CSR), NITI Aayog, Legal environment: Brief Study of Indian Contract Act 1872, The companies Act 2013, Goods and Services Tax (GST).

Unit-7
Business Management

Principles and functions of management; Essentials of Planning, Importance and process of decision making, Nature of organising, Different types of organisational structure, Responsibility and authority: Delegation of authority and decentralization, Leadership and its role in management of organizations, Nature, Process and Types of control, Essentials of an effective control system; Ethical issues in management, Social Responsibilities of business, Corporate governance.

Unit-8
Auditing

Concept, objectives and classification of audit, Basic principles governing an audit, Independent financial audit, Internal audit, Vouching, Verification and valuation of assets and liabilities, Audit of financial statements and Audit Report, Appointment, Qualification, Rights, duties and liabilities of auditor, Cost audit, Recent Trends in Auditing: Management audit; Energy audit; Environment audit; Systems audit; safety audit.

Unit-9
Entrepreneurship and Small Business

Functions, Types and qualities of an Entrepreneur, Main Theories of Entrepreneurship, Environmental factors affecting Entrepreneurial Development; Role of Government and other institutions in the development of entrepreneurship in India; Role of Micro, Small and Medium Enterprises (MSMEs) in Indian Economy; Problems of MSMEs in India, Start-up, Skill Development.

Unit-10
Organisational Theory and Behaviour

Evolution; Models of organizational behaviour; Personality; perception and learning; Transaction Analysis, Theories and styles of Leadership, Management by Objective (MBO), Motivation.

4. SUBJECT : EDUCATION

Unit-1
Philosophical and Sociological foundations of Education

a) Indian Schools of philosophy (Vedic, Sankhya Yoga, Vedanta and Buddhism) with special reference to educational aims and methods of acquiring valid knowledge. Contribution of thinkers (Swami Vivekananda, Rabindranath Tagore, Mahatma Gandhi, Pandit Madan Mohan Malaviya.)
b) Western schools of philosophy (Idealism, Realism, Naturalism, Pragmatism) and their contribution to Education with special reference to information, knowledge and wisdom.
c) Educational and social institutions : Concept and types of social Institutions and their functions (family, school and society), Concept of Social Movements.
d) Socialization and education- education and culture, education and social changes, National Values as enshrined in the Indian Constitution-Socialism, Secularism, justice, liberty, democracy, equality, freedom with special reference to education.

Unit-2
History, Politics and Economics of Education

Committees and Commissions' and their Contribution to Education: Kothari Commission (1964-66), National Policy of Education and POA (1986,1992), National Curriculum Framework for Teacher Education (2009), Justice Verma Committee Report (2012), NCTE Regulations 2014.
b) Indianisation of education through Indian Traditional Knowledge, Feature of National Education Policy(NEP) 2020: vision, structure and changes in school education, Transforming the regulatory system of Higher Education.
c) Concept of Economics of Education, Concept of Educational Finance; Educational finance at Micro and Macro Levels, Concept of Budgeting and Financing, Affordable and quality education for all.

Unit-3
Learner and Learning

a) Growth and Development: Concept and principles, Cognitive Processes and stages of Cognitive Development, Personality: Definitions and theories, Mental health and Mental hygiene.
b) Approaches to Intelligence from Unitary to Multiple: Concepts of Social intelligence, multiple intelligence, emotional intelligence, Theories of Intelligence by Sternberg, Gardner, Assessment of Intelligence, Concepts of Problem Solving, Critical thinking, Metacognition and Creativity.
c) Learning Theories, Principles of learning: Behaviouristic, Cognitive and Social theories of learning, Factors affecting social learning, social competence, Concept of social cognition, understanding social relationship and socialization goals.
d) Guidance and Counselling: Nature, Principles and Need, Types of guidance (educational, vocational, personal, health, social & Directive, Non-directive and Eclectic. Approaches to counselling – Cognitive-Behavioural (Albert Ellis – REBT) & Humanistic, Person centred Counselling (Carl Rogers) - Theories of Counselling (Behaviouristic, Rational, Emotive and Reality).

Unit-4

Teacher and Teacher Education

a) Meaning, Nature and Scope of Teacher Education; Types of Teacher Education Programs, Models of Teacher Education - Behaviouristic, Competency-based and Inquiry Oriented Teacher Education Models.

b) Concept, Need, Purpose and Scope of In-service Teacher Education, Organization and Modes of In-service Teacher Education, Agencies and Institutions of In-service Teacher Education at District, State and National Levels (SIEMAT, SCERT, NCERT, NCTE and UGC), Preliminary Consideration in Planning in-service teacher education programme (Purpose, Duration, Resources and Budget).

c) Concept of Profession and Professionalism, Teaching as a Profession, Professional Ethics of Teachers, Personal and Contextual factors affecting Teacher Development, Quality, Innovation in Teacher Education.

d) NEP 2020 and teacher: Teacher and mentoring, National Professional Standards for teachers(NPST), ITEP:A new initiative ,NCF's 2023 and teachers, Continuous professional development (CPD) and Career Management and Progression(CMP).

Unit-5

Curriculum Studies

a) Concept and Principles of Curriculum, Foundations of Curriculum Planning - Philosophical Bases (National, democratic), Sociological basis (socio cultural reconstruction), Psychological Bases (learner's needs and interests), Role of National level Statutory Bodies - UGC, NCTE and University in Curriculum Development.

b) Instructional System, Instructional Media, Instructional Techniques and Material in enhancing curriculum Transaction, Approaches to Evaluation of Curriculum: Approaches to Curriculum and Instruction (Academic and Competency Based Approaches).

c) Meaning and types of Curriculum change, Factors affecting curriculum change, Role of students, teachers and educational administrators in curriculum change and improvement.

Unit-6

Educational Research

a) Meaning and Scope of Educational Research, Meaning, characteristics and Types of Scientific Method (Exploratory, Explanatory and Descriptive), Types of research (Fundamental, Applied and Action), Approaches to educational research (Quantitative and Qualitative), Designs in educational research (Descriptive, Experimental and Historical).

b) Variables: Meaning and Types of Variables (Independent, Dependent, Extraneous, Intervening and Moderator), Hypothesis - Concept, Sources, Types (Research, Directional, Non-directional, Null), Formulating Hypothesis, Characteristics of a good hypothesis, Steps of Writing a Research Proposal, Sample-Characteristics, Techniques of Sampling (Probability and Non-probability Sampling), Tools of Research - Validity, Reliability and Standardisation of a Tool, Types of Tools (Rating scale, Attitude scale, Questionnaire, Aptitude test and Achievement Test, Inventory), Techniques of Research (Observation, Interview and Projective Techniques).

c) Types of Measurement Scale (Nominal, Ordinal, Interval and Ratio), Quantitative Data Analysis - Descriptive data analysis (Measures of central tendency, variability, fiduciary limits and graphical presentation of data), Testing of Hypothesis (Type I and Type II Errors), Levels of Significance, Power of a statistical test and effect size, Parametric Techniques, Non- Parametric Techniques.

d) Qualitative Research Designs: Grounded Theory Designs (Types, characteristics, designs, Case Study (Meaning, Characteristics, Components), Ethnography (Meaning, Characteristics, Underlying assumptions, Mixed Method Designs: Characteristics, Types of Mixed Method designs (Triangulation, explanatory and exploratory designs).

Unit-7

Pedagogy, Andragogy and Assessment

a) Pedagogy, Pedagogical Analysis - Concept and Stages, Critical Pedagogy- Meaning, Need and its implications in Teacher Education, , Concept of Andragogy in Education:

b) Assessment – Meaning, nature, perspectives (assessment for Learning, assessment of learning and Assessment as Learning) ,Performance assessment review and analysis of knowledge for holistic development (PARAKH).

c) Assessment in Andragogy of Education - Interaction Analysis: Flanders' Interaction analysis, Criteria for teacher evaluation (Product, Process and Presage criteria, Rubrics for Self and Peer evaluation (Meaning, steps of construction).

Unit-8

Technology and Education

a) Concept of Educational Technology (ET) as a Discipline: (Information Technology, Communication Technology & Information and Communication Technology (ICT) and Instructional Technology, Applications of Educational Technology in formal, non formal (Open and Distance Learning), informal and inclusive education systems.

b) Application of Computers in Education: CAI, CAL, CBT, CML, Concept, Process of preparing ODLM, Concept of e learning, Approaches to e-learning (Offline, Online, Synchronous, Asynchronous, Blended learning, mobile learning).

c) Emerging Trends in e learning: Social learning (concept , use of web 2.0 tools for learning, social networking sites, blogs, chats, video conferencing, discussion forum), Open Education Resources (Creative Common, Massive Open Online Courses(MOOCs), Ethical Issues for E Learner and E Teacher, Digital Repositories and Online Libraries, Online and Offline assessment tools (Online survey tools or test generators) – Concept and Development, Digital Infrastructure, Minimizing digital divide, Life long learning through technology, Chat GPT and AI in education, Ensure equitable use of technology.

Unit-9

Management, Administration and Leadership in education

a) Educational Management and Administration – Meaning, Functions and importance, Institutional building and Management, SWOC analysis, Organisational climate.

b) Leadership in Educational Administration: Meaning and Nature, Approaches to leadership: Trait, Transformational, Value based, Cultural, Psychodynamic and Charismatic.

c) Change Management: Meaning, Need for Planned change, Three-Step-Model of Change (Unfreezing, Moving, Refreezing), Indian and International Quality Assurance Agencies: Objectives, Functions, Roles and Initiatives (National Assessment Accreditation Council [NAAC], Performance Indicators, Quality Council of India [QCI], NIRF.

Unit-10

Equitable and Inclusive education: Learning for all

Inclusive Education: Concept, Principles, and Target Groups (Diverse learners; Including Marginalized group and Learners with Disabilities), Socio-Economically disadvantaged groups (SEDGs), Difference among Special, Integrated, Inclusive Education ,Persons with Disabilities Act (1995), National Policy of Disabilities (2006), National Curriculum Framework (2005), Rehabilitation Council of India Act (1992), Gender Inclusion Fund, Rights of persons with disabilities (RPWD) Act 2016.

Concept of Disability, Classification of Disabilities based, Readiness of School and Models of Inclusion, Types, Characteristics and Educational Needs of Diverse learners' Intellectual, Physical and Multiple Disabilities, Identification of Diverse Learners for Inclusion.

c) Planning and Management of Inclusive Classrooms: Infrastructure, Human Resource and Instructional Practices, Curriculum and Curricular Adaptations for Diverse Learners, Assistive and Adaptive Technology for Diverse learners: Product (Aids and Appliances) and Process (Individualized Education Plan, Remedial Teaching), Role of Parents, Peers, Professionals, Teachers, School.

d) Barriers and Facilities in Inclusive Education: Attitude, Social and Educational, Current Status and Ethical Issues of inclusive education in India, Research Trends of Inclusive Education in India.

5. SUBJECT : ENGLISH LITERATURE

(16th Century to 20th Century)

Unit-I

Forms of Literature, Background to Various Literary Trends, and Movements
(**16th Century to 20th Century**)

Unit-II

Poetry

Geofrey Chaucer :	Prologue to The Canterbury Tales (Modern version)
John Donne :	"The Canonization"
	"A Valedication: Forbidding Morning"
	"The Ecstasy"
Andrew Marvell :	"To His Coy Mistress"
Edmund Spenser :	"Epithalamion"
John Milton :	*Paradise Lost: Book I*
Alexander Pope :	*The Rape of the Lock(Canto 1 and 2)*
William Blake:	*"The Tyger"*
	"The Lamb"
William Wordsworth :	" Lines Composed a Few Miles Above Tintern Abbey"
	"Ode: On Intimations of Immortality from Recollections of Early Childhood"
Samuel Taylor Coleridge :	"The Rime of the Ancient Mariner"
	"Christabel"
John Keats :	"Ode on a Grecian Urn, Ode to a Nightingale"
P. B. Shelley :	"*Adonais: An Elegy on the Death of John Keats"*
	"To a skylark"
Alfred Lord Tennyson :	"The Defence of Lucknow"
	"Ulysses"
	"The Lotus-Eaters"
Robert Browning :	"Last Ride Together"
	"My Last Duchess"
	"Prospice"
Matthew Arnold :	"Dover Beach"
	"Scholar Gypsy"
T. S. Eliot :	The Waste Land
W. B. Yeats :	"The Second Coming"
	"Sailing to Byzantium"
	"Prayer for my Daughter
Seamus Heaney :	"Digging"
	"Punishment"
W H Auden :	"In the Memory of W B Yeats"
	"Musee des Beaux Arts"
	"The Shield of Achilles"
Philip Larkin :	"Church Going"
	"Poetry of Departures"
Ted Hughes :	"The Thought Fox"
	" Hawk Roosting"

Unit-III

Drama

Christopher Marlowe :	Dr. Faustus
William Shakespeare :	Hamlet
	Twelfth Night
John Webster :	Duchess of Malfi
Ben Johnson :	Volpone
Aphra Behn :	The Rover
Oliver Goldsmith :	She Stoops to Conquer
G B Shaw :	Candida
T S Eliot :	The Family Reunion
Harold Pinter :	The Homecoming
Samuel Beckett :	Waiting for Godot
John Osborne :	Look Back in Anger

Unit-IV

Fiction and Prose

Henry Fielding :	Joseph Andrews
Jane Austen :	Pride and Prejudice
George Eliot :	Silas Marner
Charles Dickens :	Hard Times : For These Times
Thomas Hardy :	Tess of the D'Urbervilles
Joseph Conrad :	Heart of Darkness
James Joyce :	A Portrait of the Artist as a Young Man
Virginia Woolf :	To the Lighthouse
D. H. Lawrence :	The Rainbow
William Golding :	Lord of the Flies
Graham Green :	The Power and The Glory
Francis Bacon :	"Of Truth"
	"Of Studies"
	"Of Adversity"
Joseph Addison :	"The Spectator's Account of Himself"
	" Sir Roger at Home"
Thomas Carlyle :	"The Hero as Man of Letters"
James Stuart Mill :	"On Liberty"
Bertrand Russell :	"Science and Values" and "Science and War"(from The Impact of Science on Society)

Unit-V

Linguistics

i. Descriptive Linguistics; Generative Linguistics

ii. Scope and branches of Linguistics: Socio Linguistics, Psycholinguistics, Pragmatics, Stylistics

iii. Language Variations: Direct, Register, Pidgins, Creoles Processes of standardization of Language, Language Typology

iv. Major Concepts: Syntagmatic and Paradigmatic, Synchronic and Diachronic, Competence and Performance, Innate Hypothesis

v. Approaches, Linguistic Principles and Techniques in Language Teaching

vi. Methods of Language Teaching: Grammar Translation Method, Direct Method, Audio-Lingual Method, Communicative Language Teaching.

vii. Teaching of Language Skills: Listening, Speaking, Reading, Writing

viii. Error Analysis; Technological Aids in Language, Language Testing.

Unit-VI

Indian Writing in English

Toru Dutta :	"The Louts"
Rabindranath Tagore :	"Thou hast made me Endless"
	"Leave this Chanting and Singing"
	"I am like a Remnant of Cloud"
Sarojini Naidu :	"Song of Radha", "The Milk Maid"
Raja Rao :	On the Ganga Ghat and Other Stories
Girish Karnad :	Nagamandala
Salman Rushdie :	Midnight's Children
Arundhati Roy :	The God of Small Things
Anita Desai :	The Fire on the Mountain
Jayata Mahapatra :	"Hunger"
	"Grandfather"
A. K. Ramanujan :	"A River"
	"Another View of Grace"
Kamala Das :	"An Introduction"
	"The Looking Glass"

Unit-VII

American Literature

Walt Whitman :	"When Lilacs Last in the Dooryard Bloom'd"
	"One's-Self I Sing"
Robert Frost :	"Mending Wall",
	"After Apple Picking",
	"The Gift Outright"
Edgar Allen Poe :	"The Raven"
Arthur Miller :	Death of Salesman
Herman Melville :	Moby Dick
Sylvia Plath :	"Lady Lazarus"
	"Daddy"
Ernest Hemingway :	A Farewell to Arms
Tennessee Williams :	A Glass Menagerie
Langston Hughes :	"The Negro Speaks of Rivers"
	"Harlem"

Unit-VIII

New Literature in English

A D Hope :	"The Death of the Bird"
Patrick White :	The Solid Mandala
Margaret Atwood :	The Blind Assassin
Derek Walcott :	"A Far Cry from Africa"
	"Ruins of a Great House"
Chinua Achebe :	*Things Fall Apart*
V S Naipaul :	*A House for Mr. Biswas*
Wole Soyinka :	A Dance of the Forest
Ngugi wa Thiong'o :	*"Decolonising the Mind"*

Unit-IX

Women Writing

Jean Rhys : Wide Sargasso Sea
Charlotte Bronte : Jane Eyer
Tony Morrison : Beloved
Virginia Woolf : A Room of One's Own
Chimamanda Ngozi Adichie : "We Should All Be Feminists"
Partibha Ray : Yajnaseni
Charlotte Perkins Stetson Gilman : Women to Men
Gwendolyn Brooks : "A Sunset of the City"
Adrienne Rich : "Snapshots of a Daughter-in-law"
Vinda Nabar : Caste as Woman (Chapter One- Our Women, Their Women)

Unit-X

Literature in Translation

Main Concepts : Source Text; Target Text; Foreignization; Domestication; Equivalence; Skopos Theory; Kinds of Translation

Translation, Theory and Practice

1. "Translation Studies" Chapter One of Andre Lefevere's Translating Literature.
2. "India, England, France: A (Post-) Colonial Translation Triangle by Harish Trivedi.
3. "Translation and Society: The Emergence of a Conceptual Relationship" by Daniel Simeoni.
4. "The Task of Translator" by Walter Benjamin

Saadat Hasan Manto : "Toba Tek Singh"
Munshi Premchand : The Gift of a Cow Translated by Gordon.
C. Roadarmel.
Vijay Tendulkar : Silence! The Court is in Session
Fakir Mohan Senapati : Six Acers and a Third
Gustave Flaubert : Madam Bovary
Fyodor Dostoyevsky : Notes from Underground
Charles Baudelaire : "The Flowers of Evil" : fleurs du mal

Unit-XI

Literary Theory and Criticism

Bharat Muni : The Natyasastra (Chapter VI and VII)
Philip Sidney : An Apology for Poetry
Samuel Johnson : "Preface to Shakespeare"
Willam Wordsworth : "Preface to Lyrical Ballads"
S. T. Coleridge : Biographia Literaria Chapters XIII
T.S. Eliot : "Tradition and the Individual Talent"
Ferdinand de Saussure : "Nature of the linguistic sign"
Jacques Derrida : "Structure, sign and play in the discourse of the human sciences"
Louis Althusser : "Ideology and Ideological State Apparatuses"
Elaine Showalter : "Feminist criticism in the wilderness"
Edwar Said : "Introduction" to Orientalism
Homi K. Bhabha : "Introduction : Location of Culture" from The Location of Culture
Gayatri C. Spivak : "Can the Subaltern Speak ?"
Richard Kerridge : "Ecocritical Approaches to Literary Form and Genre"

6. SUBJECT : ECONOMICS

Unit-1

Micro Economics

(a) Theory of Consumer behavior, Ordinal, Cardinal approach, Revealed Preference Theory, Consumers behaviour Under Risk and Uncertainty
(b) Theory of Production:- Production Function -Short Run, Long Run, Cobb-Douglas Production Function, Different Concepts of Cost and Revenue Curves, Technical Progress-Neutral and Non-neutral
(c) Markets:- Equilibrium of firms under Perfect Competition, Monopoly, Monopolistic Competition, Duopoly, Collusive and Non-collusive Oligopoly, Sales Maximization Models.
(d) Theories of pricing of factors of production, Rent, Wages, Interest and Profit.
(e) Welfare Economics-Pareto optimality, Compensation principal, Arrows Impossibility
(f) Equilibrium-Partial and General, Stable and Unstable
(g) Linear Programming, Input-Output Analysis

Unit-2

Macro Economics

(a) National Income Determination and Accounting, Social Accounting system, Different concepts of National Income – GDP, GVA (Gross Value Added), GNP. NNP. etc.
(b) Theories of Employment, Classical, Keynesian and Modern
(c) Consumption function - Linear and Non-linear, Investment function, Multiplier, Accelerator, Income hypothesis – Relative and Permanent.
(d) Growth Models- Harrod, Domer, Solow, Meade, Joan Robinson, Fildman.
(e) Trade Cycles - Monetary theories, Hicks, Samuelson and Kaldor theory.
(f) Macro Theories of Distribution- Ricardo, Kaldor, Marx and Kalecki

Unit-3

Money and Banking

(a) Concept and Meaning:- Fiduciary Money, Credit, High powered money, Crypto Currency, Digital Currency, Supply of Money- Reddy Committee
(b) Demand for Money – Quantity Theory- Fisher, Cambrige, Patinkin and Friedman approach, Inventory theotric approach, Portfolio Balance Approach
(c) Theories of Inflation- Classical, Neo-classical ,Keynesian, Phillips curve, Monetery Approach, Rational Expectation Approach
(d) Theories of Interest Rate- Classical Theory, Keynesian Theory, IS-LM Approach

Unit-4

Public Finance

(a) Role of Government in Economic Activity- Allocation, Stabilization, Distribution
(b) Types of Goods- Public Goods, Private Goods, Merit Goods. Theories of Public Expenditure- Wagnar, Wiseman-Peacock Hypothesis
(c) Public Revenue- Tax vs Non-Tax Revenue, Impact, Incidence and Shifting of Tax, Public Debt-Types and Impact.
(d) Fiscal Policy- Deficit Financing, Types of Deficit, Fiscal and Revenue Deficit, Fiscal Federalism - Vertical vs Horizontal Inequality, Finance Commissions, Latest Commissions and its recommendations.
(e) Functional Finance

Unit-5

International Economics

(a) Theories of International Trade- Comparative cost, Opportunity cost, Heckscher- Ohlin, Product Life cycle
(b) Free Trade vs Protection- Infant Industry Argument, Methods of Protection, Tariff and Quota, Exchange Control
(c) Terms of Trade, Gains From Trade ,Fixed vs Floating Exchange Rate
(d) Balance of Payments – Equlibrium, Devaluation Absorption Approach Theory of customs union.
(e) WTO and Global Trade – Main Agreements-GATT 1994, GATS, TRIPS, Latest Ministerial conferences

Unit-6

Growth & Development

(a) Economic Growth, Development, Sustainable Development; Development Models- Nurkse, Lewis, Hirschman, Rosenstion Rodan, Leibenstein, Nelson, Gunnar Myrdal, Rostow & Marx, Endogenous Growth Model.
(b) State Vs Market; Planning Objectives, Formulation and Fundamentals.
(c) NITI Ayoga- Functions & Role; Role of Markets, Globalization, Liberalization and Privatization in India; Development Indices such as HDI, Poverty Index, MDPI, GDI, etc.
(d) Environmental Challenges and Climate Change; Sustainability, Global Development Goals; SDGs.

Unit-7

Indian Economy

(a) Basic Features and Structure of Indian Economy; Trends of National Income in India, Sectoral Distribution, Per Capita Income; Indian Agriculture- Institutional, Structural and Technological Changes, Food Security; Recent Advances in Agriculture.
(b) Indian Industry- Changing Scenario, Industrial Policy, Role of MSMEs, MNCs and Foreign Capital in India;
(c) Indian Demographic Scenario, Demographic Dividend in India.
(d) India's Trade- Structure, Composition, BOP and Policy;
(e) India's Monetary Policy- RBI and Inflation Targeting; MPC
(f) India's Fiscal Policy- Changing Structure; Features of Latest Union Budgets; GST and India;
(g) Indian Energy Challenges for Clean Energy,
(h) Indian Economic Policy - Dimensions and Impact. Unemployment, Poverty and Income Inequality in India.

Unit-8

Techniques of Economic Analysis

(a) Statistical Techniques- Measures of Central Tendency, Measures of Dispersion, Skewness and Kurtosis; Simple Correlation and Regression Analysis; Index Number-Meaning, Types, Tests & Uses; Time Series Analysis-Meaning, Component etc. Elementary Theory of Probability-Binomial, Poisson and Normal Distribution; Sampling Analysis - Types, Tests of Significance, Testing Hypothesis, Large and Small sampling such as t, F, χ^2 (chi-square) etc. Analysis of Variance.
(a)(Mathematical Techniques- Equations and Identity; Matrices and Determinants- Types & Uses in Economics; Differentiation- Simple & Partial, Maxima and Minima, Constrained Optimization & Their Uses/Applications in Economics, Homogenous Functions & Uses; Simple Integration & Uses.

7. SUBJECT : GEOGRAPHY

UNIT-1

Geomorphology

Origin of Earth, Interior of the Earth, Theories for Continent and Ocean Basins formation, Plate Tectonics, Earth Movements, Seismicity, Folding, Faulting and Vulcanicity, Rocks, Endogenetic and Exogenetic Forces, Erosion and Weathering and Mass Movement, Geomorphic Processes and associated landforms, Geomorphic Cycle (Davis and Penck), Causes and types of Geomorphic Hazards.

UNIT-II

Climatology

Composition and Structure of Atmosphere; Insolation, Heat Budget, Temperature, Pressure and Winds, Atmospheric stability and instability, Atmospheric Circulation (Air-masses, Fronts and Upper air circulation, Cyclones and Anticyclones). World Climate and its Classification, ENSO, Meteorological Hazards, Climate Change: Causes and Evidences, Human impact on Global Climate.

UNIT-III

Oceanography

Bottom relief of oceans, Ocean water: Composition, Temperature, Density and Salinity, Circulation, Warm and Cold Currents, Waves, Tides, Sea Level Changes Ocean Deposits and Coral reefs. Oceans as Ecosystems Marine Pollution; Climate change and Marine Ecosystem. Oceanic resources, Classification, Management, and its conservation.

UNIT –IV

Geography of Environment

Environment and its types, Ecological principles; Man – environment relationship. Ecosystem and its Functions, Trophic Levels, Energy Flows, Geo-chemical cycles. Food Chain, Food Web and Ecological Pyramid, Human Interaction and Impacts, Environmental Hazards and Disasters, Environmental Policies, Treaties and Programmes and Sustainable Development Goals.

UNIT-V

Population and Settlement Geography

Population Geography: World population distribution (patterns and determinants) and growth (prehistoric to modern period). Demographic Transition, Theories of population growth. Population structure composition and its characteristics. Fertility and Mortality: its determinants and world patterns. Migration (types, causes and consequences and models), Population Policies.
Settlement Geography: Rural Settlements; types, patterns, distribution and contemporary challenges. Origin of Towns, Characteristics and Classification. Urban Systems (Primate city and Rank size rule), Rural Urban Fringe, Central Place Theories, Internal Structure of the City, Changing Urban Forms and emerging challenges, Concept of Mega Cities and Satellite Towns.

Unit-VI

Geography of Economic Activities and Regional Development

Economic Geography: Economic activities, types and their dynamics, factors and their location, utilisation and conservation, surplus and deficit regions. Resource sustainability and emerging trends.
Agricultural Geography: Basic concepts, modern day relevance and recent trends. Crop performance and key elements. Agricultural Systems of the world, Agricultural Regionalization, Land use Planning, Green Revolution and newer challenges.
Industrial Geography: Manufacturing Activity-Classification and Locational theories and models. Industrial regions, Industrialization and development, Globalisation, recent trends and challenges.
Geography of Transport and Trade: Spatial Interaction, theories, and models. Measures and indices of connectivity and accessibility, Spatial flow models, Globalisation and liberalisation and world trade patterns, problems, and prospects of inter and intra-regional cooperation.
Regional Development: Region-concepts, attributes, and types. Regional disparities and theories of regional development. Regional imbalances and global economic blocks.

Unit-VII

Cultural, Social and Political Geography

Cultural and Social Geography: Concept of Culture, Cultural Complexes, Areas and Region, Cultural Heritage, Cultural Ecology. Cultural Convergence, Social Structure and Processes, Social Well-being and Quality of Life, Social Exclusion, Human Health and Diseases Ecology.
Political Geography: Concept of Nation and State, Frontiers and Boundaries, Heartland and Rimland Theories. Geography of Federalism, Electoral Geography, Determinants of Electoral Behaviour, Geopolitics of Climate Change, Geopolitics of World Resources, Regional Organisations of Cooperation.

Unit VIII

Geographic Thought

Contributions of Greek, Roman, Arab, Chinese and Indian Scholars, Contemporary trends in Indian Geography: Major Geographic Traditions, Dualisms in Geographic Studies, Paradigm Shift, Quantitative revolution, and locational analysis. Perspectives in Geography (Positivism, Behaviouralism, Humanism, Structuralism and Postmodernism).

Unit — IX

Geographic Techniques:

Geographic data representation - diagrams and graphs. Maps and their elements, Map types, thematic mapping. Morphometric analysis, profiles, Slope Analysis.
Geographic data sources and measurements. Central tendency, correlation, regression, dispersion. Cluster analysis. Sampling types and procedures. Remote Sensing- basic principles, Electro Magnetic Radiation (EMR) its properties, interactions, Sensor, Platforms, Resolution. Photograph and image, elements, and interpretation. Digital image processing. GPS components and application.
Geographic Information System (GIS)- data formats, Concept of database Spatial and non-Spatial data, conversion, editing and analysis. Georeferencing, GIS operations and applications.

Unit — X

Geography of India

Major Physiographic Regions, Drainage System, Climatic types and climatic regions, Indian Monsoon. Natural Resources: Soil, Vegetation, Water, Mineral and Marine Resources. Agriculture (Production, Productivity and Yield of major crops), Agro-Climatic Zones and Major Agricultural Regions, Food Security. Industrial Development since Independence, Industrial Regions and their characteristics, Industrial Policies in India. Development and patterns of Transport Networks, Trade patterns and Economic Corridors, Regional Development and Planning in India, Globalisation and its impact on Indian Economy, Impact of climate change, Environmental problems and challenges. Demographic characteristics: Population density, growth, distribution and migration. Cultural diversity: Languages,

Religions, and Ethnic groups. Urbanization and major Urban centres. Geography of Uttar Pradesh.

8. विषय : हिन्दी

खण्ड–1

हिन्दी साहित्य का इतिहास:

साहित्य का इतिहास दर्शन, हिन्दी साहित्य के इतिहास. लेखन की परम्परा और विकास, हिन्दी साहित्य के प्रमुख इतिहास–ग्रन्थ और उनकी विशेषताएँ, हिन्दी साहित्य का इतिहास– काल–विभाजन एवं नामकरण।

- **आदिकाल (वीरगाथाकाल)** : आदिकालीन साहित्य की सामाजिक–सांस्कृतिक एवं धार्मिक पृष्ठभूमि, आदिकाल के विविध नामकरण, आदिकाल की प्रवृत्तियाँ / विशेषताएँ, आदिकालीन हिन्दी का धार्मिक साहित्य– सिद्ध साहित्य, नाथ साहित्य, जैन साहित्य, लौकिक साहित्य, रासोकाव्य, आदिकाल के प्रमुख कवि और उनकी रचनाएँ।
- **भक्तिकाल (पूर्व मध्यकाल)** : भक्ति–आन्दोलन की पृष्ठभूमि, भक्ति–आन्दोलन के उदय के सामाजिक, सांस्कृतिक एवं राजनीतिक कारण, भक्तिकाल का प्रमुख सम्प्रदाय और उनका वैचारिक आधार, भक्तिकाल की सामान्य प्रवृत्तियाँ / विशेषताएँ, भक्तिकाल की विविध धाराएँ एवं उनकी प्रवृत्तियाँ– निर्गुणधारा (ज्ञानाश्रयीशाखा एवं प्रेमाश्रयीशाखा), सगुणधारा (कृष्णभक्तिशाखा एवं रामभक्तिशाखा), भक्तिकाल के प्रमुख कवि और उनकी रचनाएँ।
- **रीतिकाल (उत्तर मध्यकाल)** : रीतिकाल की सामाजिक–सांस्कृतिक एवं राजनीतिक पृष्ठभूमि, रीतिकाल के विविध नामकरण, रीतिकाल की अन्तर्धाराएँ– रीतिबद्धधारा, रीतिसिद्धधारा, रीतिमुक्तधारा, रीतिकाव्य की प्रवृत्तियाँ, रीतिकालीन कवियों का आचार्यत्व, मौलिकता एवं महत्त्व, रीतिकाल के प्रमुख कवि एवं उनकी रचनाएँ।
- **आधुनिककाल** :

(अ) हिन्दी का पद्य–साहित्य : आधुनिककाल की सामाजिक–सांस्कृतिक, आर्थिक एवं राजनीतिक पृष्ठभूमि, आधुनिककाल के विविध सोपान– भारतेन्दुयुग, द्विवेदीयुग, छायावाद, प्रगतिवाद, प्रयोगवाद, नयीकविता, समकालीन कविता।

भारतेन्दुयुग : भारतेन्दु और हिन्दी नवजागरण, भारतेन्दुयुग की प्रवृत्तियाँ, भारतेन्दुयुग के प्रमुख कवि और उनकी रचनाएँ।

द्विवेदीयुग : नामकरण, महावीरप्रसाद द्विवेदी और उनका युग, हिन्दी नवजागरण और 'सरस्वती', द्विवेदीयुगीन काव्य की प्रवृत्तियाँ, द्विवेदीयुग के प्रमुख कवि और उनकी रचनाएँ, हिन्दी की राष्ट्रीय काव्यधारा और उसके प्रमुख कवि और काव्य।

छायावाद : छायावाद की सामाजिक.सांस्कृतिक तथा दार्शनिक पृष्ठभूमि, छायावाद का आरम्भ, छायावाद के संबंध में विभिन्न मत एवं नामकरण, परिवेश, छायावाद की प्रवृत्तियाँ / विशेषताएँ, छायावाद के प्रमुख कवि और उनकी रचनाएँ।

प्रगतिवाद : प्रगतिवाद की अवधारणा, प्रगतिवादी काव्य की प्रवृत्तियाँ / विशेषताएँ, प्रगतिवाद के प्रमुख कवि और उनकी रचनाएँ।

हालावाद : हरिवं ाराय 'बच्चन' एवं हालावाद।

प्रयोगवाद और नयीकविता : प्रवृत्तियाँ, प्रमुख कवि और उनकी रचनाएँ।

प्रपद्यवाद (नकेनवाद)

समकालीन कविता : समकालीन कविता की प्रवृत्तियाँ, समकालीन कविता के प्रमुख कवि और उनकी रचनाएँ।

(ब) हिन्दी का गद्य.साहित्य : हिन्दी.गद्य का उद्भव और विकास– भारतेन्दु. पूर्व हिन्दी गद्य से लेकर अद्यावधि तक; हिन्दी.गद्य की विधाएँ– उपन्यास, कहानी, निबन्ध, नाटक, एकांकी और आलोचना साहित्य का उद्भव और विकास; हिन्दी की अन्य / नव्यतर गद्य.विधाएँ– रेखाचित्र, संस्मरण, जीवनी (परकथा), आत्मकथा, रिपोर्ताज, यात्रासाहित्य (यात्रावृत्तांत), पत्रसाहित्य, गद्यगीत, साक्षात्कार (इण्टरव्यू), डायरी, व्यंग्य इत्यादि का उद्भव और विकास; हिन्दी. गद्य की विविध विधाओं के प्रमुख रचनाकार और उनकी रचनाएँ ; हिन्दी का प्रवासी साहित्य– अवधारणा एवं प्रमुख साहित्यकार तथा उनकी रचनाएँ; अस्मितामूलक विमर्श– अस्मिता की अवधारणा और सिद्धान्त, दलित–विमर्श, स्त्री–विमर्श एवं समकालीन स्त्री. लेखन, आदिवासी–विमर्श (आदिवासी–साहित्य), किन्नर (थर्ड जेण्डर)–विमर्श / साहित्य।

(स) हिन्दी–पत्रकारिता : पत्रकारिता का अर्थ एवं उद्देश्य, पत्रकारिता की महत्ता, पत्रकारिता के विविध रूप हिन्दी. पत्रकारिता का उद्भव और विकास– भारतेन्दुयुगीन पत्रकारिता, द्विवेदीयुगीन पत्रकारिता, छायावादयुगीन पत्रकारिता, समकालीन पत्रकारिता; हिन्दी की साहित्यिक पत्र– पत्रिकाएँ; हिन्दी.पत्रकारिता: दशा, दिशा, संभावना।

प्रिन्ट मीडिया– समाचार एवं सम्पादकीय, रिपोर्ट, आलेख, फीचर. लेखन, साक्षात्कार।

श्रव्य मीडिया– रेडियो, दृश्य एवं श्रव्य मीडिया. दूरदर्शन, विज्ञापन. लेखन, संगोष्ठी. संचालन।

हिन्दी का लोकसाहित्य– लोकसाहित्य का सामान्य परिचय– परिभाषा, क्षेत्र, महत्व एवं वर्गीकरण, लोकसाहित्य में लोकसंस्कृति का चित्रण, लोकसाहित्य की विविध विधाएँ– लोकगीत, लोककथा, लोकनाट्य, लोकनृत्य, लोकसंगीत; लोक का प्रकीर्ण साहित्य– लोकोक्तियाँ, मुहावरे, पहेलियाँ; लोकसाहित्य: संरक्षण के प्रयास।

खण्ड–2

काव्यशास्त्र

(अ) भारतीय काव्यशास्त्र : काव्य. लक्षण, काव्य .हेतु, काव्य .प्रयोजन, काव्य. भेद, भरतमुनि का रससूत्र और उसके व्याख्याकार, प्रमुख सम्प्रदाय और सिद्धान्त–रस, अलंकार, रीति, वक्रोक्ति, ध्वनि और औचित्य, रसनिष्पत्ति, साधारणीकरण, काव्य .गुण, काव्य .दोष, शब्द–शक्तियाँ, प्रमुख काव्य शास्त्रीय आचार्य एवं उनके ग्रन्थ।

- **रस, छंद तथा अलंकार : लक्षण एवं उदाहरण**

छन्द : दोहा, सोरठा, चौपाई, छप्पय, रोला ,बरवै, हरिगीतिका, इन्द्रवज्रा, उपेन्द्रवज्रा, वंशस्थ, वसंततिलका, कवित, सवैया, कुण्डलिया।

अलंकार : शब्दालंकार–अनुप्रास, यमक, श्लेष, वक्रोक्ति, अर्थालंकार–उपमा, रूपक, उत्प्रेक्षा, अतिशयोक्ति, अनन्वय, अन्योक्ति, समासोक्ति, प्रतीप, व्यतिरेक, सन्देह, भ्रांतिमान, विभावना, परिसंख्या, मीलित, उन्मीलित, असंगति, दृष्टांत, अपह्नुति, अर्थान्तरन्यास, काव्यलिंग।

(ब) पाश्चात्य काव्यशास्त्र : प्लेटो का काव्यसिद्धान्त, अरस्तू का काव्यसिद्धान्त–अनुकरण सिद्धान्त, त्रासदी की अवधारणा, विरेचन सिद्धान्त, लोंजाइनस का उदात्त सिद्धान्त, टी0एस0 इलियट– निर्वैयक्तिकता का सिद्धान्त, आई0ए0रिचर्ड्स–मूल्य सिद्धान्त, सम्प्रेषण का सिद्धान्त; क्रोचे का अभिव्यंजनावाद, वर्ड्सवर्थ का काव्यभाषा सिद्धान्त, कॉलरिजः कल्पना और फैन्टेसी।

(स) हिन्दी एवं पाश्चात्य आलोचना के पारिभाषिक शब्द और कतिपय अवधारणाएँ

- काव्यभाषा, बिम्ब, प्रतीक, मिथक, कल्पना, फैन्टेसी, कविसमय, काव्यरूढ़ि।
- उत्तर आधुनिकतावाद, मार्क्सवाद, मनोविश्लेषणवाद, अस्तित्ववाद, यथार्थवाद, आदर्शवाद, आधुनिकतावाद, संरचनावाद, शास्त्रीयतावाद एवं स्वच्छन्दतावाद।
- हिन्दी आलोचना के प्रकार– सैद्धान्तिक आलोचना, स्वच्छन्दतावादी, आलोचना, मनोविश्लेषणवादी आलोचना, मार्क्सवादी आलोचना। भाषा वैज्ञानिक एवं शैली वैज्ञानिक आलोचना।
- हिन्दी के प्रमुख आलोचक एवं उनकी प्रमुख आलोचनात्मक स्थापनाएँ– आचार्य रामचन्द्र शुक्ल, आचार्य हजारीप्रसाद द्विवेदी, डॉ0 नगेन्द्र, आचार्य नन्ददुलारे वाजपेयी, डॉ0 रामविलास शर्मा, डॉ0 नामवर सिंह, बाबू श्यामसुन्दर दास।

खण्ड– तीन

हिन्दी भाषा और उसका विकास (भाषाविज्ञान एवं हिन्दी भाषा) :

- हिन्दी भाषा की उत्पत्ति और विकास– हिन्दी भाषा की व्युत्पत्ति, हिन्दी का नामकरण।
- हिन्दी भाषा की ऐतिहासिक पृष्ठभूमि– प्राचीन भारतीय आर्यभाषाएँ (वैदिक, लौकिक संस्कृत), मध्यकालीन भारतीय आर्यभाषाएँ (पालि, पाकृत– शौरसेनी, अर्धमागधी, मागधी–, अपभ्रंश), अपभ्रंश अवहट्ट और पुरानी हिन्दी का सम्बन्ध, आधुनिक आर्यभाषाएँ, और उनका वर्गीकरण।
- हिन्दी का भौगोलिक विस्तार (हिन्दी. क्षेत्र)
- हिन्दी की उपभाषाओं और बोलियों का परिचय : हिन्दी की उपभाषाएँ : वर्गीकरण और क्षेत्र– पश्चिमी हिन्दी, पूर्वी हिन्दी, राजस्थानी हिन्दी, पहाड़ी हिन्दी, बिहारी हिन्दी। हिन्दी की बोलियाँ; खड़ी बोली, ब्रज और अवधी की व्याकरणिक विशेषताएँ, हिन्दी की क्षेत्रीय बोलियों का विकास, काव्यभाषा के रूप में अवधी तथा ब्रज भाषा का उद्भव और विकास, साहित्यिक हिन्दी के रूप में खड़ी बोली का उद्भव और विकास, उत्तर प्रदेश की बोलियाँ।
- हिन्दी भाषा. प्रयोग के विविध रूप– बोली, मानक भाषा, राजभाषा, राष्ट्रभाषा, सम्पर्कभाषा, संचारभाषा।
- हिन्दी की संवैधानिक स्थिति– राजभाषा आयोग, राजभाषा अधिनियम, प्रयोजनमूलक हिन्दी, कार्यालयी हिन्दी, मानक हिन्दी आदि।
- राष्ट्रभाषा के रूप में हिन्दी की स्थिति– राजभाषा : तात्पर्य एवं महत्त्व, राष्ट्रभाषा हिन्दी की समस्याएँ, राष्ट्रभाषा : दशा, दिशा, सम्भावना।

हिन्दी.विस्तारीकरण के वैयक्तिक एवं संस्थागत प्रयास :

- स्वतन्त्रता.आन्दोलन के दौरान राष्ट्रभाषा के रूप में हिन्दी का विकास।
- हिन्दी–प्रसार के आन्दोलन, प्रमुख व्यक्तियों एवं संस्थाओं का योगदान।
- हिन्दी से संबंधित सरकारी संस्थाएँ एवं विभाग– केन्द्रीय हिन्दी संस्थान, केन्द्रीय हिन्दी निदेशालय, हिन्दी संस्थान लखनऊ, हिन्दुस्तानी एकेडमी, नागरी प्रचारिणी सभा, हिन्दी साहित्य सम्मेलन एवं विभिन्न मंत्रालयों की हिन्दी सलाहकार समितियाँ आदि।
- सम्मान–पुरस्कार।
- हिन्दी की पत्र–पत्रिकाएँ, लघु पत्रिकाओं का योगदान।
- हिन्दी के जनसंचार–माध्यम।
- हिन्दी पोर्टल एवं वेबपटल।
- **हिन्दी का भाषिक स्वरूप** :
- **हिन्दी–ध्वनियाँ** : हिन्दी वर्णमाला / वर्णविचार, हिन्दी ध्वनियों के वर्गीकरण का आधार।
- **हिन्दी–व्याकरण**– संज्ञा, सर्वनाम, विशेशण, क्रियाएँ, क्रियाविशेशण, लिंग, वचन, काल, अव्यय, कारक–व्यवस्था।
- **शब्द.रचना**– हिन्दी शब्द–संपदा और उसके मूल स्रोत– तत्सम, तद्भव, देशज, विदेशी शब्द ; रचना के अनुसार शब्दों का वर्गीकरण– रूढ़, यौगिक एवं योगरूढ़ शब्द ; उपसर्ग और प्रत्यय, सन्धि–समास, शब्द–भेद, पर्यायवाची शब्द, विलोम शब्द, एकार्थी शब्द, अनेकार्थी शब्द, अनेक शब्दों के लिए एक शब्द (वाक्यांश के लिए एक शब्द), समोच्चरितप्राय भिन्नार्थक शब्द (युग्म शब्द)।
- **हिन्दी वाक्य.रचना :** अर्थ एवं रचना की दृष्टि से वाक्य का वर्गीकरण, वर्तनी तथा वाक्यगत अशुद्धियाँ और उनका संशोधन।
- **मुहावरे एवं लोकोक्तियाँ**
- **कम्प्यूटर और हिन्दी**
- **हिन्दी विरामचिन्ह**
- **पत्रलेखन**– अर्धशासकीय एवं शासकीय पत्र, कार्यालय–आदेश, अधिसूचना, परिपत्र, अनुस्मारक, कार्यालय–ज्ञाप।
- **कार्यालयी हिन्दी की पारिभाषिक शब्दावली ।**
- **पारिभाषिक शब्द**: तात्पर्य एवं लक्षण, पारिभाषिक शब्दावली–निर्माण के सिद्धान्त, पारिभाषिक शब्दावली–निर्माण की प्रक्रिया।
- **अपठित गद्यांश और प्रश्नोत्तर**– अपठित गद्यांश से संबंधित प्रश्न, रेखांकित अंशों की व्याख्या, दिये गये अपठित गद्यांश का शीर्षक, अपठित गद्यांश का संक्षेपण।
- **अर्थबोध (comprehension)**
- **देवनागरी लिपि** : नामकरण, उद्भव और विकास, विशेषताएँ, वैज्ञानिकता एवं मानकीकरण, दोष, समस्या (सीमाएँ), सुधार के उपाय।
- **हिन्दी अनुवाद** : अनुवाद की अवधारणा– परिभाशा, स्वरूप ,महत्त्व, अनुवादक के गुण, दायित्व एवं उससे अपेक्षाएँ, अनुवाद के प्रकार– साहित्यिक अनुवाद, प्रशासनिक अनुवाद, विधि अनुवाद, बैंकिंग अनुवाद, ज्ञान–विज्ञान एवं तकनीकी अनुवाद, अनुवाद : सांस्कृतिक सेतु।

9. SUBJECT : HISTORY

Unit-1

Negotiating the Source: Archaeological sources: Epigraphy and Numismatics, Dating of Archaeological Sites, Literary Sources: Indigenous Literature: Religious and Secular Literature, Myths, Legends, etc. Foreign Accounts: Greek, Chinese and Arabic.

Prehistoric Background : Paleolithic and Mesolithic, Neolithic and Chalcolithic Phase: Settlement, distribution, tools and patterns of exchange.

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 Varnas and Social Stratification, Religious and Philosophical Ideas; Introduction of Iron Technology, Megaliths of South India.

Expansion of State system: Mahajanapadas, Monarchical and Republican States, Economic and Social Developments and Emergence of Second Urbanization in 6th century BCE; Jainism and Buddhism.

Unit-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, Role of Ashoka in Decline of Mauryan Empire, Mauryan art and architecture, Asokan edicts: language and script.

Dissolution of Empire and Emergence of Regional Powers: Indo-Greeks, Sungas, Satavahanas, Kushanas and Saka-Ksatrapas, Sangam literature, polity and society in South India as reflected in Sangam literature, Kharavela, Post-Mauryan art and Architecture, Gandhara, Mathura and Amaravati schools, Trade and Commerce from 2nd century BCE to 3rd century CE, Trade with the Roman World.

Gupta Vakataka age: Polity and Society, Agrarian Economy, Land Grants, Land Revenue and Land Rights, Gupta Coins, Beginning of Temple Architecture, Development of Sanskrit Language and Literature. Developments in Science Technology, Astronomy, Mathematics and Medicine. Concept of Golden age.

Harsha and his Times: Administration and Religion.

Unit-3

Emergence of Regional Kingdoms: Kingdoms of Deccan: Gangas, Kadmabas, Western and Eastern Chalukyas, Rashtrakutas, Kalyani Chalukyas, Kakatiyas, Hoysalas and Yadavas.

Kingdoms of South India: Pallavas, Cheras, Cholas and Pandyas.

Kingdoms of Eastern India: Palas and Senas of Bengal.

Kingdoms of Western India: Maitrakas of Vallabhi and Chalukyas of Gujarat.

Kingdoms of North India. Gurjara-Pratiharas, Kalacuri-Chedis, Gahadavalas and Paramaras.

Characteristics of Early Medieval India: Administration and Political Structure Legitimation of Kingship.

Agrarian economy; land grants, changing production relations; Graded land rights and peasantry, water resources, taxation system, coins and currency system, Feudalism.

Trade and Urbanization: Patterns of trade, urban settlements, ports and trade routes, merchandise and exchange, trade guilds; trade and colonization in South- East Asia.

Growth of Brahminical religions: Vaisnavism and Saivism; Tamil Bhakti movement - Shankara, Madhava and Ramanujacharya; Temple Architecture and Regional Style.

Society: Varna, Jati and Proliferation of Castes, Position of women; Gender, marriage and property relations. Tribes as peasants and their place in Varna order. Untouchability.

Education and Educational Institutions: Agraharas, Mathas and Mahaviharas as Centres of Education.

Unit-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, Alberuni's Accounts.

Political Developments; Ghaznavi conquests and invasions of Ghori. The Delhi Sultanate, the Turks, the Khaljis, the Tughlaqs, the Sayyids and the Lodis. Decline of Delhi Sultanate.

Foundation of the Mughal Empire- Babur, Hummayun 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 Suryavamshi Gajapatis.

Rise of the Marathas & the foundation of Swaraj by Shivaji; its expansion under the Peshwas Mughal- Maratha relations, Maratha Confederacy, Causes of Decline.

Unit-5

Administration & Economy: Administration under the Sultanate, Nature of State Theocratic and Theocentric, Central, Provincial and Local Administration, Law of succession.

Sher Shah Suri'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.

Industries- Cotton Textiles, Handicrafts, Agro-Based industries, Organisation, Factories & Technology.

Trade and Commerce- State Policies, Internal and External Trade: European Trade, Trade Centres and Ports, Transport and Communication.

Hundi (Bills of Exchange) and Insurance, State Income and Expenditure, Currency, Mint System; Famines and Peasant Revolts.

Unit-6

Society and Culture: Social Organisation and Social Structure.

The Sufis - Their Orders, Beliefs and Practices, the leading Sufi Saints, Social Synchronization.

Bhakti Movements - 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 and his teachings, Adi Granth; the Khalsa.

Social Classification: Ruling Class, Major Religious Groups, the Ulemas, the Mercantile and Professional Classes - Rajput Society.

Rural Society - Petty Chieftains, Village Officials, Cultivators and Non-Cultivating Classes, Artisans.

Position of Women - Zanana System - Devadasi System.

Development of Education - Centres of Education and Curriculum, Madarasa

Fine Arts - Major Schools of Painting Mughal, Rajasthani, Pahari, Garhwali; Development of Music.

Art and Architecture, Indo-Islamic Architecture, Mughal Architecture, Regional Styles of Architecture.

Indo-Arabic Architecture, Mughal Gardens, Maratha Forts, Shrines and Temples.

Unit-7

Sources of Modern Indian History: Archieval Materials, Biographies and Memoirs, Newspapers, Oral Evidence, Creative Literature and Painting, Monuments, Coins.

Rise of British Power: European Traders in India in the 16th to 18th 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 and Sequential growth of Central and Provincial Structure under East India Company.
Paramountcy, Civil Service, Judiciary, Police and the Army under the Company; British Policy and Paramountcy in the Princely States under the Crown.
Local Self-Government.
Constitutional Changes, 1909-1935.

Unit-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-Industrialisation De-urbanisation; Economic Drain; World Wars and Economy.
British Industrial Policy; Major Modern Industries; Nature of Factory Legislation: Labour and Trade Union Movements.
Monetary Policy, Banking, Currency and Exchange, Railways and Road Transport, Communications - Post & Telegraph.
Growth of New Urban Centres; New Features of Town Planning and Architecture, Urban Society and Urban Problems.
Famines, Epidemics and the Government Policy.
Tribal and Peasant Movements.
Indian Society in Transition: Contact with Christianity the Missions and Missionaries; Critique of Indian Social and Economic Practices and Religious Beliefs; Educational and Other Activities.
The New Education - Government Policy; Levels and Contents; English Language; Development of Science, Technology, Public Health & Medicine Towards Modernism.
Indian Renaissance Socio-Religious Reforms; Emergence of Middle Class; Caste Associations and Caste Mobility.
Women's Question- Nationalist Discourse; Women's Organisations: British Legislation concerning women, Gender Identity & Constitutional Position.
The Printing Press - Journalistic Activity and the Public opinion.
Modernisation of Indian Languages and Literary Forms Reorientation in Painting, Music and Performing Arts.

Unit-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; Subhas Chandra Bose and INA; Role of Middle Class in National Movement; Women Participation in National Movement.
Left Wing Politics; Depressed Class Movement and Communalism.
Independence of India 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.

Unit-10

Historical Method, Research Methodology and Historiography.
Nature, Scope and Importance of History.
Objectivity and Bias in History, Causation and Imagination in History.
Heuristics Operation, Criticism in History, Synthesis and Presentation.
History and its Auxiliary Sciences: Science, Art History or a Social Science.
Significance of Regional History.
Research Methodology, Hypothesis in History and Area of Proposed Research.
Sources - Data Collection, Primary / Secondary, Original and Transit Sources.
Recent Trends in Historical Research and Indian Historiography.
Selection of Topic in History.
Thesis and Assignment Writing; Design, Methods of Bibliography, Footnotes, Editing and Final Draft of Thesis.
Plagiarism, Intellectual Dishonesty and History Writing.
Beginnings of Historical Writings - Greek, Roman and Church.
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.
Public Ethics: Definition and importance.
Open Access Publication : Concept, Identification, Predatory Publishers and Journals.

10. SUBJECT : HOME SCIENCE

Unit-1

Human Development & Family Studies

1. Human Development: Introduction & Concepts- Principles & Concepts of Development, Growth & Development, General Principles of Development, Developmental tasks, Types of Development- Physical, Motor, Language, Play, Intellectual, Emotional and Social.
2. Prenatal Development: Stages of Prenatal Development, Genetic and Environmental factors, Maternal Conditions, Teratogens & Seratogens, Birth process and the neonates, Sensory Capacities and reflexes, Developmental milestones of Infants.
3. Developmental stages and tasks across life span: Early Childhood & Middle Childhood, Adolescence & Youth- Changes, Challenges and Programmes to promote optimal development; Adulthood- Characteristics, Changing roles and responsibilities in early and middle adulthood, Aging- Physical and Psychological changes.
4.Early Childhood Care & Education: Concepts, Objectives, Need & Scope of ECCE in light of National Education Policy (NEP); Montessori concept of ECCE, Contribution of philosophers in development of ECCE- Indian philosophers - Gijjubhai Badheka, Tarabai Modak, M. K. Gandhi and Rabindranath Tagore; Contribution of ICCW, NCERT, ICDS, UNICEF, NCTE to ECCE in India.
5. Theoretical perspectives of Human Development: Ecological theories- Uric Bronfen Brenner, Psychodynamic theories- Freud & Erickson, Learning theories- Pavlov and Skinner, Social Learning theories- Albert Bandura, Cognitive Development theories- Jean Piaget, Socio-cultural theory of Cognitive development- Vygotsky, Moral development theory- Kohlberg.
6. Children and Persons with special needs: Types of disabilities- Physical, Intellectual, Sensory and Learning, gifted children; Techniques to identify and assess various disabilities, Special education for children with developmental challenges, Physical and Social barriers for persons with special needs, Programmes and Policies catering to people with special needs and their rehabilitation.
7. Assessment techniques in Human Development: Projective techniques, Non-Projective techniques; Scales for Infant development- Bayley's Scale, APGAR, Neonatal behavioral Assessment scale.
8. Family Issues and Approaches**:** Marriage- Meaning, readiness for marriage (Physiological, Social, Psychological etc); Marital disharmony and family relations; Legal aspects in marriage, divorce and adoption; Developmental programmes for women & Children; Family in crisis- Dowry, Domestic violence, conflict and resolution; Guidance & Counseling across life span- objectives, principles and approaches. Gender sensitization and women empowerment.

Unit-2
Food Science

1. Foods: Properties of foods- Physical & Chemical; Quality evaluation of foods- Subjective & Objective; Energy value of foods, BMR, RMR, Factors affecting energy requirements.
2. Food pigments, additives and their role in food preparation.
3. Sensory evaluation: definition & types.
4. Food Processing: Food processing techniques, its effect on nutritional value; Methods of cooking; Principles and methods of food processing- drying, concentration, freezing, cryogenic freezing, fermentation, irradiation, canning, sterilization, pasteurization; HACCP – definition, Principles and application during food product processing
5. Food analysis – Sampling for products, nutrient analysis, general analytical techniques (Calorimeter, Spectrophotometer, ELISA test).
6. Food Packaging and Labeling: Processing and packaging techniques of fruits and vegetables, Meat, fish, eggs, poultry and milk; Storage of perishable and non perishable foods; Traditional and modern food storage methods.
7. Food Safety & Sanitation: Microbiology of foods, microbes responsible for common diseases; Food toxins, Antinutritional factors, food safety and sanitation in kitchen and hospitals. Sources of food contamination and spoilage- Biological, Chemical and Mechanical spoilage; Food adulteration and methods of detection; toxicants in foods.
8. Food fortification: Programmes & Policies in food fortification; Functional foods; Nutraceutical foods.
9. Food standards, Legislation, quality control and assurance, Food laws and acts, FSSAI, FAO, MPO, AGMARK, BIS, FPO and others.
10. Food service management: Perspectives; menu planning; food cost analysis; food service management at institutional level- hospitals, educational institutions, social and special institutions.

Unit-3
Nutrition & Dietetics

1. Nutrition- Basic concepts & Definitions, Nutrients and their role in the body functioning; Balanced diet; Macro & Micro nutrition; Nutrient deficiencies and nutritional requirements; Types of diets: Food groups, balanced diet, food pyramid, EAR, TUL, DRI.
2. Clinical & Therapeutic nutrition: Diet in health & disease, causes, Physiological conditions, clinical symptoms, dietary management.; Nutritional therapy in obesity, diabetes mellitus, food allergies and intolerances, Types of therapeutic diets for Infective hepatitis, Cirrhosis, hypertension, Coronary heart diseases, renal failure and renal diseases, cancer; Diet Counseling and management.
3. Nutrition through life span- Physiological changes, growth and development from conception to adolescence, nutritional needs and dietary guidelines for adequate nutrition through life cycle, nutrition concerns.
4. Inborn errors of metabolism, phytochemicals, antioxidants, Prebiotics and Probiotics
5. Community Nutrition: Concept, Nutritional epidemiology; Assessment of nutritional status using various methods.
6. National Nutritional policy; National and International programmes to combat various nutritional problems- PEM, Vitamin A deficiency, Anaemia, Iodine deficiency, Objectives & principles of nutrition education, Nutrition monitoring and Surveillance.
7. Nutrition Education: Objectives of education programmes, dietary counseling, needs and techniques. sports nutrition, nutrition in emergencies and disasters.

Unit-4
Family Resource Management/ Resource Management & Consumer Sciences

1. Management: Concept & Purpose of Management; Systems approach to Family Resource Management; Management process – Stages (Planning, Supervision, Controlling, Organising and Evaluation); Role of Decision making in management; Applications in management of time, energy, money and space.
2. Resources: Classification, Resource conservation and use of resources; time management; Energy management- Work simplification, Mundel's classes of change, Fatigue & types.
3. Motivation & factors: Values- definition & types; Goals- Definition & types; Standards- Definition & types, Theories of motivation.
4. Family finance Management: Family income, expenditure; Budgeting and records types and maintenance, Family savings & Investment; Tax implications.
5. Interior designing: Elements of art, Principles of design, Color and its dimensions, Psychological effects of color, color schemes; applications of elements of art and design in interiors.
6. Furnishing in Interiors: Types of curtains, draperies, floor coverings, rugs and carpets; cushion covers; accessories and their role in interiors.
7. Housing & Space designing: Housing need and importance; Principles of planning spaces, types of house plans, planning for different income groups; Building regulations – norms & standards; Housing and environment; building materials – Impact on environment; energy efficiency in buildings; energy auditing.
8. Energy as a resource: Conventional and non-conventional sources, renewable/ non-renewable energy, energy management; energy conservation.
9. Ergonomics: Significance, scope and nature of work; anthropometry; factors affecting physiological cost of work, body mechanics, Functional design of work places and furniture. Enviromental factors in relation to occupational ergonomics.
10. Consumer: Definition, roles, rights & responsibilities, Consumer protection forums, Standards; Consumer behavior and redressal.

Unit-5
TEXTILE SCIENCE

1. Textile terminologies; Classification of fibers: Natural and manmade fibers, Manufacturing process of major natural and manmade fibers, their physical and chemical properties and uses.
2. Methods of fabric construction: Woven, Knitted and nonwoven fabrics, their properties and uses. Types of weaves and their characteristics-basic weave (plain, twill and satin), decorative /fancy weaves (jacquard, dobby, leno, double cloth, warp and weft figuring, pile weave); Principles and classification of Knitting.
3. Textile finishes: Classification, Major finishes; Purpose and application method of finishes.
4. Surface decoration techniques: Dyeing and printing, classification of dyes, Types of dyes, dyeing techniques (solution dyeing, fiber dyeing, yarn dyeing, piece dyeing and garment dyeing), resist dyeing ; Methods of Printing (block , screen, stencil, roller, transfer printing and batik).
5. Traditional textiles and embroideries of India : Woven textiles, painted, printed and dyed textiles of different regions of India, their identification on the basis of fiber content, techniques used, motif, colour and design; Embroideries of different states of India.
6. Textile testing and quality control: Importance, techniques of testing fibers, yarns and fabrics; colour fastness testing and standards.
7. Textile ecology: Ecofriendly textiles, contamination and effluent treatment; Banned dyes; ecomark and eco lables.
8. Recent advances in textiles and apparels: types and scope of technical textiles, sustainable textiles, upcycling and recycling.

Unit-6
APPAREL DESIGNING & GARMENT MANUFACTURING

1. Apparel Designing and manufacturing: Elements of art and principles of design, their application in field of apparel and textile; Use of CAD in textile designing.
2. Anthropometric measurements: Importance, techniques and procedure.
3. Fashion: Terminologies, fashion cycle, theories of fashion, fashion forecasting and factors affecting fashion trends.
4. Principles and techniques of garment construction: Drafting, flat pattern and draping methods; grading and alteration of basic blocks; Use of CAD in garment industry.
5. Apparel manufacturing: Terminology, seam and seam finishes, techniques and machines used. Process of apparel manufacturing.

6. Apparel quality testing: Quality standards and specifications; Quality parameters, defects of fabrics and garments
7. Factors affecting clothing choices, selection of clothing for different age groups, fabric selection for varied uses.
8. Role and importance of textile and garment industry in Indian economy; status of textiles and apparel industries at global scenario.

Unit-7

EXTENSION EDUCATION & COMMUNICATION

1. Extension Education: Historical perspective of Extension Education, Extension system in India. Objectives of Extension education, extension programme development; Components of extension and changing concepts of extension; Philosophy of extension education.
2. Extension methods: Steps in extension teaching methods; Teaching aids- Types, characteristics and functions; Preparation and effective use of audio-visual aids in extension work.
3. Programme management: Need, situation analysis, planning, organization, implementation, monitoring and evaluation of programmes.
4. Media in process learning: Theories and role of media; Trends in print media, electronic media, Contemporary issues in media; Human rights and media.
5. Curriculum development and planning for extension development activities, Bloom's taxonomy of educational objectives and learning.
6. Community Development: Perspectives, approaches, community organization, leadership, support structures for community development, Panchayati Raj institutions; NGOs and community based organizations.
7. Non-formal adult education- its importance, historical perspective, concept, theories, methods and materials used, challenges of implementation and evaluation. Program for life long and continuing education: local, state, national and internal agencies, policy and program of Non-formal adult education. Meaning and concept of life-long education and its definitions.
8. Developmental programmes in India for urban, rural and tribal population; Programmes for nutrition, health, education, wage, and self employment for urban, rural women's development, skill development, sanitation and infrastructure.
9. Communication systems: Concept, types, Function and significance, Elements and characteristics of mass communication.
10. Concept of leadership in communities; Role and responsibilities of leadership in community development.

Unit-8

Research Methodology

1. Research and Research Design**:** Definition and types of research; Types of Research design; Research process; Identification of research problem- Steps; Ethics in Research; Research Management techniques; PERT, CPM, SWOT analysis.
2. Sampling: Definition and types of sampling; Sampling and Non sampling error; Tools and techniques of Data collection; Measuring scales; Reliability & Validity of tools.
3. Variables**:** Definition; Classification; Types of variables.
4. Conceptual understanding of statistical measures**:** Classification and tabulation of data; Measures of Central tendency, Measures of Variation.
5. Frequency Distribution: Frequency distribution tables; Types of tables; Graphical representation of data.
6. Data Distribution: Types of distribution; Normal distribution; Use of normal probability tables
7. Hypothesis: Definitions; Classification of Hypothesis; Testing of Hypothesis; Levels of Significance.
8. Parametric and Non Parametric Tests: Application of Z test, T test; Analysis of Variance (ANOVA); Chi – square test.
9. Relational Analysis: Coefficient of Correlation; Rank Correlation; Regression Analysis.
10. Scientific Writing: Types of Reports; Steps in report writing.

11. SUBJECT : MATHEMATICS

UNIT – 1

Analysis: Elementary set theory, finite, countable and uncountable sets, Real number system as a complete ordered field, Archimedean property, supremum, infimum. Sequences and series, convergence, limsup, liminf, uniform convergence. Bolzano Weierstrass theorem, Heine Borel theorem. Metric spaces, completeness, connectedness. Riemann integration, Lebesgue measure, Lebesgue integration. Normed linear Spaces, Banach spaces, Spaces of continuous functions as example, open mapping theorem, closed graph theorem, Hahn Banach theorem, Hilbert spaces.

UNIT – 2

Calculus: Continuity, Types of discontinuity, uniform continuity, differentiability, Monotonic functions, Functions of bounded variation, Mean value theorems. Sequences and series of functions, Functions of two or more variables, directional derivative, partial derivative, total derivative, maxima and minima, saddle points, Method of Lagrange's multipliers, Double and triple integrals and their applications, Improper integrals and their convergence. Vector Calculus: Gradient, divergence and curl, Green's Theorem, Stokes Theorem, Gauss Divergence Theorem.

UNIT – 3

Algebra: Divisibility in Z, Fundamental theorem of arithmetic, Congruences and residue classes, Chinese Remainder Theorem, Euler's φ- function, Fermat's theorem, Groups, subgroups, normal subgroups, quotient groups, homomorphisms, cyclic groups, permutation groups, Cayley's theorem, Fundamental theorem of group homomorphism, group action, Class equation, Sylow's theorems. Rings, ideals, prime and maximal ideals, quotient rings, unique factorization domain, principal ideal domain, Euclidean domain, Polynomial rings and irreducibility criteria. Fields, finite fields, field extensions, Galois Theory, Modules, Submodules, Cyclic modules, free modules, Noetherian and Artinian modules, Hilbert basis theorem.

UNIT – 4

Linear Algebra: Vector spaces, subspaces, linear dependence and independence, basis, dimension, algebra of linear transformations. Rank-Nullity theorem, Matrix representation of linear transformations. Change of basis, Solution of system of linear equations, Eigenvalues and eigenvectors, Cayley Hamilton theorem, Reduction to diagonal form, triangular form, rational and Jordan canonical form. Inner product spaces, orthonormal basis. Quadratic forms, reduction and classification of quadratic forms.

UNIT – 5

Complex Analysis: Limit, continuity and differentiability of complex functions, Analytic functions, Cauchy-Riemann equations. Complex integration, Cauchy's theorem, Cauchy's integral formula, Liouville's theorem, Maximum modulus principle, Schwarz lemma, Taylor series, Laurent series, calculus of residues, Contour integral, Conformal mappings, Mobius transformations. Topology: Basic concepts of topology, basis, dense sets, topological subspaces, First countable & second countable spaces, Separation axioms, Connected spaces and their basic properties, components, locally connected, spaces, Compactness, basic properties, Sequential and countable compactness.

UNIT – 6

Differential Equations: Existence and uniqueness of solutions of initial value problems for first order ordinary differential equations, singular solutions of first order ODEs, system of first order ODEs. General theory of homogenous and non-homogeneous linear ODEs, Sturm-Liouville boundary value problem, Green's function. Linear differential equations of second order- Method of changing of dependent/independent variables, variation of parameters. Partial Differential Equations (PDEs): Linear PDE of first order, Lagrange's method, Non-linear PDE of first order-Charpit's method, General solution of higher order PDEs with constant coefficients, Classification of second order PDEs, Method of separation of variables, Laplace equation, Wave equation and Heat equation.

UNIT – 7

Numerical Analysis : Numerical solutions of algebraic equations, Method of iteration and Newton-Raphson method, Rate of convergence, Solution of systems of linear algebraic equations using Gauss elimination and GaussSeidel methods, Finite differences, Gregory-Newton, Lagrange interpolation formulae, Newton's divided difference formula, Numerical differentiation and integration, Newton Cote's formulae, Numerical solutions of ODEs using Picard, Euler, modified Euler and Runge-Kutta methods. Calculus of Variations: Variation of a functional, Euler-Lagrange equation, Fixed end-point problem, variable end-point problem, Variational problems with subsidiary conditions. Linear Integral Equations: Linear integral equation of the first and second kind of Fredholm and Volterra type, Solution by the method of successive approximation, conversion of differential equation with initial condition, separable kernels. Eigenvalues and eigenfunctions, resolvent kernel.

UNIT – 8

Geometry: Polar equation of a conic, Cartesian and polar coordinates in three dimensions, Plane, straight lines, shortest distance between two skew lines; sphere, cone, cylinder, central conicoids, paraboloid. Tensors: Contravariant and covariant tensors, transformation formulae, Tensor of (r, s)-type, symmetric and skew symmetric properties, contraction of tensors, inner product of tensors, quotiont law. Differential Geometry: Curves in space, curvature and torsion of curves, Serret-Frenet's formulae, Helix, first and second fundamental forms of a surface.

UNIT – 9

Operations Research: Linear programming problem, basic feasible solution, Graphical method, simplex method, duality, transportation problem, assignment problem, travelling salesman problem, convex optimization, gradient descent, stochastic gradient descent.
Statistics and probability: Variance and standard deviation, Curve fitting by least squares, Corelation and regression, logistic regression, support vector regression, linear discriminant analysis, Sample space, Basic laws of probability, Independent events, Expectation, Bayes theorem. Random variables, discrete and continuous probability distribution functions-Binomial, Poisson and Normal. Graph Theory: Graphs, isomorphism, subgraphs, matrix representations, operations on graphs, degree of a vertex, Connected graphs and shortest paths: Walks, trails, connected graphs, shortest path algorithms. Trees: minimum spanning trees. Bipartite graphs, Hamilton graphs, Planar graphs, Euler's formula, Eulerian directed graphs.

UNIT – 10

Mechanics: Moment of inertia, Motion of a rigid body about an axis, Twodimensional motion of rigid bodies, Generalized coordinates, generalized momentum, Lagrange's equations, Hamilton's canonical equations, Hamilton's principle of least action, Contact transformations, Possion bracket. Fluid Dynamics: Equation of continuity, Euler's equation of motion for inviscid flow, stream lines, boundary surface, Motion in two dimensions: Sources and sinks, method of images, Flow past a cylinder and sphere.

12. SUBJECT : PHYSICS

Unit-1

Mathematical Physics

Vector algebra and calculus, Gauss and Stokes theorems, orthogonal coordinates, differential vector operators, special coordinate systems, circular cylindrical coordinates, spherical polar coordinates, tensor analysis, contraction, direct product, quotient rule, pseudo-tensors, dual tensors, non-cartesian tensors, covariant differentiation, and tensors differentiation operators, elements of group theory, second order ordinary differential equations, Legendre's equation, Legendre polynomials and Bessel function with their properties, Laguerre equation and its solutions, Laguerre polynomials and their properties, Hermite equation, Hermite Polynomials and their properties, different types of matrices, orthogonal, Hermitian, unitary and normal matrices, eigenvalues and eigen functions of matrices, diagonalization of matrices, properties of analytical functions, complex variable, Cauchy's integral theorem, Cauchy integral formula, Laurent expansion, singularities, Cauchy's residue theorem, Laplace Transform (LT) and its applications in Physics, Fourier series and Fourier transform (FT), FT and LT of delta and Gaussian functions.

Unit-2

Classical Mechanics

Centre of mass, total angular momentum and total kinetic energies of a system of particles, conservation of linear momentum, energy and angular momentum, constraints and their classification, degrees of freedom, generalized coordinates, virtual displacement, D'Alembert's principle, Lagrange's equations of motion of the first and second kind, uniqueness of the Lagrangian, simple applications of the Lagrangian formulation to some physical systems, generalized momenta, canonical variables, Legendre transformations and Hamilton's equation of motion, cyclic coordinates and conservation theorems, derivation of Hamilton's equations from variational principle, generating functions and their properties, Linear harmonic oscillator and coupled oscillators, reduction of two particle equations of motion to the equivalent one-body problem, reduced mass of the system, conservation theorems, Kepler's problem, scattering cross-section, impact parameter, Rutherford scattering, center of mass and laboratory coordinate systems, motion of a particle in a general non-inertial frame of reference, equations of motion in a rotating frame of reference, the Coriolis force, degrees of freedom of a free rigid body, angular momentum and kinetic energy of a rigid body, moment of inertia tensor, moments of inertia, classification of rigid bodies as spherical, symmetric and asymmetric, Euler's equations of motion for a rigid body, torque-free motion of a rigid body, precession of earth's axis of rotation, Euler angles, angular velocity of a rigid body, notions of spin, precession of a rigid body, Special theory of relativity, Lorentz transformation, Lagrangian formulation of relativistic mechanics.

Unit-3

Quantum Mechanics

Fundamental concepts of Heisenberg Uncertainty Principle, wave equations, Schrödinger equation (time independent and dependent), eigenvalues and eigenfunctions of the linear harmonic oscillator, the periodic potential, spherically symmetric potential and the hydrogen atom, dynamical variables and operators, expectation value, expansion of eigenfunctions, completeness property, commutator algebra, commuting observables, unitary transformations, matrix representations of wave functions and operators, equations of motion in Schrödinger, Heisenberg and interaction pictures, linear harmonic oscillator by operator method, symmetric and antisymmetric wave functions, Slater's determinantal wave functions, Born-Oppenheimer approximation, partial wave analysis, phase shift, scattering from square well potential, time-independent and time-dependent perturbation, problems in relativistic quantum mechanics.

Unit-4

Electromagnetic Theory

Green's functions, boundary value problems, dielectrics, polarization of a medium and electrostatic energy, Biot-Savart law, differential equation for static magnetic field, vector potential, magnetic field from localized current distributions, examples of magnetostatic problems, Faraday's law of induction, magnetic energy of steady current distributions, displacement current, Maxwell's equations, vector and scalar potentials, gauge symmetry, Coulomb and Lorentz gauges, electromagnetic energy and momentum, conservation laws, inhomogeneous wave equation and Green's function solution, plane waves in a dielectric medium, reflection and refraction at dielectric interfaces, frequency dispersion in dielectrics and metals, dielectric constant and anomalous dispersion, wave propagation in one dimension, group velocity, metallic waveguides, boundary conditions at metallic surfaces, propagation modes in wave guides, resonant modes in cavities, field of a localized oscillating source, fields and radiation in dipole and quadrupole approximations, radiation by moving charges, Lienard-Wiechert potentials, total power radiated by an accelerated charge, Lorentz formula, formation of plasma, Debye theory of screening, plasma oscillations, motion of charges in electromagnetic fields, magneto-plasma, plasma confinement, hydromagnetic waves.

Unit-5

Thermodynamics and Statistical Physics

Laws of thermodynamics, thermodynamic and chemical potentials, specific heat, classical theory, Einstein's theory, Debye's theory, thermal conductivity, thermal expansion of materials, Drude model of electrical and thermal conductivity, Sommerfeld model of free election gas; motion of electrons in a one-dimensional periodic potential, phase equilibria, free energy and its relations with thermodynamical quantities, Ideal Bose and Fermi gases, phase space trajectory, concept of a statistical ensemble, micro canonical, grand canonical ensembles, partition function, distribution function, mean value of a physical quantity, statistical equilibrium, statistical independence and quasi-closed systems, Liouville's theorem and its significance, entropy and law of increase of entropy, theorem of small increments, dependence of thermodynamic quantities, white dwarf and Chandrasekhar limit, statistical distribution in quantum statistics, Boltzmann distribution, Fermi-Dirac (F-D) and Bose-Einstein (B-E) distribution, F-D and B-E gases of elementary particles, first and second order phase transitions, Ising model, black body radiation, Planck's formula and Boltzmann's law.

Unit-6

Electronics

Semiconductors and their properties, semiconductor devices (p-n junction diode, Zener diode, Schottky diode, LED, Photodiode, Gunn diode, BJT, UJT, JFET, MOSFET, SCR, etc.), **analog and digital circuits (different kinds of amplifiers and oscillators, multivibrators, GATES, OP-AMP, filter circuits, etc.), network analysis,** admittance, impedance, scattering and hybrid matrices for two and three-port networks and their cascade and parallel combinations, **Kirchoff's law,** superposition theorem, Thevenin's theorem, Norton's theorem, Millman's theorem, maximum power transfer theorem, Boolean laws and theorems, conversion of codes, flip flops, shift Registers and counters, various frequency bands used for communication, types of communications and need of modulation, AM, FM, PM modulations, different kinds of memories, i.e., C-MOS, ROM, RAM, MOS, A/D and D/A convertors, microprocessors and microcontrollers.

Unit-7

Atomic and Molecular Physics

Spatial rotations, orbital angular momentum, commutation relations – L_x, L_y, L_z and L^2, Eigenfunctions and eigenvalues of L^2 and L_z, particle on a sphere and the rigid rotator, spin angular momentum, Pauli spin matrices, total angular momentum, spectrum of J^2 and J_z, ladder operators, addition of two angular momenta, Clebsch-Gordan coefficients for $j_1=j_2=1/2$ and $j_1=1/2$, $j_2=1$, selection rules, quantum states of electrons in an atom, spin-orbit interaction, LS coupling, JJ coupling, fine structure and hyperfine structure, interaction energy, spectra of He and different alkali atoms, normal and anomalous Zeeman effect, Paschen-Back effect and Stark effect, Frank-Condon principle and selection rules, photoelectron spectroscopy, Mössbauer spectroscopy, nuclear magnetic resonance, chemical shift, and electron spin resonance, electronic, rotational, vibrational and Raman spectra of diatomic molecules, selection rules, basic principles of laser, Einstein coefficients, optical and electrical pumping, population inversion, rate equations, cavity and mode of resonance, light amplification, threshold condition, coherence length, laser broadening mechanisms, gas, solid state and semiconductor lasers, operating principle and applications of lasers.

Unit-8

Nuclear and Particle Physics

Fundamental properties of Nucleus, Nuclear radiation measurements - Ionization Chamber, Proportional Counter, Geiger Muller Counter, Scintillation Counters, luminescence detectors, **Spark counter, Solid State detector,** Interaction of radiation with matter, Interaction of ionized radiation with matter – Stopping power, Bethe's formula. Liquid drop model and Bethe-Weizsäcker mass formula, Magic numbers, Shell model- Evidence of shell structure, Spin-orbit coupling, Collective model- Vibrational and rotational spectra for nuclear particles. Predictions of spin, parity and magnetic moments, Alpha, Beta and Gamma decay, accelerators, synchrotron, cyclotrons and linear accelerators and their applications in various scientific and medical fields. Nuclear reaction and their types, Q-equation, Solution of Q-equation, Threshold energy, Nuclear reaction cross section and its measurement, Compound reaction mechanism, Level width, Nuclear resonances and single level, Breit -Winger formula, Theory of deuteron, Nuclear forces- Spin dependence and non-central features, Low energy n-p scattering, Scattering length and effective range theory, Low energy p-p scattering, Charge symmetry and charge independence of nuclear forces, Meson theory of nuclear forces, elementary particles, types of interactions between elementary particles, Exact conservation laws, Approximate conservation laws- Isospin, parity, strangeness, charge conjugation, time reversal, charge conjugation parity (CP) violation, Charge-Parity-Time (CPT) theorem, Resonances and their properties, SU(3) classification of particles and resonances, Quark flavor and color, Quark model of hadrons, Strangeness oscillation, CP non-conservation in K0 decays, Regeneration phenomenon, Basic idea about the standard model, discovery of Higg's bosons and related theory.

Unit-9

Solid State Physics

Fundamental types of lattices and Bravais lattice; Miller Indices of a family of planes and interplanar spacing for different crystal structures, Bragg's law, scattered wave amplitude, reciprocal lattice, concept of Brillouin zone, Fourier analysis of the basis, crystal binding and elastic constants of crystals, group theory in crystallography and **symmetry elements, nomenclatures of different groups,** wave motion of one dimensional atomic lattice, group velocity and phase velocity, force constants, Brillouin zones, normal modes of vibration in one dimensional atomic lattice of finite length, lattice with two atoms per primitive cell, Optical and acoustical phonons, momentum of phonons, inelastic scattering of photons by long wavelength of phonons, Band theory of solids: Metals, insulators and intrinsic semiconductors; Kroning-Penney Model, direct and indirect band gap of semiconductors, construction of Fermi surfaces, Fermi surface and Brillouin zones, experimental Methods in Fermi surface studies, de Hass van Alphen effect, quantum Hall effect, Magnetoresistance, Boltzmann transport equations, occurrence of superconductivity, Meissner effect, London equation, high temperature superconductors, Cooper pairs and elementary discussion of BCS model, Josephson junction, Langevin theory of diamagnetism and quantum theory of diamagnetism and paramagnetism, ferromagnetism, magnons, magnetic hysteresis, point defects, Schottky defects and Frenkel defects, line and stacking faults, volume imperfections, ordered phases of matter: translational and orientational order, kinds of liquid crystalline order, quasicrystals, materials design and selection, metals and alloys: solid solutions, solubility limits, Gibb's phase rule, binary phase diagrams, methods of fabrication and applications of few composites, smart materials, superalloys, shape memory alloys, **materials characterization techniques: X-Ray Diffraction (XRD),** Scanning electron microscopy (SEM), transmission electron microscopy (TEM), atomic force microscopy (AFM), scanning tunneling microscopy (STM), X-ray photoelectron spectroscopy (XPS), Fourier Transform Infrared Spectroscopy (FTIR), Ultraviolet-VISIBLE Infrared Spectroscopy (UV-IR), Raman Spectroscopy, Thermal Gravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential scanning calorimetry (DSC).

Unit-10

Topic of Special Interest

Dosimetry of high energy radiations/particles, superfluidity, nanostructured materials and their applications, synthesis techniques of nanomaterials, Quantum confinement, and 0 D, 1 D and 2 D systems, Transport properties of 2D and 1D systems, Fullerenes; Synthesis of C60 and properties, various forms of fullerenes, Graphene, carbon nanotubes and their applications, Non-linear optical properties, nanotechnology in nature, metamaterials, self-healable materials, energy devices: solar cells, self-powered nanogenerators, supercapacitors, batteries and fuel cells, physics and technology of sensors such as humidity, gas, pressure and biosensors, transducers, superconducting quantum interference devices (SQUIDs), optical fibres and their applications in science, industry, medicine and defense.

13. SUBJECT : POLITICAL SCIENCE

Unit-1

Political Theory

- Concepts- Liberty, Equality, Justice, Rights, Democracy, Power, Authority and Influence, Citizenship.
- Theories of Sovereignty-Monastic, Pluralistic.
- State- Theories of Origin, Nature and Functions.
- Political Ideologies- Liberalism, Conservatism, Socialism, Feminism, Ecologism, Multiculturalism and Postmodernism.

Unit-2

Political Thinkers

- Plato, Aristotle, Machiavelli, Hobbes, Locke, Rousseau, Bentham, J.S. Mill, Hegel, T.H. Green, Karl Marx, Gramsci, Jahn Rawls, Robert Nozick.
- Manu, Kautilya, Tilak, Jayotiba Phule, Vivekanand, Gandhi, J.L. Nehru, Jayaprakash Narayan, Deendayal Upadhyaya, V.D. Savarakar and M.N. Roy.

Unit-3

Comparative Politics

- Approaches- Traditional, Behavioural and Post Behavioural, Political Economy, Concepts of Political system, Classification of Political Systems, (British and American Models) Dictatorship, Totalitarian, Modernization, Political Culture.
- Constitution and Constitutionalism, Forms of Constitutions, Rule of Law, Judicial Independence and Crisis of Constitutionalism.
- Development, Underdevelopment, Dependency, World Systems theory, Development and Democracy.
- Structure of Power- Ruling Class, Power Elites, Democratic Elitism.
- Electoral System, Party system and Political Party, Pressure groups, Social Movements, New Social Movements, Non Governmental Organizations (NGOs), Civil Society and Revolution.

Unit-4

Indian National Movement, Constitution and Political Process

- National Movement, Constitutional Development and Making of Indian Constitution.
- The Indian Constitution- Preamble, Basic features, Basic Structure, Fundamental Rights and Duties, Directive Principles of State Policy.
- Constitition as Instrument of Socio- Economic Change: Amendments and Review.
- Union Executive and Legislature, State Executive and Legislature.
- Indian Judiciary- Supreme Court, High Court and Lower Court, Judicial Review, Judicial Activism, Judicial Reforms.
- Election and Electoral Reforms in India.
- Political Parties: National and Regional, Defection.
- Constitutional and Statutory Bodies- Election Commission, Finance Commission, Comptroller and Auditor General, National Commission of Scheduled Castes, Scheduled Tribes, Other Backward Classes (OBCs), National Commission of Human Rights, National Commission for Women, NITI Aayog, Inter-State Council, National Development Council.
- Issues-Regionalism, Casteism, Linguism, Minorities, Identity Politics, Naxalism, Peasant Movement, Reservation, and Coalition Politics.

Unit-5

International Politics and Relations

- Approaches to the study of International Relations-Idealism, Realism, Neoliberalism, Neorealism, Social Constructivism, Critical International theory, Feminism, Postmodernism.
- Concepts – Power, National Interest, National Power, National Security: Traditional and Non Traditional.
- Conflict and Peace- Changing Nature of Warfare, Role of NATO, Weapons of Mass Destruction, Deterrence, Conflict Resolution, Conflict Transformation
- United Nations: Aims, Objectives, Structure and evaluation of the working of UN, Peace and Development Perspectives, Humanitarian intervention.
- Political Economy of International Relations: Globalization, Global Governance and Britton Woods System, North-South Dialogue, South- South Dialogue, WTO, G-20, BRICS, QUAD, Shanghai Cooperation Organization, ASEAN and European Union.
- Indian Foreign Policy- Principles, Development, Recent approaches, Relation with Neighbouring Countries, Emerging Role in International Relations.
- Foreign Policies of USA, Russia and China.

Contemporary Challenges- International Terrorism, Climate change and Environmental Concerns, Human Rights, Migration and Refugees, Poverty and Development.

Unit-6

Public Administration

- ·Public Administration: meaning and evolution, Public and Private Administration Approaches: System Theory, Decision Making, Ecological Approach.
- ·Public Administration Theory and Concepts: Scientific Management Theory, Rational Choice Theory, New Public Administration, Development Administration.
- ·Theories and Principle of Organization: Scientific Management Theory, Bureaucratic Theory, Human Relations Theory.
- ·Governance, Good Governance , Role of State, Civil Society and Individuals.
- ·Accountability and Control: Institutional Mechanisms for checks and balances, Legislative Control over Excutive, Administrative and Budgetary Control, Control through Parliamentary Committees, Judicial Control over Legislature and Executive, Administrative Culture, Corruption and Administrative Reforms.
- ·Institutional Mechanisms for Good Governance: Right to Information, Consumer Protection Act, Citizen's Charter, Grievance Redressal system, Ombudsman: Lokpal, Lokayukta.

14. SUBJECT : PSYCHOLOGY

Unit-1

Theoretical Approaches to Psychology : S-R, Cognitive information processing, humanistic.

Cognitive Neuropsychology : Assumption, methods, organization of brain, techniques of measuring of Brain Activities.

Perception, Attention, Learning, Memory and Forgetting :

Perception : Approaches to study of perception, perceptual organization, perceptual constancy : size, shape, colour and illusions, depth perception, Bottom-up and top-down processes, perceptual development : nature and nurture controversy.

Attention : Selective, divided and sustained attention-Concepts and theories.

Learning : Classical and Instrumental Conditioning : Reinforcement Schedules, Observational learning, Behaviour modification.

Memory and Forgetting : Memory processes : Encoding, Storage and Retrieval; Sensory Memory, Short-term and long-term memory; Models : Atkinson-Shiffrin model, Level of processing approach, Tulving's Model; Parallel distributed processing approach, Eye witness and flashbulb memory. Theories of Forgetting, Retrograde Amnesia.

Unit-2

Reasoning, Decision Making, Problem Solving and Language

Reasoning : Types and factors of Reasoning

Decision Making : Heuristic and Algorithm; Models of Decision Making.

Problem Solving : Types of Problems and Strategies of Problem Solving and Creative Thinking, Stages of Creative Thinking.

Language : Components, Acquisition and Development.

Unit-3

Personality, Intelligence, Motivation and Emotion

Personality : Approaches to Personality : Trait and Types; Psychoanalytic, Behaviouristic and Humanisitic, Existential approaches, Positive Psychology; Determinants , Objective and Projective Assessment of Personality.

Intelligence : General Mental Ability, Theoretical Approaches : Spearman, Sternberg, Gardner; Factors Influencing Intelligence; Emotional Intelligence, Artificial Intelligence.

Motivation : Conceptual issues and Theoretical Frameworks, Types of Motives.
Emotion : Conceptual and theoretical issues, Physiological bases of Emotions. James Lange, Connon-Bard Theoris.

Unit-4

Research Methods, Experimental Design and Statistics, Psychological Assessment and Testing

Research Methods : Sampling, Problem, Hypothesis, Variables, Control Techniques.
Experimental Design : Types, Between group, Single factors, Randomized and Matched group; Within group design : one and multiple factors, Repeated Measures. Factorial Design : Main and interaction effects, Types; Quasi Experimental Design and Ex-post-facto Design; Qualitative Research.
Statistics : Testing of Hypothesis, Analysis of Variance (ANOVA) : One way and Two way; Repeated Measures : Post-hoc Comparisons. Non-Parametric Statistics : Chi-square, Median test, Wilcoxon test, Mann-Whitney U-test, Friedman test, Kruskal Wallis H-test. Correlational Methods : Product moment, Biserial, Point Biserial and Tetrachoric correlation. Factor Analysis : Extraction and Rotation of Factors, Multivariate Analysis : Multiple Regression Analysis : Simultaneous, Hierarchical and Step-wise.
Psychological Assessment : Nature, Purpose and Principles of Assessment, Ethical Considerations, Testing in various settings : Educational, Clinical and Organizational.
Test Construction : Item Writing, Item Analysis, Reliability, Validity and Norms.

Unit-5

Life Span Development

Developmental Stages and Determinants, Cognitive, Social and Moral Development, Changes in Adulthood and Old age.

Unit-6

Social Psychology and Organizational Psychology

Social Psychology : Social Influence : Bases of Social Influence processes : Norms, Conformity, Compliance, Obedience, Persuasion and its consequences, Leadership, Group Factors in Performance, Control and Power, Cultural Influence : Social Cognition : Meaning, Approaches : Attribution, Schema and Cross-Cultural. Interpersonal Attraction : Theories.
Organizational Psychology : Human Resource Management : Planning, Assessment, Job Analysis, Recruitment, Selection and Training ; Organizational Development and Change : Process, Action Research, Interventions; Organizational Communication : Model, Process, Barrier, Direction and Network in Communication. Communication Skills. Industrial Relations : Union Management Relations, Grievances Handling.

Unit-7

Clinical Psychology and Health Psychology

Clinical Psychology : Diagnosis : Methods : Case Study, Interview, Testing and Neuropsychological Testing. Therapy : Major Approaches : Psychodynamic (Freudian), Cognitive-Behaviour (Ellis and Beck), Humanistic-Existential (Rogers, Gestalt and Frankl) and Systems Approach.
Health Psychology : Models and Issues, Stress and Health, Coping with Stress; Type-A, B, C, D Behaviour, Managing Stress – Diet and Nutrition, Relaxation, Biofeedback and Yoga.

Unit-8

Psychopathology

Classification of Disorders (ICD – 11 and DSM – 5- TR), Symptoms and Etiology of disorders; Child Psychopathology : Types of Disorders : Autism Spectrum Disorder (ASD), Attention-Deficit-Hyperactivity Disorder (ADHD) and Learning Disabilities.

Unit-9

Counselling Psychology and Community Psychology

Counselling Psychology : Principles of Counselling and Guidance, Counselling Approaches : Directive, Non-directive and Career Counselling.
Community Psychology : Types of Intervention in Community Psychology, Primary, Secondary and Tertiary Prevention Programmes.

15. विषय : संस्कृत

इकाई–1

संस्कृत वाङ्मय का सामान्य परिचय

(क) वैदिक साहित्य का सामान्य परिचय

- वेदों का कालः मैक्समूलर, ए.वेबर, जैकोबी, एम. विंटरनित्स, बाल गंगाधर तिलक एवं परम्परागत भारतीय विचार।
- संहिता साहित्य
- ब्राह्मण साहित्य
- आरण्यक साहित्य
- वेदाङ्ग साहित्य

(ख) प्रमुख भारतीय दर्शनों का सामान्य परिचय

चार्वाक, जैन, बौद्ध, न्याय, सांख्य, योग, वैशेषिक, मीमांसा दर्शन के संदर्भ में।

(ग) व्याकरण शास्त्र का सामान्य परिचय

पाणिनि, कात्यायन, पतञ्जलि, भर्तृहरि, वामनजयादित्य, कैयट, भट्टोजिदीक्षित, नागेशभट्ट, जैनेन्द्र, शकटायन।

(घ) कवि एवं काव्यशास्त्र का सामान्य परिचय

- कवि–वाल्मीकि, वेदव्यास, भास, अश्वघोष, कालिदास, शूद्रक, विशाखदत्त, भारवि, माघ, श्रीहर्ष, बाणभट्ट, दण्डी, भवभूति, अम्बिकादत्त व्यास, पण्डिता क्षमाराव।
- काव्यशास्त्र– रससम्प्रदाय, अलंकारसम्प्रदाय, रीतिसम्प्रदाय, ध्वनिसम्प्रदाय, वक्रोक्तिसम्प्रदाय, औचित्यसम्प्रदाय।

इकाई–2

वैदिक वाङ्मय

(क) निम्नलिखित सूक्तों का अध्ययन

- ऋग्वेद– अग्नि (1.1), वरुण (1.25), इन्द्र (2.12) हिरण्यगर्भ (10.121), वाक् (10.125), नासदीय (10.129), ।
- शुक्ल यजुर्वेद– शिवसंकल्प, अध्याय–34 (1–6)।

(ख) ब्राह्मण एवं आरण्यक

- ऐतरेय ब्राह्मण (शुनः शेप आख्यान)।
- तैत्तिरीय आरण्यक (द्वितीय प्रपाठक 1–10)

(ग) उपनिषद्

- ईशावास्योपनिषद् ।
- कठोपनिषद् (प्रथम अध्याय)

(घ) वेदाङ्ग

- निरुक्त–प्रथम अध्याय
- पाणिनीय शिक्षा– वर्णोच्चारणस्थान, वर्णभेद, प्रयत्न

इकाई–3

दर्शन साहित्य

(क) सांख्यदर्शन–सांख्यकारिका (1–40 कारिका)
(ख) वेदान्तदर्शन–वेदान्तसारः (सम्पूर्ण)
(ग) मीमांसादर्शन–अर्थसंग्रहः (विधिनिरूपण पर्यन्त)
(घ) न्यायवैशेषिक– तर्कभाषा (अनुमान प्रमाण पर्यन्त)

इकाई–4

व्याकरण एवं भाषा विज्ञान

(क) महाभाष्य(पस्पशाह्निक)– शब्दपरिभाषा, शब्द एवं अर्थ का सम्बन्ध, व्याकरण के अध्ययन का प्रयोजन, व्याकरण की परिभाषा, साधु शब्द के प्रयोग का परिणाम, व्याकरण पद्धति।

(ख) सिद्धान्तकौमुदी– कारकप्रकरण

(ग) लघुसिद्धान्तकौमुदी

- संज्ञाएँ–संहिता, संयोग, गुण, वृद्धि, प्रातिपदिक, उपधा, पद, विभाषा, सवर्ण, सर्वनाम, निष्ठा।
- सन्धि– अच्सन्धि, हल्सन्धि, विसर्गसन्धि।
- समास– अव्ययीभाव, तत्पुरुष, बहुव्रीहि, द्वन्द्व।
- स्त्रीप्रत्यय
- सुबन्त– राम, हरि, सखि, रमा, मति, नदी, ज्ञान, वारि, मधु, राजन्, विद्वस्, अस्मद्, युष्मद्, तत् (तीनों लिंगों में)
- तिङन्त– भू, एध्, अद्, हु, दिव्, षुञ्, तुद्, तन्, कृ, रुध्, क्रीञ्, चुर्
- कृदन्त– तव्य/तव्यत्, अनीयर् , यत्, ण्यत्, क्यप्, शतृ, शानच्, क्वा, क्त, क्तवतु, तुमुन्, णमुल्।

(घ) भाषाविज्ञान– भाषा की परिभाषा, भाषा का वर्गीकरण (आकृतिमूलक एवं पारिवारिक), ध्वनियों का वर्गीकरण : स्पर्श, संघर्षी, अर्धस्वर, स्वर (संस्कृत ध्वनियों के विशेष संदर्भ में), मानवीय ध्वनि यन्त्र, ध्वनि परिवर्तन के कारण, ध्वनि नियम(ग्रिम, ग्रासमान, वर्नर), अर्थ परिवर्तन की दिशाएँ एवं कारण, भारोपीय परिवार का सामान्य परिचय, वैदिक संस्कृत एवं लौकिक संस्कृत में अन्तर, भाषा तथा वाक् में अन्तर, भाषा तथा बोली में अन्तर।

इकाई–5

काव्य एवं काव्यशास्त्र

(क) पद्य– मेघदूतम् (पूर्वमेघ), किरातार्जुनीयम् (प्रथम सर्ग), शिशुपालवधम् (प्रथम सर्ग), नैषधीयचरितम् (प्रथम सर्ग)।
(ख) गद्य– दशकुमारचरितम् (अष्टम उच्छ्वास), कादम्बरी (शुकनासोपदेश), शिवराजविजयम् (प्रथम निःश्वास)
(ग) नाट्य– स्वप्नवासवदत्तम्, अभिज्ञानशाकुन्तलम् (1–4 अंक), उत्तररामचरितम् (1–3 अङ्क), मृच्छकटिकम् (केवल तृतीय अङ्क), रत्नावली (सम्पूर्ण)।
(घ) ध्वन्यालोक (प्रथम उद्द्योत)
काव्यप्रकाश–
काव्यपरिभाषा, काव्यप्रयोजन, काव्यहेतु, काव्यभेद, शब्दशक्ति, रसस्वरूप एवं रससूत्र विमर्श, काव्यगुण।
अलंकार–वक्रोक्ति, अनुप्रास, यमक, श्लेष, उपमा, उत्प्रेक्षा, रूपक, समासोक्ति, अपह्नुति, निदर्शना, अर्थान्तरन्यास, दृष्टान्त, विभावना, विशेषोक्ति, स्वभावोक्ति, विरोधाभास, संसृष्टि, संकर।
(ङ) दशरूपकम् (प्रथम एवं तृतीय प्रकाश)
टिप्पणी–
1. मुख्य परीक्षा हेतु संस्कृत अथवा हिन्दी माध्यम रहेगी।
2. परीक्षार्थी को मुख्य परीक्षा के किन्हीं 08–08 अंकों के 02 एवं 12–12 अंकों के 02 प्रश्नों के उत्तर संस्कृत में देना अनिवार्य होगा।

16. SUBJECT : SOCIOLOGY

Unit-1

Basic Sociological concepts

Historicity of Sociology, Institution, Association, Status and Role, Reference Group, Norms and Values, Ideology and Utopia, Community and Virtual Community, Society and Network Society, Culture, Group & Types.

Unit-II

Social Processes

Cooperation, Competition, Conflict, Diffusion, Assimilation, Acculturation, Enculturation Alienation, Integration, Social, Exclusion, Social Inclusion, Digitalization, Socialization.

Unit-III

Classical Sociological Theories

Evolutionary, Structural, Functional, Interactionist, Conflict.

Unit-IV

Contemporary Sociological Theories

Pheonomenolgy, Ethnomethodology, Neo-functionlism, Neo-Structuralism, Critical Theory, Neo-Marxism, Post modernism, Exchange theory, Network theory, Macro-micro Integration.

Unit-V

Research Methodology

Social Survey Vs Social Research, Epistemology, Logic of Inquiry, Objectivity Vs Subjectivity, Quantitative Vs. Qualitative Method, Positivism Vs Hermeneutics, Research Design, Sampling, Hypothesis, Ethical Issues in Social Research, Plagiarism and Copyright, P.R.A., Case study.

Unit-VI

Social Change-Concept and Processes

Concept: Development, Progress, Transformation, Theories of Social change, Social Movement, Neo Social Movement.
Process: Industrialization, Urbanization, Westernization, Liberalization, Modernization, Privatization and Globalization, Role of Technology, Social Media, Social Mobility.

Unit-VII

Indian Society- Concepts, Perspectives and Processes

Concept: Class, Caste, Kinship, Religion, Ethnicity, Marriage, Family.
Perspectives: Indological, Structural Functional, Civilizational, Subaltern Perspective, Marxist, Cultural.
Process: Sanskritization, Westernization, Secularization, Planned Change, Rurbanization, Niti Ayog.

Unit-VIII

Contemporary Issues/Problems

Gender, Caste and Regional inequality, Family Disharmony, Crime. White Collar Crime, Corruption, Ecological Degradation, Communalism, Ethnic Diversity, Poverty, Unemployment, Drug Addiction, Internet Addiction, Cyber crime, Deviance, Black Money in India. Juvenile Delinquency JJ Act, POCSO Act 2012, Feticide (Bhrun Hattya).

Unit-IX

Rural Society in India

Caste System, Jajmani System, Agrarian Relations, Mode of Production, 73rd Amendment in Panchayti Raj, Rural Development and Rural Transformation, Marginalization of Peasantry. Little and Great Tradition, Universilation and Parochilization, Peasent Movenent, Migration.

Unit-X

Other Issues

(a) Empowerment of SCs and STs, Women, OBC's, Constitutional Provisions and their Consequences.
(b) Ecology and Sustainability.
(c) Corporate Social Responsibility.
(d) Ageing.

* Population and Society.
* Honour Killing.
*Tribal Society.

17. SUBJECT : URDU

Unit-1

- Language and its importance, Difference between Language and dilect.
- History of Indo-Arian Languages (Prakrit, Apbhransh and Khadi Boli)
- Different theories of the origin of Urdu Language Mohd. Hussain Azad, Mahmood Shirani, Nasiruddin Hashmi, Masood Hussain Khan, Syed Sulaiman Nadvi, Shaukat Sabzwari and Muhiuddin Qadri Zor.

Unit-2

- Development of Urdu Literature in Deccan.
- Role of Sufi's in the development of Urdu Language and Literature.
- Major early works of Urdu Literature in Deccan - Sabras, Qutub Mushtari, Kulliyat-e-Quli Qutub Shah, Kulliyat-e-Wali, Kulliyat-e-Siraj Aurangabadi.
- Literary Contributions of Fort William College, Delhi College and Lucknow College.
- Two Classical School of Urdu Poetry- Delhi and Lucknow School.
- Literary Movements and trends of Urdu Literature (Aligarh Movement, Romanticism, Progressive Movement, Halqa-e-Arbab-e-Zauq, Modernism, Post Modernism, Dalit Literature and Feminism).
- Folk Literature (Qissa Goee, Folk Stories and Folk Songs).
- Urdu Literature after independence.

Unit-3

- Definition of Ghazal, Origin and Development.
- Eminent Poets of Ghazal- Wali, Dard, Meer, Galib, Momin, Aatish, Dagh, Shad Azeemabadi, Faani, Hasrat, Firaq, Nasir Kazmi and Sheharyar.
- Definition of Qasidah and its elements.
- Origin and development of Urdu Qasidah.
- Eminent Poets of Qasidah- Sauda, Zauq, Ghalib, Mohsin Kakorvi.
- Definition of Masnavi Origin and development.
- Eminent Poets and their Writings (Mulla Wajhi-Qutub Mushtari, Mir Hasan- Sehrul Bayan, Pt. Dayashankar Nasim- Gulzar-e-Nasim, Nawab Mirza Shauq- Zehr-e-Ishq, Meer-Taqi-Meer-Shola-e-Ishq).
- Definition of Marsiya and its elements.
- Origin and development of Urdu Marsiya.
- Eminent Poets of Marsiya (Zameer, Anis, Dabeer, Nasim Amrohni, Jamil Mazhari)

Unit-4

- Definition of Nazm, Origin and Development.
- Eminent Poets of Nazm - Nazeer Akbarabadi, Hali, Chakbast, Iqbal, Akhtar Shirani, Josh Malihabadi, Faiz, Akhtar-ul-Iman, Noon. Meem. Rashid, Makhdoom Muhiddin.
- Definition of Rubayi, Origin and Development.
- Eminent poets of Rubayi- Hali, Jagat Mohan lal Rawan, Firaq Gorakhpuri, Amjad Haidri.
- Balaghat- Tashbih, Ishteyarah, Kanaya, Majaz Mursal, Tajnees, Tazaad, Talmeeh, Laf-o-Nasr, Husn-e-Taleel, Iham, Mubalagha.

Unit-5

- Definition of Dastan and its tradition.
- Eminent writers and their writings- Mulla Wajhi-Sabras, Mir Amman-Bagh-O-Bahar, Rajab Ali Beg Suroor-Fasan-e-Ajaib, Insha Allah Khan Insha- Rani Ketki Ki Kahani.
- Definition of Novel and its elements.
- Origin and development of Novel
- Eminent writer and their writing- Deputy Nazeer Ahmad- Ibn-Ul-Waqt, Mirza Mohd. Hadi Ruswa- Umrao-Jan-Ada, Premchand- Gaudan, Krishna Chander-Shikasht, Rajinder Singh Bedi- Ek Chadar Maili Si, Qurtulain Haider- Aag ka Dariya, Qazi Abdussattar- Darashikoh.
- Definition of Short Story and its elements.
- Origin and development of Urdu Short stories.
- Eminent Short Story Writer – Premchand, Rajinder Singh Bedi, Krishna Chander, Ismat Chugtai, Sadat Hasan Manto,

Ghulam Abbas, Surendra Prakash, Syed Mohd. Ashraf.

- Definition of Drama and its element.
- Origin and development of Drama.
- Eminet writers of Drama- Amanat Lakhnawi- Inder Sabha, Aagha Hashar Kashmiri- Yahoodi Ki Ladki, Imteyaz Ali Taj- Anarkali, Mohd Hassan- Zahak, Habib Tanvir- Agra Bazar.

Unit-6

- Definition of Criticism.
- History of Criticism in Urdu.
- Important Schools of Literary Criticism.(Tassurati Tanqeed, Nafsiyati Tanqeed, Taraqqi Pasand Tanqeed)
- Important Critics- Hali, Shibli, Imdad Imam Asrar, Aal Ahmad Suroor, Ehtesham Hussain, Kalimuddin Ahmad, Mohd. Hasan, Gopi Chand Narang, Shamsur Rahman Farooqi.
- History of Literary Research and its tradition.
- Eminent writers- Hafiz Mahmood shirani, Qazi Abdul Wadood, Maulavi Abdul Haq, Imteyaz Ali Khan Arshi, Rasheed Hasan Khan, Gyan Chand Jain.
- Non Fictional Prose:-
- Biography/Autobiography- Hali, Shibli, Josh.
- Khaka- Farhatullah Baig, Maulavi Abdul Haq, Rasheed Ahmad Siddiqui.
- Humour and Stire- Pitaras Bukhari, Mushtaq Ahmad Yusufi.
- Travelogue- Yusuf Khan Kambal Posh, Mujtaba Hussain.
- Essay- Sir Syed Ahmad Khan.
- Letter Writing- Mirza Ghalib, Abul Kalam Azad.
- Inshaiya- Mohd. Hussain Azad, Kanhaiyya Lal Kapoor.
- Definition of Media and Mass Media.
- Origin and development of Media.
- Print Media-News, Column writing, Feature and Editorial.
- Electronic Media- Radio Drama, Radio Feature, Feature Film, Documentary, Script writing and Advertisement.

18. SUBJECT : ZOOLOGY

Unit-1

Non-Chordates

Principles of Animal Taxonomy- Classification of Non-chordates, Locomotory Organs, Types of Locomotion, Nutrition and Reproduction in Non-Chordates. Protozoa and Important Diseases. Canal system in Sponges. Polymorphism in Coelenterata. Coral Reefs and their environmental significance. Parasitic adaptation in Helminthes. Metamerism in Annelides. Affinities in Hemichordata. Respiratory Organs, Respiratoy Pigments and mechanism of respiration in Non-chordates. Excretory organs and mechanism of excretion in Non-chordates. Origin and evolution of nervous system in Non-chordates. General organization of Rotifers. Larval forms of free living invertebrates and their evolutionary significance.

Unit-2

Chordates

Origin and evolution of Chordates. Classification, characteristics, adaptive features in Chordates. Detailed comparative study of different Organ System in amniotes and anamniotes: Integumentary, Skeletal, Digestive, Respiratory, Circulatory, Urinogenital, Nervous and Sense Organs. Gametogenesis : Spermatogenesis, Oogenesis, Fertilization. Biochemistry of Fertilization, Types of Eggs, egg envelopes and Cleavage in Chordates. Foetal membranes with special reference to chick. Placenta development in Mammals.

Unit-3

Ecology, Animal Behaviour and Evolution

Principles and concepts of energy and energy flow in ecological system. Ecological Pyramids, Food Chain and Food web. Community and its Organization. Predation, Mutualism and Commensalism. Terrestrial, Marine and Fresh water Ecology, Ecosystem services. Air and Water Pollution: Causes and Control Measures, Global Warming, Reasons and Solutions. Green House Effects and Green House Gases, Biodiversity conservation, Major Hotspots in India, Kyoto Protocol, National Parks and Sancturies, Red Data Book and Endangered Species.

Animal Behaviour: Parental care, Types of Memory, Circadian rhythm. Innate Behaviour, Learning, Social Communication. Population Dynamics, Species Concepts, Hardy Weinberg Law. Natural Selection, Micro and Macro Evolution. Evolution of Horse and Man.

Unit-4

Entomology, Fish and Fisheries

Insect Taxonomy, General Organization of Insect body, Insect Morphology, Physiology with reference to Neuro-endocrinology. Insect Ecology, Forensic Entomology, Medical Entomology, Bioluminescence. Metamorphosis and Dispose. Various Methods of Insect control, Types of Insecticides, mode of communication, photoreception. Pheromones, Insect Hormones. Integrated Pests Management. Insects of economic importance. Social behavior in insects.

Morphological, taxonomic, habitat and population attributes in fishes. Fish Structure, organ systems and their functions, fish diversity. Fish Breeding, Fish Diseases and their control, Fish preservation and processing, Fish Culture – Induced Breeding and their ecology. Capture Fisheries, Pond Fresh water Fishes, Cold water Fishes and Brackish water Fishes. Management and other culture practices. Overview of Aqua culture practices. Introduction to Poly culture of Fishes. Fabrication and maintenance of the aquarium.

Unit-5

Developmental Biology

Developmental patterns in Metazoan. Stages of Animal development, Embryonic homologies, Malformation and Teratology. Early Embryonic development : Fertilization, patterns of cleavages, Morulation, Blastulation, and Gastrulation. Morphogenetic movements. Development of Fowl upto the formation of Primitive Streak. Late Embryonic Development, Metamorphosis, Regeneration. Sex determination and modern approaches in Developmental Biology. Environmental disruption of normal development. Hox Genes : Descent with Modification, Epigenetic regulation of developmentally relevant genes. Development of Genetically modified animals.

Unit-6

Cell Physiology and Biochemistry

Prokaryotic and Eukaryotic cells, Membrane Structure and function : Plasma Membrane, Nucleus, Cytoskeleton, Endoplasmic reticulum, Golgi Apparatus, Mitochondria, lysosomes. Cell Communication: Cell Junction, Cell cycle and Regulation of Eukaryotic Cell cycle. Brief account of Stem cells and their significance.

Structure, properties and Classification of Carbohydrates, Lipids, Amino-acids, Proteins and Nucleic Acids. Enzymes, Mechanism of Actions and classification. Vitamins (Fat and Water soluble). Biosynthesis of Vitamins. Metabolic pathways of Carbohydrates, Lipids and Amino-acids.

Unit-7

Cytogenetics and Biostatistics

Chromosome structure and their behaviour in cell division, Karyotype analysis, chromosomal aberrations and various syndromes. Chromosomal banding, Flourescent *in situ* hybridization (FISH). Concepts of Genomes, transcriptomes and proteomes. Mutagens, Mutation and Mutagenesis, Cytoplasmic Inheritance.

Biostatistics: Matrics and Vectors, Sampling, Data Collection and Recording. Central tendency: concepts, arithmetic mean, median and mode for ungrouped and grouped data, standard deviation, variance, quarterly deviation, coefficient of variability, probability, normal and binomial. Statistical Methods: Significance of correlation. t-test and chi-square test. Basic Concepts of Bioinformatics.

Unit-8

Mammalian Physiology

Digestive system – feeding habits, digestion, absorption and assimilation of food. Role of gastro-intestinal hormones, energy balance and BMR. Structure of blood, total blood volumes, blood groups, genetical basis and inheritance of blood groups. Rh factor and its medical importance. Haemostasis. Cardiac cycle, structure of heart and function. Lymphatic system. Comparison of respiration in vertebrates, respiratory pigments, physiology of respiration. Thermoregulation. Comparative physiology of excretion, urine formation. Vertebrate nervous system, nerve impulse conduction, mechanism of muscle contraction, sense organs in vertebrates. Male and female reproductive systems in human.

Unit-9

Endocrinology

Introduction to endocrinology and endocrine system. Phylogeny and Ontogeny of endocrine glands. Discovery and classification of Hormones. Hormones effects on behaviour and immunity. Biosynthesis and regulation of Hormones. Hormones and Homeostasis. Pituitary, Pineal, Thyroid, Parathyroid, Thymus, Adrenal, Steroid Hormones : Their Structure and Functions and related diseases. Overview of Reproductive Hormones in Spermatogenesis and Oogenesis. Biological activity of Prostaglandins. Biosynthesis of Amino acid derived small size Hormones. Termination Mechanism of Hormone action.

Unit-10

Toxicology and Immunology

Introduction to Toxicology, Kinds of Toxic Substances, Dose related Toxicity, Xenobiotics, Toxification and Detoxification, Toxicity influencing factors, Exposure to the toxic substances. Synergism, Potentiation and Antagonism. Behavioural and Physiological Responses. Reproductive and Developmental effects.

Self and Non-self recognition, specific, memory of immune system. Essential Features of Antigens, Haptens, Carrier molecule. Nature, Primary structure of immunoglobulins, light chain, Heavy chain, Variable region, Constant region. Domain Structure of Ig, IgA, IgD and IgE. Immune Deficiencies. T-Cell, B-Cell and combined immunodeficiencies. Major Histocompatibility complex. Principle, methodology and application of ELISA.

Unit-11

Modern Techniques in Molecular Biology

Basic Principles of Microscopy; Phase contrast Microscope, Electron Microscope, Fluroscence Microscope, Confocal Microscope. Colorimetry and Spectrophotometry, Beer-Lambert law. PCR : Machine, Types of PCR. Gel documentation system, Flow Cytometer, DNA Sequencer. DNA replication, transcription and translation. Gene Expression and regulation, post translational modifications. Structure and Functions of Nucleic Acid. Restriction endonucleases, Plasmids, Bacteriophage and cosmids. BAC, YAC and Yeast based vectors, Expression Vectors. Mobile Genetic Elements.

DNA replication, DNA repair and recombination. Enzymes involved in DNA replication. Regulation of Gene Expression (Various models of Operons). RNA synthesis and processing : Formation of initiation complex, transcription activators and repressors, RNA Polymerases, Capping Elongation and Termination, RNA processing, Editing, splicing, Polyadenylation. Application of Recombinant DNA technology. Human Genome Project. Cancer : Oncogenes, Tumor suppressor Genes, Cancer and cell cycle, Virus induced Cancer, Metastasis.

19. SUBJECT : COMPUTER SCIENCE

Unit-1

Computer Arithmetic

Representation of Integers: Octal, Hex, Decimal, and Binary. 2′s complement and 1′s complement arithmetic. Floating point representation of numbers. Propositional (Boolean) Logic, Predicate Logic, Well – formed – formulae (WFF), Satisfiability and Tautology.

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

Unit-2

Discrete Structures

Set Theory: Sets, Relations, Functions. Pigeonhole Principle, Inclusion-Exclusion Principle, Equivalence and Partial Orderings, Elementary Counting Techniques, Probability. Measure (s) for information and Mutual information.

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

Groups: Finite fields and Error correcting / detecting codes.

Unit-3

Data and File Structures

Data Structures: Definition, Simple and Composite structures, Arrays, Lists, Stacks, Queues, Linked lists, Trees, Priority queues and heaps. Hashing, inverted lists, Binary trees, B-trees.

File Structures: Fields, records and files, Sequential, direct, Index-sequential & relative files.

Unit-4

Design and Analysis of Algorithm

Sorting and Searching Algorithms, Analysis of Algorithms, Interpolation and Binary Search, Asymptotic notations: big oh, omega and theta. Average case analysis of simple programs like finding of a maximum of n elements, Recursion and its systematic removal. Quicksort-Non-recursive implementation with minimal stack storage. Design of Algorithms (Divide and Conquer, Greedy method, Dynamic programming, Back tracking, Branch and Bound). Lower bound theory, Non-deterministic algorithm-Non-deterministic programming constructs. Simple non-deterministic programs. NP-hard and NP-complete problems.

Unit-5

Object Orientation

Object, messages, classes, encapsulation, inheritance, polymorphism, aggregation, abstract classes, generalization as extension and restriction, Object oriented design. Multiple inheritance, metadata.

Unit-6

Programming

Programming language (C/C++/JAVA) concepts, paradigms and models. Data, Data types, Operators, Expressions, Assignment, Flow of Control, Control structures, I/O statements, User-defined and built-in functions, Parameter passing. Principles of object orientation, classes, inheritance, class hierarchies, polymorphism, dynamic binding, reference semantics and their implementation, Higher order functions, lazy evaluation, equations and pattern matching.

Unit-7

Database Management System

Database Concepts, ER diagrams, Data Models, Design of Relational Database, Normalization, SQL and QBE, Query Processing and Optimization, Centralized and Distributed Database, Security, Concurrency and Recovery in Centralized and Distributed Database Systems, Object Oriented Database, Management Systems (Concepts, Composite objects, Integration with RDBMS applications), ORACLE. Data Warehousing and Data Mining.

Unit-8

Operating System

Operating System: Basics, functions and types. Process Management, Memory Management, Device Management. Scheduling: CPU Scheduling, I/O Scheduling, Resource Scheduling, Deadlock and Scheduling algorithms.

Concurrent Processing: Mutual Exclusion, Critical regions, semaphores, lock and unlock.

UNIX: Structure of UNIX Operating System, UNIX Files and Commands, Interfacing with Unix, Editors and Compilers for Unix, LEX and YACC, File system, System calls, Filters, Shell programming.

Windows: Windows environment, Unicode, Documents and Views, Drawing in a window, Message handling, Scrolling and Splitting views, Docking toolbars and Status bars, Common dialogs and Controls, MDI, Multithreading, OLE, Active X controls, ATL, Database access, Network programming.

Unit-9

Theory of Computation

Formal language, Need for formal computational models, Non-computational problems, diagonal argument and Russel's paradox, Deterministic Finite Automaton (DFA), Non-deterministic Finite Automaton (NFA), Regular languages and regular sets. Equivalence of DFA and NFA. Minimizing the number of states of a DFA. Non-regular languages and Pumping lemma. Pushdown Automaton (PDA), Deterministic Pushdown Automaton (DPDA), Nonequilvalence of PDA and DPDA. Context free Grammars: Greibach Normal Form (GNF) and Chomsky Normal Form (CNF), Ambiguity, Parse Tree Representation of Derivations, Equivalence of PDA's and CFG's. Parsing techniques for parsing of general CFG's, Early's, Cook-Kassami-Younger (CKY) and Tomita's parsing. Linear Bounded Automata (LBA): Power of LBA. Closure properties. Turing Machine (TM) :

One tape, multitape. The notions of time and space complexity in terms of TM, Construction of TM for simple problems, Computational complexity, Chomsky Hierarchy of languages: Recursive and recursively-enumerable languages.

Unit-10

Artificial Intelligence

Introduction : Definition, Future of Artificial Intelligence, Characteristics of Intelligent Agents, Typical Intelligent Agents, Problem Solving Approach to Typical AI problems. Problem solving Methods, Search Strategies, Uninformed, Informed, Heuristics, Local Search Algorithms and Optimization Problems, Searching with Partial Observations, Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search, Game Playing, Optimal Decisions in Games, Alpha–Beta Pruning, Stochastic Games.

Knowledge Representation : First Order Predicate Logic, Prolog Programming, Unification, Forward Chaining-Backward Chaining, Resolution, Knowledge Representation, Ontological Engineering: Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

Software Agents : Architecture for Intelligent Agents, Agent communication, Negotiation and Bargaining, Argumentation among Agents, Trust and Reputation in Multi-agent systems. AI applications, Language Models, Information Retrieval- Information Extraction, Natural Language Processing, Machine Translation, Speech Recognition, Robot: Hardware, Perception, Planning, Moving.

Expert Systems : Architecture, inference engine, knowledge base, expert system shell.

Unit-11

Data Communication and Computer Networks

Data Communication: Components of a Data Communication System, Simplex, Half-Duplex and Duplex Modes of Communication; Analog and Digital Signals; Noiseless and Noisy Channels; Bandwidth, Throughput and Latency; Digital and Analog Transmission; Data Encoding and Modulation Techniques; Broadband and Baseband Transmission; Multiplexing, Transmission Media, Transmission Errors, Error Handling Mechanisms.

Computer Networks: Network Topologies, Local Area Networks, Metropolitan Area Networks, Wide Area Network, Wireless Networks, Internet.

Network Models: Layered Architecture, OSI Reference Model and its Protocols; TCP/IP Protocol Suite, Physical, Logical, Port and Specific Addresses; Switching Techniques.

Functions of OSI and TCP/IP Layers: Framing, Error Detection and Correction; Flow and Error Control; Sliding Window Protocol, HDLC, Multiple Access – CSMA/CD, CSMA/CA, Reservation, Polling, Token Passing, FDMA, CDMA, TDMA, Network Devices, Backbone Networks, Virtual LANs. IPv4 Structure and Address Space; Classful and Classless Addressing; Datagram, Fragmentation and Checksum; IPv6 Packet Format, Mapping Logical to Physical Address (ARP), Direct and Indirect Network Layer Delivery; Routing Algorithms, TCP, UDP and SCTP Protocols; Flow Control, Error Control and Congestion Control in TCP and SCTP.

World Wide Web (WWW): Uniform Resource Locator (URL), Domain Name Service (DNS), Resolution - Mapping Names to Addresses and Addresses to Names; Electronic Mail Architecture, SMTP, POP and IMAP; TELNET and FTP.

Network Security: Malwares, Cryptography and Steganography; Secret-Key Algorithms, Public-Key Algorithms, Digital Signature, Virtual Private Networks, Firewalls.

Mobile Technology: GSM ; Services and Architecture of GSM and Mobile Computing; Middleware and Gateway for Mobile Computing; Mobile IP and Mobile Communication Protocol; Communication Satellites, Wireless Networks and Topologies; Cellular Topology, Mobile Adhoc Networks, Wireless Transmission and Wireless LANs; Wireless Geo location Systems, GPRS and SMS.

Unit-12

Software Engineering

System Development Life Cycle (SDLC) : Steps, Water fall model, Prototypes, Spiral model, Requirement analysis and specifications. Software Metrics, Software Project Management.

Software Design : System design, detailed design, function oriented design, object oriented design, user interface design. Design level metrics, Coding and Testing - Testing level metrics. Software quality and reliability. Clean room approach, software re- engineering. Programming techniques and tools, Software validation and quality assurance techniques, Software maintenance and advanced concepts, Software management.

Unit-13

Web Technology

Web Fundamentals, Browsers and Protocols. Web servers and securities. Web designing and mark –up languages. HTML, DHTML, XML, Scripting, Java, Servelets, Applets.

Unit-14

Emerging Trends

Python Fundamentals and Programming, Soft Computing, Machine Learning: Supervised and Unsupervised Learning, Machine Learning libraries: Scipy, Numpy, Matplotlib, Neural Networks, Deep Learning, Block Chain, Cloud Computing, Parallel Computing, Distributed Computing.

Cyber Security Fundamentals, Threat Actors, Attacks, and Mitigation, Security Policies and Procedures, Information Security Governance, Risk Management, Incident Management, Digital Forensics.

20. SUBJECT : STATISTICS

UNIT-1

Probability Theory

Random experiment, Sample Space, Events, Algebra of events, Various definitions of Probability, Probability Space, Probability Measure and its Properties, Boole's inequality, Conditional Probability, Total and Compound Theorem of Probability, Bayes Theorem and its Applications, Independence of events.

Discrete and Continuous Random Variables, Probability mass function and Probability density function, Distribution function and its Properties, Expectation of random variable and its properties, moments, cumulants, Probability generating function, moment generation function, Characteristic function, Inversion theorem, Continuity theorem. Chebyshev's inequality, Markov's inequality, Different types of Convergences – Convergence in Probability, in distribution, in r-th mean, almost sure convergence and their inter-relationships.

Laws of large numbers: Weak Law of Large Numbers (WLLN), Strong Law of Large Numbers (SLLN), Khinchin's theorem, Kolmogorov's theorem, Borel Zero-one criterion, Borel-Cantelli Lemma, Central Limit Theorem (CLT), Lindeberg-Levy CLT, Liapunov's CLT, Lindeberg- Feller's CLT.

UNIT-2

Distribution Theory

One- dimensional random variable, Bivariate distribution – joint, marginal and Conditional distributions, Independence of random variables.

Discrete distributions – Binomial, Poisson, Negative Binomial, Geometric, Uniform, Hyper-geometric and Multinomial distributions.

Continuous distributions – Uniform, Normal, Gamma, Beta, Exponential, Laplace, Cauchy, Weibull, Pareto, Log-Normal distributions, Bivariate Normal distributions.

Sampling distributions- Derivation of Chi-Square, t and F distributions and their properties and inter-relationships.

Order Statistics- Distributions of Smallest and Largest order statistics, distribution of r-th order statistic, joint distribution of all n order statistics, joint distribution of r-th and s-th order statistics, distribution of sample median and sample range, Coverages.

Unit-3

Estimation Theory

Point Estimation : Unbiasedness, Consistent estimators, Efficient estimators, Cramer-Rao Inequality, Best Linear unbiased estimators (BLUE), Sufficiency and minimal sufficiency, Factorization Criterion, Completeness, Rao-Blackwell Theorem, Lehmann-Scheffe Theorem, Exponential family of distributions and its completeness, CAN estimator.

Methods of Estimation : Method of Moments, Method of Maximum likelihood, Method of Least Squares and their properties.

Bayesian Estimation: Loss function, prior and posterior distributions, Bayes Risk, Bayes estimators.

Interval Estimation: Confidence intervals, shortest length confidence intervals, construction of Confidence intervals using Pivots, Confidence intervals for large Samples.

Unit-4

Testing of Hypothesis

Fundamental Concepts of Testing of Hypothesis, Two types of errors, Critical Regions, Power function, Neyman-Pearson Lemma, Most Powerful test (MPT) and uniformly most powerful test (UMPT), Unbiased test and uniformly most powerful Unbiased test (UMPUT), similar regions, Likelihood Ratio Test (LRT), its properties and applications, Sequential Probability Ratio Test (SPRT), its properties, OC and ASN functions.

Tests of significance based on t, F and Chi-square distributions, Fisher's Z- transformation and tests based on it, large sample tests.

Non-parametric tests -- Sign test, Signed- rank test, Median test, Run test, Mann- Whitney U- test, Wilcoxon test, Goodness of fit tests — Chi-square test and Kolmogorov-Smirnov test.

Unit-5

Survey Sampling

Concept of sampling design, Sampling scheme, Probability and Non-Probability sampling, Simple Random sampling (with and without replacement), sampling with varying probabilities with and without replacement, Horvitz-Thompson method of estimation, Desraj Method of Estimation.

Stratified Random Sampling, Choice of sample sizes in different strata, Relative Precision of Stratified Random Sampling with Simple Random sampling. Estimation of gain in Precision due to Stratification, Construction of strata, Post-Stratification.

Systematic Sampling, Cluster Sampling (With equal and unequal cluster sizes), Two-stage sampling with equal and unequal first-stage sampling units, Two-phase sampling (Double Sampling).

Ratio and Regression Methods of Estimation, Unbiased Ratio type estimator, Midzuno scheme of sampling, Product estimator, Non- sampling errors.

UNIT -6

Linear Estimation and Design of Experiments

Gauss-Markov Set–up: Theory of linear estimation, Estimable functions, Method of least squares estimation, Gauss-Markov theorem, Estimation of error variance.

Regression Analysis: Simple Linear Regression, Least Square Estimation and maximum likelihood Estimation in case of Simple Linear and Multiple Linear Regression Models, Properties of Ordinary Least Square Estimates (OLSE), Best Linear Unbiased Estimator (BLUE), Hypothesis testing in simple linear and multiple linear regression models, Confidence Intervals.

Use of g-inverse, distribution of quadratic forms.

Design of Experiments: Analysis of Variance and Covariance in one-way classified data for fixed effect model, Analysis of Variance and Covariance for two - way classified data with one observation per cell for fixed effect model, Basic principles of design of experiments, Completely Randomized Design (CRD), Randomized Block Design (RBD) and Latin Square Design (LSD), Missing plot technique in RBD and LSD, Balanced Incomplete Block Design (BIBD), Partially Balanced Incomplete Block Design (PBIBD), Split Plot Design.

2^n, 3^2 and 3^3 factorial experiments, Complete and partial confounding in factorial experiments.

UNIT -7

Linear Algebra and Multivariate Analysis

Matrix Theory- Inverse of partitioned matrices, g-inverse, orthogonal matrices, properties of Idempotent matrices, Characteristic roots and vectors, Cayley-Hamilton theorem, quadratic forms, definite, semi-definite and indefinite forms, Simultaneous reduction of two quadratic forms, properties of similar matrices.

Multivariate Analysis: Multivariate Normal distribution (MND), marginal and conditional distributions, Characteristic function of MND, Maximum likelihood estimators of mean vector and co-variance matrix, Multiple and Partial correlation coefficients and their null sampling distributions, Wishart distribution and its properties, Hotelling's T^2 and Mahalanobis D^2 statistics and their properties and applications, Discriminant analysis, Principal components Analysis (PCA), Canonical correlations and variables, Factor Analysis.

UNIT-8

Applied Statistics

Statistical Quality Control: Process control and product control, Control charts for variables- X and R chart, X and s chart, Control charts for attributes: np-chart, p-chart, c-chart and u-chart.

Sampling Inspection plan: Single and double sampling plans, their OC, AQL, LTPD, AOQ, AOQL, ASN and ATI functions.

Time Series: Time series and its components, Measurements of Trend, Seasonal Variations and Cyclical Variations.

Index Numbers and their construction: Laspeyre's, Paasche's and Marshall-Edgeworth index numbers, Fisher's Ideal index number, time-reversal and factor-reversal tests, Cost of living index number and its uses.

Vital Statistics: Measurements of mortality- Crude death rate (CDR), Specific death rate (SDR), Infant Mortality Rate (IMR) and Standardized Death Rate (STDR), Stationary and Stable populations, Central mortality rate, Life Table, its components and their properties.

Measurements of Fertility- Crude Birth rate (CBR), General fertility rate (GFR), Specific fertility rate (SFR) and total fertility rate (TFR).

Measurement of population growth- Gross Reproduction rate (GRR) and Net Reproduction rate (NRR), Concept of migration, net migration.

Indian Official Statistics, Statistical Organizations in India and Uttar-Pradesh, Important data related to Uttar-Pradesh.

21. SUBJECT : MUSIC GAYAN (VOCAL)

Unit-1

Study of the Historical Development of Hindustani music from Vedic to modern period.

Unit-2

Study of ancient, medieval and modern treaties in Indian music like Natya Shashtra, Nardiya Shiksha, Sangeet Makrand, Brihaddeshi, Mansollas, Bharat Bhasya, Sangeet Ratnakar, Sangeet Samaysar, Sangitopnishad-saaroddhar, Swarmelkalanidhi, Sangeet Darpan, Sangeet Parijat, Rag Vibodh, Pranavbharti, Kramik Pustakmallika, Sangeet Chintamani etc.

Unit-3

Study of Gharanas of Khyal, Banies of Dhrupad and Purab and Punjab Angs of Thumri Dadra like Gwalior, Agra, Kirana, Jaipur, Delhi, Patiala, Banaras, Panjab, Vishnupur, Darbhanga and Dagar Banee etc.

Unit-4

Comparative study of Hindustani Karnatak Swar and Tal system. Study of Western Music like-Staff Notation, key signature, Time-Signature, Musical scale, Musical Intervals, Harmony and Melody, consonance and dissonance, Chords and its different kinds etc.

Unit-5

Biographies of Musicians and Musicologists- Pt. Bal Krishna bua Ichalikarajikar. Ustad Faiyaz Khan, Pt Omkar Nath Thakur, Ustad Bade Gulam Ali Khan, Acharya Brihaspati, Smt. Gangoo Bai Hangal, Kesar Bai Kerkar, Girija Devi, Bade Ramdas, Begham Akhtar, Balvant Rai Bhatt. Pt Ramashray Jha, Pt. Siya Ram Tiwari, Pt. Vidur Mallick, Raja Bhaiya Poonchwale, Pt. Lal Mani Mishra, Ustad Abdul Halim Zafar Khan, Amjad Ali Khan, Vishwa Mohan Bhatt, Pt. Ravi Shankar, Manilal Nag, Pt Anokhe Lal Mishra, Kishan Maharaj, Gudai Maharaj, Zakir Hussain, AllaRakha Khan etc.

Unit-6

Study of Instruments like Tanpura, Harmonium. Study of folk Music and folk instruments. Brief study of musical style like Dhrupad, Dhamar, Khyal. Thumri, Tappa study of various forms of folk music and folk dance. Haveli Sangeet, Music therapy. concept of Aesthetics and different views of scholars Rasa and its different kinds. Relation of Music with aesthetics and Rasa. Utility of Raag Dhyana and Rag-

Ragini paintings in music. Role of electronic equipments in music teaching. Contemporary trends in music, music and its relation with other arts like music and painting, music and dance, music and poetry. Relation of Raga with Ritu, Kaku Bhed, Importance of Bandish.

Unit-7

Brief study of Ragas like-Todi, Chhayanat, Lalit, Bhairav, Darbari Kanhda, Devgiri Bilawal, Kedar, Sur Malhar, Nat Malhar, Chandrakauns, Rageshree, Kalyan, Shyam Kalyan, Vrindavani Sarang. Patdeep, Madhuwanti, Multani, Maru Bihag, Basant, Jog, Jogkauns, Nand, Deshi, Paraj, Miyan Malhar, Jai-jaiwanti, Aanand Bhairav, Ahir Bhairav, Nat Bhairav, Puriya Kalyan, Gorakh Kalyan, Madhymad sarang, Megh Malhar, Gurjari Todi, Bilaskhani Todi, Yamni Bilawal, Hans Kinkini, Narayani, Sarparda Bilawal etc.

Brief study of Taals like Teental, Jhaptal, Tilwada, Chartal. Dhamar, Roopak, Ada-Chartal, Tivra etc.

Knowledge of laya and different laykaries like Dugun, Tigun, Chaugun, Aad, Kuaad etc.

Unit-8

Study of Technical terms of Hindustani Music:- Naad, Shruti & its Jaties, Shuddha Vikrit Swar, Gandarv Gaan, Maargi, Kutup, Vrind, Mel, Thaat, Raagang, Upaang, Bhashang, Meend, Khatka, Murki, Soot, Gat, Jod, Jhala, Ghasit, Baj, Gram, Moorchhana, Dwadas swar Moorchhanavad, Jati Gayan, Rag Vargikaran, Shruti and its placements, Sarana Chatustai etc.

22. SUBJECT : PERSIAN

Unit-1

Origin of Persian Language and Arab invasion

- Old Persian
- Avesta
- Pahalavi
- Arab Invasion
- Modern Persian
- After Islamic revolution of Iran

Unit-2

Grammer, Figure of Speech and Prosody

- Noun(Ism)
- Pronoun(Zameer)
- Verb(Fail)
- Adjective(Sifat)
- Tashbeeh, Isteara, Iham, Talmeeh, Tajnees
- Sabab, Watad, Huruf-e-Qafiya, Bahar-e-Ramal, Bahar-e-Mutaqarib

Unit-3

Literary history, Criticism, Movements and Modern Trends

- Rudaki; Firdausi, Saadi, Sanai, Umar Khayyam, Attar, Nizami, Khaqani, Rumi, Hafiz, Salman Saoji, Jami, Jamal Zadeh, Sadiq Hidayat, Saeed Nafisi, Samad Behrangi, Nima Yusheej, Parveen Etesami, Ali Dashti, Iraj, Qazvini.
- Khusrau, Hafiz Mehmood Sheerani, Qazvini, Sirajuddin Ali Khan Arzu, Prof. Nazir Ahmad, Prof. Amir Hasan Abidi, Prof. Sharif Hussain Qasemi.
- Shaubia, Darulfunun, Constutitional movement, Anjuman-e-Roshanfikran.
- Tasneef, Sher-e-Nimai, Sher-e-Nau, Sher-e-Sapeed, Sher-e-Azad.

Unit-4

- Short Essay in Persian (500 words) on anyone of the following topics.(compulsory)
- Firdausi, Khaqani, Saadi, Khusrau, Rumi, Hafiz, Nizami Aruzi Smarqandi, Bedil, Ghalib, Iqbal.

Unit-5

Indo-Persian Prose

- Taj-ul-Maasir, Tabqat-e-Nasiri, Tarikh-e-Firoz Shahi, Akbar Nama, Muntakhab-ut-tawarikh, Tuzuk-e-Jahangiri, Shahjahan Nama, Muntakhab-ul –Lubab, Siyar-ul-Mutakhireen, Riyaz-ul-Insha.
- Lubab-ul-Albab, Riaz-ush-Shuara, Sarv-e-Azad, Tazkara-e-Husaini, Riyaz-ul-Arifeen.
- Fawaid-ul-Fowad, Khairul Majalis, Siyar-ul-Auliya, Akhbar-ul-Akhyar, Maktubat-e-Sadi, Kashf-ul-Mahjoob.

Unit-6

Indo Persian Poetry

- Masud Saad Salman, Bu Ali Shah Qalander Panipati, Isami, Khusrau, Ghani Kashmiri, Naziri Nishapuri, Faizi, Urfi, Bedil, Ghalib, Iqbal.

Unit-7

Critical and Biographical questions on Poets and Authors

- Unsuri, Ubaid Zakani, Shahab Mahmara, Ghazali Mashhadi, Abu Talib Kaleem, Talib-e-Amuli, Rasheed Watwaat, Ali Sher Nawai, Fakhruddin Iraqi, Ibn-e-Yameen.
- Farabi, Abu Rehan Bairuni, Bu Ali Sina, Abul Fazl, Abdul Qadir Badayuni, Shaikh Abdul Haq Muhaddis Dehlavi, Anand Ram Mukhlis, Sujan Rai Bhandari, Ali Dashti, Dahkuda.

Unit-8

Translation of Unseen Passage from Urdu/English into Persian

Unit-9

Translation of Unseen Passage from Persian into Urdu/ English

Unit-10

Translation from the text given in Prose and Poetry.

- Chahar Maqala (Dabiri), Gulistan (Chapter I), Tarikh-e-Firoz Shahi (Wasaya-e-Balban), Ain-e-Akbari (Aain-e-Chiragh Afruzi), Jamal Zadeh (Farsi Shakar Ast), Saeed Nafisi (Khanah-i-Pidari), Samad Behrangi (Mahi-e-Kuchulu), Ghulam Hussain Saaidi (Ai Bi Kulah Ai Ba Kulah, Drama)
- Rudaki (Bui-jui-…..), Firdausi (Rustam-o-Sohrab), Rubaiyat-e-Khayyam (Radif-e-Alif), Rumi(Nai Nama), Amir Khusrau (Ghazalyat-e-Radif-e-Alif), Hafiz (Ghazalyat-e-Radif-e-Alif), Khaqani (Aiwan-e-Madain), Malik-Ush-shuara Bahar (Qasidai Wataniyeh), Nima Yusheej (Ai Aadamha).

23. SUBJECT : PHYSICAL EDUCATION

Unit-1

Principles and History of Physical Education

- Definition, Aim and Objectives of Physical Education and Recreation
- Philosophical Foundation of Physical Education- Philosophical Schools :- Idealism, Naturalism, Realism, Pragmatism, Existentialism, Humanism.
- Benefits of Exercise, Exercise and Well-being and body parts.
- Biological Foundation of Physical Education-Definition and Theory of Play, General Principle of Growth and Development, Principles of Motor Skills Acquisition, Transfer of Training.
- Sociological Foundation of Physical Education- Role of Sports in Socialisation Process, Physical activities and Sports as cultural heritage, role of sports in globalization process.
- History of Physical education- Physical Education in ancient Greece, Rome, Germany, Sweden, Denmark and Russia.
- Olympic movement, Historical development of ancient and modern Olympic games.
- Historical development of physical education in pre and post independence in India.

Unit-2

Exercise Physiology, Sports Injuries and Rehabilitation

- Physiology of muscular activity, neurotransmission and movement mechanism.
- Physiology of cardio respiratory system.
- Energy cost of various sports activities.
- Bio-energetics and energy process.
- Physiological factors influencing sports performance.
- Sports injuries and their management and rehabilitation.
- Theraputic modelities and massage.
- Ergogenic aids and doping.
- Ageing process and exercise.

Unit-3

Kinesiology and Biomechanics

- Joints and their movements-planes and axes.
- Kinematics-linear and angular motion, levers and their applications in sports.
- Laws of motion, principles of equilibrium and force, spin and elasticity.
- Postural deformities and their corrections.
- Muscular/mechanical analysis of motor movements and basic movement like running, walking, jumping, throwing, pulling and pushing.

Unit-4

Sports Psychology

- Learning process-theories and laws of learning, factors effecting motor learning.
- Motivation-types, theories and dynamics of motivation in sports.
- Psychological factors affecting sports performance.
- Personality-its dimensions and its theories, relationship between personality and performance, traits of athletic personality.
- Individual difference and sport performance.
- Group dynamics, team cohesion and leadership in sport.
- Media and sports, audience behavior and performance, cognitive process in sports.

Unit-5

Professional Preparation and Curriculum design

- Development of teacher education in physical education.
- Ethical values in physical education and sport.
- Principles of curriculum planning and designing.
- Principles of classification of pupils for physical activities.

Unit-6

Health Education and Recreation

- Definition, aims and objectives of health education.
- Guiding principles of Health Education.
- Balanced diet and nutrition.
- Health related fitness, obesity and its management.
- Communicable diseases- their preventive and therapeutic aspects.
- School health program and personal hygiene.
- Theories and principles of recreation.
- Recreation program for various categories of pupils.

Unit-7

Sports Training and Competition

- Principles and characteristics of sport training.
- Training load- its component, super compensation and adaptation process.
- Process of periodisation.
- Training method and specific training program for developing various motor abilities.
- Technique and phases of skill acquisition.
- Strategy and tactics, various system of play in team games.
- Short term and long term training programmes.
- Principles of planning physical activities.
- Talent identification, its process and procedures.
- Types of competitions, special preparations for competition, psychological preparation.
- Rules of games and sports and their interpretations.

Unit-8

Research Methods and Statistics in Physical Education

- Meaning, nature, scope and types of research, formulation and selection of research problem.
- Sampling- process and techniques.
- Methods of research.
- Data collection- Tools and techniques.
- Statistical techniques of data analysis, measures of central tendency and variability, correlation, normal probability curve, t-test, f-test, chi-square test, z-test.
- Hypothesis-formulation types and testing.
- Writing research report.
- Application of ICT in physical education and sports.

Unit-9

Test, Measurement and Evaluation in Physical Education

- Concept of test, measurement and evaluation.
- Principles of measurement and evaluation.
- Construction and classification of tests.
- Criteria of selection of good test.
- Concepts and assessment of physical fitness, motor fitness, motor abilities and motor educability.
- Specific skill tests for badminton, basketball, hockey, lawn tennis, soccer and volleyball.
- Testing psychological variables- competition anxiety, aggression, team-cohesion, motivation and self concept.
- Anthropometric measurement and body composition.

Unit-10

Sports Management

- Concept and principles of management.
- Organizations and functions of sports bodies.
- Intramural and extramural programs.
- Management of infrastructure, equipments, finance and personnel.
- Methods and techniques of teaching in physical education.
- Principles of planning physical education lessons.
- Pupil-Teacher inter-action and relationship.
- Concept of supervision and its techniques.

24. SUBJECT : DRAWING & PAINTING

Unit-1

Fundamentals of Art

- Art-Meaning, Origin, Development, Definition and Classification
- Shadanga (six Limbs of Indian Painting)
- Elements of Painting – Line, Form, Color, Tone, Texture and Space.
- Principles of Composition – Balance, Unity, Rhythm, Proportion, Harmony, Effectiveness and Repetition.

Method and Material

- Surface of painting- canvas, paper, mural/wall, panel, mixed surface, Land surface.
- Medium of painting – Watercolor (acrylic poster etc.), Oil color, Dry Color (wax, pastel, pencil, crayon, charcoal etc.)
- Techniques of Painting – Water color technique (wash, poster and acrylic color), Dry Color Technique (wax, pastel, pencil, crayon, charcoal etc.)
- Techniques of wall painting- Fresco (Secco and Bueno), Mural.
- Color theory, color Harmony and effects of color.

Unit-2

History of Art

History of Indian Painting-

- Pre-Historic Period, Rock Paintings, Indus Valley, Mauryan period, Gupta period, Cave Paintings (Ajanta, Ellora, Elephanta, Sigiriya, Jogimara, Bagh, Badami)
- Miniature painting- Apabhransh, Pal, Rajasthani, Pahari and Mughal paintings.
- Dakhani painting- Ahmed Nagar, Bijapur, Golconda

History of Western painting –

- Prehistoric Painting, Egyptian and Mesopotamian painting, Classical art, Early Christian Art, Romanesque art and Gothic art.
- Renaissance painting- (Venice and Florence)
- Renaissance painters- Fra Angelico, Paolo Uccello, Piero da Francesco, Santo Bontipelli, Michelangelo, Leonardo da Vinci, Raphael, Giorgione, Titian.
- Mannerism, Baroque art, Rococo art.

Unit -3

Art and Aesthetics

Indian Art and Aesthetics –

- Meaning, Definition and Characteristics of Indian Art and Beauty
- Classification of Art, Fine Art and its Branches according to Indian Thinkers.
- Principles of Indian Art and Aesthetics – Theory of Rasa, Theory of Dhvani, Theory of Alankar, Theory of Auchitya.
- Indian aesthetic philosophy- Bharatmuni, Abhinavagupta, Acharya Bhama, Acharya Kshemendra, Anand Kumar Swami, Rabindranath Tagore.
- Art and beauty according to Vishnudharmottara Purana, Natyashastra, Chitrasutra, Kamasutra.

Western art and Aesthetics –

- Meaning, definition and Characteristics of Western Art and Beauty, Fine Art and its Branches according to Western Thinkers.
- Theories of Western beauty- Imitation theory, Rationalism, Empiricism, Psychological Theory, Communication theory.
- Western Art, Aesthetics and Philosophy- Plato, Aristotle, Hegel, Kant, Croce, Tolstoy, Freud, Baumgartner, Roger Fry, Clivell.

Unit -4

Modern Art

Indian modern painting –

- Painting of Kalighat, Company style, Bengal style.
- Renaissance painters- Rajaravi Verma, Abanindranath Tagore, Nandlal Basu, Asit Kumar Haldar, Amrita Shergill, Yamini Roy, Rabindranath Tagore, Gagendra Nath.
- Realism, Expressionism, Impressionism, Tantra Art, Illustration.
- Modern painters- Satish Gujral, Narayan Shridhar Bendre, B. Prabha, Arpita Singh, K.S. Kulkarni, K.K. Habbar, Pran Nath Margo, K.H. Ara, Vinod Bihari Mukherjee, Bhavesh Sanyal, G.R. Santosh, S.H. Raza, Tayyab Mehta, Krishna Khanna, K.C.S.Panikkar, K.G. Subramanian, Bhupendra Khakkar, Nalini Malani, Arpana Caur, Gogi Saroj Pal, Vivaan

Sundaram etc.

Western modern painting –

• Neo-Classicism, Romanticism, Realism, Impressionism (Neo-Impressionism, Post-Impressionism), Fauvism, Cubism, Expressionism, Futurism

• Modern painter- Edourt Manet, Claude Monet, Pisarro and Sisly, Edgar Degas, Paul Cezanne, Van Gogh, Henri Matisse, Pablo Picasso, Edvard Munch, Gustave Courbet.

Unit -5

Folk art and tribal art

• Pate painting-(Kalighat, Orissa, Tanjore, Nathdwara)

• Folk art of different State of India - Pichwai Kawad, Mandana (Rajasthan), Sanjhi (U.P.), Madhubani (Bihar), Aipan (Uttarakhand) etc.

• Tribal art- Warli painting (Maharashtra), Pithora painting (Gujarat), Gond painting (M.P.), Saora painting (Orissa), Santhal painting (from Santhal Pargana district from Bengal and Bihar border), Bhil painting (M.P., Gujarat, Rajasthan) Etcetera. Relationship between folk art.

• Interrelationship between Tribal art and Environment, Environmental Art.

Unit -6

Indian sculpture and Indian architecture

Indian sculpture

• Prehistoric period- (Harappa, Mohenjodaro), Maurya period, Shunga period, Gupta period, Gandhara period, Chalukya period, Rashtrakuta period.

• Ramkinkar Baij, Satish Gujral, Sankho Chaudhary, Meera Mukherjee, Jagana Chaudhary etc. Indian Architecture-Architecture of Indus Valley Civilization, Mauryan Stupa Architecture (Sanchi, Bharhut, Sarnath)

• Architecture of temples- Temples of Orissa during Gupta period, Chandela period, Chalukya period, Rashtrakuta and Hoysala.

• Architecture of cave temples- Ajanta, Ellora, Elephanta.

• Architectural styles of temples- Nagar, Dravida, Besar.

25. SUBJECT : MILITARY SCIENCE (DEFENCE STUDIES)

Unit - 1

CONCEPTUAL ASPECTS OF DEFENCE AND STRATEGIC STUDIES & WAR

• Meaning and definition of Defence and Strategic Studies – Its relevance and significance.

• Nation-State, National Power and elements.

• War - basic concepts, types, Contemporary cases of war.

• Basic Concepts : Campaign, Battle, Strategy, Tactics, Security and Defence.

• Principles of war.

• Revolutionary War and Guerilla Warfare: Concept, Characteristics, strategy and tactics and Counter guerrilla measures.

• Psychological warfare: Propeganda, Rumour and Brain washing.

• Modern & Unconventional warfare in the Nuclear Age.

• Nuclear Warfare- Deterrence, Massive Retaliation and Nuclear Doctrines.

Unit- 2

ECONOMIC ASPECTS OF WAR

• Economic Theories of Defence: Adam Smith, David Recordo, J. M. Keynes.

• Sustainable Development: Challenges & Responses.

• Basics of Defence Planning, Determinants of Defence Expenditure.

• Defence Budgeting.

• Economic Causes of War.

• Economic Warfare in modern times.

• Economic Problems of Post War reconstruction.

• National Security and International Trade regimes (WTO, TRIPS, TRIMS, FTA's, NAFTA, SAPTA, & NSG).

• India's role in Regional and Global Economic Forums and Organizations.

Unit - 3

EVOLUTION OF WARFARE IN INDIA

• Vedic, Epic and Hindu Period warfare.

• Military organisations and techniques of fighting of Rajputs and Turks- Battle of Tarain (1192 AD).

• Military organisations and techniques of fighting of Mughals with particular reference to the First Battle of Panipat, 1526 A.D.

• Military organisations of Marathas under Shivaji and his techniques of fighting

• Military organisation of Sikh Army and its fighting techniques under Maharaja Ranjit Singh

• Anglo-Maratha and Anglo-Sikh Warfare with particular reference to the Battle of Assaye , 1803

• Role of British Indian armed forces in the First and the Second World Wars

• Evolution of Higher Defence Organization in India.

• India's post independence wars and relations with her neighbors with special reference to:

a. The First India-Pakistan War (1947-1948)
b. India-China War of 1962
c. The India Pakistan War of 1965
d. Liberation of Bangladesh of 1971
e. The Kargil Conflict of 1999

Unit - 4

NATIONAL SECURITY – CONCEPTUAL ASPECTS

• National Security
  a. Meaning and Definition
  b. Threat Perceptions
  c. Types of threats to India
• Challenges to National Security
  a. Internal Challenges
  b. External Challenges
• Global Contemporary security environment in brief.

• Conflicting ideologies: Militarism, Nationalism, Fundamentalism, Separatist, Irredentism.

• Defence and Development: Concept and its implications for India,

• Balance of Power, Collective Security and Non Alignment.

• Military Alliances and their role in the preservance of national and international security in 21st century.

Unit - 5

STRATEGIC THOUGHT

• Sun Tzu's concept and Theories of war.

• Kautilya Philosophy of War

• Clausewitz's theories on war.

• Jomini's Thoughts and Principles of War.

• Mahan's views on See Power and Naval Warfare

• J.F.C. Fuller and Liddell Hart: concepts and Theories.

• Mao-Tse-Tung & Che-Guevara

• Douhet and Mitchell: Their views on the Role of Air Power in Modern Warfare.

• Y. Harkabi, John Foster Dulles and Andre Beaufre - Theories of Nuclear War and Deterrence.

Unit - 6

SCIENCE AND TECHNOLOGY IN RELATION TO WARFARE

• Science, Technology and National Security.

• Impact of Science and Technology on Society and warfare.

• Transfer of Technology .
  a. International Interdependence
  b. Role of Multinational Corporations.
• Armament Technology
  a. Armoured vehicles: Tanks and APC`s: uses and counter measures.
  b. Aircrafts, UAV's and Missiles, uses and counter measures.
  c. Submarine and Aircraft carrier, uses and counter measures.
• Electronics Warfare: Concept and applications
• Space, Security and War
  a. Use of Space in Communication, Surveillance and Intelligence Gathering
  b. Use of Space in Command and Control
  c. Ballistic Missile Defence (BMD): Concept and applications.

Unit - 7

NON TRADITIONAL SECURITY THREATS

• Human Security – Definition, meaning and concept

• Environmental Security, Disasters and their management

• Energy Security-Definition and importance.

• Illegal Migration- Causes and effects.

• Narco -Terrorism and Drug Trafficking

• Organized Crimes and Money Laundering

• Cyber Security: Concept and Issues.

Unit - 8

WMD, NUCLEAR PROLIFERATION AND NATIONAL SECURITY

• Weapons of Mass Destruction - Nuclear Weapons, Chemical & Biological Weapons.

• Basic Concepts and Theory of Disarmament & Arms Control, Approaches to Disarmament & Arms Control

• Arms Aid, Arms Trade, Proliferation of Small Arms

• Historical Survey of Disarmament Efforts:
  a. Under the League of Nations
  b. Under the United Nations
  c. Unilateral, Bilateral and Multilateral approaches
• Chemical and Biological Weapons Convention.
• Concept of Non-proliferation, NPT, CTBT, PTBT, MTCR & other treaties.
• Terrorism and Nuclear Proliferation.

26. SUBJECT : PHILOSOPHY

Unit-1

Indian Philosophy

• Ved and Upanishad- Atman, Jagat and Brahman

• Charvaka- Epistemology and Metaphysics

• Jainism- Syadvada, Anekantvada, Nayavada, Bondage and liberation

• Buddhism- Four noble truths, Pratityasamutpada, Nirvana, Astangik marga, Kshanbhangvada, Anatmavada.

• Schools of Buddhism-Epistemological distinction between Vaibhasika and Sautrantika, arguments for Idealism, Kinds of Vijnana, Various interpretations of Sunya.

• Samkhya- Satkarvada, Prakriti and its evolutes, arguments for the existence of Prakriti, Nature of Purusa, arguments for the existence and plurality of Purusa, Relationship between Purusa and Prakriti, Bondage and Liberation.

• Yoga- Patanjali's concept of citta and citta-Vritti, eight fold path of Yoga, the role of God in Yoga.

• Nyaya- Sources of knowledge, Pramanya and Apramanya, Concept of God and arguments for the existence of God, Theory of error.

• Vaisesika- Vaisesika categories, causation, Atomism.

• Purva-Mimansa- Pramanyavada, sources of valid Knowledge, Nature of Knowledge, Triputi- Pratyakshavada and Jnatatavada, Plurality of self, concept of Dharma and Apurva, The nature of Vedic statements, theories of error.

• Vedanta-

Advaita Vedanta- Adhyasa, Anirvacaniya Khyativada, Brahman and Maya, Vivartvada, Brahman and Isvara, Jiva and Jagat, Knowledge and liberation, Samkara as a pseudo Buddhist

Visistadvaita- Saguna Brahman, Refutation of Maya, Sat Khyativada, Aprithaksiddhi, Parinamvada, Jiva, Bhakti and Prapatti.

Unit-2

Geeta, Vaishnav and Shaivism Philosophy

• Philosophical theories in Geeta- Nishkam Karmvad, Concept of Loksangrah, Swakarma and Swadharma

• Kashmir Shaivism

• Philosophy of Madhvacharya

• Philosophy of Nimbarkacharya

• Philosophy of Vallabhacharya

(Note- Candidates are expected to go through the comprehensive Philosophical readings)

Unit-3

Western Philosophy

• Pre Socratic Philosophers, Sophists and Socrates

• Plato- Theory of Knowledge, Theory of Ideas, Dialectical Method, Soul and God

• Aristotle- Critique of Plato's Theory of Ideas, Theory of Causation, Form and matter, Potentiality and actuality, Soul and God

• St. Augstein- The Problem of Evil

• St. Anselm- Ontological Proof for the existence of God

• St. Thomas Aquinas- Faith and reason, Proof for the existence of God

• Descartes- The Method of doubt, Cogito Ergo Sum, Mind-Body Relation, God: Proof for the existence of God.

• Spinoza- Substance, Attributes and modes, The Concept of God and Nature, Pantheism, Mind-Body Relation

• Leibnitz- Monadology, Theory of Pre-established Harmony, Proof for the existence of God

• Locke- Theory of Knowledge, Kinds of Ideas, Refutation of innate ideas, Limits of Knowledge, Primary and Secondary Qualities.

• Berkeley- Subjective Idealism, Esse est Percipii, Refutation of abstract ideas, Solipsism, God and Self

• Hume- Theory of Knowledge, Refutation for the existence of God and self, Refutation of causality, Skepticism

• Kant- The Critical Philosophy, Classification of Judgments, Possibility of Synthetic apriori judgments, Forms of Sensibility, Categories of Understanding, The metaphysical and the transcendental deduction of categories, Phenomena and Noumena, The Ideas of Reason, Soul, God and the World as a whole, Freedom and Immortality.

• Hegel- Dialectic and its structure, Concepts of Being, Non-Being and Becoming Absolute Idealism.

Unit-4

Ethics (Indian, Western and Applied)

Indian Ethics

• Concept of Purusartha, Sreyas and Preyas

• Varnashrama Dharma and Sadharana Dharma

• Rna and Yajna, Concept of Duty

• Karma-Yoga, Sthitiprajna, Svadharma, Lokasamgraha

• Apurva and Adrishta

• Sadhya-Sadhana, Itikartavyata

• Law of Karma : Ethical Implications

• Rta and Satya

• Yoga-Kshema

• Astanga Yoga

• Jainism : Samvara- nirjara, Tri-ratna, Pancha-vrata

• Buddhism : Upaya-Kaushal, Brahma-vihara : maitri, karuna, mudita, Upeksha, Bodhisattva

• Charvaka's Hedonism

Western Ethics

• Concepts of Good, Right, Justice, Duty, Obligation, Cardinal Virtues, Eudaemonism, Intuition as explained in Teleological and Deontological Theories

• Egoism, Altruism and Universalism

• Subjectivism, Cultural Relativism, Super-naturalism, Ethical realism.

• Kant's Moral Theory : Postulates of morality, Good-will, Categorical Imperative, Duty, Mean and ends, Maxims

• Utilitarianism : Principle of Utility, Problem of Sanction and Justification of morality, Kinds of Utilitarianism, Moral theories of Bentham, J.S. Mill, Sidgwick

• Theories of Punishment

Applied Ethics

• Applied Ethics: Meaning, Definition, Nature

• Ethics of Technology; Technology, Dominance, Power and Social Inequalities

• Democratization of Technology

• Public Evaluation of Science and Technology

• Ethical Implication of Information Technology, Bio-Technology, Non-Technology

• Environmental Ethics; Nature as means or End, Arne Naess- Deep Ecology, Peter Singer- Animal Right

• Medical-Ethics: Surrogacy, Doctor-Patient Relationship, Abortion. Euthanasia, Female-Infanticide

• Professional Ethics; Corporate Governance and Ethical Responsibility

• Media Ethics: Ethical Issues in Privacy, Cyber Space, Pornography, Representation and Difference

• Legal Ethics: Law and Morality, Legal Obligation, Authority and validity of Law

• Philosophical Counselling: Managing Everyday Problems

Unit-5

Philosophy of Religion

• Foundation of Religious Belief; Faith, reason, Revelation and Mystical Experience.

• Attributes of God

• Traditional Arguments and Arguments based on Religious Experience for the existence of God

• Problem of Evil and its solution

• Religious Tolerance, conversion and secularism

• Religious Language

Unit-6

Philosophy of World Religions

• Meaning of Religion, Theories of origin of Religion

• Hindu Religion, Sikh Religion

• Boudh Religion, Jain Religion

• Zorosastrian Religion, Christian Religion

• Islam Religion and Sufism

Unit-7

Indian Logic

• Nature & Types of Inference in Old Nyaya and Navya-Nyaya

- Nature & Types of Inference in Buddhism and Jainism
- Vyapti-Definition, Types & Methods of establishing Vyapti
- Types of Hetvabhasa/Fallacies of Inference

Western Logic

- Differences between Deductive and Inductive Logic
- Truth and Validity
- Nature of Propositions
- Categorical Syllogism
- Laws of Thought
- Classification of Propositions
- Traditional Square of opposition
- Truth-Functions and Propositional Logic
- Quantification and Rules of Quantification
- Symbolic Logic : Use of Symbols
- Decision Procedures : Truth Table, Using Truth-Tables for testing the validity of arguments
- Venn Diagram, Informal and Formal Fallacies
- Proving Validity, Argument and Argument-form
- Axiomatic System, Consistency, Completeness

Unit-8

Socio-Political Philosophy

- Social and Political Ideals : Equality, Justice and Liberty
- Sovereignty : Austin, Bodin, Laski and Kautilya
- Individual and State : Rights, Duties and Accountability
- Forms of Government : Monarchy, Theocracy and Democracy
- Political Ideologies : Anarchism, Marxism and Socialism
- Humanism, Secularism, Multi-Culturalism
- Crime and Punishment : Corruption, Mass Violence, Genocide, Capital Punishment
- Development and Social Progress
- Gender Discrimination : Female Foeticide, Land and Property Rights, Empowerment
- Caste Discrimination : Gandhi and Ambedkar

Unit-9

Contemporary Indian Philosophy

- Swami Vivekananda- Practical Vedanta, Universal Religion, Religious Experience, Religious Rituals
- Sri Aurobindo- Evolution, Mind and Supermind, Integral Yoga
- Rabindra Nath Tagore- Religion of man, Ideas on Education, Concept of Nationalism
- K.C. Bhattacharya- Swaraj in ideas, Concept of Philosophy, Subject as Freedom, The Doctrine of Maya
- S. Radhakrishnan- Intellect and Intuition, The Idealist view of Life, Concept of Universal Religion, Hindu view of Life
- Mahatma Gandhi- Truth, Non-Violence, Satyagraha, Swaraj, Critique of Modern Civilization
- Bhim Rao Ambedkar- Annihilation of Caste, Philosophy of Hinduism, Neo-Buddhism
- Deen Dayal Upadhyaya- Integral Humanism, Advaita Vedanta, Purusartha
- M.N. Roy- Radical Humanism, Materialism
- Swami Dayanand Saraswati- Reconciliation of the six systems of Indian Philosophy, Traitavada (God, Self and Nature)

Unit-10

Contemporary Western Philosophy

- G. E. Moore- Refutation of Idealism, Defence of Common Sense, Philosophy and Analysis.
- B. Russell- Knowledge by Acquaintance and Knowledge by Description, Logical Construction & Logical Atomism
- L. Wittgenstein- Language and Reality, Facts and Objects, Names and Propositions, The Picture Theory, Functions of Philosophy, Meaning and Use, Language-Game, Private Language
- A. J. Ayer- Problem of Knowledge
- J. P. Sartre- Existence preceeds Essence, Freedom and Responsibility, Humanism
- E. Husserl- The Husserlian Method, Intentionality
- C. S. Pierce, William James, John Dewey- Pragmatism
- P. F. Strawson- Person, Basic Particular, Identification
- W. V.O. Quine- Two Dogmas of Empiricism, Radical Translation

27. SUBJECT : MUSIC INSTRUMENTAL (SITAR)

Sangeet Swar Vadya

Music is a performing art, therefore practical and theory both are very Important. Hundred marks is for stage performance and hundred marks for theory. For stage performance and Viva Experts of music are genuine.

1- Stage performance and Viva

a- performance in detail of choice raga
b- to present a raga composition, other than trital
c- Thumari, Dhune (light classical music)
d- Experiment for new composition

2- Detailed Ragas for study

1- Shudh Kalyan
2- Yamani Bilawal
3- Shudh Sarang
4- Sarang
5- Ahir Bhairav
6- Gurjari Todi
7- Desi
8- Jog
9- Yaman
10- Bagashwari
11- Todi
12- Devgiri Bilawal
13- Kaunsi Kanhada
14- Puriya Dhanashri
15- Megh Malhar
16- Bilaskhani Todi
17- Miya Malhar
18- Komai Ashawari
19- Jog Kauns
20- Puriya Kalyan
21- Puriya
22- Darbari Kanhada
23- Malkaus
24- Bhairav
25- Lalit
26- Marva
27- Shyam Kalyan
28- Kedar
29- Bhairavi
30- Anand Bhairav

3- Non-Detailed Ragas

1- Khambavati
2- Sahana
3- Bhopal Todi
4- Abhogi Kanhada
5- Nand
6- Hans Dhwani
7- Madhrnad Sarang
8- Samant Sarang
9- Dev Gandhar
10- Malgunji

At least one composition in Ektal, Jhumara, Roopak Taal, Knowledge of Layakari 5/4 or 3/4

Theory

1- Comparative study of Ragas
2- Knowledge of Gat and Notation
3- Elementary knowledge of staff notation
4- comparative study of Hindustani and Karnataka Music Ragas
5- Development, classification and techniques of the Indian Music in reference of musical instruments.
6- Contribution of instrumental musicians of 18th century
7- Development of Western Instruments
8- Define - Swar-Samvad, Melody, Hormony, Tone, Shruti, Gram, Murchhana, Naad, Murki, Jhala, Alap.
9- Classification of Ragas
10- Music and psychology
11- The utility of Vadya Sangeet
12- Music and Science
13-The Scale of Karnataka and Hindustani Music
14- Views of Plato and Aristotle about Music
15- The importance of Ras-Bhav in Music
16- Relation between Chhand and Taal
17- Use of Kutup
18- Comparative study of classical/ Semi classical and folk Music
19- Comparative Study of Tat (Vitat), Ghan, Sushir and Avanadha Vadya

Who were the authors of following books.

1- Natya Shastra
2- Sangeet Ratnakar
3- Pranav Bharti
4- Bhartiya Sangeet Vadya
5- Raga Parichaya
6- Sitar Malika

Describe Gharanas of following Artists:

1- Nikhil Banerjee
2- Ustad Halim Jafar
3- Ustad Allauddin Khan
4- Pandit Ravi Shanker
5- Ustad Vilayat Khan
6- Vishnu Digamber Paluskar
7- Bade Gulam Ali Khan

28. SUBJECT : MUSIC INSTRUMENTAL (TABLA)

Unit:- I

Origin and development of Percussion Instruments.

(a) Classification of Indian Musical Instruments as described by Bharat, Sharangdev, and Lalmani Mishra.
(b) Detailed study of Origin and development of Ancient (According to Bharat) Medieval (According to Sharang dev) and Morden percussion instrument.
(c) Origin and Historical development of Tablas
(d) Structure and Playing Technique of the following Instruments in brief. Mridang, Pakhawaj, Tabla, Mridangam, Ghatam, Tavil, Khanjira, Khol, Chenda, Chang, Upang, Duff, Nakkara, Dhol, Dholak, Sambal, Dholaki, Naal, Huddaka, Pung and Percussion instruments of Uttar Pradesh
(e) Basic knowledge of the following instruments: **Tat Vadya:** Rudra Veena, Vichitra Veena, Saraswati Veena, Sitar, Sarod, Sarangi, Violin, Israj, Santoor, Surbahar, Guitar Tanpura. **Sushir Vadya:** Flute, Shehanai, Nagasvaram, Algoza, Sundari. **Ghana Vadya:** Jal-Tarang, Nal-Tarang, Morsing, Chipli, Jalra, Kartaal, Jhanjh, Manjira.
(f) Popular percussion instruments used in Western Music: Kettle Drum, Snare Drum, Bass Drum, Tenor Drum.

Unit- II

Technical terms, Playing Technique and Compositions of Tabla.

(a) Basic Varna of Tabla and their combinations.
(b) Study of the main characteristics of Theka, Uthan, Peshkar, Quaida, Bant, Rela, Rau, Tukda, Mukhada, different type of Gat, Fard, and different types of Paran, Tihai, and Chakradar.
(c) Definition of all technical terms related to Tabla.

Unit- III

Study of Taals

(a) Taal Shastra

(i) Study of Margi and Deshi Taal system.
(ii) Ten Pranas of Taal.
(iii) Brief knowledge Chhand and its relationship with Taal.
(iv) Variety of Rasa and its relationship with Taal.

(b) Study of Various Taal Systems and comparative study

(i) Bhatkhande Taal Notation System.
(ii) Paluskar Taal Notation System.
(iii) Karnatak Taal System.
(iv) Brief Study of staff notation system.

(c) Prachalit and Aprachalit Talas of North Indian Music.

Unit- IV

Application of Mathematical Calculation in Tabla Instruments

(a) Laya and different Layakaris.
(b) Ways to compose different types of Tihais of different number of matras in North Indian Taals.
(c) Chakradar - Sadharan, Firmaishi and Kamali.
(d) Nauhakka.
(e) The Chakra of Thirty-two Tihais described by Acharya Brihaspati.

Unit- V

Concept of Gharanas in Tabla

(a) Evolution & Development of Gharanas and Baaj.
(b) Detailed knowledge of Tablas Gharanas : Delhi, Ajarada, Faffukhabad , Lucknow , Benaras, Punjab.
(c) Salient feature of each gharana.
(d) Different Playing styles and prominent compositions of Gharanas of Tabla.

Unit- VI

Study of the following texts (Special reference to Percussion Instruments and Taals)

(a) Natya Shastra, Sangeet Ratnakar, Brihaddhesi, Sangeet Samyasar, Sangeet Raj, Ashtottar Shat Taal Lakshanam, Bhartiya Sangeet Vadya, Table Ka Udagam Vikas avam Vadan Shailiyan, Bhartiya Talon Ka Shastriya Vivechan, Pakhawaj avam Table ke Gharane avam Paramparayen, Taal Kosh, Tabla Vadan Kala avam Shastra, Aesthetics of Tabla, Tabla Puran, Taal Vadya Parichaya, Tabla Granth Manjusha, Laya Taal Vichar Manthan, Tabla Vadan Mein Nihit Saundarya, Solo Tabla Drumming of North India, Tabla of Lucknow, Taal Vadya Shastra, Bhartiya Sangeet Mein Taal Chhand Evam Roop Vidhan, Tabla Kaumadi, Tabla(Arvind Mulgaonkar), Taal Prichaya -(Part 3), The Arts of Tabla Rhythm, Avnaddya Vadya, Taal prakash.

Unit-VII

Performers & Composers:

(a) Tablas: Natthu Khan, Modu Khan, Bakshu Khan, Abid Hussain Khan, Haji Vilayat Ali, Salari Khan, Chudiya Imam Baksh, Ram Sahay, Munir Khan, Maseet Khan, Habibuddin Khan, Ahmemadjan Thirukuwa, Amir Hussain, Shekh Daud, Bade Munne Khan, Karamtullah Khan, Allarakha Khan, Gyan Prakash Ghosh, Nikhil Ghosh, Bhairav Sahai, Baladev Sahai, Biru Mishra, Wajjid hussian, Afak hussain Khan, Bikku Maharaj, Kishan Maharaj, Kanthe Maharaj, Samta Prasad (Gudai Maharaj), Anokhe Lal Mishra, Inam Ali Khan, Pandharinath, Nageshkar, Latif Ahamad Khan, Lacchu Maharaj, Lalji Shrivastava Safat Ahemd Khan, Sharada Sahai Suresh Talwalkar Swapan Chaudhari, Zakir Hussain, Anindo Chatarjee, Kumar Bose.

(b) Pakhawaj: Kudau Singh, Jodhsingh, Nana Panse, Ayodhya Prasad, Pagal Das, Chatrapati Singh, Pannalal Upadhyay, Ramashish Pathak, Ramakant Pathak, Sakharam, Prushottom Das, Parvat Singh.

(c) North Indian Vocalist & Instrumentalist:-

Allauddin Khan, Mustaq Ali Khan, Vilayat Khan, Ravishankar, Abdul Haleem Jafer, Balram Pathak, Nikhil Banerjee, Hafeez Ali Khan, Ali Akbar Khan, Amajad Ali Khan, V.G. Jog, D.K. Datar, N Rajam, Hari Prasad Chourasiya, Pannalal Ghosh, Bismillah Khan, Krishna Rao Shankar, Pandit, Mogubai Kurdikar, Kesar Bai Kerkar, Mallikarjun Mansoor, Abdul Karim Khan, Faiyaz Khan, Bhimsen Joshi, Gangubai Hangal, Malini Rajurkar, Kishori Amonkar, Shoba Gurtu, Girja Devi, Jasraj, Kumar Gandharava and Aamir Khan Shiv Kumar Sharma, Bjahan Supori.

South Indian Percussionist: Palghat Raghu, Palghat Mani Iyer, Umayalpuram Shivraman, Vikku Vinayak Ram.

Dancers:- Sitara Devi, Gopi Krishna, Birju Maharaj, Durga Lal, Kanak Rele, Sanyukta Panigrahi, Guru Bipin Singh, Vempati Chinna Satyam,Yamini Krishanamurti and Raman Kutty Nair.

(d) Contribution of Sangeet Natak Academy, Doordarsan, All India Radio, ICCR, CCRT, ITC- SRA for the development of Percussion Music.

(e) Prominent cultural festivals of Uttar Pradesh.

Unit-VIII

Principles of Tablas Accompaniment

(a) Principles of Tabla accompaniment.
(b) Basic knowledge of Musical forms in reference to Tabla accompaniment.

Vocal Musical forms: Dhrupad, Dhamar, Sadara, Bada Khayal, Chota Khayal, Tarana, Tappa, Thumari, Dadra, Chaiti Kajri, Bhajan, Gazal, Qawwali,

Intrumental Music form: Masitkhani Gat, Razakhani Gat, Vilambat Gat, Drut Gat, Gat based upon different Matra Talas and Dhun.

Dance form: Amad, Paran, Toda, Stuti Paran, Parmelu

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