ANNIXURE-I

TIRUMALA TIRUPATI DEVASTHANAMS, TIRUPTI

SCHEME AND SYLLABUS FOR RECRUITMENT TO THE POST OF LECTURERS IN TTD DEGREE COLLEGE/ORIENTAL COLLEGES

(As per G.O.Ms.No.141 Fincnace (HR-I plq and policy dept) dated:1-8-2016)

PART-A: Written „Examination (Objective Type)			
Papers	**No. of Questions**	**Duration (Minutes)**	**Maximum Marks**
Paper-1: General Studies & Mental Ability (Degree Standard)	150	150	150
Paper-2: Concerned Subject (One only) (PG Standard)	150	150	300
		TOTAL	**450**
NEGATIVE MARKS: As per G.O.Ms. No.235, Finance (HR-I, Plg & Policy) Dept., Dt. 06/12/2016, for each wrong answer will be penalized with 1/3rd of the marks prescribed for the question.			

NB: The Candidates have to choose one of the following subjects relevant to the PG Degree for writing Paper-2:

Subject Code	**Subject**	**Subject Code**	**Subject**
01	Botany	10	Telugu
02	Chemistry	11	Zoology
03	Commerce	12	Population Studies
04	English	13	Dairy Science
05	Hindi	14	Sanskrit Vyakarana
06	History	15	Electronics
07	Physics	16	Home Science
08	Sanskrit	17	Physical Education.
09	Statistics		

SYLLABUS

PAPER-1

GENERAL STUDIES AND MENTAL ABILITY

1. Major Current Events and Issues pertaining to International, National and State of Andhra Pradesh.
2. General Science and its applications to the day to day life Contemporary developments in Science & Technology and Information Technology.
3. History of India - emphasis will be on broad general understanding of the subject in its social, economic, cultural and political aspects with a focus on AP and Indian National Movement.
4. Geography of India with focus on Andhra Pradesh.
5. Indian polity and Governance: constitutional issues, public policy, reforms and e-Governance initiatives.
6. Indian Economy and planning
7. Sustainable Development and Environmental Protection
8. Disaster management: vulnerability profile, prevention and mitigation strategies, Application of Remote Sensing and GIS in the assessment of Disaster
9. Logical reasoning, analytical ability and logical interpretation.
10. Data Analysis: Tabulation of data Visual representation of data Basic dataanalysis (Summary Statistics such as mean, median, mode and variance)and Interpretation.

PAPER-2-SUBJECT

1. BOTANY

CELL AND MOLECULAR BIOLOGY OF PLANTS

Cell Wall : Structure and functions, biogenesis, growth.

Plasma membrane : Structure, models and functions : Sites for ATPases, Ion carriers, Channels and pumps, Receptors.

Plasmodesmata : Structure, Role in movement of molecules and macromolecules, Comparison with gap junctions.

Chloroplast : Structure, genome organization, gene expression, RNA editing, nucleo-chloroplastic interactions.

Mithochondria : Structure, genome organization, Biogenesis.

Plant Vacuoles : Tonoplast membrane, ATPases, transporters, as storage organelle.

Nucleus : Structure, nuclear pores, nucleosome organization, DNA structure : A, B and Z forms, replication, damage and repair, transcription, Plant promoters and transcription factors, splicing mRNA transport, nucleolus, rRNA biosynthesis.

Ribosomes : Structure, site of protein synthesis, mechanism of translation, initiation, elongation and termination; structure and role of tRNA.

Protein sorting : Targeting of proteins to organelles.

Cell shape and motility : The cytoskeleton; organization and role of microtubules and microfilaments; motor movements; implications in flagellar and other movements.

Cell cycle and apoptosis : Control mechanisms; role of cyclins and cyclin dependent kinases; retinoblastoma and E2F proteins; cytokinesis and cell plate formation; mechanisms of programmed cell death.

Other cellular organelles : Structure and functions of microbodies, Golgi apparatus, lysosomes, endo plasmic reticulum.

Techniques in cell biology : Immuno techniques; in situ hybridization, FISH, GISH; confocal microscopy.

CYTOLOGY, GENETICS AND CYTOGENETICS

Chromatin organization : Chromosome structure and Packaging of DNA, molecular organization of centromere and telomere; nucleolus and ribosomal RNA genes ; euchromatin and heterochromatin ; karyotype analysis ; banding patterns ; specialized types of chromosomes ; polytene, lampbrush, B-chromosomes and sex chromosomes ; molecular basis of chromosome pairing.

Structural and numerical alterations in chromosomes : Duplication, deficiency, inversion and translocation ; autopolyploids ; allopolyploids ; evolution of major crop plants.

Genetics of prokaryotes and eukaryotic organelles : genetic recombination in phage ; genetic transformation, conjugation and transduction in bacteria ; genetics of mitochondria and chloroplasts cytoplasmic male sterility.

Gene structure and expression : Genetic fine structure ; cis – trans test ; Benzer's experiment; introns and their significance ; RNA splicing ; regulation of gene expression in prokaryotes and eukaryotes.

Genetic recombination and genetic mapping : Recombination ; independent assortment and crossing over ; molecular mechanism of recombination ; role of RecA and RecBCD enzymes ; site-specific recombination ; chromosome mapping, linkage groups, genetic markers, construction molecular maps.

Mutations : Spontaneous and induced mutations ; physical and chemical mutagens ; molecular basis of gene mutations ; transposable elements in prokaryotes and eukaryotes ; mutations induced transposons ; site-directed mutagenesis ; DNA damage and repair mechanisms.

Plant Breeding : Principles and methods of plant breeding ; Marker assisted breeding.

Biostatistics : Mean, Variance, Standard deviation, Standard error, Student't' test, chi-square and ANOVA.

Molecular cytogenetic : Nuclear DNA content; C-value paradox; cot curve and its significance; restriction mapping - concept and techniques ; multigene families and their evolution.

BIOLOGY AND DIVERSITY OF LOWEER PLANTS : CRYPTOGAMS

Microbiological techniques : Pure culture, enrichment and anaerobic culture.

Importance of microorganisms : Microbes in medicine, agriculture and environment.

Microbial growth : Nutritional requirements of microorganisms and methods to measure growth.

Microbial Ecology : Genetrification ; phosphorous solubilization ; nitrogen fixation

Phycology : Thallus organization ; cell ultra structure ; reproduction (vegetative, sexual, asexual) ; criteria for classification of algae : pigments, reserve food, flagella ; classification, salient features of Chlorophyta, Charophyta, Xanthophyta, Bacillariophyta, Phaeophyta and Rhodophyta ; algal blooms, algal biofertilizers ; algae as food, feed and uses in industry.

Mycology : General characters of fungi ; substrate relationship in fungi ; cell ultrastructure ; unicellular and multicellular organization ; cell wall composition ; nutrition (saprobic, biotropic, symbiotic) ; reproduction (vegetative, asexual, sexual) ; heterothallism ; heterokaryosis parasexuality ; Molecular aspects in classification.

General account of Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina ; fungi in industry, medicine and as food ; fungal diseases in plants and humans ; Mycorrhizae ; fungi as biocontrol agents.

Bryophyta : Morphology, structure, reproduction and life history ; distribution ; classification, general account of Marchantiales, Junger maniales, Anthoceratales, Sphagnales, Funariales and Polytrcales ; economic and ecological importance.

Pteridophyta : Morphology, anatomy and reproduction ; classification ; evolution of stele ; heterospory and origin of seed habit; general account of fossil pteriodophyta ; introduction to Psilo psida, Lycopsida, Sphenopsida and Pteropsida.

TAXONOMY AND DIVERSITY OF SEED PLANTS

Introduction and classification of Gymnosperms

Structure and reproduction in Cycadales, Ginkgoales, Coniferales, Ephedrales, Welwitschiales and Gnetales.

The species concept : Taxonomic hierarchy, species, genus, family and other categories ; principles used in assessing relationship, delimitation of taxa and attribution of rank.

Salient features of the International Code of Botanical nomenclature.

Taxonomic tools : Herbarium ; floras ; histological, cytological, phytochemical, serological, biochemical and molecular techniques ; computers and GIS.

Systems of angiosperm classification : Phenetic versus phylogenetic systems ; cladistics in taxonomy ; relative merits and demerits of major systems of classification.

Concepts of phytogeography : Endemism, hotspots; plant explorations; invasions and introductions.

PLANT PHYSIOLOGY AND METABOLISM

Energy flow : Principles of thermodynamics, free energy and chemical potential, redox reactions, structure and functions of ATP.

Fundamentals of enzymology : General aspects, allosteric mechanism, regulatory and active sites, isoenzymes, kinetics of enzymatic catalysis, Michaelis – Menton equation and its significance.

Membrane transport and translocation of water and solutes : Plant water relations, mechanism of water transport through xylem, passive and active solute transport, membrane transport proteins.

Signal transduction : Receptors and G-proteins, phospholipid signaling, role of cyclic nucleotides, calcium calmodulin cascade, diversity in protein kinases and phosphatases.

Photochemistry and photosynthesis : Photosynthetic pigments and light harvesting complexes, photo oxidation of water, mechanisms of electron and proton transport, carbon assimilation – the Calvin cycle, photorespiration and its significance, the C_4 cycle, the CAM pathway, biosynthesis of starch and sucrose.

Respiration and lipid metabolism : Glycolysis, the TCA cycle, electron transport and ATP synthesis, pentose phosphate pathway, glyoxylate cycle, alternative oxidase system, structure and function of lipids, fatty acid biosynthesis, synthesis of membrane lipids, structural lipids and storage lipids and their catabolism.

Nitrogen fixation and metabolism : Biological nitrogen fixation, nodule formation and nod factors, mechanism of nitrate uptake and reduction, ammonium assimilation.

Photobiology : Photochromes and cryptochromes, photophysiology of light –induce responses, cellular localization.

Plant growth regulators and elicitors : Physiological effects and mechanism of action of auxins, gibberellins, cytokinins, ethylene, abscisic acid, brassinosteroids, polymines, jasmonic acid and salicyclic acid.

The flowering process : Photoperiodism, endogenous clock and its regulation, floral induction and development – genetic and molecular analysis, role of vernalization.

Stress physiology : Plant responses to biotic and abiotic stress; mechanisms of biotic and abiotic stress tolerance, HR and SAR, water deficit and drought resistance, salinity stress, metal toxicity, freezing and heat stress, oxidative stress.

Coping with biotic stress : Chemical control, Biological control, IPM

PLANT DEVELOPMENT AND REPRODUCTION

Shoot development : Organization of the shoot apical meristem (SAM); control of cell division and cell to cell communication; control of tissue differentiation especially xylem and phloem ; secretory ducts and laticifers.

Phyllotaxy and leaf differentiation

Root development : Organization of root apical meristem (RAM); cell fates and lineages; vascular tissue differentiation; homeotic muntants in Arabidopsis and Antirrhinum, sex determination.

Male gametophyte: Structure of anthers; microsporogenesis, role of tapetum; pollen development and gene expression; male sterility; sperm dimorphism and hybrid seed production; pollen germination, pollen tube growth and guidance ; pollen storage ; pollen allergy, pollen embryos.

Female gametophyte: Ovule development; megasporogenesis; organization of the embryo sac, structure of the embryo sac cells.

Pollination, pollen – pistil interaction and fertilization : Floral characteristics, pollination mechanisms and vectors; self-incompatibility; double fertilization.

Seed development and fruit growth: Endosperm development during early, maturation and desiccation stages; embryogenesis, cell lineages during late embryo development; storage proteins of endosperm and embryo; polyembryony; apomixes; embryo culture; fruit maturation.

Dormancy: Seed dormancy; overcoming seed dormancy; bud dormancy.

Senescence and programmed cell death (PCD): Types of cell death, PCD in the life cycle of plants, metabolic changes associated with senescence and its regulation; influence of hormones and environmental factors on senescence.

PLANT ECOLOGY

Climate, soil and vegetation patterns of the world: Life zones; major biomes and major vegetation and sol types of the world.

Vegetation organization: Concepts of community and continuum ; analysis of communities(analytical and synthetic characters)

Ecological succession: Hydrosere and xerosere.

Ecosystem organization: Structure and functions; primary production (methods of measurement, global pattern, controlling factors); energy dynamics (trophic organization, energy flow Pathways, ecological efficiencies); litter fall and decomposition (mechanism, substrate quality land climatic factors); global biogeochemical cycles of C,N,P and S; mineral cycles (pathways, processes, budgets) in terrestrial and aquatic ecosystems.

Biological diversity: Concept and levels; role of biodiversity in ecosystem functions and stability ; speciation and extinction; IUCN categories of threat; distribution and global patterns, terrestrial biodiversity hot spots; inventory.

Air, water and soil pollution: Kinds, sources, quality parameters; effects on plants ecosystems.

Climate change: Green house gases (CO_2, CH_4, N_2O, CFCs: sources, trends and role); ozone layer and ozone hole ; consequences of climate change (CO_2 fertilization, global warming, sea level rise, UV radiation).

Ecosystem stability : Concept (resistance and resilience); ecological perturbations (natural and anthropogenic) and their impact on plants and ecosystems ; ecology of plant invasion ; environmental impact assessment ; ecosystem restoration.

Ecological management : Concepts; sustainable development; sustainability indicators.

PLANT RESOURCE UTILIZATION AND CONSERVATION

Plant Biodiversity and sustainable development

Origin, evolution, botany, cultivation and uses of (i) Food forage and fodder crops (ii) fibre crops (iii) medicinal and aromatic plants and (iv) vegetable oil-yielding crops. Ethnobotany

Important fire-wood and timber – yielding plants and non-wood forest products (NWFPs) such as bamboos, rattans, raw materials for paper-making, gums, tannins, dyes, resins and fruits.

Green revolution : Benefits and adverse consequences.

Plants used as avenue trees for shade, pollution control and aesthetics.

Principles of conservation; extinctions; environmental status of plants based on International Union for Conservation of Nature.

Strategies for conservation – in situ conservation : International efforts and Indian initiatives ; protected areas in India - sanctuaries, national parks, biosphere reserves, wetlands, mangroves and coral reefs for conservation of wild biodiversity.

Strategies for conservation – ex situ conservation : Principles and practices; botanical gardens, field gene banks, seed banks, in vitro repositories, cryobanks; general account of the

activities of Botanical Survey of India (BSI), National Bureau of Plant Genetic Resources (NBPGR), Indian Council of Agricultural Research (ICAR), Council of Scientific and Industrial Research (CSIR) and the Department of Biotechnology (DBT) for conservation, non-formal conservation efforts.

BIOTECHNOLOGY AND GENETIC ENGINEERING OF PLANTS AND MICROBES

Plant Biotechnology – Principles, scope and applications.

Plant cell and tissue culture : General introduction, scope, cellular differentiation, and totipotency.

Organogenesis and adventives embryogenesis : Morphogenesis; somatic embryogenesis.

Somatic hybridization : Protoplast isolation, fusion and culture.

Applications of plant tissue culture : Clonal propagation, artificial seed, production of hybrids and soma clones, production of secondary metabolites / natural products, cryopreservation and germplasm storage.

Recombinant DNA technology : Gene cloning principles and techniques, genomic / c DNA libraries, vectors, DNA synthesis and sequencing, polymerase chain reaction, DNA fingerprinting and DNA markers.

Genetic engineering of plants : Transgenic plants, Methods of gene transfer – *Agrobacterium* - medicated and microprojectile, chloroplast transformation, intellectual property rights, ecological risks and ethical concerns.

Microbial genetic manipulation : Bacterial transformation, selection of recombinants and transformants, genetic improvement of industrial microbes.

Genomics and proteomics : High throughput sequencing, genome projects, bioinformatics, functional genomics, microarrays.

2. CHEMISTRY

INORGANIC CHEMISTRY

1. Atomic structure and chemical bonding – structure and bonding in homo and hetero nuclear molecules. Applications of VSEPR, Valence Bond and Molecular orbital theories in explaining the structures of simple molecules.
2. Transition elements and coordination compounds – physical and chemical characteristics of transition elements – Bonding theories – crystal field theory – crystal field splitting patterns in various geometries. Calculation of CFSE – Jahn-Teller effect – Application of MO theory to octahedral and square planar complexes – Electronic spectra of complexes – Russell Saunders coupling – term symbols – spectra of octahedral and tetrahedral complexes – charge transfer spectra – magnetic properties of complex compounds.
3. Metal - ligand equilibria in solution – step wise and overall stability constants – factors affecting the stability of metal complexes – Pearson's theory of hard and soft acids and bases (HSAB) – Chelate effect.
4. Reaction mechanisms in complexes – Inert and level complexes – Ligand substitution reactions of octahedral complexes - Acid hydrolysis, base hydrolysis - conjugate base mechanism – Anation reactions – substitution reactions of square planar complexes – Trans effect – Electron transfer reactions – Inner and outer sphere mechanisms.
5. Metal complexes - EAN rule – structure and bonding of metal carbonyls of Mn, Fe, Co and Ni – Metal nitrosyls – structure and bonding.
6. Cages and ring compounds – preparation, structure and reactions of boranes and carboranes – Boron-nitrogen and Sulfur-nitrogen cyclic compounds.
7. Metal clusters – factors favoring M-M bonds – Structure and bonding in $Re_2Cl_8^{2-}$ $Mo_6Cl_8^{4+}$, $Nb_6X_{12}^{2+}$, Re_3Cl_9 and $Re_3Cl_{12}^{3-}$.
8. Bio-inorganic chemistry – metal complexes as oxygen carriers – hemoglobin and myoglobin – oxygen transport – non heme proteins – hemerythrin and hemocyanin.

9. Analytical chemistry – chromatography – general principles involved in separations by paper, thin layer and column chromatography – GC and HPLC.

Physical Chemistry

1. Thermodynamics

Brief review of concepts of I and II laws of thermodynamics. Concept of entropy. Entropy as a state function. Calculation of entropy changes in various processes. Entropy changes in an ideal gas. Entropy changes on mixing of ideal gases. Entropy as a function of V and T. Entropy as a function of P and T. Entropy change in isolated systems- Clausius inequality. Entropy change as criterion for spontaneity and equilibrium.

Third law of thermodynamics. Evaluation of absolute entropies from heat capacity data for solids, liquids and gases. Standard entropies and entropy changes of chemical reactions. Helmholtz and Gibbs free energies (A and G). A and G as a criteria for equilibrium and spontaneity. Physical significance of A and G. Driving force for chemical reactions- relative signs of ΔH and ΔS.

Thermodynamic relations. Gibbs equations. Maxwell relations. Temperature dependence of G. Gibbs- Helmholtz equation. Pressure dependence of G.

Chemical potential: Gibbs equations for non-equilibrium systems. Material equilibrium. Phase equilibium. Clapeyron equation and Clausius-Clapeyron equation .

Conditions for equilibrium in a closed system. Chemical potential of ideal gases. Ideal-gas reaction equlibrium-derivation of equilibrium constant. Temperature dependence of equilibrium constant-the van't Hoff equation.

Solutions: Specifiying the Solution composition. Partial molar poperties-significance. Relation between solution volume and partial molar volume. Measurement of partial molar volumes- slope and intercept methods. The chemical potential. Variation of chemical potential with T and P. Gibbs-Duhem equation-derivation and significance

Ideal solutions. Thermodynamic properties of ideal solutions. Mixing quantities. Vapour pressure-Raoult's law. Thermodynamic properties of ideally dilute solutions. Vapour pressure-Henry's law.

Nonideal systems. Concept of fugacity, fugacity coefficeient. Determination of fugacity. Non ideal solutions. Activities and activity coefficients. Standard-state conventions for non ideal solutions. Determination of activity coefficients from vapour pressure measurements. Activity coefficients of nonvolatile solutes using Gibbs-Duhem equation.

Multicomponent phase equilibrium: Vapour pressure lowering, freezing point depression and boiling point elevation

2. Statistical Thermodynamics

Concepts of distribution and probability. Estimation of probability and the most probable distribution. Systems composed of noninteracting particles. Derivation of Boltzmann distribution law.

The molecular partition function. Systems composed of interacting particles. The concept of ensemble and canonical ensemble. Canonical partition function and its relation to molecular partition function. The factorization of molecular partition function – translational, rotational, vibrational and electronic partition functions. Derivation of expressions for translational, rotational (diatomic) and vibrational partition functions. Relationship between partition functions and thermodynamic functions.

The relationship between partition functions and thermodynamic functions. Specific heats of solids – Einstein equation of heat capacity of solids – derivation. Explanation of heat capacity at very low and very high temperatures – Dulong and Petits Law. Debye theory.

The entropy of a monoatomic ideal gas. The Sackur-Tetrode equation- derivation. Mean translational and vibrational energies.

3. Electrochemistry

Electrochemical Cells : Derivation of Nernst equation – problems. Chemical and concentration cells (with and without transference). Liquid junction potential - derivation of the expression for LJP – its determination and elimination. Applications of EMF measurements : Solubility product, potentiometric titrations, determination of transport numbers, equilibrium constant measurements.

Decomposition potential and its significance. Electrode polarization – its causes and elimination. Concentration overpotential.

Concept of activity and activity coefficients in electrolytic solutions. The mean ionic activity coefficient. Debye-Huckel theory of electrolytic solutions. Debye-Huckel limiting law (derivation not required). Calculation of mean ionic activity coefficient. Limitations of Debye-Huckel theory. Extended Debye-Huckel law.

Theory of electrolytic conductance. Derivation of Debye-Huckel-Onsager equation – its validity and limitations.

Concept of ion association – Bjerrum theory of ion association (elementary treatment) -

ion association constant – Debye-Huckel-Bjerrum equation.

4. QUANTUM CHEMISTRY

Black body radiation-Planck's concept of quantization-Planck's equation, average energy of an oscillator (derivation not required). Wave particle duality and uncertain principle-significance of these for microscopic entities. Emergence of quantum mechanics. Wave mechanics and Schroedinger wave equation.

Operators-operator algebra. Commutation of operators, linear operators.Complex functions. Hermitian operators. Operators ∇ and ∇^2 . Eigenfunctions and eigenvalues. Degeneracy. Linear combination of eigenfunctions of an operator. Well behaved functions. Normalized and orthogonal functions.

Postulates of quantum mechanics. Physical interpretation of wave function. Observables and operators. Measurability of operators. Average values of observables. The time dependent Schrodinger equation. Separation of variables and the time-independent Schrodinger equation..

Theorems of quantum mechanics. Real nature of the eigen values of a Hermitian operator-significance. Orthogonal nature of the eigen values of a Hermitian operator-significance of orthogonality. Expansion of a function in terms of eigenvalues. Eigen functions of commuting operators-significance. Simultaneous measurement of properties and the uncertainty principle.

Particle in a box- one dimensional and three dimensional. Plots of ψ and ψ^2-discussion. Degeneracy of energy levels. Comparison of classical and quantum mechanical particles. Calculations using wave functions of the particle in a box-orthoganality, measurability of energy, position and momentum, average values and probabilities. Application to the spectra of conjugated molecules.

Cartesian, Polar and spherical polar coordinates and their interrelations

Schrodinger equation for the hydrogen atom- separation into three equations. Hydrogen like wave functions. Radial and angular functions. Quantum numbers n, l and m and their importance. The radial distribution functions. Hydrogen like orbitals and their representation. Polar plots, contour plots and boundary diagrams.

Many electron systems. Approximate methods. The variation method-variation theorem and its proof. Trial variation function and variation integral. Examples of variational calculations. Paricle in a box. Construction of trial function by the method of linear combinations. Variation parameters. Secular equations and secular determinant..

Bonding in molecules. Molecular orbital theory-basic ideas. Construction of MOs by LCAO , H_2^+ ion. The variationan integral for H_2^+ ion. Detailed calculation of Wave functions and energies for the bonding and antibonding MOs. Physical picture of bonding and antibonding wave functions. Energy diagram. The MO and VB wave functions for H_2 molecule and their comparision

5. Chemical Kinetics

Theories of reaction rates : Collision theory, steric factor. Tranition state theory. Reaction coordinate, activated complex and the transition state. Thermodynamic formulation of transition state theory. Unimolecular reactions and Lindamann's theory.

Complex reactions- Opposing reactions, parallel reactions and consecutive reactions(all first order type). Chain reactions-general characteristics, steady state treatment. Example- H_2-Br_2 reaction. Derivation of rate law.

Effect of structure on reactivity- Linear free energy relationships. Hammett and Taft equations-substituent(σ and σ^*) and reaction constant (ρ and ρ^*)with examples.

Factors affecting reaction rates in solution. Diffusion controlledr eactions. Influence of dielectric constant and ionic strength on ion-ion, ion-dipole and dipole-dipole reactions. Primary and secondary salt effects. Kinetic isotope effects: Primary and secondary isotope effects. Solvent isotope effects.

Enzyme catalysis: Chemical catalysis and enzyme catalysis – distinction – energy considerations and rate accelerations – examples.

Michaelis-Menten mechanisms of enzyme catalyzed reactions involving one and two intermediates. Steady-sate approximation. Derivation of kinetic equations. Evaluation of kinetic parameters. Enzyme-substrate complex: Fischer's lock and key and Koshland's induced fit hypotheses. Specificity of enzyme-catalyzed reactions. Discussion of the various types of forces involved in the formation of E-S complex. pH dependence of enzyme-catalyzed reactions – the kinetics and the equations involved.

6. Photochemistry

Electronic transitions in molecules. The Franck Condon principle. Electronically excited molecules- singlet and triplet states. Radiative life times of excited states-theoretical treatment. Measured lifetimes. Quantum yield and its determination. Actinomety-ferrioxalate and uranyl oxalate actinometers-problems.

Derivation of fluorescence and phosphorescence quantum yields. E-type delayed fluorescence- evaluation of triplet energy splitting(ΔE_{ST}). Photophysical processes-photophysical kinetics of unimolecular reactions. Calculation of rate constants of various photophysical processes-problems, State diagrams

Photochemical primary processes. Types of photochemical reactions- electron transfer, photodissociation, addition, abstraction, oxidation and isomerization reactions with examples. Effect of light intensity on the rates of photochemical reactions. Photosensitization. Quenching - Stern Volmer equation. Experimental set up of a photochemical reaction. Introduction to fast reactions- Principle of flash photolysis

7. Solid state chemistry

Magnetic properties of solids- classification of magnetic materials, Magnetic susceptibility, Langevin diamagnetism, Weiss theory of para magnetism

Electronic properties of metals, insulators and semi conductors: Electronic structure of solids, Band theory, band structure of metals, insulators and semiconductors. Electrons, holes and Excitons. The temperature dependence of conductivity of extrinsic semi conductors. Photo conductivity and photovoltaic effect-p-n junctions.

Superconductivity. Occurrence of superconductivity. Destruction of superconductivity by magnetic fields-Meisner effect. Types of superconductors. Theories of super conductivity- BCS theory.

ORGANIC CHEMISTRY

1. IUPAC nomenclature of organic molecules including structural, positional, functional, regio- and stereoisomers.

2. Molecular representations: Wedge, Fischer, Newman and Saw-horse formulae, their description and interconversions. Stereoisomers-classification-configuration –R,S-nomenclature-Criteria for Chirality. Axially chiral allenes, spiranes, alkylidene cycloalkanes, chiral biaryls,

atropisomerism. Planar chiral ansa compounds and trans- cyclooctene. Helically chiral compounds, Determination of absolute configuration by chemical correlation methods. Determination of configuration in E,Z-nomenclature: Spectral and Chemical methods of configuration determination of E,Z isomers. Determination of configuration in aldoximes and ketoximes.

3. Nature of Bonding in Organic Molecules and Aromaticity, Delocalized chemical bonding-conjugation, cross conjugation, resonance, hyperconjugation, tautomerism, Huckle's rule and the concept of aromaticity, aromaticity in benzenoid and non-benzenoid compounds, alternant and non-alternant hydrocarbons, metallocenes- Ferrocene, Azulenes, Fulvenes, Annulenes, anti-aromaticity, pseudo-aromaticity, homo-aromaticity.

4. Reactive intermediates and Molecular rearrangements. Reactive Intermediates: Generation, detection, structure, stability and reactions of carbocations, carbanions, carbenes, nitrenes and free radicals. Molecular rearrangements: Definition and classification. Molecular rearrangements involving 1) electron deficient carbon: Wagner- Meerwein, Pinacol-Pinacolone, Allylic and Wolf rearrangement. 2) Electron deficient Nitrogen: Hofmann, Lossen, Curtius, Schmidt and Beckmann rearrangements 3) electron deficient Oxygen: Baeyer-Villiger oxidation. 4) Base catalyzed rearrangements: Benzilic acid, Favourski, Transannular, Sommlett-Hauser and Smiles rearrangement

5. Organic Reaction mechanism-I Electrophilic addition to carbon-carbon double bond: Stereoselective addition to carbon-carbon double bond; *anti* addition- Bromination and epoxidation followed by ring opening. *Syn* addition of OsO_4 and $KMnO_4$. Hydroboration. Michael reaction. Elimination reactions E2, E1, E1CB mechanisms. Orientation and stereoselectivity in E2 eliminations. Pyrolytic *syn* elimination and α-elimination, elimination Vs substitution. Determination of reaction mechanism: Energy profiles of addition and elimination reactions, transition states, product isolation and structure of intermediates, use of isotopes, chemical trapping, crossover experiments.

6. Importance of heterocyclic compounds as drugs. Nomenclature of heterocyclic systems based on ring size, number and nature of hetero atoms. Synthesis and reactivity of pyrrole, furan, thiophene, pyridine, indole, benzofuran, benzothiophene, quinoline, isoquinoline.

7. Alkaloids and terpenoids- Importance of natural products as drugs. Isolation of natural products by steam distillation, solvent extraction and chemical methods. Structure determination and synthesis of papaverine, nicotine and quinine-General methods in the structure determination of terpenes. Isoprene rule, structure determination and synthesis of α-terpeniol and camphor.

8. Organic Photochemistry, Photochemical energy, Frank-Condon principles, Jablonski diagram, singlet and triplet states, dissipation of photochemical energy, photosensitization, quenching, quantum efficiency and quantum yield. Photochemistry of carbonyl compounds - $n\rightarrow\pi^*$ and $\pi\rightarrow\pi^*$ transitions. Norrish type-I and Norrish type-II cleavages. Paterno-Buchi reactions, Photoreduction, photochemistry of enones - hydrogen abstraction, rearrangements of α,β- unsaturated ketones and cyclohexadienones, photochemistry of *p*-benzoquinones. Dienes - photochemistry of 1,3-butadienes, (2+2) additions leading to cage structures, photochemistry of cyclohexadienes, photochemistry of aromatic compounds, exicited state of benzene and its 1,2-, 1,4- additions

9. Pericyclic Reactions Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3 butadiene, 1,3,5 hexatriene and allyl system. Classification of pericyclic reactions. Woodward - Hoffmann correlation diagrams. FMO and PMO (Mobius Huckel) approaches. Electrocyclic reactions-Conrotatory and disrotatory. 4n, 4n+2 and allyl systems. Cycloadditions-antarafacial and suprafacial additions, 4n and 4n+2 systems, 2+2 addition of ketene, 1,3 dipolar cycloadditions Sigmatropic rearrangements - Suprafacial and antarafacial shifts of H, Sigmatropic shifts involving carbon moieties, 3,3 and 5,5 sigmatropic rearrangements.

10. Structure determination of organic compounds by UV IR, NMR an Mass Various electronic transitions, Beer-Lambert's law, effect of solvent on electronic transitions, ultraviolet bands for carbonyl compounds, unsaturated carbonyl Compounds, dienes, conjugated polyenes, Effect of hydrogen bonding and solvent effects-NMR-Shielding mechanism, mechanism of measurement, chemical shift values, chemical exchange, complex spin-spin interaction, ^{13}C NMR spectroscopy, chemical shift-Mass spectral fragmentation of organic compounds, common functional groups, molecular-ion peak, metastable peak,

3. COMMERCE

Financial management : Meaning, nature, objectives and scope of financial management. Capital budgeting, process, techniques. Sources of finance. Cost of capital – cost of various sources of finance. Leverages – operating and financial leverages. Capital structure theories. Dividend decisions Working .capital management- cash, receivables and inventory management.

Financial and management accounting : Techniques of analysis of financial statements – comparative and common size statements, trend analysis and ratio analysis. Funds flow and cash flow analyses. Marginal costing and decision making.

Managerial economics : Meaning, nature and scope of managerial economics. Demand analysis. Production and cost analysis. Market structure – perfect and imperfect markets.

Business environment : Meaning and components of business environment. Industrial policies 1956, and 1991. Liberalization, privatization and globalization. WTO.

Marketing management : Meaning, concepts, nature, and scope of marketing management – Marketing environment. Consumer behavior and market segmentation. Product, Price, Promotion and Channel management.

Human resources management : HR functions. HR planning – job analysis, recruitment and job evaluation, Training and development methods. Performance appraisal methods. Trade unions and collective bargaining.

Quantitative techniques: Sampling and sampling methods. Probability and probability distributions – Hypothesis testing. Parametric tests (Z, t-tests, and ANOVA) and non-parametric tests (Chi-square test).

IT and e-commerce : E-Commerce business models – Internet and web technologies. E-payment methods – e-cash, e-cheques, credit cards, smart cards, and debit cards.

4. ENGLISH

I. Movements and Concepts

Renaissance, Metaphysical poetry, Neo-classicism, Romanticism, Rise of the novel, Modernism, Postmodernism, Colonialism, Postcolonialsim, Diaspora, Psychoanalytical criticism, Myth and archetype, Feminism, Structuralism, Poststructuralism, Deconstruction.

II. Writers and Texts

1)	William Shakespeare	*Hamlet*, *Tempest*
2)	John Milton	*Paradise Lost*-Book 1 and 9
3)	William Wordsworth	"Immortality Ode", *Tintern Abbey*
4)	John Keats	"Ode to a Nightingale", "To Autumn"
5)	Robert Browning	"My Last Duchess", "The Last Ride Together"
6)	**Charles Dickens**	**David Copperfield**
7)	**TS Eliot**	**"The Waste Land", Murder in the Cathedral**
8)	**GB Shaw**	**Saint Joan**
9)	**Virginia Woolf**	**"A Room of One"s Own"**
10)	**Samuel Beckett**	**Waiting for Godot**
11)	**William Golding**	**Lord of the Flies**
12)	**Robert Frost**	**"Home Burial", "The Road Not Taken"**
13)	**Eugene O"Neill**	**The Hairy Ape**
14)	**Toni Morrison**	**Beloved**
15)	**Mulk Raj Anand**	**Untouchable**
16)	**AK Ramanujan**	"Love Poem for a Wife", "Small-Scale Reflections on a Great House"
17)	**Girish Karnad**	**Hayavadana**
18)	**Salman Rushdie**	**Midnight"s Children**
19)	**Chinua Achebe**	**Things Fall Apart**
20)	**Margaret Atwood**	**Edible Woman**
21)	**AD Hope**	**"Australia", "Crossing the Frontier"**
22)	**Bessie Head**	*A Question of Power*

III. English Language Teaching

1) ELT in India: (History and status of English in India; English as Second Language, English as Foreign Language, and Ensglish as Global Language).
2) Methods and Approaches: (Grammar Translation method, Direct method, Audio-Lingual method; Structural approach, Communicative language teaching)
3) Teaching of Language Skills: (Teaching of Listening, Speaking, Reading, and Writing Skills; Teaching of Grammar and Functional English; Teaching of Vocabulary; Classroom techniques; Use of authentic materials)
4) Testing and Evaluation: (Principles, Types, Objectives of testing and evaluation)
5) Phonetics and Phonology; Syntax and Structure.

5. HINDI

HINDI

हिन्दी भाषा और उसका विकास

इकाई-1

हिन्दी की ऐतिहासिक पृष्ठभूमि : प्राचीन भारतीय आर्यभाषाएँ – वैदिक तथा लौकिक संस्कृत और उनकी विशेषताएँ। मध्यकालीन भारतीय आर्यभाषाएँ – पालि; प्राकृत – शौरसेनी, अर्धमागधी, मागधी, अपभ्रंश और उनकी विशेषताएँ। आधुनिक भारतीय आर्यभाषाएँ और उनका वर्गीकरण। देवनागरी लिपि: विकास, विशेषताएँ और मानकीकरण।

इकाई-2

हिन्दी का भौगोलिक विस्तार: हिन्दी की उपभाषाएँ, पश्चिमी हिन्दी, पूर्वी हिन्दी, विशेषताएँ।

इकाई 3

हिन्दी का भाषिक स्वरूप : हिन्दी की स्वनिम व्यवस्था – खंड्य, खंड्येतर। हिन्दी शब्द रचना – उपसर्ग, प्रत्यय, समास। रूपरचना – लिंग, वचन, और कारक – व्यवस्था के संदर्भ में हिंदी के संज्ञा, सर्वनाम, विशेषण और क्रियारूपा। हिन्दी वाक्य रचना: पदक्रम और अन्विति।

इकाई 4

हिन्दी के विविध रूप: संपर्क भाषा, राष्ट्रभाषा, राजभाषा के रूप में हिन्दी, माध्यम-भाषा, संचार-भाषा; हिन्दी की सांविधानिक स्थिति। हिन्दी प्रसार के आंदोलन, प्रमुख व्यक्तियों तथा संस्थाओं का योगदान।

इकाई-5

हिन्दी साहित्य का इतिहास

हिन्दी साहित्य का इतिहास- दर्शन, हिन्दी साहित्य के इतिहास-लेखन की पद्धतियाँ। हिन्दी साहित्य के प्रमुख इतिहास ग्रंथ, हिन्दी के प्रमुख साहित्यिक केन्द्र, संस्थाएँ एवं पत्र-पत्रिकाएँ, हिन्दी साहित्य के इतिहास का काल विभाजन और नामकरण

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

इकाई 6

मध्यकाल

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

हिन्दी सन्त काव्य : सन्त काव्य का वैचारिक आधार, प्रमुख निर्गुण संत कवि कबीर, नानक, दादू, रैदास, संत काव्य की प्रमुख विशेषताएँ, भारतीय धर्म साधना में संत कवियों का स्थान।

हिन्दी सूफी काव्य: सूफी काव्य का वैचारिक आधार, हिन्दी के प्रमुख सूफी कवि और काव्य – मुल्ला दाऊद(चन्दायन), कुतुबन (मृगावती), मंझन (मधुमालती), मालिक मुहम्मद जायसी (पद्मावत), सूफी प्रेमाख्यानकों का स्वरूप, हिन्दी सूफी काव्य की प्रमुख विशेषताएँ।

हिन्दी कृष्ण काव्य : विविध संप्रदाय, वल्लभ संप्रदाय, अष्टछाप, प्रमुख कृष्ण भक्त कवि और काव्य, सूरदास (सूरसागर), नंददास (रास पंचाध्यायी), भ्रमरगीत परंपरा, गीति परंपरा और हिन्दी कृष्ण काव्य – मीरा और रसखान।

हिन्दी राम काव्य विविध संप्रदाय, राम भक्ति शाखा के कवि और काव्य, तुलसीदास की प्रमुख कृतियाँ, काव्य रूप और उनका महत्व।

रीति काल: सामाजिक-सांस्कृतिक परिप्रेक्ष्य, रीतिकाव्य के मूल स्त्रोत, रीतिकाल की प्रमुख प्रवृत्तियाँ, रीतिकालीन कवियों का आचार्यत्व, रीतिमुक्त काव्यधारा, रीतिकाल के प्रमुख कवि: केशवदास, मतिराम, भूषण, बिहारीलाल, देव, घनानन्द और पद्माकर, रीतिकाव्य में लोकजीवन।

इकाई 7

आधुनिक काल: हिन्दी गद्य का उद्भव और विकास। भारतेन्दु पूर्व हिन्दी गद्य, 1857 की राज्य क्रान्ति और सांस्कृतिक पुनर्जागरण, भारतेन्दु और उनका मण्डल, 19वीं शताब्दी के उत्तरार्द्ध की हिन्दी पत्रकारिता।

द्विवेदी युग: महावीर प्रसाद द्विवेदी और उनका युग, हिन्दी नवजागरण और सरस्वती, मैथिलीशरण गुप्त और राष्ट्रीय काव्यधारा, राष्ट्रीय काव्यधारा के प्रमुख कवि, स्वच्छन्दतावाद और उसके प्रमुख कवि।

छायावाद और उसके बाद: छायावदी काव्य की प्रमुख विशेषताएँ, छायावाद के प्रमुख कवि: प्रसाद, निराला, पंत, और महादेवी, उत्तर छायावादी काव्य और उसके प्रमुख कवि, प्रगतिशील काव्य और उसके प्रमुख कवि, प्रयोगवाद और नई कविता, नई कविता के कवि, समकालीन कविता, समकालीन साहित्यिक पत्रकारिता।

इकाई 8

हिन्दी साहित्य की गद्य विधाएँ

हिन्दी उपन्यास: प्रेमचंद पूर्व उपन्यास, प्रेमचंद और उनका युग, प्रेमचंद के परवर्ती प्रमुख उपन्यासकार: जैनेन्द्र, अज्ञेय, हजारी प्रसाद द्विवेदी, यशपाल, अमृतलाल नागर, फणीश्वरनाथ रेणु, भीष्म साहनी, कृष्ण सोबती, निर्मल वर्मा, नरेश मेहता, श्रीलाल शुक्ल, राही मासूम राजा, रंगेय राघव, मन्नू भण्डारी।

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

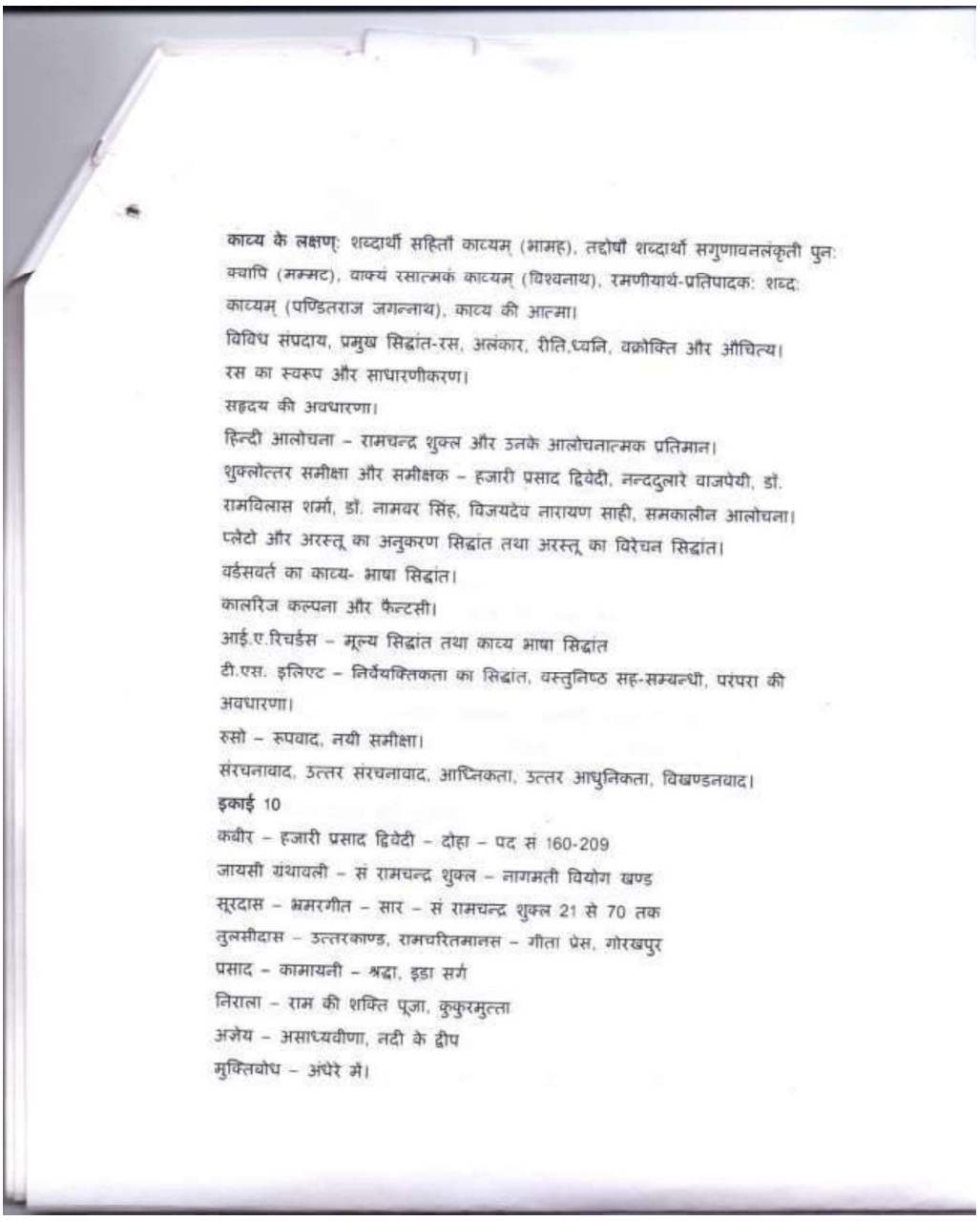
हिन्दी नाटक: हिन्दी नाटक और रंगमंच, विकास के चरण और प्रमुख नाट्यकृतियाँ: अंधेर नगरी, चंद्रगुप्त, अंधायुग, आधे-अधूरे, आठवां सर्ग, हिन्दी एकांकी।

हिन्दी निबंध: हिन्दी निबंध के प्रकार और प्रमुख निबंधकार – रामचन्द्र शुक्ल, हजारीप्रसाद द्विवेदी, कुबेरनाथ राय, विद्यानिवास मिश्र, हरिशंकर परसाई।

हिन्दी आलोचना: हिन्दी आलोचना का विकास और प्रमुख आलोचक: रामचन्द्र शुक्ल, नंददुलारे वाजपेयी, हजारी प्रसाद द्विवेदी, रामविलास शर्मा, डॉ.नगेन्द्र, डॉ. नामवर सिंह, विजयदेव नारायण साही। हिन्दी की अन्य गद्य विधाएँ : रेखाचित्र, संस्मरण, यात्रा-साहित्य, आत्मकथा, जीवनी और रिपोर्ताज।

इकाई 9

काव्य शास्त्र और आलोचना:



काव्य के लक्षण: शब्दार्थौ सहितौ काव्यम् (भामह), तद्दोषौ शब्दार्थौ सगुणावनलंकृती पुन: क्वापि (मम्मट), वाक्यं रसात्मकं काव्यम् (विश्वनाथ), रमणीयार्थ-प्रतिपादक: शब्द: काव्यम् (पण्डितराज जगन्नाथ), काव्य की आत्मा।

विविध संप्रदाय, प्रमुख सिद्धांत-रस, अलंकार, रीति,ध्वनि, वक्रोक्ति और औचित्य।

रस का स्वरूप और साधारणीकरण।

सहृदय की अवधारणा।

हिन्दी आलोचना – रामचन्द्र शुक्ल और उनके आलोचनात्मक प्रतिमान।

शुक्लोत्तर समीक्षा और समीक्षक – हजारी प्रसाद द्विवेदी, नन्ददुलारे वाजपेयी, डॉ. रामविलास शर्मा, डॉ. नामवर सिंह, विजयदेव नारायण साही, समकालीन आलोचना।

प्लेटो और अरस्तू का अनुकरण सिद्धांत तथा अरस्तू का विरेचन सिद्धांत।

वर्डसवर्त का काव्य- भाषा सिद्धांत।

कालरिज कल्पना और फैन्टसी।

आई.ए.रिचर्डस – मूल्य सिद्धांत तथा काव्य भाषा सिद्धांत

टी.एस. इलिएट – निर्वैयक्तिकता का सिद्धांत, वस्तुनिष्ठ सह-सम्यन्धी, परंपरा की अवधारणा।

रुसो – रूपवाद, नयी समीक्षा।

संरचनावाद, उत्तर संरचनावाद, आधुनिकता, उत्तर आधुनिकता, विखण्डनवाद।

इकाई 10

कबीर – हजारी प्रसाद द्विवेदी – दोहा – पद सं 160-209

जायसी ग्रंथावली – सं रामचन्द्र शुक्ल – नागमती वियोग खण्ड

सूरदास – भ्रमरगीत – सार – सं रामचन्द्र शुक्ल 21 से 70 तक

तुलसीदास – उत्तरकाण्ड, रामचरितमानस – गीता प्रेस, गोरखपुर

प्रसाद – कामायनी – श्रद्धा, इड़ा सर्ग

निराला – राम की शक्ति पूजा, कुकुरमुत्ता

अज्ञेय – असाध्यवीणा, नदी के द्वीप

मुक्तिबोध – अंधेरे में।

प्रेमचंद – गोदान

अज्ञेय – शेखर एक जीवनी, भाग-1

प्रसाद – चन्द्रगुप्त

मोहन राकेश – आधे-अधूरे

इकाई 11

प्रयोजनमूलक हिन्दी

प्रयोजनमूलक हिन्दी : अर्थ, परिभाषा और क्षेत्र, ज्ञान प्रधान, सूचनात्मक और रचनात्मक साहित्य में प्रयुक्त भाषा भेद, हिन्दी का क्षेत्रीय, राष्ट्रीय एवं अंतर्राष्ट्रीय संदर्भ

हिन्दी भाषा-नियोजन एवं भाषा प्रबंधन

भारतीय बहुभाषिकता और हिन्दी, हिन्दी की व्यापक संकल्पना

प्रयुक्ति का अर्थ और प्रकार

प्रयोजनमूलक हिन्दी की विविध प्रयुक्तियाँ

प्रमुख प्रयुक्ति क्षेत्र – वैज्ञानिक, तकनीकी, कार्यालयीं, व्यवसायिक आदि

इन क्षेत्रों से संबंधित विशिष्ठ अभिव्यक्तियों एवं पारिभाषिक शब्दावली का सामान्य परिचय

प्रयोजनमूलक हिन्दी और अनुवाद

इकाई 12

हिन्दी में कंप्यूटर की सुविधाएँ

शब्द संसाधन, हिन्दी साफटावेर , हिन्दी में कंप्यूटर अनुप्रयोग और मशीनी अनुवाद

इकाई 13

भारतीय साहित्य

भारतीय साहित्य का स्वरूप

भारतीय साहित्य के अध्ययन की समस्याएँ

भारतीय साहित्य का इतिहास और हिन्दी साहित्य के विकास में भारतीय साहित्य की भूमिका

इकाई 14

तेलुगु भाषा और साहित्य का इतिहास

तेलुगु भाषा का उद्भव और विकास

मध्ययुगीन तेलुगु साहित्य की मुख्य प्रवृत्तियाँ और प्रमुख रचनाकार

तेलुगु शैव और संत-साहित्य, राम काव्य, कृष्ण भक्ति काव्य, अष्ट दिग्गज कवि, दक्षिणांध्र युग-साहित्य, तेलुगु साहित्य का आधुनिक काल- आधुनिक तेलुगु कविता: भाव कविता-अभ्युदय कविता-दिगंबर कविता-तेलुगु कविता की अद्यतन प्रवृत्तियाँ-तेलुगु गद्य का विकास-उपन्यास-कहानी-नाटक-निबंध और अन्य गद्य विधाएँ- प्रतिनिधि रचनकार

इकाई 15

पत्रकारिता और मीड़िया-लेखन

हिन्दी पत्रकारिता का इतिहास

हिन्दी में समाचार लेखन कला

संपादकीय लेखन शीर्षक की संरचना, लीड, इंट्रो

पृष्ट-सज्जा

साक्षात्कार

मीड़िया-लेखन

विभिन्न जनसंचार माध्यमों का स्वरूप, मुद्रण, श्रव्य, दृश्य, इंटरनेट

मौखिक भाषा की प्रकृति, समाचार-लेखन एवं वाचन।

दृश्य माध्यमों में भाषा की प्रकृति।

6. HISTORY

Ancient India :

1. Pre and protohistoric background – Stone ages and Chalcolithic cultures.
2. Harappan Civilization – Exten, major cities, characteristic features, social and economic conditions, script, religious practices, causes for the decline.
3. Iron Age – Aryan migration – Second urbanization.
4. Vedic Age : Importance literature, Political, Social and economic conditions in the early and later vedic age.
5. India in the 6th century B.C. : Political, Social and economic conditions, Rise and spread of Jainism and Buddhism.
6. Mauryan Age: Political history of the Mauryans, Ashoka, Mauryan Administration, social and economic conditions, decline of the Mauryan empire.
7. The Satavahanas: Political history, administration, contribution to the culture.
8. Gupta Period: Political history, administration, social and economic conditions, growth of culture, decline of the empire.
9. India in the 7th century A.D.: Harsha Vardhana, Pallavas and Chalukyas, Rashtrakutas their political history and their contribution to culture.

Medieval India :

10. India between 650 and 1200 A.D. - Political, social and economic conditions, Chola administration and culture.
11. Age of the Delhi Sultanate: (1206-1526), Political history, Military and Administrative organisation, changes in society and economy, Bhakti movement.
12. The Vijayanagar Empire: Origin, History, Krishnadevaraya, social and economic conditions, contribution to art and architecture, decline.
13. Mughal Age (1556-1707) : Political history, Akbar, Administration, Social and economic conditions, culture, decline of the Mauryan empire, Marattas and Shivaji.

Modern India (1757-1947):

14. Historical forces and factors which led to the establishment of the British power in India - Early resistance to the British power in India - Hyder Ali, Tippu Sultan, causes for their failure.
15. Evolution of British paramountacy in India : Policies of Wellesley and Dalhousie - Economic policies of the British.
16. Socio-religious reform movements – Rajaram Mohan Roy, Dayananda Saraswathi and others - Educational policies of the British and their impact on Indian society.
17. Revolt of 1857 : Causes, results, significance.
18. Rise and growth of the Indian National Movement: Birth of the Indian National Congress, the national movement from 1885 to 1905; movement from 1905 to 1920. Role of Tilak and Annie Besant: The movement from 1920 to 1947 ; Emergence of Gandhi; Non-cooperation movement, Salt Satyagraha and the Quit India Movement.
    Freedom movement in Andhra Pradesh with special reference to the role of Alluri Sitarama Raju and Tanguturi Prakasam, Revolt against the nizam's rule in Telangana.

Modern World:

19. Industrial Revolution - Significance and results.
20. American War of Independence - course, results, significance.
21. French Revolution – course, effects, significance.
22. National liberation movements in Italy and Germany in the 19th century - Mazzini, Cavour, Garibaldi, Bismarck.
23. World War-I - Causes and effects.
24. The Russian Revolution of 1917 – Causes, results and importance.
25. The World between the two world wars - Nazism in Germany, Fascism in Italy, Turkey under Mustafa Kamal Pasha.
26. Developments in China 1911-1949 – Nationalist Revolution of 1911 – Communist Revolution of 1948.
27. World War-II - Causes and effects.

7 .PHYSICS

PART-A

I. Mathematical Methods of Physics

Dimensional analysis. Vector algebra and vector calculus. Linear algebra, matrices, Cayley-Hamilton Theorem. Eigenvalues and eigenvectors. Linear ordinary differential equations of first & second order, Special functions (Hermite, Bessel, Laguerre and Legendre functions). Fourier series, Fourier and Laplace transforms. Elements of complex analysis, analytic functions; Taylor & Laurent series; poles, residues and evaluation of integrals. Elementary probability theory, random variables, binomial, Poisson and normal distributions. Central limit theorem.

Data interpretation and analysis. Precision and accuracy. Error analysis, propagation of errors. Least squares fitting, Linear and non-linear curve fitting and Chi-Square Test.

II. Classical Mechanics

Newton's laws. Dynamical systems, Phase space dynamics, stability analysis. Central force motions. Two body Collisions – scattering in laboratory and Centre of mass frames. Rigid body dynamics-moment of inertia tensor. Non-inertial frames and pseudoforces. Variational principle. Generalized coordinates. Lagrangian and Hamiltonian formalism and equations of motion. Conservation laws and cyclic coordinates. Periodic motion: small oscillations, normal modes. Special theory of relativity-Lorentz transformations, relativistic kinematics and mass-energy equivalence.

III. Electromagnetic Theory

Electrostatics : Gauss's law and its applications, Laplace and Poisson equations, boundary value problems. Magnetostatics : Biot-Savart law, Ampere's theorem. Electromagnetic induction. Maxwell's equations in free space and linear isotropic media; boundary conditions on the fields at interfaces. Scalar and vector potentials, gauge invariance. Electromagnetic waves in free space. Dielectrics and conductors. Reflection and refraction, polarization, Fresnel's law, interference, coherence, and diffraction. Dynamics of charged particles in static and uniform electromagnetic fields. Charged particles in inhomogeneous fields.

IV. Quantum Mechanics

Wave-particle duality. Schrödinger equation (time-dependent and time-independent). Eigenvalue problems (particle in a box, harmonic oscillator, etc.). Tunneling through a barrier. Wave-function in coordinate and momentum representations. Commutators and Heisenberg uncertainty principle. Dirac notation for state vectors. Motion in a central potential : orbital angular momentum, angular momentum algebra, spin, addition of angular momenta; Hydrogen aom. Stern-Gerlach experiment. Time-independent perturbation theory and applications. Variational method. Time dependent perturbation theory and Fermi's golden rule, selection rules. Identical particles, Pauli exclusion principle, spin-statistics connection.

V. Thermodynamics and Statistical Physics

Laws of thermodynamics and their significance. Thermodynamic potentials, Maxwell relations, chemical potential, phase equilibria. Phase space, micro-and macro-states. Micro-canonical, canonical and grand-canonical ensembles and partition functions. Free energy and its connection with thermodynamic quantities. Classical and quantum statistics. Bose and Fermi gases. Principle of detailed balance. Blackbody radiation and Planck's distribution law.

VI. Electronics

Semiconductors devices (diodes, junctions, transistors, field effect devices, homo- and hetero-junction devices), device structure, device characteristics, frequency dependence and applications. Opto-electronic devices (solar cells, photo-detectors, LEDs). Operational amplifiers and their applications. Digital techniques and applications (Logic circuits, registers, counters and comparators). A/D and D/A converters. Microprocessor microcontroller basics. Fundamentals of communication electronics, modulation techniques.

VII. Atomic & Molecular Physics

Quantum states of an electron in an atom. Electron spin. Spectrum of helium and alkali atom. Relativistic corrections for energy levels of hydrogen atom, hyperfine structure and isotopic shift, width of spectrum lines, LS & JJ couplings. Zeeman, Paschen-Bach & Stark effects. Electron spin resonance. Nuclear magnetic resonance, chemical shift. Frank-Condon principle. Electronic, rotational, vibrational and Raman spectra of diatomic molecules, selection rules. Lasers : spontaneous and stimulated emission, Einstein A & B coefficients. Optical pumping, population inversion, rate equation. Modes of resonators and coherence length.

VIII. Condensed Matter Physics

Bravais lattices. Reciprocal lattice. Diffraction and the structure factor. Bonding of solids. Elastic properties, phonons, lattice specific heat. Free electron theory and electronic specific heat. Response and relaxation phenomena. Drude model of electrical and thermal conductivity. Hall effect and thermoelectric power. Electron motion in a periodic potential, band theory of solids : metals, insulators and semiconductors. Superconductivity : type-I and type-II superconductors. Josephson junctions. Superfluidity. Defects and dislocations. Ordered phases of matter : translational and orientational order, kinds of liquid crystalline order. Quasi crystals.

IX. Nuclear and Particle Physics

Basic nuclear properties ; size, shape and charge distribution, spin and parity. Binding energy, semi-empirical mass formula, liquid drop model. Nature of the nuclear force, form of nucleon-nucleon potential, charge-independence and charge-symmetry of nuclear forces. Deuteron problem. Evidence of shell structure, single-particle shell model, its validity and limitations. Elementary ideas of alpha, beta and gamma decays and their selection rules. Fission and fusion. Nuclear reactions, reaction mechanism, compound nuclei and direct reactions.

PART-B

I. Mathematical Methods of Physics

Green's function. Partial differential equations (Laplace, wave and heat equations in two and three dimensions). Elements of computational techniques : root of functions, interpolation, extrapolation, integration by trapezoid and Simpson's rule, Solution of first order differential equation using Runge-Kutta method. Finite difference methods. Tensors. Introductory group theory.

II. Classical Mechanics

Basic concepts of dynamical systems, Poisson brackets and canonical transformations. Symmetry, invariance and Noether's theorem. Hamilton-Jacobi theory.

III. Electromagnetic Theory

Dispersion relations in plasma. Lorentz invariance of Maxwell's equation. Transmission lines and wave guides. Radiation- from moving charges and dipoles and retarded potentials.

IV. Quantum Mechanics

Spin-orbit coupling, fine structure. WKB approximation. Elementary theory of scattering : phase shifts, partial waves, Born approximation. Relativistic quantum mechanics : Klein-Gordon and Dirac equations. Semi-classical theory of radiation.

V. Thermodynamics and Statistical Physics

First- and second-order phase transitions. Diamagnetism, paramagnetism, and ferromagnetism. Ising model. Bose-Einstein condensation. Diffusion equation. Random walk and Bronian motion. Introduction to nonequilibrium processes.

VI. Condensed Matter Physics

Electron spin resonance, Nuclear magnetic resonance, chemical shift and applications. X-ray diffraction technique, scanning electron micrscopy and transimission electron microscopy.

VII. Nuclear and Particle Physics

Classification of fundamental forces. Elementary particles and their quantum numbers (charge, spin, parity, isospin, strangeness, etc.). Quark model, baryons and mesons. C, P, and T invariance. Application of symmetry arguments to particle reactions. Parity non-conservation in weak interaction. Relativistic kinematics.

8. SANSKRIT

50% of questions will be set in Sanskrit and the remaining 50% questions will be set in ENGLISH.

In writing Sanskrit Devanagari should be used.

1. General introduction to Vedic literature Four Samhitas, Brahmanas, Aranyakas, Upanishads and Vedangas.

2. The Ramayana and Mahabharata - The age of their composition, Social and Political conditions revealed-Their influence on later literature.

3. Study of the following poets, their works and their age Bhasa-Kalidasa-Bharavi-Naga-Sri Harsha-Bhavabuthi-harsha Vardhana-Visakhatatta-Bhattanarayana-Dandin Banabhatta, Sudraka.

4. History of classical sanskrit literature-the origin and development of different types of literary compositions - Mahakavya - Laghukavya -Historical Kavya - Lyric Poetry - Diadactic poetry - Fable - Drama (Basic knowledge of Dasarupakas) - Gadya kavya.

5. Alankaras - Simple definitions and examples of, without varieties upama - rupaka - utpreksha - Atisayokti - Sandeha - Bhrantiman - Samaskoti - Aprastutaprasamsa - Dipaka - Tulya Yogita - Arathantharanyasa Drushtanta - Kavyalingam - Ananvyalankara - Swabhavokti.

6. Grammar - Ajanta Sadharana Sabdas in all genders - Halanta Sadharana Sabdas in all genders - Sarvanama sabdas in all genderspati - Mati - Atman - Rajan - ap.

7. Conjugations - I, IV, VI and X conjugations in (1) Lat (present tense) (2) Lit (Past perfect), (3) Lrit (Second future), Lot (imperative mood) (5) Lang (past perfect), (6) Vidhiling (potential mood).

8. Samasas - Tatpurusha - Karmadharaya - Dvandva - Ekasesh - Dvigu - Bahu vrihi - Avyavibhava.

9. Sandhi's :
   a) Ach-sandhi-Guna-Vridhi-Savarnadirgha-Prakrutibhava-Purvarupa-Pararupa-Ayavayava-Yanadesa.
   b) Halsandhi-Schutva-Shtutva-Jastva-Anunasiktva-Chartva-Anuswara.
   c) Visargasandhi.

10. Philology: Origin of the language - Classification of languages into various groups - Indo European group - Satam and Kentum - languages - Phonetic changes and their causes - Samantic changes and their causes.

11. Chandas-Vrattas (I) Vamsastham (ii) Indra Vajra (iii) Upendra Vajra (iv) Bhujanga Prayatam (v) Manda Kranta (vi) Sardulavikriditam (vii) Sikharini (viii) Sragdhara (ix) Vasantatilakam (x) Anustup.

9. STATISTICS

Probability Theory :

- Random experiment, Random event, Sample Space, Classes of sets, fields, sigma-fields, minimal sigma-fields, Borel sigma fields in R, Measure, Lebesque mesure, Lebesque-Stieltjes measures, Measurable functions, Borel function, induced sigma field, Probability Measure, Basic Properties of a Measure, conditional probability and Bayes Theorem. Caratheodory extension theorem (Statement only), measurable function, random variables, distribution function and its properties, expectation, statements and applications of monotone convergence theorem, Foatou's lemma, dominated convergence theorem.
- Expectations of functions of rv's, conditional expectation and conditional variance, their applications. Characteristic function of a random variable and its properties. Inversion theorem, uniqueness theorem (Functions which cannot be Characteristic functions). Levy's continuity theorem (Statement only). Chebychev, Markov, Cauchy-Schwartz, Jenson, Liapunov, Holder's and Minkowsky's inequalities.
- Sequence of Random variables, convergence in Probability, convergence in distribution, almost sure convergence, convergence in quadratic mean and their interrelationships, Slutskey's theorem, Borel-Cantelli lemma Borel 0-1 law, Kolm ogorov 0-1 law (Glevenko – Cantelli Lemma Statement only).
- Law of large numbers, Weak law of large numbers, Bernoulli and Khintchen's WLLN's, Kolomogorov Inequality, Kolmogorov SLLN for independent random variables and statement only for i.i.d. case and their applications, statements of three series theorem. Central Limit theorem : Demoviere – Laplace CLT, Lindberg-Levy CLT, Liapounou' CLT, Statement of Lindberg-Feller CLT, simple applications.
- Introduction to stochastic processes; classification of stochastic process according to state-space and time-domain. Finite and countable state Markov chains; time-homogeneity; Chapman-Kolmogorov equations; marginal distribution and finite – dimensional distribution; classification of states of a Markov chain – recurrent, positive recurrent, null-recurrent and transient states.

Distribution Theory

- Standard discrete and continuous univariate distributions : Binomial, geometric, Poisson, Negative Binomial, Hyper-geometric, Uniform, Triangular, beta, exponential, gama, Weibull, Normal, Lognormal, and Cauchy distributions and their properties. Joint, Marginal and conditional pmf's and pdf's.
- Families of Distributions : Power series distributions, Exponential families of distributions. Functions of Random variables and their distributions (including transformation of rv's). Bivariate Normal, Bivariate Exponential (Marshall and Olkins form), Compounding distributions using Binomial and Poisson. Truncated (Binomial, Poisson, Normal and Lognormal) and mixture distributions – Definition and examples.
- Sampling Distributions of sample mean and variance, independence of X and s^2. Central and Non-central χ^2, t and F distributions. Order statistics Joint and marginal distributions of order statistics and Distribution of Range. Distributions of order statistics from rectangular, exponential and normal distributions. Empirical distribution function.
- Multinomial distribution. Multivariate normal, bi-variate as a particular case, moments, c.f., conditional and marginal distributions. Distributions of correlation coefficient, partial and multiple correlations, and inter relationships. Dimension reduction method : PCA, FA, Canonical Correlations an MDS. Discriminent analysis and cluster Analysis.
- Distributions of quadratic forms under normality and related distribution theory.

Statistical Inference :

- Point Estimation : Point Estimation Vs. Interval Estimation, Advantages, Sampling distribution, Likelihood function, exponential family of distribution. Desirable properties of a good estimator : Unbiasedness, consistency, efficiency and sufficiency – examples. Neyman factorization theorem (Proof in the discrete case only), examples. UMVU estimation, Rao-Blackwell theorem, Fisher Information, Cramer-Rao inequality and Bhattacharya bounds. Completeness and Lehmann-Scheffe theorem. Median and modal unbiased estimation.
- Methods of estimation : method of moments and maximum likelihood method, examples. Properties of MLE. Consistency and asymptotic normality of the consistent solutions of likelihood equations. Definition of CAN and BAN, estimation and their properties, examples. Interval estimation, confidence level CI using pivots and shortest length CI. Confidence intervals for the parameters for Normal, Exponential, Binomial and Poisson Distributions.
- Fundamental notions of hypothesis testing-Statistical hypothesis, statistical test, Critical region, types of errors, test function, randomized and non-randomized tests, level of significance, power function, Most powerful test, Neyman –Pearson fundamental lemma. MLR families and Uniformly most powerful tests for one parameter exponential families.
- Concepts of consistency, unbiased and invariance of tests. Likelihood Ratio tests, statement of the asymptotic properties of LR statistics with applications (including homogeneity of means and variances). Relation between confidence interval estimation and testing of hypothesis. Concept of robustness in estimation and testing with example.
- Concept of sequential estimation, sequential estimation of a normal population. Notions of sequential versus fixed sample size techniques. Wald's sequential probability Ratio test (SPRT) procedure for testing simple null hypothesis against simple alternative. Termination property of SPRT. SPRT procedures for Binomial, Poisson, Normal and Exponential distributions and associate OC and ASN functions. Statement of optimality of SPRT.
- Concepts of loss, risk and decision functions, admissible and optimal decision functions, Estimation and testing viewed as decision problems.

- **Nonparametric methods :** Nonparametric methods for one-sample problems based on sign test, Wilcoxon signed Rank test, run test and Kolmogorov – Smirnov test.
- Two sample problems based on sign test, Wilcoxon signed rank test for paired comparisons, Wilcoxon Mann-Whitney test, Kolmogorov – Smirnov Test, (Expectations and variance of above test statistics, except for Kolmogorov – Smirnov tests, Statements about their exact and asymptotic distributions), Wald-Wolfowitz Runs test and Normal scores test.
- Chi-Square test of goodness of fit and independence in contingency tables. Tests for independence based on Spearman's rank correlation and Kendall's Tau. Ansari-Bradley test for two sample dispersions. Kruskal – Wallis test for one-way layour (K-samples). Friedman test for two-way layout (randomised block).
- Asymptotic Relative Efficiently (ARE) and Pitman's theorem. ARE of one sample, paired sample and two sample locations tests.

Sampling Techniques

- Non – Sampling errors : Sources and treatment of non-sampling errors. Non – sampling bias and variance.
- SRSWR / WOR, Stratified random sampling and Systematic Sampling.
- Unequal probability Sampling : ppswr / wor methods (including Lahiri's scheme) and related estimators of a finite population mean. Horowitz – Thompson, Hansen – Horowitz and Yates and Grundy estimators for population mean / total and their variances.
- Ratio Method Estimation: Concept of ratio estimators, Ratio estimators in SRS, their bias, variance / MSE. Ratio estimator in Stratified random sampling – Separate and combined estimators, their variances / MSE.
- Regression method of estimation : Concept, Regression estimators in SRS with pre-assigned value of regression coefficient (Difference Estimator) and estimated value of regression coefficient, their bias, variance / MSE, Regression estimators in Stratified Random sampling – Separate and combined regression estimators, their variance / MSE.
- Cluster Sampling : Cluster sampling with clusters of equal sizes, estimator of mean per unit, its variance in terms of intracluster correlation, and determination of optimum sample and cluster sizes for a given cost. Cluster sampling with clusters of unequal sizes, estimator – population mean its variance / MSE.

- Sub sampling (Two – Stage only) : Equal first stage units – Estimator of population mean, variance / MSE, estimator of variance. Determination of optimal sample size for a given cost. Unequal first stage units – estimator of the population mean and its variance / MSE.

Design of Experiments

- Formulation of a linear model through examples. Estimability of a linear parametric function. Gauss-Markov linear model, BLUE for linear functions of parameters, relationship between BLUE's and linear Zero-functions. Gauss-Markov theorem.
- Simple linear regression, examining the regression equation, Lack of fit and pure error. Analysis of Multiple regression models. Estimation and testing of regression parameters, sub-hypothesis. Introduction of residuals, overall plot, time sequence plot, plot against Yi, Predictor variables $\mathbf{X}_{ij}$, Serial correlation among the residual outliers. The use of dummy variables in multiple regression, Polynomial regressions – use of orthogonal polynomials. Derivation of Multiple and Partial correlations, tests of hypothesis on correlation parameters.
- Analysis of Covariance : One-way and Two-way classifications. Factorial experiments : Estimation of Main effects, interaction and analysis of 2^k, factorial experiment in general with particular reference to k = 2, 3 and 4 and 3^2 factorial experiment. Multiple Comparisons : Fishers least significance difference (LSD) and Duncan's Multiple Range test (DMR test).
- Total and Partial Confounding in case of 2^3, 2^4 and 3^2 factorial designs. Concept of balanced partial confounding. Fractional replications of factorial designs : One half replications of 2^3 and 2^4 factorial designs, one-quarter replications of 2^5 and 2^6 factorial designs. Resolutions of a design. Split – Plot design.
- Youdin design, intra block analysis. **B.I.B.D., P.B.I.B.D.,** their analysis, estimation of parameters, testing of hypothesis.

10. **TELUGU**

తెలుగు

1. (ఎ) సంప్రదాయ సాహిత్యకవుల అధ్యయనం – కాలం – రచనలు
నన్నయ, తిక్కన, ఎఱ్ఱన, శివకవులు (నన్నెచోడుడు, మల్లికార్జున పండితారాధ్యుడు, పాల్కురికి సోమనాథుడు), నాచనసోమన – భాస్కర రామాయణ కవులు, రంగనాథ రామాయణ కవి – శ్రీనాథుడు – పోతన – పిల్లలమర్రి పినవీరభద్రుడు – గౌరన – జక్కన – అనంతామాత్యుడు – కొరవి గోపరాజు – నంది మల్లన, ఘంట సింగన –అష్టదిగ్గజ కవులు – తాళ్ళపాక కవులు – శ్రీకృష్ణదేవరాయలు – పొన్నగంటి తెలగన్న – చేమకూర వెంకటకవి – తంజావూరు రాజకవులు – కవయిత్రులు – కూచిమంచి తిమ్మకవి – జగ్గకవి.

(బి) వేమన తాత్వికత – సమకాలిక పరిశీలన, దృక్పథం – సమాజంపై వేమన కవిత్వ ప్రభావం.

2. సాహిత్య ధోరణుల అధ్యయనం – యుగప్రభావం – రూపాలు – మొదలైనవి. ఇతిహాసం – పురాణం ప్రబంధం – శతకం – సంకీర్తన సాహిత్యం – చారిత్రక కావ్యం – సంప్రదాయ, ఆధునిక గద్య రచనలు – నవల – కథానిక – వ్యాసం – ఏకాంకిక మొదలైనవి – వాదాలు (దళిత, హేతు, స్త్రీ, ప్రాంతీయ)

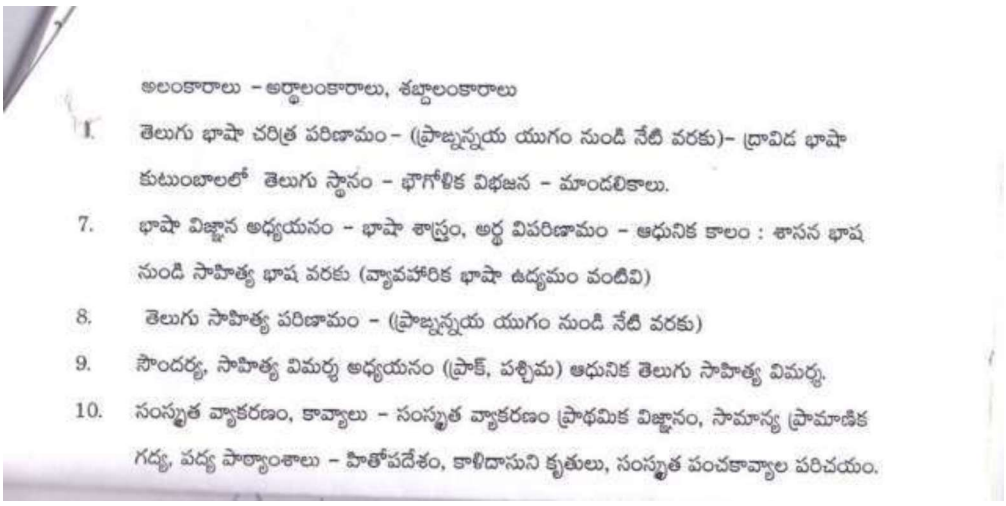
3. జానపద విజ్ఞానం – గేయాలు – కథాగేయాలు – గద్యాఖ్యానాలు – (పురాణగాథలు – ఇతిహ్యాలు– కథలు), సామెతలు – పొడుపుకథలు – జానపద కళలు – (వీధి నాటకాలు, యక్షగానాలు, బొమ్మలాటలు, పగటివేషాలు, చిందు, గంగ జాతర కళారూపాలు.

4. ఆధునిక కవుల అధ్యయనం – ఆధునిక ధోరణులు వారి రచనలు – గురజాడ – రాయప్రోలు – వీరేశలింగం – చిలకమర్తి – పానుగంటి – విశ్వనాథ – దేవులపల్లి – బసవరాజు – పింగళి – కాటూరి – దువ్వూరి – పుట్టపర్తి – శ్రీశ్రీ – ప్రసిద్ధ ఆధునిక కవులు – భావ అభ్యుదయ – దిగంబర.

5. తెలుగు వ్యాకరణ, ఛందస్సు అధ్యయనం :

వ్యాకరణం – బాల వ్యాకరణం (సంజ్ఞ, సంధి, క్రియా, తత్సమ, అచ్చిక ప్రకరణాలు)
ప్రౌఢ వ్యాకరణ (సంజ్ఞ, సంధి, కారక, శబ్ద వాక్య పరిచ్ఛేదాలు)

ఛందస్సు – వృత్తాలు, జాతులు, ఉపజాతులు
(ఉత్పలమాల, చంపకమాల, శార్దూలం, మత్తేభం, ద్విపద, తరువోజ, సీసం, కందం, స్రగ్ధర, పంచచామరం)



అలంకారాలు – అర్థాలంకారాలు, శబ్దాలంకారాలు

1. తెలుగు భాషా చరిత్ర పరిణామం – (ప్రాఙ్నన్నయ యుగం నుండి నేటి వరకు)– ద్రావిడ భాషా కుటుంబాలలో తెలుగు స్థానం – భౌగోళిక విభజన – మాండలికాలు.
7. భాషా విజ్ఞాన అధ్యయనం – భాషా శాస్త్రం, అర్థ విపరిణామం – ఆధునిక కాలం : శాసన భాష నుండి సాహిత్య భాష వరకు (వ్యావహారిక భాషా ఉద్యమం వంటివి)
8. తెలుగు సాహిత్య పరిణామం – (ప్రాఙ్నన్నయ యుగం నుండి నేటి వరకు)
9. సౌందర్య, సాహిత్య విమర్శ అధ్యయనం (ప్రాక్, పశ్చిమ) ఆధునిక తెలుగు సాహిత్య విమర్శ.
10. సంస్కృత వ్యాకరణం, కావ్యాలు – సంస్కృత వ్యాకరణం ప్రాథమిక విజ్ఞానం, సామాన్య ప్రామాణిక గద్య, పద్య పాఠ్యాంశాలు – హితోపదేశం, కాళిదాసుని కృతులు, సంస్కృత పంచకావ్యాల పరిచయం.

11. ZOOLOGY

General Concepts :

1. Levels of structural organization :
   Unicellular, colonial and multicellular forms. Prokaryotic and Eukaryotic cells. Levels of organization of tissues, organs & systems.
2. Acoelomata, Pseudocoelomata, Coelomata, Proterostomia and Dueterostornia.
3. Concepts of species and hierarchical taxa, biological nomenclature, classical methods of taxonomy of animals.

Non-Chordata :

1. General characteristics and classification of invertebrates up to class level.
2. Protozoa: Locomotion, Nutrition and Reproduction in protozoa, Protozoan diseases of man.
3. Porifera: Canal system in porifera, skeleton in porifera, Reproduction in sponges.
4. Coelenterata : Polymorphism, Metagenesis, coral formation,Etenophora.
5. Hemlinths: Common Helminthic parasites of Man – *Taenia solium, Schistosoma sp., Ascaris, Ancylostoma, Oxyuris, Loa, Trichinella, Strongyloides* – their life cycles. Parasitism and parasitic adaptations.
6. Annelida: Excretory system, Coelom formation, coelom and coelomoducts.
7. Arthropoda: Mouthparts of Insects, useful and harmful insects, Metamorphosis in insects. Apiculture and sericulture in India, crustacean larvae.
8. Mollusca: Respiritation, Torsion and De-torsion, pearl formation and Pearl industry.
9. Echinodermata: Echinoderm larvae, Water vascular system.

CHORDATA :

1. General Characters and classification of chordates upto class, Origin of Chordates, phylogeny and affinities of Hemichordata, Retrogressive metamorphosis.
2. Vertebrate integument and derivatives, Comparative account of Digestive, Respiratory,Circulatory, Excretory and Reproductive systems of Vertebrates.
3. Pisciculture in India, Common edible fishes of Andhra Pradesh.
4. Origin and evolution of Amphibia, Paedogenesis, Neotony.
5. Important Snakes of India, Dinosaurs.
6. Flight adaptations and Migration in birds. Archeopteryx, Poultry in India.
7. Adaptive radiation and Dentition in Mammals.

CELL BIOLOGY :

1. Prokaryotic and Eukaryotic cell, Plasma Membrane-Ultrastructure, Permeability, intercellular communication, Endocytosis, Exocytosis, Phagocytosis, Active transport, membrane pumps.
2. Structure & function of Intracellular organelles - Nucleus, Mitochondria, Golgi bodies,

lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, Cell wall, Cytoskeleton and its role in motility.

3. Organization of genes and chromosomes - Operon, unique and repetitive DNA, structure of chromatin and chromosomes, heterochromatin, euchromatin, transposons.
4 Cell division and cell cycle - Mitosis and meiosis, their regulation, steps in cell cycle, regulation and control of cell cycle.
5. DNA replication, repair and recombination - Unit of replication, replication origin and replication fork, Recombinant technology, Transgenic and cloned animals, DNA damage and repair mechanisms.
6. Protein synthesis - initiation, elongation and termination of Genetic code.
7. Regulation of gene expression - Lac operon, Lambda operan.

GENETICS :

1. Mendel's law of inheritance - Critical review and Linkage.
2. Gene mapping methods : Linkage-complete and Incomplete linkage; Linkage maps, Recombination, mapping with molecular markers, somatic cell hybrids.
3. Crossing over : Types (Somatic or mitotic crossing over and Germinal or meiotic crossing over), theories about the mechanism of crossing over, tetrad analysis, and cytological detection of crossing over.
4. Mutations : Types (Spontaneous and Induced), causes and detection, mutant types (lethal, conditional, biochemical, loss of function, gain of function, germinal versus somatic mutants), Molecular basis of mutations.
5. Chromosomal aberrations (deletion, duplication, inversion and translocation, ploidy and their genetic implications); Autosomal abnormalities (Down's syndrome, Trisomy-13, -18); Sex anamolies (Turner's syndrome, Klinefelter's syndrome, Hermaphroditism).
6. Human genetics : Human karyotyping, Genetic disorders due to mutant genes (Huntington's chorea), Inborn errors of metabolism-Pheynylketonuria, alkaptonuria, Sickle cell anemia.

SYSTEM AND CELL PHYSIOLOGY :

1. Blood and circulation - Blood corpuscles, haemopoiesis, plasma function, blood groups, haemoglobin, haemostasis.
2. Cardiovascular System : Neurogenic, myogenic hearts, cardiac cycle, heart as a pump, neural and chemical regulation of all above.
3. Respiratory system - Transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration.
4. Nervous system - Neurons, action potential, Conduction of nerve impulse, synapse, Neurotransmitters.
5. Muscle : Ultraa structure and mechanism of muscle contraction.
6. Sense organs – Eye, Ear.
7. Excretory system - Comparative physiology of excretion, urine formation, micturition.
8. Osmaregulation – Osmoregulation in fishes, Hormonal control of osmoregulation.
9. Digestive system - Digestion, absorption, assimilation and egestion.
10. Endocrinology and reproduction - Endocrine glands, basic mechanism of hormone action, hormones and diseases, reproduction in mammals.
11. Chemical bonds (Covalent, Hydrogen and Ionic bonds, Van der waals interactions).
12. Outline classification of organic compounds (carbohydrates, proteins and lipids).
13. Order of protein structure, primary, secondary, tertiary and quaternary; Ramachandran plot.
14. Glycolysis, TCA cycle and their Biomedical importance. Pentose phosphate pathway, Gluconeogenesis. Redox Potentials, Mitochondrial electron transport system, Oxidative phosphorylation.

EVOLUTION :

1. Origin of life - Modern concepts, theories of Evolution.
2. Isolation, Speciation, Natural Selection.
3. Hardy weinberg' Law.
4. Population Genetics (Gene pool, Gene frequency), Genetic drift and convergent evolution, Adaptive radiation.
5. Evolution of Man.
6. Zoogeographical realms of the world.

DEVELOPMENTAL BIOLOGY :

1. Speamatogenesis, oogenesis.
2. Fertilization, cleavage, gastrulation formation of germ layers, parthenogenesis.
3. Embryogenesis in vertebrates.

4. Formation and function of foetal membranes.
5. Types of Placenta.
6. Regualtion, genetic control of development.
7. Development of Frog and chick.

HISTOLOGY :

1. Histology of Mammalian tissues and organs - Epithelial, connective, blood, bone, cartilage, skin, stomach, intestine, liver, pancreas, kidney, Testis and Ovary.

ECOLOGY :

1. Concept of Ecosystem.
2. Biogeochemical cycles (Carbon, Nitrogen and Phosphorous).
3. Influence of environmental factors on animals, energy flow in Ecosystem, food chains, food web and trophic levels.
4. Community and population ecology. Ecological succession.
5. Environmental pollution-Air, water, land, noise, radioactive, thermal and visual, effects of pollution on ecosystem, prevention of pollution.
6. Wildlife in India-conservation, Chipko movement.
7. Biodiversity-Economic significance, conservation, hot spots of India.

IMMUNOLOGY :

1. Cells of the immune system : Lymphoid cells, Mononuclear cells, granulocytic cells, Mast cells.
2. Organs of the immune system - primary and secondary lymphoid organs, lymphatic system.
3. Antigens: Antigenic determinants or epitopes, immunogenicity, Haptens.
4. Innate (Non-specific immunity): Anatomical barriers, phagocytosis, NK cells, interferon.
5. Humoral immunity: Immunoglobulins (fine structure of immunoglobulins and immunoglobulin classes); the complement system, Classical and alternate pathway, inflammation.
6. Cell mediated immunity : Mechanism of cell mediated immunity; Brief account on Antigen presentation, Major histocompatability complex.
7. Antigen-Antibody interactions : Affinity, Avidity, Cross-reactivity, precipitation reactions, and Agglutination reactions and ELISA.
8. Brief account on immunological Hypersensitivity disorders :

   a) Tolerance and Autoimmunity
   b) Transplantation.
   c) Immunodeficiency diseases - HIV.
   d) Immunization (Active and passive immunity).

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12. POPULATION STUDIES

UNIT I:

Introduction and Sources of Population Data History, definition, nature and scope of Population Studies, relationship of other social sciences with population studies, Social structure, Social and Racial Groups, Society and Culture and its role in Population studies, Social Institutions (family, marriage, kinship, and religion) and their role in influencing population studies, Social change in India, Tribes in India and their culture, Social-Psychological concepts and its relevance to Population studies, communication concepts, processes and its relevance in context of Population studies.

UNIT II:

Population census: History of population; definition and scope Indian census: Historical background, coverage, features and uses. Strengths and weaknesses of various data sources in India,

National Family Health Surveys (NFHS), Comprehensive Nutrition Survey, Aging survey. Data appraisal (Evaluation and Adjustment of Data): Types and sources of errors in population data.

UNIT III:

Methods of Demographi/Population Analysis: Rates, Ratio, Proportion, percentages, density, incidence and prevalence, person-years.

Rate of Population Growth: Arithmetic, Geometric and Exponential growth rates, Decadal growth rate Doubling time, concept of population stabilization and net reproduction rate unity Crude and Standardized methods for fertility and mortality estimates.

UNIT IV:

Population Composition and Change Spatial and temporal changes in the size and distribution of population-global perspective with focus on India Age and sex structure of population in developed and developing countries

Composition of India's population: Demographic, social, economic and Cultural factors affecting age-sex structure of population and its relevance in population dynamics: global and India perspectives;

Population Ageing: Concepts and measures of population ageing, components of population ageing. Trends and pattern of ageing in India and States. Demographic dividend, Sex-ratio, Sex-ratio at birth, Child-Women ratio, Median Age, Age Sex Pyramid, Dependency Ratio (Child Dependency Ratio, Old Dependence Ratio, Total Dependency Ratio).

Social, economic and health aspects of Ageings; Living arrangements, family support, dependency; Emerging issues related to elderly.

UNIT V:

Nuptiality and Fertility Nuptiality: Concepts and sources of data; Measures- crude marriage rate, age specific marriage rates, order specific marriage rates.

Indices of Nuptiality (Coale's Indices) Marriage patterns in India: levels, trends and differentials in age at marriage, divorce, widowhood, widow remarriage Levels and trends in widowhood in India and States. Impact of changes in widowhood/ divorce on fertility, mean age of widowhood/divorce from Census data.

Fertility: Basic concepts and terms used in study of fertility. Fertility Indicators: sources of data and their computation, Cross-sectional or Period indicators.

UNIT VI :

Mortality, Morbidity and Health Mortality: Basic concept, definitions and measures of pregnancy wastage (miscarriage, abortion, fetal death, still birth), live birth, early, late and post neo-natal deaths; infant and child death. Mortality Indicators: Crude Death Rate (CDR), Age Specific Death Rate (ASDR), Infant Mortality Rate (IMR), Under-five mortality Rate, Neo-natal mortality rate, Post-natal mortality rate, Maternal Mortality Rate (MMR).

Infant Mortality: Levels and determinants of Infant and Child mortality in India, causes of Infant mortality (Endogenous and Exogenous).

Morbidity: Concepts and definitions of health and morbidity; sources of data and measures of morbidity.

Unit – VII:

Reproductive Health:- Definition, rationale, approach, evolution of ideas about reproductive health, Maternal morbidity, Emergency obstetric care, Adolescent reproductive morbidity, Strategies to reduce maternal morbidity and mortality in India.

Unit VIII :

Urbanization and Migration Urbanization: Concept and definition of 'Urban' in India and other countries. Process of urbanization, measures and sources of data. Inter-relationship between urbanization and migration in developed and developing countries. Trends, patterns, characteristics and differentials of Urbanization in India.

Types of migration: internal and international Trends. Patterns and differentials of Internal and international migration. Determinants and consequences of Internal and International migrations. Refugees – issues and implications.

Unit IX :

Population, Development and Environment Environment in the context of development, interrelationship between population growth, environment and development Concepts of Development and its Measures: Limitations of per capita income as an indicator of development, human centered development-welfare approach, investment in human capital approach.

Human Development Index (HDI), Physical Quality of Life Index (PQLI), Concepts of Social Development, Social capital and Social change, Social Development Index (SDI), Gender Development Index (GDI), Millennium Development Goals (MDG), Concept of Sustainable Development, Sustainable Development Goals (SDG),Concepts and Measures of Poverty, Human Poverty Index (HPI).

Unit X :

Population & Health Policies and Programmes National Policies: Evolution and Development of Population, Health and related Policies viz., National Population Policy 1977, National Health Policy 1983, National Population Policy 2000, National Health Policy 2002, National Health policy 2017, National Nutrition Policy, National Policy on Older Persons, Social Security for Elderly, Legislations to protect Elderly in India, Protect National Youth Policy, National Policy on HIV/AIDS, National Environment Policy etc., its Purpose, Goals & Objectives,

Thematic areas and Strategies. Population and Policies on special groups, Ageing and Disabilities, Ageing and Quality of Life, Ageing and Mental Health problems, Social Gradients of health for Ageing Population, Healthy Ageing, WHO Frame Work for Healthy Ageing, Geriatric care in India Role of NITI Ayog in Health and Population related policies and programme Population, Health and related Policies and Programme at State levels.

S. V. ARTS COLLEGE::TTD::TIRUPATI

13. DEPARTMENT OF DAIRY SCIENCE

Livestock Production and Management Syllabus

Importance of livestock in national economy and different livestock development programmers of Government of India, Livestock census and trends of livestock production, Terminologies used in livestock and poultry production, Important Indian and Exotic breeds of cattle, buffalo, swine and poultry, Principles of maximization of livestock production, Feeding and management of calf, heifer, and milking animals, Feeding and management of dry, pregnant, draft animals and breeding bull. Housing principles, Space requirements for different classes and types of animals. Housing system for cattle and buffalo, Milk secretion and factors affecting milk yield and composition, Breeds characteristics of poultry, their methods of rearing, Cost of production of milk, economics of livestock production.

Organic Livestock Farming

Definition, Concepts of organic livestock farming, Present scenario of organic livestock production in India and abroad. Importance and scope, Limitations in implications organic livestock production, Requirements for organic livestock farming, Socio-economic impact of organic livestock farming, Marketing and export potential – inspection, certification, labeling, evaluation, accreditation, Steps to promote organic animal husbandry in India, Legal aspects – Registration, National programme and standards for organic animal husbandry, Organic fodder production, Characteristics of organic milk.

Livestock Management

Handling and restraining of animals, Grooming, Brushing and cleaning of animals, Identification methods of animals, Hoof trimming of cow, sheep, goat, Tattooing in piggery, Branding of dairy animal, sheep, goat etc. Ear notching of pets animal ,pigs etc, Deworming, importance of Deworming and different deworming medicins, Culling, Animal Husbandry Different reasons of culling in animals, Docking in sheep and goat, Mastitis and Management practices adopted to prevent infection of mastitis, Disbudding of dairy calf ,Nose ringing of dairy animal ,Need of hoof trimming practices ,Different tools needed for management of animals, Tools for branding ,tool of ear notching ,Tool for nose ringing and hoof trimming.

Livestock Hygiene Credits:

Rainfall and geology relation to water supply Sources of water supply, impurities and pollution of natural water, Prevention of pollution and contamination of water sources, Hardness of water, Significance of hard and soft water, treatment of hard waters, Water supply for domesticated animals, Animal diseases associated with water supplies, General principle of sewage disposal and purification, removal and disposal of extra and other wastage from animal habitation. Effect for environment on the health and productivity of livestock and measures to counteract this, Day light change, effect of light on breeding habits, body covering, growth and production of farm animals, Experimental light treatment, mechanism of light action, Practical consideration, Concept of clean

milk production, Contamination and control measures at farm level, Summary of hygienic and good milking practices, Milk quality control

Farm Animal Behaviour

Introduction, Importance and Patterns of livestock behavior, Daily and seasonal cycles of behavior, Physiological basis of behavior, Environmental modification of behavior, Developmental changes in behavior, Developmental changes in behavior, Genetic differences in behavior, Behavioral disorders, Physical environment and behavior, Common vices and their remedial measures, Analysis of behavior in relation to location, Climatic environment and social behavior, Scope and limitation of integrated farming systems, Sustainability of integrated livestock farming systems and their economic importance, Livestock enterprises viz; cattle, buffalo, Livestock enterprises viz; sheep, goat, Livestock enterprises viz, poultry, New approach for changing farming systems in present Energy crises vis-à-vis Gobar gas plant, FYM, solar and wind energy utilization, Project formulation, and evaluation of various livestock enterprises. Various livestock farming systems and their economic analysis. Practical Behavioral pattern of cattle- Indigenous and crossbreds, Behavioral pattern

Integrated Livestock Farming System:

Scope and limitation of integrated farming systems - Sustainability of integrated Livestock Farming Systems and their economic importance. Integration of fish, arable farming and different livestock enterprises, Gobar gas plant, FYM, Vermi-compost, cattle, buffalo sheep, goat, pig, poultry, Bee-keeping etc. New approach for changing farming systems in present energy crises. Project formulation and evaluation of various livestock enterprises.

Animal Housing and Milking Systems

Animal Housing and Milking Systems General principles in planning animal houses- farmstead and animal houses .Selection of site and planning; layouts for livestock farm of different sizes in different climatic zones in India - Farm structures - General principles of construction of enclosures, floor and road. Housing requirements of different classes of Livestock - Preparation of layouts, plans, arrangement of alleys- Fitting and facilities in the houses for horses, dairy cattle, calves, bulls, work cattle, dogs, pigs, sheep, goats, and poultry. Improvement of existing buildings; water supply; feed and fodder delivery systems - Economics of Livestock housing Housing - Disease control measures and sanitation of all classes of livestock, Milking processes – milk, udder anatomy, milk ejection, milk collection, post milking, Milking Installations – Vacuum, milk, extra material, Milking Parlors – All types of milking parlors, milking robots, Cooling, Maintenance and cleaning, Milking parlor design – Milking floor, hygiene, light and ventilation, waiting area

Livestock Farm Hygiene:

Sources of water supply and their qualities, Sources of contamination of water and preservation. Bacteriology of water and air. Purification and sanitation of water. Disposal of sewage and farm

refuses their relation with animal human health respectively. Sanitation of animal houses. Sources of air pollution in animal houses and its effect on animal health and production , method of prevention control of air and water home diseases of man and animal. Atmospherics pollution and methods of control, stray animal control , fallen animals and environment, radiation, drugs etc. as sources of pollution, Disaster management. Possibilities of recycling farm surplus / wastes etc, Importance of Zoonotic diseases of farm animals such as Bird flues, Tuberculosis, Brucellosis etc.

Livestock Farm Practices

- Approaching and handling of cattle, sheep, Recording of respiration, pulse and rectal temperature in animals, Health management of farm animals, Carcass disposal, Disinfection, Housing Principles and Housing Systems, Layout plans for livestock housing, Layout plans for poultry, Routine livestock farm operations, Weighing of farm animals, First aid of farm animals

Animal Nutrition

Principles of Animal Nutrition Nutrition- History, importance of nutrients in health and reproduction. Composition of animal body and plants, comparison between plant and animal, Nutritional terms and their definitions, Nutrient and their metabolism, role and requirement of water, carbohydrates, their digestion, absorption and metabolism in ruminants and non ruminants, proteins and amino acids and their digestion, use of NPN compound for ruminants and non ruminants. Composition of selected foodstuff with reference to selected amino acid, carbohydrate and fat as a source of energy and vitamin. Dog, rat, guinea pig and rabbit dietary allowances.

Analytical Techniques in Animal Nutrition

General precaution while working in laboratory. Preparation of different standard solution, reagents and indicators. Preparation of sample for chemical analysis. Determination of proximate principles i.e estimation of crude protein, ether extract, crude fibre, nitrogen free extract and total ash. feed mixing, different feed processing techniques. Conservation of fodder- hay, silage and haylage making.

Applied Animal Nutrition

Feeding standards and nutrient requirement of different classes of animal. Energy requirement of different classes of animal. Protein energy inter relationship, thumb rule. Feed processing techniques. Preparation of UMMB, complete feed block, utilization of byproduct and top feeds. Concept of bypass nutrients. Importance of mineral elements, vitamins, feed additives and feed supplements, feeding of animals, computation of ration.

Vet Anatomy

- Introductory Veterinary Anatomy Osteology: Definition of the terms used in Veterinary Anatomy in general and Osteology in particular. Classification, physical properties and structure of bones, Gross study of bones of appendicular and axial skeleton of Ox / Buffalo as type species and comparison with Sheep / Goat, Pig, Horse, Dog and Fowl with particular emphasis on their topography, contour, landmarks and functional anatomy from production point of view. Detail study of bones of head, neck, thorax, abdomen, pelvis, tail, fore limb and hind limb.

Physiology of Lactation

Theory Introduction and importance of physiology of lactation in relation with milking management, internal structure of udder of different species, duct system, blood supply, lymphatic and nervous system of udder, development of mammary glands, involution of udder, hormones and their role in development of mammary glands, initiation and maintenance of lactation, induction of lactation, control of milk secretion, biosynthesis of milk, protein, lactose, fat, minerals and vitamins, milk harvesting and milking management, factors affecting milk yield and composition viz., physiological, genetic, nutritional, and environmental.

Physiology of Digestive system

Morphological characteristic of monogastric and polygastric digestive system. Prehension, rumination; daefecation, vomition; regulation of secretory function of saliva, stomach, intestine, pancreas; bile secretion; hunger, appetite control, developmental aspects of digestion; luminous, membranous and microbial digestion in rumen and intestine; permeability characteristics of intestine, forces governing absorption, control intestinal transport of electrolyte and water, enzymatic digestion in monogastric and fermentative digestion in rumen, modification of toxic substances in rumen

Veterinary Gynecology and Obstetrics

Animal Reproduction - Animal Reproduction — Introduction, development of female genitalia, growth , puberty, sexual maturity, role of hormones, symptoms of estrous cycle, synchronization, ovulation, pregnancy diagnosis, examinations, gestation, fertility, infertility and sterility, parturition in domestic animals, causes, stages of parturition, repeat breeding and AI.

-Andrology and Artificial Insemination

TheoryIntroduction, development, comparative study of male genitalia and gonads, growth puberty, sexual maturity, endocrine control of reproduction in the male domestic animals, factors affecting maturity and sex drive in bulls, sexual behavior in males, forms of male infertility, general considerations, factors affecting infertility in male, diseases, Introduction, history development, advantages and limitations of AI , methods of semen collection in various species, techniques of AI, factors affecting quality and quantity of semen, storage of semen.

Animal Genetics and Breeding

History and concept of Animal Breeding.Study of common terms used in genetics,Chromosome, gene, mutation,Gene action, Variations, its causes and importance, Inheritance, sex linked, sex influenced and sex limited characters,Importance of heredity and environment, Concept of heritability and its estimates,Concept of repeatability and its estimates, Concept of selection and basis,Methods of selection ,Response to selection ,Sire evaluation, Breeding systems, Genotypic and phenotypic effects , Heterosis, practical uses ,Concept of GCA and SCA and selection for specific combining ability

Livestock Breeding System

Breeding method-Different mating systems . Inbreeding and its measures, effects and application of inbreeding with its merits and demerits, inbreeding coefficient and coefficient of relationship, Line-breeding. Out breeding, Strain crossing. Cross breeding its merits and demerits. Heterosis-Definition, causes, measurements and its application in animal breeding, outcrossing, top crossing ,grading up, criss-crossing, Species Hybridization, Performance records and standardization .Breeding Behavior- current breeding programmes in the state and country. Importance of breeding records in dairy animals, Pedigree sheet, Heritability etc

Pathology and Parasitology

General Pathology, Introduction, history and scope and pathology, causes of diseases – intrinsic, extrinsic, nutritional, physical, chemical and viable. Developmental disturbances, disturbance of circulation, disturbance of cell metabolism, icterus, necrosis, gangrenes, disturbance in growth , classification of inflammation, healing, fever.

General Parasitology

Parasites and parasitism. Types of Parasitism. Commensalism, symbiosis and predatorism, Types of hosts: Final and Intermediate hosts, paratenic hosts and reservoir hosts, natural and unnatural hosts. Host- parasite relationship; mode of transmission of parasites and methods of dissemination of the infective stages of the parasite. Parasite specificity in relation to species, breed, sex and location. Tissue reactions caused by parasites to the host. Resistance of hosts to parasitic infections/infestations. Immunity against parasitic infections. Standardized Nomenclature of Animal Parasitic Diseases (SNOAPAD). General description of helminth parasites affecting domestic animals and birds in India

Introductory Veterinary Microbiology

Introduction and history of Microbiology. Morphology, structure, growth and nutrition of bacteria. Classification and nomenclature of bacteria. Sources and transmission of infection. Pathogenicity, virulence and infection. Resistance and susceptibility of host, bacteraemia, septicaemia, toxaemia endotoxins and exotoxins; Bacterial genetics. Plasmids, Antibiotic resistance. Introduction to morphology, growth, nutrition, reproduction in fungi, Classification of fungi. Introduction to viruses: General properties, Replication, Cultivation and Purification of viruses Cell-Virus interaction. Viral genetics. Interferon.

Laboratory Diagnoses

Training in examining clinical samples (biochemical, pathological, parasitological and bacteriological). Analyzing and correlating with clinical findings and interpreting the results. Collection, labeling, transportation, and preservation of body fluid samples. Writing results and report Interpretation of date in relation to specific diseases. Clinical significance and of serum glucose, lipids, proteins, blood urea nitrogen, creatinine, uric acid, ketone bodies, bilirubin from samples. Clinical significance of examination of urine samples. Clinical evaluation of blood (Haemoglobin, packed cell volume, total erythrocytic count erythrocytic sedimentation rate, total leukocytic count and differential leococytjc count) from clinical samples. Laboratory evaluation of samples for parasitic diseases (routine faecal examinations- direct smear method, simple sedimentation and floatation methods, Quantitative

faecal examination, pastoral larval counts). Examination of skin scrapings, examination of blood smear/blood for protozoan diseases.

DAIRY SCIENCE

Present status of Dairy Industry in India. Definition and composition of milk. Physico-chemical properties of milk. Microbial quality of raw milk. Factors affecting composition of milk. Physico-chemical and microbial standards for different types of milk. Nutritional importance of milk and its constituents. Reception and processing (Platform test, Chilling, Standardization, Homogenization, Pasteurization, Storage, Marketing) of milk. Classification and composition of milk products (Heat coagulated, Heat and acid coagulated, Evaporated, Fermented Frozen and Fat riched products). ISI, PFA and Agmark standards for milk products,A1 and A2 type of milk. International requirement for export of milk. Preservation of milk and milk products by-Bio, Herbal, Chemical and physical preservatives. Utilization of dairy by-product: whey and high acid milk. Packaging of milk and milk products with modern techniques.

Chemical composition of various food of plant and animal origin, structure and functions of food constituents, additives, preservatives, flavours and antioxidants, composition and physico-chemical and nutritional properties of milk and colostrum, chemistry of milk, constituents, nutrients and milk products. Test for the quality of milk, butter, ghee, milk powder etc., adulterants, neutralizers and preservatives, their detection, heat stability of milk.

Composition and chemistry of cream, butter, ghee, ice-cream, cheese, condensed and dried milks, infant food, spoilage of ghee and use of antioxidants, chemistry of milk fermentation, chemistry of rennin coagulation of milk and changes occurring during ripening of cheese, physico-chemical changes in the manufacture and storage of milk powder, lactose, crystallization and its significance, physicochemical changes during the manufacture of indigenous milk products, quality standards of dairy products.

Dairy Microbiology

Introduction to dairy microbiology – Milk production hygiene and critical risk factors affecting microbiological quality on-farm; Microorganisms associated with milk and their classification based on growth temperature– psychrotrophs, mesophiles, thermodurics and thermophiles; Microbial metabolites and their role in spoilages- souring, curdling, gassiness, ropiness, proteolysis, lipolysis, abnormal flavour and colour; Antimicrobial systems in raw milk; Microbiological grading of raw milk; Microflora of mastitic milk and its importance in dairy industry; Food poisoning, food infections, toxi-infections and other milk borne diseases and their control. Microbial spoilage of food- milk and their products. Fermented dairy products. preservatives and preservation methods, physical method, chemical method. Definitions of pre and probiotic symbiotic and bacteria, Critical control point systems in controlling microbiological hazards in foods. Dairy starter culture-role, classification of dairy starter organisms.types of starter cultures, propagation of starter culture, preservation of starter, commercial starter, probiotic starter organisms- nutritional and therapeutic benefits. Factors affecting starter activity. Microbiological considerations of fermented milk and milk products, manufacture of various fermented milk products, Nutritional and therapeutic importance of fermented milk and milk products.

Dairy technology

Unit I Use of bio-protective factors for preservation of raw milk: effects on physico-chemical, microbial and nutritional properties of milk and milk products; Present status of preservation of raw milk.Unit II Methods of determining lethality of thermal processing; UHT processed milk products, their properties and prospects, types of UHT plants, aseptic fillers, heat stability and deposit formation aspects, effect on milk quality; techno-economic considerations; Nutritional aspects of UHT treated milk vis-à-vis retort sterilized/ HTST treated milk. Unit III Principles and equipment for bactofugation and bactotherm processes; Partial homogenization and its application in dairy industry, Low pressure homogenization; Microfluidization of milk: Principle, equipment, effects and applications.Unit IV Concentration processes and their impact on quality of finished products; Dehydration: advances in drying of milk and milk products; Freeze dehydration: physico-chemical changes and in-dustrial developments; Glass Transition Temperature and its relevance to dried milks. Unit V Water activity; Sorption behaviour of foods, energy of binding water, control of water activity of different milk products in relation to their chemical, microbiologi-cal and textural properties; Hurdle technology and its application in development of shelf-stable and intermediate-moisture foods; Use of carbonation in extending the shelf life of dairy products. Unit VI Current trends in cleaning and sanitization of dairy equipment; Automation, Ultrasonic techniques in cleaning; Bio-films; Bio-detergents, innovations in sanitizers - chemical, radiation; Mechanism of fouling and soil removal; Assessing the effectiveness of cleaning and sanitization of dairy equipment, Water conservation methods.

Advances in Traditional Indian Dairy Products

Unit I Global prospects and export potential of traditional Indian dairy products. Unit II Differences in quality of traditional dairy products from cow, buffalo, goat, camel, and sheep milks; Process innovations in commercial production of heat-desiccated, coagulated and fermented traditional dairy products; Mechanized production of traditional milk based sweets; Automation for manufacture of ghee, paneer, dahi, lassiand traditional sweetmeats.Unit III Composite traditional milk products; Application of membrane technology and microwave processing for industrial production of traditional Indian dairy products. Unit IV Technologies for region specific traditional Indian dairy products and their value addition, their application as a vehicle for delivering functional ingredients; Manufacture of dietetic traditional dairy products. Unit V Techno-economic aspects for establishing commercial units for traditional products.Unit VI Convenience traditional dairy products; Food safety issues; Shelf life extension of food using newer techniques; Novel packaging and preservatives

Non-Conventional Processes for Dairy and Food Industry

Unit I Irradiation: sources and properties of ionizing radiation; Mechanism of interaction with microorganisms and food components; Chemi-cal effects; Industrial irradiation systems, benefits and limitations; UV pasteurization of milk; Safety aspects in radiation processing; National and international regulations in relation to radiation processing; Cold plasma processing. Unit II High frequency heating (Microwave and Radio frequency processing): Principles, merits and demerits; Design and working of processing units; Applications in dairy and food processing; Microwavable packaging; Safety aspects.Unit III Infra-red (IR) heating and Ohmic heating: Principle, equipment and applications. Unit IV Ultrasonic treatment of food: Mechanism of ultrasound induced cell damage

generation of ultrasound, design of power ultrasonic system, types of ultrasonic reactors, application of power ultrasound in food processing, effects on food constituents, ultrasound in amalgamation with other food processing operations – thermo-sonication, manosonication, thermo-manosonication, advantages and future prospects. Unit V High hydrostatic pressure (HHP) processing: Principle of microbial inactivation, barotolerance of microorganisms, effect on food constitu-ents; equipment; dairy and food applications; Merits and demerits of HHP.Unit VI Pulsed electric field processing; Description/ mechanism and factors affecting microbial inactivation, effects on food com-ponents; Present status and future scope for food applications. Unit VII Super-critical Fluid Extraction; Principle, instrumentation and applications.

Membrane Processing for Dairy Applications

Unit I Membrane techniques; Classification and characteristics of filtration pro-cesses; types of commercially available membranes; membrane hardware, design of membrane plants, modelling of ultrafiltration (UF) processes, mass transfer model, resistance model; Membrane fouling-problems and mitigation strategies; Cleaning and sanitization of different types of membranes. Unit II Factors affecting permeate flux during ultrafiltration and reverse osmo-sis of milk and sweet/sour whey, energy requirements for membrane processing of milk and whey. Unit III Applications of ultrafiltration (UF), reverse osmosis, nanofiltration and microfiltration in the dairy industry: food and pharmaceutical grade lactose, low lactose milk powder, dairy whiteners, WPC, WPI, MPC, MPI, Native micellar casein powder, etc. Preparation, properties and uses of Milk Protein Concentrate (MPC) and Milk Protein Isolate (MPI); Manufacture of some cheeses and fermented milk products and impact of membrane processing on quality of such products. Use of membrane processing techniques for separating prophylactic biological from milk. Unit IV Demineralization: principles, processes, equipment and applications.Unit V Functional properties of whey proteins (WPC and WPI), micellar casein and UF milk retentate and their modifications.

Advances in Dairy and Food Packaging

Unit I Trends in packaging industry; designing framework for packaging; Testing of packaging materials. Unit II Adhesives; Graphics; Coding (Barcode and Quick Response code), and labeling used in food packaging. Unit III Protective packaging of foods; Effect of light, oxygen and moisture on packaged food. Unit IV Packaging of dairy products, convenience foods, fresh produce and fruits and vegetable products, Packaging of fats and oils, spices, meat, poultry, fish and other sea foods. Unit V Modified atmosphere packaging, Shrink and stretch packaging; Self-heating and self-cooling cans. Unit VI Retort pouch technology, microwavable, biodegradable, and edible packages; Principles and applications of Active Packaging, Smart and Intelligent Packaging, Antimicrobial packaging. Unit VII Industrial packaging: unitizing, palletizing, containerizing, distribution systems for packaged foods. Unit VIII Safety aspects of packaging materials; sources of toxic materials and migration of toxins into food materials, packaging and flavour interaction.

SV ORIENTAL DEGREE & PG COLLEGE: TTD: TIRUPATI

SANSKRIT (VYAKARANAM)SUBJECT SYALLABUS

I. **VedicLiterature**

Dieties: Agni, Indra, Varuna, Usas, Aksha, Vak, Sarama – Pani, Visvamitra – Nadi.Subject matter of Samhitas,Brachmanas,Aranyakas,Upanisads.

HistoryofVedicLiterature

Main theories regarding the age of Rigveda – Maxmuller, A Weber, Jacobi,BalagangadaraTilak,M.Winternitz,Indian traditionalviews.

Vedangas

Siksa,Kalpa,Vyakarana,Niruktam,Chandas,Jyotisa.

II. **Darasana**

i) Samkhyakarika of Isvarakrishna, Satkaryavada, Purusa-svarupa, PrakritiSvarupa,Sristikrama,Pratyayasarga,Kaivalya.

ii) Vedantasara of Sadananda. Anubandha, Catustaya, Ajnana, Adhyaropa – Apavada,Lingasarirotpatti,Pancikarana,Vivarata,Jivanmukti.

iii) TarkabhasaofKesavamisra/TarkasamgrahaofAnnambhatta:Padartha,Karana,Pramana,Pratyksa,Anumana,Upamana,Sabda.

iv) Sarvadarsanasamgraha:Jainism,Buddhism,Charvak

v) Yogasutra–Vyasabhasya

Cittabhumi,Cittavrittis,ConceptofIsvara,Yogangas,Samadhi,Kaivalya.

❖ Grammar,Linguistics,Prosody:

1) **Grammar:**

❖ Siddhantakanmdi

Samhita,Guna,Vriddhi,Pratipadika,Nadi,Ghi,Upadha,Aprikta,Gati,Pada,Vibhasa,Savarna, KarakaSamasa Tinamta(BhuandEdhaonly)Kridanta (Krityaprakriya only)Taddhita (Matvarthiya)Stripratyaya Mahabhasya (Paspasahnika)Definition of Sabda.

❖ Relation between Sabda and ArthaPurposes of the Study of GrammarDefinition ofVyakarana Result of the proper use of SabdaMethodofGrammar.

2) Linguistics:

i. Paninīyasiksa

ii. Definition and types of languages, Genealogical and Morphological classification of languages, Speech mechanism and classification of sounds. Stops Fricatives,Semi-VowelsandVowels,PhoneticLaws,(Grimm,GrassmannandVerner) Characteristics of the three types of Indo Aryan Causes of Phonetic–change Directions of semantic change and reasons Definition ofVakya anditstypes.

Discourse Analysis (Mahavakyavicara)Difference between Bhasa and VakDifferencebetweenLanguageandDialect.

iii. Niruktam,(Chapter1and2only)Fourfold division of Padas,Concept of Nama, Concept of Akhyata,Meaning of upasarga,categories of Nipatas, Sixstatesofaction (Sadbhavikaras) Purposes of study of Niruktam,Principles of Etymology.Etymology of following words. Acarya ,Vira,Hrada,Go,SamudraVritra,Aditya,Usas,Megha,Vak,Udaka,Nadi,Asva,A gni,Jatavedas,Vaisravana,Nighantu.

iv. **PuranaandItihasa. Definition of Purana,Mahapuranas and Upapuranas.**

- Ramayana

ArrangementofRamayanaLegends in RamayanaSocietyintheRamayana RamayanaasasourceoflaterSanskritworksLiteraryvalue oftheRamayana

- Mahabharata

Arrangement of Mahabharata Legends in Mahabharata Society in the Mahabharata

Mahabharataasasource oflaterSanskritworksLiteraryvalue oftheMahabharata

v. **Kavyasastra**

- Kavyaprakasha

Kavyalakshana, kavyaprayojana, Kavyahetu, kavyabheda, Sabdasakti,Abhihitanvayavada,Anvitabhidanavada,Concept of Rasaand discussion of Rasasutra

Alankaras,Anuprasa,Slesa,Vakrokti,Upama,Rupaka,Utpreksha,Samasok ty,Apahnuti,Nidarshana,Arthantaranyasa,Dristanta,Vibhavana,Visesokti, Kavyalinga.

- ❖ Dhwanyaloka (IUdyota)
- ❖ Dasarupaka (3rdChapteronly)

vi. Poetry,Prose,Dramas and History of Sanskrit Literature

a. Poetry

Raghuvamsa (I and XIV cantos)Kumarasambhava (V canto)Kiratarjuniya (I canto)Sisupalavadha (II canto)Naisadhiyacarita(Icanto)

b. Prose

Dasakumaracaritam(VIIIch apter)Harshacharitam(V Chapter)

Kadambari(Shudrakavarnanam&Shukanasopadesha)

c. Dramas Svapnavasava datta.Abhijnanasa kuntalam Mrichakatikam Uttrara rama charitam Mudrara kshasam Ratnavali Pratimanatakam

d. History of Sanskrit Literature Mahakavyas

LagukavyasHistoricalkavyasLyric PoetryCampukavyasGadyakavyasDidacticPoetry

vii (i)Kautilya's Arthasastra(First ten Adikaras)

(ii) Manusmriti (I,II,andVIIAdhyayas)

(iii) Yajnavalkyasmriti(Vyavaharakandaonly)

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SANSKRIT(VYAKARANAM)SYALLABUS

1. **संज्ञाप्रकरणतः सामान्यप्रश्नाः-**
इत् संयोगः संहिता, सवर्णम् उदात्तः, अनुदात्तः स्वरित, उच्चारणस्थानानि, प्रयत्नाः पदम्

2. निम्नलिखित - सन्धिसूत्रानुसारं सन्धिः सन्धिविच्छेदश्च-
अच् सन्धिः - इको यणचि एचोऽयवायाव, अकः सवर्णे दीर्घ, आद्गुणः, वृद्धिरेचि एङि पररूपम्, एः पदान्तादति, ईदूदेद- द्विवचनं प्रगृह्याम्।

हल् सन्धिः - स्तोः श्चुना श्चुः ष्टुना ष्टु झलां जशोऽन्ते यरोऽनुनासिकेऽनुनासिको वा. झयो होऽन्यतरस्याम्, तोर्लि, मोऽनुस्वार अनुस्वारस्य ययि परसवर्णः शश्छोटि।
विसर्गसन्धिः - ससजुषोरुः खरवसानयोर्विसर्जनीयः विसर्जनीयस्य सः अतो रोरप्लुतादप्लुते, हशि च रो रि ढ्रलोपे पूर्वस्य दीर्घोऽणः।
3. **समासाः** - अव्ययीभावसमासः, तत् पुरुषः कर्मधारयः द्विगु द्वन्द्वः बहुव्रीहिः, एतेषां समासानां सामान्यपरिचय, पदानां समासः समासविग्रहश्च।
4. **प्रत्ययाः निम्नलिखितप्रत्ययाधारिताः प्रश्नाः-**

क्त, क्तवतु, शतृ, शानच् तुमुन्, तव्यत् अनीयर् ण्वुल् तृच् ण्यत् क्त्वा, ल्यप्, ल्युट् घञ्, क्यप्. यत् मतुप् तल् तरप् तमप्।
5. **शब्द-रूपाणि** -
राम, हरि, पति, सखि, गुरु, पितृ, भूभृत् गच्छत् आत्मन् रमा, मति, नदी, धेनु वधू स्त्री फल, वारि, मधु जगत्। अस्मद, युष्मद, सर्व तत् इदम्।
6. **धातुरूपाणि** - पंचलकारेषु लट्, लृट्, लोट्, लङ्, विधिलिङ् -
भू, इष् त्यज्, गम्, जि, दृश् नी पच् पा, लम्. वृत्, सेव् श्रु हन्, दा, जन्, नृत्. क्रुध् शक्. कृ. प्रच्छ् लिख्, नम्, चुर, कथ्।

7. **निम्नलिखिताव्ययपदसम्बन्धिसामान्य प्रश्नाः -**

अत्र, अद्य, इतः इत्थ, म् इदानीम्, शनैः, उच्चै, नमः, कथम् , , कदापि, किल, पुनः, यथा, तथा, खलु, धिक, प्रातः, चिरम्, किमर्थम्, कुतः, कदा।

8. **निम्नलिखितोपसर्गसम्बन्धिसामान्यप्रश्नाः -**

प्र, परा, अप, सम्, अनु, दुर, वि, आ, अति सु प्रति परि, उप निर्, अधि।

9. **उपर्युक्त पाठ्यक्रमाधारितवाक्यशुद्धिः संस्कृतेऽनुवादश्च।**

संस्कृतसाहित्येतिहास- सम्बन्धि - प्रश्नाः

10.निम्नलिखितानां महाकवीनाम् एव व्यक्तित्वकृतित्वसम्बन्धिसामान्यप्रश्नाः

(क) महाकाव्यकवयः -

वाल्मीकिः, अश्वघोषः, कालिदास, भारवि माघः, श्रीहर्षः

(ख) गद्यकाव्यकवयः -

दण्डी, सुबन्धु, बाणभट्टः, अम्बिकादत्तव्यास

(ग) नाट्यकवयः -

भासः कालिदास, भवभूतिः शूद्रकः, विशाखदत्तः

(घ) नीतिकवयः-

भर्तृहरिः, पं. विष्णुशर्मा, पं. नारायणपण्डितः

(ङ) अर्वाचीनकवयः -

देवर्षि कलानाथ शास्त्री भट्टमथुरा नाथ शास्त्री, पं. पद्म शास्त्री, डॉ. प्रभाकर शास्त्री, पं. सूर्यनारायणशास्त्री

(स्नातकस्तरः)

1. **निम्नलिखितानांसूत्राणांसामान्यपरिचयात्मकप्रश्नाःवाक्यप्रयोगाश्च-**

प्रातिपादिकार्थलिङ्ग-परिमाण -

वचनमात्रेप्रथमाकर्तुरीप्सिततमंकर्मअधिशीङ्स्थासांकर्म, अकथितं च, उपान्वध्याङ् यस अभितः परितः समयानिकषा हा प्रतियोगेऽपि कालाध्वनोरत्यन्तसंयोगे। साधकतमं करणम् कर्तृकरणयोस्तृतीया, अपवर्गे तृतीया, येनाङ्गविकार, सहयुक्तेऽप्रधाने। कर्मणा यमभिप्रति स संप्रदानम्, रुच्यर्थानां प्रीयमाणः क्रुधद्रुहेर्ष्यासूयार्थानां यं प्रति कोपः नमः स्वस्ति स्वाहास्वधाऽलंवषट् योगाच्च ध्रुवमपायेऽपादानम् मीत्रार्थानां भयहेतुः

- जनिकर्तुः प्रकृति, भुवः प्रभवः आधारोऽधिकरणम्, यतश्चनिर्धारणम् यस्य च भावेन भावलक्षणम् षष्ठीशेषे कर्तृकर्मणोः कृतिः।

2. **निम्नलिखितानां छन्दसां सामान्यपरिचयात्मक प्रश्नाः**

अनुष्टुप् आर्या, इन्द्रवज्रा, उपेन्द्रवज्रा उपजाति, वंशस्थम्, द्रुतविलम्बितम् भुजङ्गप्रयातम्. वसन्ततिलका, मालिनी, मन्दाक्रान्ता, शिखरिणी, शार्दूलविक्रीडितम्, सग्धरा।

3. **निम्नलिखितानाम् अलंकाराणां लक्षणोदाहरणसम्बन्धिसामान्यप्रश्नाः-**

अनुप्रासः यमकम् श्लेषः स्वभावोक्ति, उपमा, रूपकम् उत्प्रेक्षा, व्यतिरेकः सन्देह, भ्रान्तिमान् निदर्शना, दृष्टान्तः अर्थान्तरन्यासः दीपकम् तुल्ययोगिता

4. **निम्नलिखितसूक्तानां ग्रन्थानां च सामान्यप्रश्नाः -**

(क) इन्द्रसूक्तम् (2.12), पुरुषसूक्तम् (10.90), अग्निसूक्तम् (1.1) विष्णुसूक्तम् (1.154)

(ख) श्रीमद्भगवद्गीता (द्वितीयोऽध्यायः)

(ग) ईशोपनिषद्

5. भारतीयसंस्कृतिसम्बन्धिताः प्रश्नाः-

वर्णव्यवस्था, आश्रमव्यवस्था, षोडशसंस्काराः, पंचमहायज्ञाः

(शिक्षण - विषयः)

1. भाषाकौशलसम्बद्धाः प्रश्नाः

(क) पाठनकौशलाभिवृद्धिविषयका विधयः

(ख) लेखनकौशलाभिवृद्धिविषयका विधयः

2. अध्यापन - विधयः-

(क) व्याकरणशिक्षणम्

(ख) गद्यशिक्षणम्

(ग) पद्यशिक्षणम्

(घ) नाटकशिक्षणम्

3. अध्यापन कौशलम् -

(क) प्रस्तावना - प्रश्नाः

(ख) अन्वेषणप्रधानप्रश्नाः

15. ELECTRONICS

Subject: ELECTRONIC SCIENCE

UNIT-I

Introduction to Semiconductor, energy bands in solids, concept of effective mass, density of states, Fermi levels. PN Junction, Diode equation and diode equivalent circuit, Breakdown in diodes, Zener diode, Tunnel diode, Metal semiconductor junction – Ohmic and Schottky contacts, Characteristics and equivalent circuits of JFET, MOSFET. Low dimensional semiconductor devices – quantum wells, quantum wires, quantum dots. High Electron Mobility Transistor (HEMT), Solar cells – I-V characteristics, fill factor and efficiency, LED, LCD and flexible display devices.

Emerging materials for future Devices: Graphene, Carbon Nano tubes (CNT), ZnO, SiC etc.

UNIT-II

IC fabrication – crystal growth, epitaxy, oxidation, lithography, doping, etching, isolation methods, metallization, bonding, Thin film deposition and characterization Techniques: XRD, TEM, SEM, EDX, Thin film active and passive devices, MOS technology and VLSI, scaling of MOS devices, NMOS and CMOS structures and fabrication, Characteristics of MOS transistors and threshold voltage, NMOS and CMOS inverters, Charge-Coupled Device (CCD) – structure, charge storage and transfer, Basics of VLSI design, stick diagrams, Layout design rules.

UNIT-III

Superposition, Thevenin, Norton and Maximum Power Transfer Theorems, Network elements, Network graphs, Nodal and Mesh analysis. Laplace Transform, Fourier Transform and Z-transform. Time and frequency domain response, Passive filters, Two-port Network Parameters : Z, Y, ABCD and h parameters. Transfer functions, Signal representation, State variable method of circuit analysis, AC circuitanalysis, Transient analysis, Zero and Poles, Bode Plots.

Continuous time signals, Fourier Series and Fourier transform representations, Sampling theorem and applications, Discrete time signal, Discrete Fourier transform (DFT), Fast Fourier transform (FFT), Basic concepts of digital signal processing, digital filters – IIR, FIR.

UNIT – IV

Rectifiers, Voltage regulated ICs and regulated power supply, Biasing of Bipolar junction transistors and FETs, operating point and stability, Amplifiers, Classification of amplifiers, Concept of feedback, Hartley, Colpitt's and Phase Shift oscillators, Operational amplifiers (OPAMP) - characteristics, computational applications, comparators, Schmitt trigger, Instrumentation amplifiers, wave shaping circuits, Phase locked loops, Active filters, Multivibrators, Voltage to frequency convertors (V/F), frequency to voltage convertors (F/V).

UNIT-V

Logic Families, Logic Gates, Boolean algebra and minimization techniques, Combinational circuits, Programmable Logic Devices (PLD), CPLD, flip-flops, memories, Sequential Circuits: Counters – Ring, Ripple, Synchronous, Asynchronous, Shift registers, multiplexers and demultiplexers, A/D and D/A converters, Analysis and Design of fundamental mode state machines. State variables, State table and State diagram. Sequential PLD. FPGA. Analysis and Design of digital circuits using HDL.

UNIT-VI

Introduction of Microprocessor 8086: Architecture, Addressing modes, instruction set, interrupts, Programming, Memory and I/O interfacing.
Introduction of Microcontrollers – 8051 for embedded systems, Architecture and register set of Microcontroller 8051, Addressing modes, Instruction set of 8051 – Data transfer instructions, Arithmetic instructions, Logic instructions, bit level and byte level control transfer instructions, 8051 assembly programming – stack operations, subroutines, interrupts, 8051 programming as timer/counter, 8051 serial communication, 8051 interfacing RS232, LED/LCD display, Keyboard , Stepper motor.

UNIT-VII

Maxwell's equations and wave equations, Plane wave propagation in free space, dielectrics and conductors, Poynting theorem, Reflection and refraction, polarization, interference, coherence and diffraction, Transmission lines and waveguides – line equations, impedance, reflections and voltage standing wave ratio, rectangular waveguides. Antennas – retarded potential and Hertzian dipole, half wave antenna, antenna patterns, radiation intensity, gain, effective area and Friis's free space receiver power equation.

Microwave Sources and Devices -Reflex Klystron, Magnetron, TWT, Gunn diode, IMPATT diode. Crystal Detector and PIN diode.
Radar – block diagram of Radar, frequencies and power used, Radar range equation.

UNIT-VIII

Analog modulation and demodulation - AM, FM and PM, Principle of super heterodyne receiver, Random signals, noise, noise temperature and noise figure, Basic concepts of information theory, Error detection and correction. Digital modulation and demodulation – PCM, ASK, FSK, PSK, BPSK, QPSK and QAM, Time and Frequency-Division Multiplexing, Multiple Access techniques, Data Communications – Modems, Codes, Principles of Mobile and Satellite Communication, Optical communication, Optical sources - LED, spontaneous and stimulated emission, semiconductor Lasers, Detectors – PIN photodiodes, Avalanche photodiodes (APD), Optical fibers – attenuation and dispersion characteristics, Bandwidth, Wavelength division multiplexing. Fundamentals of Internet of Things (IoT) for communication.

UNIT-IX

Power devices – characteristics of SCR, DIAC, TRIAC, power transistors, Protection of thyristors againstover voltage and over current. SCR triggering - dv/dt and di/dt, triggering with single pulse and train of pulses, A.C. and D.C. motors - construction and speed control. Switched Mode Power Supply (SMPS). Uninterrupted Power Supply (UPS).

Open loop and closed loop control system, Block Diagram reduction techniques, transfer function and signal flow diagram, Stability criterion: Routh-Hurwitz and Nyquist plot, On-off controller, Proportional (P), Proportional-Integral (PI), Proportional-Derivative (PD), PID controllers.

UNIT – X

Transducers – Resistance, Inductance, Capacitance, Piezoelectric, Thermoelectric, Hall effect, Photoelectric, Measurement of displacement, velocity, acceleration, force, torque, strain, temperature, pressure, flow, humidity, thickness, pH. Measuring Equipment – Measurement of R, L and C, Bridge and Potentiometers, voltage, current, power, energy, frequency/time, phase, Digital Multimeters, CRO, Digital Storage Oscilloscope, Spectrum Analyzer., Biomedical Instruments – ECG, EEG, Blood PressureMeasurements, MEMS and its applications Sensors for IoT applications.

16. HOME SCIENCE

UNIT-I : FOOD SCIENCE AND FOOD SERVICE MANAGEMENT

Food science and nutrition, Properties of food – physical and chemical properties, Quality evaluation of foods- objectives and subjective.

Effects of cooking and processing techniques on nutritional components and other physical parameters, food preservation and application.

Perspectives of food service-menu planning, food cost analysis, Food service management of institutional level-hospital, educational institutions, social and special institutions

UNIT-II : NUTRITION AND DIETETICS

Food groups – balanced diet, food pyramid, macro and micro nutrition.

Nutrients-role of nutrients in the body, nutrient deficiencies and requirements for Indians. Public health nutrition

Community nutrition, sports nutrition, nutrition in emergencies and disasters.

Nutritional assessment-methods and techniques. Nutritional intervention-national nutrition policies and programmes, food and nutrition security.

Clinical and therapeutic nutrition. Diet counseling and management.

Unit-III : TEXTILES

Textile terminologies- fibre, yarn, weave, fabric etc., classification of fibers, yarns and weaves, Identification of fibres and weaves.

Manufacturing process of major natural and manmade fibres, properties and their end uses. Different methods of fabric construction-woven, knitted and non-woven fabrics, their properties and end uses. Textiles finishes-classification, processing and purposes of finishes. Dyeing and printing-classification.

Traditional textiles of India-embroidered textiles, printed textiles, woven textiles, dyed textiles of various regions in India.

Identification on the basis of fibre content, technique, motif, colour and designed. Textile Testing and quality control-need of testing, sampling method, techniques of testing fibres, yarn, fabrics and garments.

Textile and environment-banned dyes, eco-friendly textiles, contamination and effluent treatment, Eco-label and eco marks. Recent developments in textiles and apparels.

UNIT-IV : APPAREL DESIGNING

Body measurements-procedure, need, figure types and anthropometry. Equipment's and tools used for manufacturing garments-advancements and attachments used for sewing machine. Types of machines used and their parts. Elements and principles of design and its application to apparel. Illustrations and parts of garments.

Fashion-Terminologies, fashion cycle, fashion theories, fashion adoption, fashion forecasting and factors affecting fashion. Pattern making-drafting, draping and flat pattern making techniques, pattern alteration and dart manipulation techniques.

Apparel manufacturing-terminology used, seams, techniques and machines used, process of fabric to apparel manufacture.

UNIT-V : RESOURCE MANAGEMENT AND CONSUMER ISSUES

Management-concept, approaches, management of time, energy, money, space, motivating factors, motivation theories, decision making.

Functions of management-planning, supervision, controlling, organizing, evaluation, family life cycle-stages, availability and use of resources.

Management of natural resources-land, forest, water, air, water harvesting, municipal solid waste management, concept of sustainable development, SDGs.

Money management-family income, types, supplementation, budgeting, household accounts, family savings and investment, tax implications.

Human resource management- functions, need, human resource development challenges, functions, manpower planning, training need assessment, training methodologies, training evaluation.

Consumer-definition, role, rights and responsibilities, consumer behavior, consumer problems, education and empowerment. Consumer protection- consumer organization, cooperatives, alternative redressal, standardization, standard marks, quality control, buying aids, consumer legislation.

Entrepreneurship-concept, process, barriers, entrepreneurial motivation, challenges, enterprise setting, project planning and appraisal, enterprise management.

UNIT-VI : HOUSING AND INTERIOR DESIGN

Design fundamentals – elements of art, principles of design, principles of composition. Colour - dimensions of colour, psychological effects of colour, colour schemes, factors affecting use of colour.

Space planning and design-housing need and important, principles of planning spaces, types of house plans, economy in construction, planning for different income groups.

Housing and environment- building materials- impact on environment, green rating systems, energy efficiency in buildings, energy auditing, indices of indoor comfort.

Energy as a resource- conventional and non- conventional sources, renewable /non renewable energy, energy management, national efforts on energy conservation.

Product design - design thinking process, diffusion and innovation, design communication, ergonomic considerations.

Ergonomics - significance, scope, anthropometry, man, machine, environment relationship, factors affecting physiological cost of work, body mechanics, functional design of work place, time and motion study, energy studies.

Furniture and furnishing - historical perspectives, architectural styles, contemporary tends, wall finishes, window and window treatments.

UNIT-VII : CHILD/HUMAN DEVELOPMENT

Principles of growth and development, care during pregnancy and pre-natal and neonatal development.

Theories of human development and behaviour, Early childhood care and education – activities to promote holistic development, Influence of family, peers, school, community and culture on personality development.

Children and persons with special needs, care and support, special education, prevention of disabilities, rehabilitation.

Adolescence and youth: changes, challenges and programs to promote optimal development. Adulthood, characteristics, changing roles and responsibilities in early and middle adulthood. Aging-physical and psychological changes and care needs.

UNIT-VIII : FAMILY STUDIES

Dynamics of marriage and family relationships, Family welfare-approaches, programmes and challenges, role in national development.

Domestic violence, marital disharmony, conflict, resolution of conflict, Parent education, positive parenting, community education, Family disorganization, single parent families.

Human rights, rights of children, rights of women, status of women, gender roles, Guidance and counseling- across life span and for care givers.

Health and well being across life span development.

UNIT-IX : COMMUNICATION FOR DEVELOPMENT

Basics of communication- nature, characteristics, functions, process, models, elements, principles, barriers, perception, persuasion and empathy, types of communication, levels (settings) of communication transactions, process of listening.

Communication systems and communication theories- human interaction theories, mass communication theories, message design theories, communication systems, culture and communication.

Concept of development- communication models and approaches, diffusion and innovation, mass media, social marketing.

Role of communication in development- need and importance, development journalism, writing for development-print, radio, television and internet.

Advocacy and behavior change communication- concept, theories, models, approaches, application and challenges.

Traditional, modern and new media for development - folk forms of songs, art, dance, theatre, puppetry, advertisement, cinema, ICTs for development-community radio, participatory video, social media and mobile phones.

UNIT-X : EXTENSION MANAGEMENT AND COMMUNITY DEVELOPMENT

Historical perspectives of extension–genesis of extension education and extension systems in India and other countries, objectives of extension education and extension service, philosophy and principles of extension programme development.

Programme management- need assessment, situation analysis, planning, organization, implementation, monitoring and evaluation.

Extension methods and materials- interpersonal, small and large group methods, audiovisual aids-need, importance, planning, classification, preparation and field testing, use and evaluation of audio-visual materials.

Curriculum development and planning for extension education and development activities, Bloom's taxonomy of educational objectives and learning.

Non-Formal, adult and lifelong education-historical perspectives, concept, theories, approaches, scope, methods and materials used, challenges of implementation and evaluation, issues to be addressed.

Training, skill development and capacity building for human resource development methods of training, entrepreneurship development.

Community development- perspectives, approaches, community organization, leadership, support structures for community development, Panchyati raj institutions, NGOs and community based organisations.

People's participation and stakeholders' perspectives, Participatory Learning and Action-methods and techniques, Development programmes in India for urban, rural and tribal population groups programmes for nutrition, health, education, wage and self-employment, women's development, skill development, sanitation and infrastructure.

13. PHYSICAL EDUCATION

Unit -I:

Physical education and adapted physical education, their objectives Philosophies of education as applied to physical education Recreation- its principles, characteristics and importance.

Modern trends in recreation. Indoor and outdoor recreational programmes. Recreational programmes for various categories of people Social aspects of sports- sports as a socializing agency, social values , sports leadership, sports as cultural heritage and social aspects of competition.

Unit -II:

Exercise physiology its scope and importance in the field of physical education and sports.

Cardio respiratory adaptations to long and short term physical activities.

Women in sports- trainability. Physiological gender differences and special problems of women athletes.

Aging - Physiological consequences, life style management and healthful aging. Physiological responses of various therapeutic modalities and rehabilitation. Physiological aspects of various Ergogenic aids. Massage manipulations and their physiological responses.

Unit- III:

Kinesiology and biomechanics. Modern trends in biomechanics. Planes and Axes of human body. Joints and their movements.

Muscle attachments - Origin, insertion, action and leverage of the principal muscles used in sports. Motion: its laws and their application in sports. Projectile and principles of projections

Unit – IV:

Sports psychology- its importance in the field of physical education and sports. Motivation in sports- types, theories and dynamics. Psychological factors affecting sports performance- Emotions, Anxiety aggression, stress ,self confidence, concentration ,

mental practice and goal setting. Personality- Theories of personality, measurement of personality. 4 Group dynamics, Group cohesion and leadership in sports

Unit -V:

Development of teacher education for physical education in India. Recent Government policies for promoting physical education and sports in India.

Hierarchy of organizational set-up in physical education at schools, colleges and university level.

Role of public & private sectors in the promotion of physical education and sports in the country.

Unit -VI:

Health- its objectives and spectrum. Health education, its importance and principles . Role of genetics and environment in achieving health.

Health-related physical fitness. Community health programme- Health appraisal & health instructions.

International and national health promoting government & private agencies. School Health programme and personal hygiene. Communicable diseases: causes, symptoms, prevention through other means and Immunization.

Unit -VII :

Sports training- its characteristics and principles. Training load, its features, principles and adaptation process. Means and methods of executing training load. Overload, its Causes, symptoms and remedial measures.

Periodization- its importance, objectives and types of periodization. Concept of different periods - Preparatory, competition and transitional.

Types of Competition: Talent identification- process and procedure.

Unit -VIII:

Research in physical education- its importance and classification. Ethical issues in research.

Preparation of research proposal, report, abstract, paper for publication and paper for presentation.

Unit - IX:

Test, measurement and evaluation -their types and importance in physical education and sports. Principles and processes of evaluation in physical education.

Types of tests and construction of standard knowledge and skill tests. Tests for fitness- Physical fitness, motor fitness, motor ability and motor educability.

Health related fitness tests. Test for fitness components- strength, endurance, speed, flexibility and coordinative abilities. Sports skill tests- Badminton, Basketball, Football, Hockey, Tennis, and Volleyball

Testing of physiological phenomenon- Blood pressure, breathing frequency vital capacity, heart rate, pulse rate, body temperature and body composition.

Tests for psychological variables- Anxiety, aggression, team cohesion, achievement motivation, mental-toughness, and self-efficacy.

Unit - X:

Management- its principles and theories. Scope of management in physical education and sports. Guiding principles for organizing physical education & sports programmes in institutions.

Role of sports manager- interpersonal, informational and decision making. Managerial skills – technical, human and conceptual. Qualities and qualification of sports manager.

Event management- its principles, planning, check list, rehearsal, itinerary, execution, reporting and follow-up procedures of an event.

Public relation- principles of public relations in physical education and sports. Mass Media- communication and publicity, qualifications of Public relation officer.

ANNIXURE-II

TIRUMALA TIRUPATI DEVASTHANAMS,TIRUPATI

SCHEME AND SYLLABUS FOR RECRUITMENT TO THE POST OF JUNIOR LECTURERS IN TTD JR. COLLEGES

(As per G.O.Ms.No.141, Finance (HR-I,Plg & Policy)Department, dt:01.08.2016)

Written 'Examination (Objective Type)			
Papers	***No.of Questions***	***Duration (Minutes)***	***Maximum Marks***
Paper-1: General Studies & Mental Ability **(Degree Standard)**	150	150	150
Paper-2: Concerned Subject (One only) **(P.G. standard)**	150	150	300
TOTAL			450
NEGATIVE MARKS: As per G.O. Ms. No.235 Finance (HR-I, Plg & Policy) Dept., Dt.06/12/2016, for each wrong answer will be penalized with 1/3rd of the marks prescribed for the question.			

1. The Candidates have to write Paper-2 examination in the subject studied at PG Level **One** from the following:-

Subject Code	Name of the Subject
01	Botany
02	Chemistry
03	Civics
04	Commerce
05	English
06	Hindi
07	History

Subject Code	Name of the Subject
08	Mathematics
09	Physics
10	Telugu
11	Zoology

SYLLABUS
PAPER-1
GENERAL STUDIES AND MENTAL ABILITY

1. Major Current Events and Issues pertaining to International, National and State of Andhra Pradesh.
2. General Science and its applications to the day to day life Contemporary developments in Science & Technology and Information Technology.
3. History of India - emphasis will be on broad general understanding of the subject in its social, economic, cultural and political aspects with a focus on AP and Indian National Movement.
4. Geography of India with focus on Andhra Pradesh.
5. Indian polity and Governance: constitutional issues, public policy, reforms and e-Governance initiatives.
6. Indian Economy and planning
7. Sustainable Development and Environmental Protection
8. Disaster management: vulnerability profile, prevention and mitigation strategies, Application of Remote Sensing and GIS in the assessment of Disaster
9. Logical reasoning, analytical ability and logical interpretation.
10. Data Analysis: Tabulation of data Visual representation of data Basic dataanalysis (Summary Statistics such as mean, median, mode and variance)and Interpretation.

PAPER-2 – (CONCERNED SUBJECT)

1. BOTANY

CELL AND MOLECULAR BIOLOGY OF PLANTS

Cell Wall : Structure and functions, biogenesis, growth.

Plasma membrane : Structure, models and functions : Sites for ATPases, Ion carriers, Channels and pumps, Receptors.

Plasmodesmata : Structure, Role in movement of molecules and macromolecules, Comparison with gap junctions.

Chloroplast : Structure, genome organization, gene expression, RNA editing, nucleo-chloroplastic interactions.

Mithochondria : Structure, genome organization, Biogenesis.

Plant Vacuoles : Tonoplast membrane, ATPases, transporters, as storage organelle.

Nucleus : Structure, nuclear pores, nucleosome organization, DNA structure : A, B and Z forms, replication, damage and repair, transcription, Plant promoters and transcription factors, splicing mRNA transport, nucleolus, rRNA biosynthesis.

Ribosomes : Structure, site of protein synthesis, mechanism of translation, initiation, elongation and termination; structure and role of tRNA.

Protein sorting : Targeting of proteins to organelles.

Cell shape and motility : The cytoskeleton; organization and role of microtubules and microfilaments; motor movements; implications in flagellar and other movements.

Cell cycle and apoptosis : Control mechanisms; role of cyclins and cyclin dependent kinases; retinoblastoma and E2F proteins; cytokinesis and cell plate formation; mechanisms of programmed cell death.

Other cellular organelles : Structure and functions of microbodies, Golgi apparatus, lysosomes, endo plasmic reticulum.

Techniques in cell biology : Immuno techniques; in situ hybridization, FISH, GISH; confocal microscopy.

CYTOLOGY, GENETICS AND CYTOGENETICS

Chromatin organization : Chromosome structure and Packaging of DNA, molecular organization of centromere and telomere; nucleolus and ribosomal RNA genes ; euchromatin and heterochromatin ; karyotype analysis ; banding patterns ; specialized types of chromosomes ; polytene, lampbrush, B-chromosomes and sex chromosomes ; molecular basis of chromosome pairing.

Structural and numerical alterations in chromosomes : Duplication, deficiency, inversion and translocation ; autopolyploids ; allopolyploids ; evolution of major crop plants.

Genetics of prokaryotes and eukaryotic organelles : genetic recombination in phage ; genetic transformation, conjugation and transduction in bacteria ; genetics of mitochondria and chloroplasts cytoplasmic male sterility.

Gene structure and expression : Genetic fine structure ; cis – trans test ; Benzer's experiment; introns and their significance ; RNA splicing ; regulation of gene expression in prokaryotes and eukaryotes.

Genetic recombination and genetic mapping : Recombination ; independent assortment and crossing over ; molecular mechanism of recombination ; role of RecA and RecBCD enzymes ; site-specific recombination ; chromosome mapping, linkage groups, genetic markers, construction molecular maps.

Mutations : Spontaneous and induced mutations ; physical and chemical mutagens ; molecular basis of gene mutations ; transposable elements in prokaryotes and eukaryotes ; mutations induced transposons ; site-directed mutagenesis ; DNA damage and repair mechanisms.

Plant Breeding : Principles and methods of plant breeding ; Marker assisted breeding.

Biostatistics : Mean, Variance, Standard deviation, Standard error, Student't' test, chi-square and ANOVA.

Molecular cytogenetic : Nuclear DNA content; C-value paradox; cot curve and its significance; restriction mapping – concept and techniques ; multigene families and their evolution.

BIOLOGY AND DIVERSITY OF LOWEER PLANTS : CRYPTOGAMS

Microbiological techniques : Pure culture, enrichment and anaerobic culture.

Importance of microorganisms : Microbes in medicine, agriculture and environment.

Microbial growth : Nutritional requirements of microorganisms and methods to measure growth.

Microbial Ecology : Genetrification ; phosphorous solubilization ; nitrogen fixation

Phycology : Thallus organization ; cell ultra structure ; reproduction (vegetative, sexual, asexual) ; criteria for classification of algae : pigments, reserve food, flagella ; classification, salient features of Chlorophyta, Charophyta, Xanthophyta, Bacillariophyta, Phaeophyta and Rhodophyta ; algal blooms, algal biofertilizers ; algae as food, feed and uses in industry.

Mycology : General characters of fungi ; substrate relationship in fungi ; cell ultrastructure ; unicellular and multicellular organization ; cell wall composition ; nutrition (saprobic, biotropic, symbiotic) ; reproduction (vegetative, asexual, sexual) ; heterothallism ; heterokaryosis parasexuality ; Molecular aspects in classification.

General account of Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina ; fungi in industry, medicine and as food ; fungal diseases in plants and humans ; Mycorrhizae ; fungi as biocontrol agents.

Bryophyta : Morphology, structure, reproduction and life history ; distribution ; classification, general account of Marchantiales, Junger maniales, Anthoceratales, Sphagnales, Funariales and Polytrcales ; economic and ecological importance.

Pteridophyta : Morphology, anatomy and reproduction ; classification ; evolution of stele ; heterospory and origin of seed habit; general account of fossil pteriodophyta ; introduction to Psilo psida, Lycopsida, Sphenopsida and Pteropsida.

TAXONOMY AND DIVERSITY OF SEED PLANTS

Introduction and classification of Gymnosperms

Structure and reproduction in Cycadales, Ginkgoales, Coniferales, Ephedrales, Welwitschiales and Gnetales.

The species concept: Taxonomic hierarchy, species, genus, family and other categories ; principles used in assessing relationship, delimitation of taxa and attribution of rank.

Salient features of the International Code of Botanical nomenclature.

Taxonomic tools : Herbarium ; floras ; histological, cytological, phytochemical, serological, biochemical and molecular techniques ; computers and GIS.

Systems of angiosperm classification : Phenetic versus phylogenetic systems ; cladistics in taxonomy ; relative merits and demerits of major systems of classification.

Concepts of phytogeography : Endemism, hotspots; plant explorations; invasions and introductions.

PLANT PHYSIOLOGY AND METABOLISM

Energy flow : Principles of thermodynamics, free energy and chemical potential, redox reactions, structure and functions of ATP.

Fundamentals of enzymology : General aspects, allosteric mechanism, regulatory and active sites, isoenzymes, kinetics of enzymatic catalysis, Michaelis – Menton equation and its significance.

Membrane transport and translocation of water and solutes : Plant water relations, mechanism of water transport through xylem, passive and active solute transport, membrane transport proteins.

Signal transduction: Receptors and G-proteins, phospholipid signaling, role of cyclic nucleotides, calcium calmodulin cascade, diversity in protein kinases and phosphatases.

Photochemistry and photosynthesis : Photosynthetic pigments and light harvesting complexes, photo oxidation of water, mechanisms of electron and proton transport, carbon assimilation – the Calvin cycle, photorespiration and its significance, the C_4 cycle, the CAM pathway, biosynthesis of starch and sucrose.

Respiration and lipid metabolism : Glycolysis, the TCA cycle, electron transport and ATP synthesis, pentose phosphate pathway, glyoxylate cycle, alternative oxidase system, structure and function of lipids, fatty acid biosynthesis, synthesis of membrane lipids, structural lipids and storage lipids and their catabolism.

Nitrogen fixation and metabolism : Biological nitrogen fixation, nodule formation and nod factors, mechanism of nitrate uptake and reduction, ammonium assimilation.

Photobiology : Photochromes and cryptochromes, photophysiology of light –induce responses, cellular localization.

Plant growth regulators and elicitors : Physiological effects and mechanism of action of auxins, gibberellins, cytokinins, ethylene, abscisic acid, brassinosteroids, polymines, jasmonic acid and salicyclic acid.

The flowering process : Photoperiodism, endogenous clock and its regulation, floral induction and development – genetic and molecular analysis, role of vernalization.

Stress physiology : Plant responses to biotic and abiotic stress; mechanisms of biotic and abiotic stress tolerance, HR and SAR, water deficit and drought resistance, salinity stress, metal toxicity, freezing and heat stress, oxidative stress.

Coping with biotic stress : Chemical control, Biological control, IPM

PLANT DEVELOPMENT AND REPRODUCTION

Shoot development : Organization of the shoot apical meristem (SAM); control of cell division and cell to cell communication; control of tissue differentiation especially xylem and phloem ; secretory ducts and laticifers.

Phyllotaxy and leaf differentiation

Root development : Organization of root apical meristem (RAM); cell fates and lineages; vascular tissue differentiation; homeotic muntants in Arabidopsis and Antirrhinum, sex determination.

Male gametophyte: Structure of anthers; microsporogenesis, role of tapetum; pollen development and gene expression; male sterility; sperm dimorphism and hybrid seed production; pollen germination, pollen tube growth and guidance ; pollen storage ; pollen allergy, pollen embryos.

Female gametophyte: Ovule development; megasporogenesis; organization of the embryo sac, structure of the embryo sac cells.

Pollination, pollen – pistil interaction and fertilization : Floral characteristics, pollination mechanisms and vectors; self-incompatibility; double fertilization.

Seed development and fruit growth: Endosperm development during early, maturation and desiccation stages; embryogenesis, cell lineages during late embryo development; storage

proteins of endosperm and embryo; polyembryony; apomixes; embryo culture; fruit maturation.

Dormancy: Seed dormancy; overcoming seed dormancy; bud dormancy.

Senescence and programmed cell death (PCD): Types of cell death, PCD in the life cycle of plants, metabolic changes associated with senescence and its regulation; influence of hormones and environmental factors on senescence.

PLANT ECOLOGY

Climate, soil and vegetation patterns of the world: Life zones; major biomes and major vegetation and sol types of the world.

Vegetation organization: Concepts of community and continuum ; analysis of communities(analytical and synthetic characters)

Ecological succession: Hydrosere and xerosere.

Ecosystem organization: Structure and functions; primary production (methods of measurement, global pattern, controlling factors); energy dynamics (trophic organization, energy flow Pathways, ecological efficiencies); litter fall and decomposition (mechanism, substrate quality land climatic factors); global biogeochemical cycles of C,N,P and S; mineral cycles (pathways, processes, budgets) in terrestrial and aquatic ecosystems.

Biological diversity: Concept and levels; role of biodiversity in ecosystem functions and stability ; speciation and extinction; IUCN categories of threat; distribution and global patterns, terrestrial biodiversity hot spots; inventory.

Air, water and soil pollution: Kinds, sources, quality parameters; effects on plants ecosystems.

Climate change: Green house gases (CO_2, CH_4, N_2O, CFCs: sources, trends and role); ozone layer and ozone hole ; consequences of climate change (CO_2 fertilization, global warming, sea level rise, UV radiation).

Ecosystem stability : Concept (resistance and resilience); ecological perturbations (natural and anthropogenic) and their impact on plants and ecosystems ; ecology of plant invasion ; environmental impact assessment ; ecosystem restoration.

Ecological management : Concepts; sustainable development; sustainability indicators.

PLANT RESOURCE UTILIZATION AND CONSERVATION

Plant Biodiversity and sustainable development

Origin, evolution, botany, cultivation and uses of (i) Food forage and fodder crops (ii) fibre crops (iii) medicinal and aromatic plants and (iv) vegetable oil-yielding crops. Ethnobotany

Important fire-wood and timber – yielding plants and non-wood forest products (NWFPs) such as bamboos, rattans, raw materials for paper-making, gums, tannins, dyes, resins and fruits.

Green revolution : Benefits and adverse consequences.

Plants used as avenue trees for shade, pollution control and aesthetics.

Principles of conservation; extinctions; environmental status of plants based on International Union for Conservation of Nature.

Strategies for conservation – in situ conservation : International efforts and Indian initiatives ; protected areas in India - sanctuaries, national parks, biosphere reserves, wetlands, mangroves and coral reefs for conservation of wild biodiversity.

Strategies for conservation – ex situ conservation : Principles and practices; botanical gardens, field gene banks, seed banks, in vitro repositories, cryobanks; general account of the activities of Botanical Survey of India (BSI), National Bureau of Plant Genetic Resources (NBPGR), Indian Council of Agricultural Research (ICAR), Council of Scientific and Industrial Research (CSIR) and the Department of Biotechnology (DBT) for conservation, non-formal conservation efforts.

BIOTECHNOLOGY AND GENETIC ENGINEERING OF PLANTS AND MICROBES

Plant Biotechnology – Principles, scope and applications.

Plant cell and tissue culture : General introduction, scope, cellular differentiation, and totipotency.

Organogenesis and adventives embryogenesis : Morphogenesis; somatic embryogenesis.

Somatic hybridization : Protoplast isolation, fusion and culture.

Applications of plant tissue culture : Clonal propagation, artificial seed, production of hybrids and soma clones, production of secondary metabolites / natural products, cryopreservation and germplasm storage.

Recombinant DNA technology : Gene cloning principles and techniques, genomic / c DNA libraries, vectors, DNA synthesis and sequencing, polymerase chain reaction, DNA fingerprinting and DNA markers.

Genetic engineering of plants : Transgenic plants, Methods of gene transfer – *Agrobacterium* – medicated and microprojectile, chloroplast transformation, intellectual property rights, ecological risks and ethical concerns.

Microbial genetic manipulation : Bacterial transformation, selection of recombinants and transformants, genetic improvement of industrial microbes.

Genomics and proteomics : High throughput sequencing, genome projects, bioinformatics, functional genomics, microarrays.

2. CHEMISTRY

INORGANIC CHEMISTRY

1. Atomic structure and chemical bonding – structure and bonding in homo and hetero nuclear molecules. Applications of VSEPR, Valence Bond and Molecular orbital theories in explaining the structures of simple molecules.

2. Transition elements and coordination compounds – physical and chemical characteristics of transition elements – Bonding theories – crystal field theory – crystal field splitting patterns in various geometries. Calculation of CFSE – Jahn-Teller effect – Application of MO theory to octahedral and square planar complexes – Electronic spectra of complexes – Russell Saunders coupling – term symbols – spectra of octahedral and tetrahedral complexes – charge transfer spectra – magnetic properties of complex compounds.

3. Metal - ligand equilibria in solution – step wise and overall stability constants – factors affecting the stability of metal complexes – Pearson's theory of hard and soft acids and bases (HSAB) – Chelate effect.

4. Reaction mechanisms in complexes - Inert and level complexes - Ligand substitution reactions of octahedral complexes - Acid hydrolysis, base hydrolysis - conjugate base mechanism - Anation reactions – substitution reactions of square planar complexes – Trans effect – Electron transfer reactions - Inner and outer sphere mechanisms.

5. Metal complexes - EAN rule – structure and bonding of metal carbonyls of Mn, Fe, Co and Ni – Metal nitrosyls – structure and bonding.

6. Cages and ring compounds – preparation, structure and reactions of boranes and carboranes – Boron-nitrogen and Sulfur-nitrogen cyclic compounds.

7. Metal clusters – factors favoring M-M bonds – Structure and bonding in $Re_2Cl_8^{2-}$, $Mo_6Cl_8^{4+}$, $Nb_6X_{12}^{2+}$, Re_3Cl_9 and $Re_3Cl_{12}^{3-}$.

8. Bio-inorganic chemistry – metal complexes as oxygen carriers – hemoglobin and myoglobin – oxygen transport – non heme proteins – hemerythrin and hemocyanin.

9. Analytical chemistry – chromatography – general principles involved in separations by paper, thin layer and column chromatography – GC and HPLC.

Physical Chemistry

1. Thermodynamics

Brief review of concepts of I and II laws of thermodynamics. Concept of entropy. Entropy as a state function. Calculation of entropy changes in various processes. Entropy changes in an ideal gas. Entropy changes on mixing of ideal gases. Entropy as a function of V and T. Entropy as a function of P and T. Entropy change in isolated systems- Clausius inequality. Entropy change as criterion for spontaneity and equilibrium.

Third law of thermodynamics. Evaluation of absolute entropies from heat capacity data for solids, liquids and gases. Standard entropies and entropy changes of chemical reactions. Helmholtz and Gibbs free energies (A and G). A and G as a criteria for equilibrium and spontaneity. Physical significance of A and G. Driving force for chemical reactions- relative signs of ΔH and ΔS.

Thermodynamic relations. Gibbs equations. Maxwell relations. Temperature dependence of G. Gibbs- Helmholtz equation. Pressure dependence of G.

Chemical potential: Gibbs equations for non-equilibrium systems. Material equilibrium. Phase equilibium. Clapeyron equation and Clausius-Clapeyron equation .

Conditions for equilibrium in a closed system. Chemical potential of ideal gases. Ideal-gas reaction equlibrium-derivation of equilibrium constant. Temperature dependence of equilibrium constant-the van't Hoff equation.

Solutions: Specifiying the Solution composition. Partial molar poperties-significance. Relation between solution volume and partial molar volume. Measurement of partial molar volumes- slope and intercept methods. The chemical potential. Variation of chemical potential with T and P. Gibbs-Duhem equation-derivation and significance

Ideal solutions. Thermodynamic properties of ideal solutions. Mixing quantities. Vapour pressure-Raoult's law. Thermodynamic properties of ideally dilute solutions. Vapour pressure- Henry's law.

Nonideal systems. Concept of fugacity, fugacity coefficeient. Determination of fugacity. Non ideal solutions. Activities and activity coefficients. Standard-state conventions for non ideal solutions. Determination of activity coefficients from vapour pressure measurements. Activity coefficients of nonvolatile solutes using Gibbs-Duhem equation.

Multicomponent phase equilibrium: Vapour pressure lowering, freezing point depression and boiling point elevation

2. Statistical Thermodynamics

Concepts of distribution and probability. Estimation of probability and the most probable distribution. Systems composed of noninteracting particles. Derivation of Boltzmann distribution law.

The molecular partition function. Systems composed of interacting particles. The concept of ensemble and canonical ensemble. Canonical partition function and its relation to molecular partition function. The factorization of molecular partition function – translational, rotational, vibrational and electronic partition functions. Derivation of expressions for translational, rotational (diatomic) and vibrational partition functions. Relationship between partition functions and thermodynamic functions.

The relationship between partition functions and thermodynamic functions. Specific heats of solids – Einstein equation of heat capacity of solids – derivation. Explanation of heat capacity at very low and very high temperatures – Dulong and Petits Law. Debye theory.

The entropy of a monoatomic ideal gas. The Sackur-Tetrode equation- derivation. Mean translational and vibrational energies.

3. Electrochemistry

Electrochemical Cells : Derivation of Nernst equation – problems. Chemical and concentration cells (with and without transference). Liquid junction potential - derivation of the expression for LJP – its determination and elimination. Applications of EMF measurements : Solubility product, potentiometric titrations, determination of transport numbers, equilibrium constant measurements. Decomposition potential and its significance. Electrode polarization – its causes and elimination. Concentration overpotential.

Concept of activity and activity coefficients in electrolytic solutions. The mean ionic activity coefficient. Debye-Huckel theory of electrolytic solutions. Debye-Huckel limiting law (derivation not required). Calculation of mean ionic activity coefficient. Limitations of Debye-Huckel theory. Extended Debye-Huckel law.

Theory of electrolytic conductance. Derivation of Debye-Huckel-Onsager equation – its validity and limitations.

Concept of ion association – Bjerrum theory of ion association (elementary treatment) - ion association constant - Debye-Huckel-Bjerrum equation.

4. QUANTUM CHEMISTRY

Black body radiation-Planck's concept of quantization-Planck's equation, average energy of an oscillator (derivation not required). Wave particle duality and uncertain principle-significance of these for microscopic entities. Emergence of quantum mechanics. Wave mechanics and Schroedinger wave equation.

Operators-operator algebra. Commutation of operators, linear operators.Complex functions.

Hermitian operators. Operators ∇ and ∇^2 . Eigenfunctions and eigenvalues. Degeneracy. Linear combination of eigenfunctions of an operator. Well behaved functions. Normalized and orthogonal functions.

Postulates of quantum mechanics. Physical interpretation of wave function. Observables and operators. Measurability of operators. Average values of observables. The time dependent Schrodinger equation. Separation of variables and the time-independent Schrodinger equation..

Theorems of quantum mechanics. Real nature of the eigen values of a Hermitian operator-significance. Orthogonal nature of the eigen values of a Hermitian operator-significance of orthogonality. Expansion of a function in terms of eigenvalues. Eigen functions of commuting operators-significance. Simultaneous measurement of properties and the uncertainty principle.

Particle in a box- one dimensional and three dimensional. Plots of ψ and ψ^2-discussion. Degeneracy of energy levels. Comparison of classical and quantum mechanical particles. Calculations using wave functions of the particle in a box-orthoganality, measurability of energy, position and momentum, average values and probabilities. Application to the spectra of conjugated molecules.

Cartesian, Polar and spherical polar coordinates and their interrelations

Schrodinger equation for the hydrogen atom- separation into three equations. Hydrogen like wave functions. Radial and angular functions. Quantum numbers n, l and m and their importance. The radial distribution functions. Hydrogen like orbitals and their representation. Polar plots, contour plots and boundary diagrams.

Many electron systems. Approximate methods. The variation method-variation theorem and its proof. Trial variation function and variation integral. Examples of variational calculations. Paricle in a box. Construction of trial function by the method of linear combinations. Variation parameters. Secular equations and secular determinant..

Bonding in molecules. Molecular orbital theory-basic ideas. Construction of MOs by LCAO , H_2^+ ion. The variationan integral for H_2^+ ion. Detailed calculation of Wave functions and energies for the bonding and antibonding MOs. Physical picture of bonding and antibonding wave functions. Energy diagram. The MO and VB wave functions for H_2 molecule and their comparision

5. Chemical Kinetics

Theories of reaction rates : Collision theory, steric factor. Tranition state theory. Reaction coordinate, activated complex and the transition state. Thermodynamic formulation of transition state theory. Unimolecular reactions and Lindamann's theory.

Complex reactions- Opposing reactions, parallel reactions and consecutive reactions(all first order type). Chain reactions-general characteristics, steady state treatment. Example- H_2-Br_2 reaction. Derivation of rate law.

Effect of structure on reactivity- Linear free energy relationships. Hammett and Taft equations-substituent(σ and σ^*) and reaction constant (ρ and ρ^*)with examples.

Factors affecting reaction rates in solution. Diffusion controlledr eactions. Influence of dielectric constant and ionic strength on ion-ion, ion-dipole and dipole-dipole reactions. Primary and secondary salt effects. Kinetic isotope effects: Primary and secondary isotope effects. Solvent isotope effects.

Enzyme catalysis: Chemical catalysis and enzyme catalysis – distinction – energy considerations and rate accelerations – examples.

Michaelis-Menten mechanisms of enzyme catalyzed reactions involving one and two intermediates. Steady-sate approximation. Derivation of kinetic equations. Evaluation of kinetic parameters. Enzyme-substrate complex: Fischer's lock and key and Koshland's induced fit hypotheses. Specificity of enzyme-catalyzed reactions. Discussion of the various types of forces involved in the formation of E-S complex. pH dependence of enzyme-catalyzed reactions – the kinetics and the equations involved.

6. Photochemistry

Electronic transitions in molecules. The Franck Condon principle. Electronically excited molecules-singlet and triplet states. Radiative life times of excited states-theoretical treatment. Measured lifetimes. Quantum yield and its determination. Actinomety-ferrioxalate and uranyl oxalate actinometers-problems.

Derivation of fluorescence and phosphorescence quantum yields. E-type delayed fluorescence-evaluation of triplet energy splitting(ΔE_{ST}). Photophysical processes-photophysical kinetics of unimolecular reactions. Calculation of rate constants of various photophysical processes-problems, State diagrams

Photochemical primary processes. Types of photochemical reactions- electron transfer, photodissociation, addition, abstraction, oxidation and isomerization reactions with examples. Effect of light intensity on the rates of photochemical reactions. Photosensitization. Quenching-Stern Volmer equation. Experimental set up of a photochemical reaction. Introduction to fast reactions- Principle of flash photolysis

7. Solid state chemistry

Magnetic properties of solids- classification of magnetic materials, Magnetic susceptibility, Langevin diamagnetism, Weiss theory of para magnetism Electronic properties of metals,

insulators and semi conductors: Electronic structure of solids, Band theory, band structure of metals, insulators and semiconductors. Electrons, holes and Excitons. The temperature dependence of conductivity of extrinsic semi conductors. Photo conductivity and photovoltaic effect-p-n junctions.

Superconductivity. Occurrence of superconductivity. Destruction of superconductivity by magnetic fields-Meisner effect. Types of superconductors. Theories of super conductivity- BCS theory.

ORGANIC CHEMISTRY

1. IUPAC nomenclature of organic molecules including structural, positional, functional, regio- and stereoisomers.
2. Molecular representations: Wedge, Fischer, Newman and Saw-horse formulae, their description and interconversions. Stereoisomers-classification-configuration –R,S-nomenclature- Criteria for Chirality. Axially chiral allenes, spiranes, alkylidene cycloalkanes, chiral biaryls, atropisomerism. Planar chiral ansa compounds and trans- cyclooctene. Helically chiral compounds, Determination of absolute configuration by chemical correlation methods. Determination of configuration in E,Z-nomenclature: Spectral and Chemical methods of configuration determination of E,Z isomers. Determination of configuration in aldoximes and ketoximes.
3. Nature of Bonding in Organic Molecules and Aromaticity, Delocalized chemical bonding-conjugation, cross conjugation, resonance, hyperconjugation, tautomerism, Huckle's rule and the concept of aromaticity, aromaticity in benzenoid and non-benzenoid compounds, alternant and non-alternant hydrocarbons, metallocenes- Ferrocene, Azulenes, Fulvenes, Annulenes, anti-aromaticity, pseudo-aromaticity, homo-aromaticity.
4. Reactive intermediates and Molecular rearrangements. Reactive Intermediates: Generation, detection, structure, stability and reactions of carbocations, carbanions, carbenes, nitrenes and free radicals. Molecular rearrangements: Definition and classification. Molecular rearrangements involving 1) electron deficient carbon: Wagner- Meerwein, Pinacol-Pinacolone, Allylic and Wolf rearrangement. 2) electron deficient Nitrogen: Hofmann, Lossen, Curtius, Schmidt and Beckmann rearrangements 3) electron deficient Oxygen: Baeyer-Villiger oxidation. 4) Base catalyzed rearrangements: Benzilic acid, Favourski, Transannular, Sommlett-Hauser and Smiles rearrangement
5. Organic Reaction mechanism-I Electrophilic addition to carbon-carbon double bond: Stereoselective addition to carbon-carbon double bond; *anti* addition- Bromination and epoxidation followed by ring opening. *Syn* addition of OsO_4 and $KMnO_4$. Hydroboration. Michael reaction. Elimination reactions E2, E1, E1CB mechanisms. Orientation and stereoselectivity in E2 eliminations. Pyrolytic *syn* elimination and α-elimination, elimination Vs substitution. Determination of reaction mechanism: Energy profiles of addition and elimination reactions, transition states, product isolation and structure of intermediates, use of isotopes, chemical trapping, crossover experiments.
6. Importance of heterocyclic compounds as drugs. Nomenclature of heterocyclic systems based on ring size, number and nature of hetero atoms. Synthesis and reactivity of pyrrole, furan, thiophene, pyridine, indole, benzofuran, benzothiophene, quinoline, isoquinoline.
7. Alkaloids and terpenoids- Importance of natural products as drugs. Isolation of natural products by steam distillation, solvent extraction and chemical methods. Structure determination and synthesis of papaverine, nicotine and quinine-General methods in the structure determination of terpenes. Isoprene rule, structure determination and synthesis of α-terpeniol and camphor.
8. Organic Photochemistry, Photochemical energy, Frank-Condon principles, Jablonski diagram, singlet and triplet states, dissipation of photochemical energy, photosensitization, quenching, quantum efficiency and quantum yield. Photochemistry of carbonyl compounds - $n\rightarrow\pi^*$ and $\pi\rightarrow\pi^*$ transitions. Norrish type-I and Norrish type-II cleavages. Paterno-Buchi reactions, Photoreduction, photochemistry of enones - hydrogen abstraction, rearrangements of α,β- unsaturated ketones and cyclohexadienones, photochemistry of *p*-benzoquinones. Dienes - photochemistry of 1,3-butadienes, (2+2) additions leading to cage structures, photochemistry of cyclohexadienes, photochemistry of aromatic compounds, exicited state of benzene and its 1,2-, 1,4- additions
9. Pericyclic Reactions Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3 butadiene, 1,3,5 hexatriene and allyl system. Classification of pericyclic reactions. Woodward - Hoffmann correlation diagrams. FMO and PMO (Mobius Huckel) approaches. Electrocyclic reactions-Conrotatory and disrotatory. 4n, 4n+2 and allyl systems. Cycloadditions-antarafacial and suprafacial additions, 4n and 4n+2 systems, 2+2 addition of ketene, 1,3 dipolar cycloadditions Sigmatropic rearrangements - Suprafacial and antarafacial shifts of H, Sigmatropic shifts involving carbon moieties, 3,3 and 5,5 sigmatropic rearrangements.

   Structure determination of organic compounds by UV IR, NMR an Mass Various electronic transitions, Beer-Lambert's law, effect of solvent on electronic transitions, ultraviolet bands for carbonyl compounds, unsaturated carbonyl Compounds, dienes, conjugated polyenes, Effect of hydrogen bonding and solvent effects-NMR-Shielding mechanism, mechanism of measurement, chemical shift values, chemical exchange, complex spin-spin interaction, ^{13}C NMR spectroscopy, chemical shift-Mass spectral fragmentation of organic compounds, common functional groups, molecular-ion peak, metastable peak,

3. CIVICS

Common Syllabus: Public Policy and Research Methodology

I. (A) Public Policy

a) Nature, Scope and Importance of Public Policy, Public Policy as a Policy Science.

b) Theories / Models : Systems, Structural - Functional Incremental, Elite, Group, Rational Comprehensive.

c) Public Policy Making: Legislature, Executive Judiciary, Bureaucracy, Political Parties, Pressure Groups, NGOs

d) Policy Evaluation & Impact: Constraints.

I. (B) Research Methodology

a) Methods of Enquiry: Traditional and Scientific Methods, Objectivity in Social Science Research

b) Types of Research Design

c) Hypothesis

d) Methods of Data Collection: Library, Interview, Observation

e) Data Processing, Report Writing.

II. Public Administration

a) Definition, Meaning, Nature, Scope and Importance of Public Administration

b) Evolution of Public Administration Theories: Classical, Human Relations and System Approach

c) Union Government: President, Prime Minister and Council of Ministers, Parliament, Judiciary

d) State Government: Governor, Chief Minister and Council of Ministers, State Legislative, Judiciary (High Court and Subordinate Court)

e) Local Government: Panchayati Raj Institutions, Gram Panchayat, Mandal Parishad, Zilla Parishad

f) Impact of 73rd and 74th Constitutional Amendments on Panchayati Raj Institutions

III. Political Science

a) Definition, Meaning, Nature, Scope and Importance of Political Science

b) State : Essential Elements : Theories of Origin of State

c) Sphere of State Activity : Laissez Fair, Welfare, Fascist, Anarchist, Socialist, Marxist

d) Basic Concepts : Law, Liberty, Equality, Justice and Rights

e) Forms of Government : Unitary, Federal, Presidential and Parliamentary

f) Theory of Separation of Powers

g) India's Foreign Policy - Determinants and Features, Non-Alignment and U.N.O.

4. COMMERCE

Financial management : Meaning, nature, objectives and scope of financial management. Capital budgeting, process, techniques. Sources of finance. Cost of capital – cost of various sources of finance. Leverages – operating and financial leverages. Capital structure theories. Dividend decisions Working .capital management- cash, receivables and inventory management.

Financial and management accounting : Techniques of analysis of financial statements – comparative and common size statements, trend analysis and ratio analysis. Funds flow and cash flow analyses. Marginal costing and decision making.

Managerial economics : Meaning, nature and scope of managerial economics. Demand analysis. Production and cost analysis. Market structure – perfect and imperfect markets.

Business environment : Meaning and components of business environment. Industrial policies 1956, and 1991. Liberalization, privatization and globalization. WTO.

Marketing management : Meaning, concepts, nature, and scope of marketing management – Marketing environment. Consumer behavior and market segmentation. Product, Price, Promotion and Channel management.

Human resources management : HR functions. HR planning – job analysis, recruitment and job evaluation, Training and development methods. Performance appraisal methods. Trade unions and collective bargaining.

Quantitative techniques: Sampling and sampling methods. Probability and probability distributions – Hypothesis testing. Parametric tests (Z, t-tests, and ANOVA) and non-parametric tests (Chi-square test).

IT and e-commerce : E-Commerce business models - Internet and web technologies. E-payment methods – e-cash, e-cheques, credit cards, smart cards, and debit cards.

5. ENGLISH

I. Movements and Concepts

Renaissance, Metaphysical poetry, Neo-classicism, Romanticism, Rise of the novel, Modernism, Postmodernism, Colonialism, Postcolonialsim, Diaspora, Psychoanalytical criticism, Myth and archetype, Feminism, Structuralism, Poststructuralism, Deconstruction.

II. Writers and Texts

1)	William Shakespeare	*Hamlet*, *Tempest*
2)	John Milton	*Paradise Lost*-Book 1 and 9
3)	William Wordsworth	"Immortality Ode", *Tintern Abbey*
4)	John Keats	"Ode to a Nightingale", "To Autumn"
5)	Robert Browning	"My Last Duchess", "The Last Ride Together"
6)	**Charles Dickens**	***David Copperfield***
7)	**TS Eliot**	**"The Waste Land", *Murder in the Cathedral***
8)	**GB Shaw**	***Saint Joan***
9)	**Virginia Woolf**	**"A Room of One"s Own"**
10)	**Samuel Beckett**	***Waiting for Godot***
11)	**William Golding**	***Lord of the Flies***
12)	**Robert Frost**	**"Home Burial", "The Road Not Taken"**
13)	**Eugene O"Neill**	***The Hairy Ape***
14)	**Toni Morrison**	***Beloved***
15)	**Mulk Raj Anand**	***Untouchable***
16)	**AK Ramanujan**	"Love Poem for a Wife", "Small-Scale Reflections on a Great House"
17)	**Girish Karnad**	***Hayavadana***
18)	**Salman Rushdie**	***Midnight's Children***
19)	**Chinua Achebe**	***Things Fall Apart***
20)	**Margaret Atwood**	***Edible Woman***
21)	**AD Hope**	**"Australia", "Crossing the Frontier"**
22)	**Bessie Head**	*A Question of Power*

III. English Language Teaching

1) ELT in India: (History and status of English in India; English as Second Language, English as Foreign Language, and Ensglish as Global Language).
2) Methods and Approaches: (Grammar Translation method, Direct method, Audio-Lingual method; Structural approach, Communicative language teaching)
3) Teaching of Language Skills: (Teaching of Listening, Speaking, Reading, and Writing Skills; Teaching of Grammar and Functional English; Teaching of Vocabulary; Classroom techniques; Use of authentic materials)
4) Testing and Evaluation: (Principles, Types, Objectives of testing and evaluation)
5) Phonetics and Phonology; Syntax and Structure.

6. HINDI

HINDI

हिन्दी भाषा और उसका विकास

इकाई-1

हिन्दी की ऐतिहासिक पृष्ठभूमि : प्राचीन भारतीय आर्यभाषाएँ – वैदिक तथा लौकिक संस्कृत और उनकी विशेषताएँ। मध्यकालीन भारतीय आर्यभाषाएँ – पालि; प्राकृत – शौरसेनी, अर्धमागधी, मागधी, अपभ्रंश और उनकी विशेषताएँ। आधुनिक भारतीय आर्यभाषाएँ और उनका वर्गीकरण। देवनागरी लिपि: विकास, विशेषताएँ और मानकीकरण।

इकाई-2

हिन्दी का भौगोलिक विस्तार: हिन्दी की उपभाषाएँ, पश्चिमी हिन्दी, पूर्वी हिन्दी, विशेषताएँ।

इकाई 3

हिन्दी का भाषिक स्वरूप : हिन्दी की स्वनिम व्यवस्था – खंड्य, खंड्येतर। हिन्दी शब्द रचना – उपसर्ग, प्रत्यय, समास। रूपरचना – लिंग, वचन, और कारक – व्यवस्था के संदर्भ में हिंदी के संज्ञा, सर्वनाम, विशेषण और क्रियारूपा। हिन्दी वाक्य रचना: पदक्रम और अन्विति।

इकाई 4

हिन्दी के विविध रूप: संपर्क भाषा, राष्ट्रभाषा, राजभाषा के रूप में हिन्दी, माध्यम-भाषा, संचार-भाषा; हिन्दी की सांविधानिक स्थिति। हिन्दी प्रसार के आंदोलन, प्रमुख व्यक्तियों तथा संस्थाओं का योगदान।

इकाई-5

हिन्दी साहित्य का इतिहास

हिन्दी साहित्य का इतिहास- दर्शन, हिन्दी साहित्य के इतिहास-लेखन की पद्धतियाँ। हिन्दी साहित्य के प्रमुख इतिहास ग्रंथ, हिन्दी के प्रमुख साहित्यिक केन्द्र, संस्थाएँ एवं पत्र-पत्रिकाएँ, हिन्दी साहित्य के इतिहास का काल विभाजन और नामकरण

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

इकाई 6

मध्यकाल

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

हिन्दी सन्त काव्य : सन्त काव्य का वैचारिक आधार, प्रमुख निर्गुण संत कवि कबीर, नानक, दादू, रैदास, संत काव्य की प्रमुख विशेषताएँ, भारतीय धर्म साधना में संत कवियों का स्थान।

हिन्दी सूफी काव्य: सूफी काव्य का वैचारिक आधार, हिन्दी के प्रमुख सूफी कवि और काव्य – मुल्ला दाऊद(चन्दायन), कुतुबन (मृगावती), मंझन (मधुमालती), मालिक मुहम्मद जायसी (पद्मावत), सूफी प्रेमाख्यानकों का स्वरूप, हिन्दी सूफी काव्य की प्रमुख विशेषताएँ।

हिन्दी कृष्ण काव्य : विविध संप्रदाय, वल्लभ संप्रदाय, अष्टछाप, प्रमुख कृष्ण भक्त कवि और काव्य, सूरदास (सूरसागर), नंददास (रास पंचाध्यायी), भ्रमरगीत परंपरा, गीति परंपरा और हिन्दी कृष्ण काव्य – मीरा और रसखान।

हिन्दी राम काव्य विविध संप्रदाय, राम भक्ति शाखा के कवि और काव्य, तुलसीदास की प्रमुख कृतियाँ, काव्य रूप और उनका महत्व।

रीति काल: सामाजिक-सांस्कृतिक परिप्रेक्ष्य, रीतिकाव्य के मूल स्त्रोत, रीतिकाल की प्रमुख प्रवृत्तियाँ, रीतिकालीन कवियों का आचार्यत्व, रीतिमुक्त काव्यधारा, रीतिकाल के प्रमुख कवि: केशवदास, मतिराम, भूषण, बिहारीलाल, देव, घनानन्द और पद्माकर, रीतिकाव्य में लोकजीवन।

इकाई 7

आधुनिक काल: हिन्दी गद्य का उद्भव और विकास। भारतेन्दु पूर्व हिन्दी गद्य, 1857 की राज्य क्रान्ति और सांस्कृतिक पुनर्जागरण, भारतेन्दु और उनका मण्डल, 19वीं शताब्दी के उत्तरार्द्ध की हिन्दी पत्रकारिता।

द्विवेदी युग: महावीर प्रसाद द्विवेदी और उनका युग, हिन्दी नवजागरण और सरस्वती, मैथिलीशरण गुप्त और राष्ट्रीय काव्यधारा, राष्ट्रीय काव्यधारा के प्रमुख कवि, स्वच्छन्दतावाद और उसके प्रमुख कवि।

छायावाद और उसके बाद: छायावदी काव्य की प्रमुख विशेषताएँ, छायावाद के प्रमुख कवि: प्रसाद, निराला, पंत, और महादेवी, उत्तर छायावादी काव्य और उसके प्रमुख कवि, प्रगतिशील काव्य और उसके प्रमुख कवि, प्रयोगवाद और नई कविता, नई कविता के कवि, समकालीन कविता, समकालीन साहित्यिक पत्रकारिता।

इकाई 8

हिन्दी साहित्य की गद्य विधाएँ

हिन्दी उपन्यास: प्रेमचंद पूर्व उपन्यास, प्रेमचंद और उनका युग, प्रेमचंद के परवर्ती प्रमुख उपन्यासकार: जैनेन्द्र, अज्ञेय, हजारी प्रसाद द्विवेदी, यशपाल, अमृतलाल नागर, फणीश्वरनाथ रेणु, भीष्म साहनी, कृष्ण सोबती, निर्मल वर्मा, नरेश मेहता, श्रीलाल शुक्ल, राही मासूम राजा, रंगेय राघव, मन्नू भण्डारी।

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

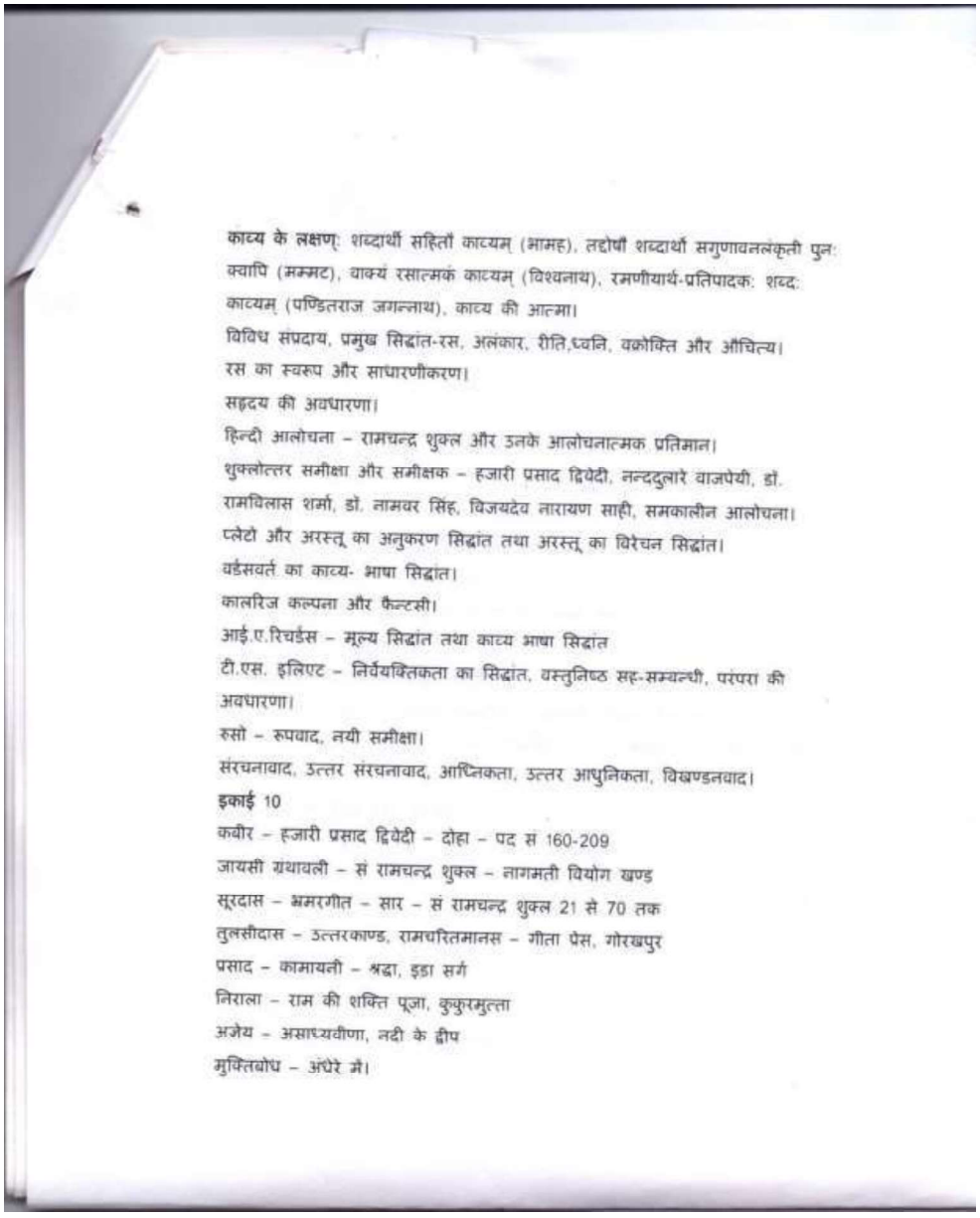
हिन्दी नाटक: हिन्दी नाटक और रंगमंच, विकास के चरण और प्रमुख नाट्यकृतियाँ: अंधेर नगरी, चंद्रगुप्त, अंधायुग, आधे-अधूरे, आठवां सर्ग, हिन्दी एकांकी।

हिन्दी निबंध: हिन्दी निबंध के प्रकार और प्रमुख निबंधकार – रामचन्द्र शुक्ल, हजारीप्रसाद द्विवेदी, कुबेरनाथ राय, विद्यानिवास मिश्र, हरिशंकर परसाई।

हिन्दी आलोचना: हिन्दी आलोचना का विकास और प्रमुख आलोचक: रामचन्द्र शुक्ल, नंददुलारे वाजपेयी, हजारी प्रसाद द्विवेदी, रामविलास शर्मा, डॉ.नगेन्द्र, डॉ. नामवर सिंह, विजयदेव नारायण साही। हिन्दी की अन्य गद्य विधाएँ : रेखाचित्र, संस्मरण, यात्रा-साहित्य, आत्मकथा, जीवनी और रिपोर्ताज।

इकाई 9

काव्य शास्त्र और आलोचना:



काव्य के लक्षण: शब्दार्थौ सहितौ काव्यम् (भामह), तद्दोषौ शब्दार्थौ सगुणावनलंकृती पुनः क्वापि (मम्मट), वाक्यं रसात्मकं काव्यम् (विश्वनाथ), रमणीयार्थ-प्रतिपादकः शब्दः काव्यम् (पण्डितराज जगन्नाथ), काव्य की आत्मा।

विविध संप्रदाय, प्रमुख सिद्धांत-रस, अलंकार, रीति,ध्वनि, वक्रोक्ति और औचित्य।

रस का स्वरूप और साधारणीकरण।

सहृदय की अवधारणा।

हिन्दी आलोचना – रामचन्द्र शुक्ल और उनके आलोचनात्मक प्रतिमान।

शुक्लोत्तर समीक्षा और समीक्षक – हजारी प्रसाद द्विवेदी, नन्ददुलारे वाजपेयी, डॉ. रामविलास शर्मा, डॉ. नामवर सिंह, विजयदेव नारायण साही, समकालीन आलोचना।

प्लेटो और अरस्तू का अनुकरण सिद्धांत तथा अरस्तू का विरेचन सिद्धांत।

वर्डसवर्थ का काव्य- भाषा सिद्धांत।

कालरिज कल्पना और फैन्टसी।

आई.ए.रिचर्डस – मूल्य सिद्धांत तथा काव्य भाषा सिद्धांत

टी.एस. इलिएट – निर्वैयक्तिकता का सिद्धांत, वस्तुनिष्ठ सह-सम्बन्धी, परंपरा की अवधारणा।

रूसो – रूपवाद, नयी समीक्षा।

संरचनावाद, उत्तर संरचनावाद, आधुनिकता, उत्तर आधुनिकता, विखण्डनवाद।

इकाई 10

कबीर – हजारी प्रसाद द्विवेदी – दोहा – पद सं 160-209

जायसी ग्रंथावली – सं रामचन्द्र शुक्ल – नागमती वियोग खण्ड

सूरदास – भ्रमरगीत – सार – सं रामचन्द्र शुक्ल 21 से 70 तक

तुलसीदास – उत्तरकाण्ड, रामचरितमानस – गीता प्रेस, गोरखपुर

प्रसाद – कामायनी – श्रद्धा, इड़ा सर्ग

निराला – राम की शक्ति पूजा, कुकुरमुत्ता

अज्ञेय – असाध्यवीणा, नदी के द्वीप

मुक्तिबोध – अंधेरे में।

प्रेमचंद – गोदान

अज्ञेय – शेखर एक जीवनी, भाग-1

प्रसाद – चन्द्रगुप्त

मोहन राकेश – आधे-अधूरे

इकाई 11

प्रयोजनमूलक हिन्दी

प्रयोजनमूलक हिन्दी : अर्थ, परिभाषा और क्षेत्र, ज्ञान प्रधान, सूचनात्मक और रचनात्मक साहित्य में प्रयुक्त भाषा भेद, हिन्दी का क्षेत्रीय, राष्ट्रीय एवं अंतर्राष्ट्रीय संदर्भ

हिन्दी भाषा-नियोजन एवं भाषा प्रबंधन

भारतीय बहुभाषिकता और हिन्दी, हिन्दी की व्यापक संकल्पना

प्रयुक्ति का अर्थ और प्रकार

प्रयोजनमूलक हिन्दी की विविध प्रयुक्तियाँ

प्रमुख प्रयुक्ति क्षेत्र – वैज्ञानिक, तकनीकी, कार्यालयीं, व्यवसायिक आदि

इन क्षेत्रों से संबंधित विशिष्ठ अभिव्यक्तियों एवं पारिभाषिक शब्दावली का सामान्य परिचय

प्रयोजनमूलक हिन्दी और अनुवाद

इकाई 12

हिन्दी में कंप्यूटर की सुविधाएँ

शब्द संसाधन, हिन्दी साफटावेर , हिन्दी में कंप्यूटर अनुप्रयोग और मशीनी अनुवाद

इकाई 13

भारतीय साहित्य

भारतीय साहित्य का स्वरूप

भारतीय साहित्य के अध्ययन की समस्याएँ

भारतीय साहित्य का इतिहास और हिन्दी साहित्य के विकास में भारतीय साहित्य की भूमिका

इकाई 14

तेलुगु भाषा और साहित्य का इतिहास

तेलुगु भाषा का उद्भव और विकास

मध्ययुगीन तेलुगु साहित्य की मुख्य प्रवृत्तियाँ और प्रमुख रचनाकार

तेलुगु शैव और संत-साहित्य, राम काव्य, कृष्ण भक्ति काव्य, अष्ट दिग्गज कवि, दक्षिणांध्र युग-साहित्य, तेलुगु साहित्य का आधुनिक काल- आधुनिक तेलुगु कविता: भाव कविता-अभ्युदय कविता-दिगंबर कविता-तेलुगु कविता की अद्यतन प्रवृत्तियाँ-तेलुगु गद्य का विकास-उपन्यास-कहानी-नाटक-निबंध और अन्य गद्य विधाएँ- प्रतिनिधि रचनकार

इकाई 15

पत्रकारिता और मीड़िया-लेखन

हिन्दी पत्रकारिता का इतिहास

हिन्दी में समाचार लेखन कला

संपादकीय लेखन शीर्षक की संरचना, लीड़, इंट्रो

पृष्ट-सज्जा

साक्षात्कार

मीड़िया-लेखन

विभिन्न जनसंचार माध्यमों का स्वरूप, मुद्रण, श्रव्य, दृश्य, इंटरनेट

मौखिक भाषा की प्रकृति, समाचार-लेखन एवं वाचन।

दृश्य माध्यमों में भाषा की प्रकृति।

7. HISTORY

Ancient India :

1. Pre and protohistoric background – Stone ages and Chalcolithic cultures.

2. Harappan Civilization – Exten, major cities, characteristic features, social and economic conditions, script, religious practices, causes for the decline.

3. Iron Age – Aryan migration – Second urbanization.

4. Vedic Age : Importance literature, Political, Social and economic conditions in the early and later vedic age.

5. India in the 6th century B.C. : Political, Social and economic conditions, Rise and spread of Jainism and Buddhism.

6. Mauryan Age : Political history of the Mauryans, Ashoka, Mauryan Administration, social and economic conditions, decline of the Mauryan empire.

7. The Satavahanas : Political history, administration, contribution to the culture.

8. Gupta Period : Political history, administration, social and economic conditions, growth of culture, decline of the empire.

9. India in the 7th century A.D. : Harsha Vardhana, Pallavas and Chalukyas, Rashtrakutas their political history and their contribution to culture.

Medieval India:

10. India between 650 and 1200 A.D. – Political, social and economic conditions, Chola administration and culture.

11. Age of the Delhi Sultanate : (1206-1526), Political history, Military and Administrative organisation, changes in society and economy, Bhakti movement.

12. The Vijayanagar Empire : Origin, History, Krishnadevaraya, social and economic conditions, contribution to art and architecture, decline.

13. Mughal Age (1556-1707) : Political history, Akbar, Administration, Social and economic conditions, culture, decline of the Mauryan empire, Marattas and Shivaji.

Modern India (1757-1947) :

14. Historical forces and factors which led to the establishment of the British power in India – Early resistance to the British power in India – Hyder Ali, Tippu Sultan, causes for their failure.

15. Evolution of British paramountacy in India : Policies of Wellesley and Dalhousie – Economic policies of the British.

16. Socio-religious reform movements – Rajaram Mohan Roy, Dayananda Saraswathi and others – Educational policies of the British and their impact on Indian society.

17. Revolt of 1857: Causes, results, significance.

18. Rise and growth of the Indian National Movement : Birth of the Indian National Congress, the national movement from 1885 to 1905; movement from 1905 to 1920. Role of Tilak and Annie Besant :The movement from 1920 to 1947 ; Emergence of Gandhi; Non-cooperation movement, Salt Satyagraha and the Quit India Movement.

    Freedom movement in Andhra Pradesh with special reference to the role of Alluri Sitarama Raju and Tanguturi Prakasam, Revolt against the nizam's rule in Telangana.

Modern World :

19. Industrial Revolution – Significance and results.

20. American War of Independence – course, results, significance.

21. French Revolution – course, effects, significance.

22. National liberation movements in Italy and Germany in the 19th century – Mazzini, Cavour, Garibaldi, Bismarck.

23. World War-I – Causes and effects.

24. The Russian Revolution of 1917 – Causes, results and importance.

25. The World between the two world wars – Nazism in Germany, Fascism in Italy, Turkey under Mustafa Kamal Pasha.

26. Developments in China 1911-1949 – Nationalist Revolution of 1911 – Communist Revolution of 1948.

27. World War-II – Causes and effects.

8. MATHEMATICS

I. Real Analysis

Finite, countable and uncountable sets – Real Number system R – infimum and supremum of a subset of R – Bolzano – Weierstrass theorem.

Sequences, convergence, limit superior and limit inferior of sequences, sub sequences, Heine Borel Theorem.

Infinite series – Tests of convergence.

Continuity and uniform continuity of real valued functions of real variable. Monotonic functions and functions of bounded variation.

Differentiability and mean value theorems.

Riemann integrability.

Sequences and Series of functions.

II. Metric Spaces

Metric spaces – completeness, compactness and connectedness – continuity and uniform continuity of functions from one metric space into another.

Topological spaces – base and subbase – continuous function.

III. Elementary Number

Primes and composite numbers – Fundamental Theorem of arithmetic – divisibility – congruences – Fermat's theorem – Wilson's Theorem – Euler's Ø - function.

IV. Group Theory

Groups, subgroups, normal subgroups – quotient groups – homomorphisms and isomorphism theorems – permutation groups, cyclic groups, Cayley's theorem. Sylow's theorems and their applications.

V. Ring Theory

Rings, integral domains, fields – subrings and ideals – Quotient rings – homomorphisms – Prime ideals and maximal ideals – polynomial rings – Irreducibility of polynomials – Euclidean domains and principal ideal domains.

VI. Vector Spaces

Vector Spaces, Subspaces – Linear dependence and independence of vectors – basis and dimension – Quotient spaces – Inner product spaces – Orthonormal basis – Gram – Schmidt process.

VII. Matrix Theory

Linear transformations – Rank and nullity – change of bases.

Matrix of a linear transformation – singular and non-singular matrices – Inverse of matrix – Eigenvalues and eigenvectors of matrix and of linear transformation – Cayley – Hamilton's theorem.

VIII. Complex Analysis

Algebra of complex numbers – the complex plane – Complex functions and their Analyticity – Cauchy-Riemann equations – Mobius transformations.

Power Series.

Complex Integration - Cauchy's theorem - Morera's Theorem - Cauchy's integral formula – Liouville's theorem – Maximum modules principle – Schwarz's lemma – Taylor's series – Laurents series.
Calculus of residues and evaluation of integrals.

IX. Ordinary Differential Equation

Ordinary Differential Equation (ODE) of first order and first degree – Different methods of solving them – Exact Differential equations and integrating factors.

ODE of first order and higher degree – equations solvable for p, x and y – Clairaut's equations – Singular Solutions.

Linear differential equations with constant coefficients and variable coefficients – variation of parameters.

X. Partial Differential Equations

Formation of differential equations (PDE) – Lagrange and Charpit methods for solving first order – PDE's – Cauchy problem for first order PDE's Classification of second order PDE's – General solution of higher order PDE's with constant coefficients.

9. PHYSICS

PART-A

I. Mathematical Methods of Physics

Dimensional analysis. Vector algebra and vector calculus. Linear algebra, matrices, Cayley-Hamilton Theorem. Eigenvalues and eigenvectors. Linear ordinary differential equations of first & second order, Special functions (Hermite, Bessel, Laguerre and Legendre functions). Fourier series, Fourier and Laplace transforms. Elements of complex analysis, analytic functions; Taylor & Laurent series; poles, residues and evaluation of integrals. Elementary probability theory, random variables, binomial, Poisson and normal distributions. Central limit theorem.

Data interpretation and analysis. Precision and accuracy. Error analysis, propagation of errors. Least squares fitting, Linear and non-linear curve fitting and Chi-Square Test.

II. Classical Mechanics

Newton's laws. Dynamical systems, Phase space dynamics, stability analysis. Central force motions. Two body Collisions – scattering in laboratory and Centre of mass frames. Rigid body dynamics-moment of inertia tensor. Non-inertial frames and pseudoforces. Variational principle. Generalized coordinates. Lagrangian and Hamiltonian formalism and equations of motion. Conservation laws and cyclic coordinates. Periodic motion: small oscillations, normal modes. Special theory of relativity-Lorentz transformations, relativistic kinematics and mass-energy equivalence.

III. Electromagnetic Theory

Electrostatics : Gauss's law and its applications, Laplace and Poisson equations, boundary value problems. Magnetostatics : Biot-Savart law, Ampere's theorem. Electromagnetic induction. Maxwell's equations in free space and linear isotropic media; boundary conditions on the fields at interfaces. Scalar and vector potentials, gauge invariance. Electromagnetic waves in free space. Dielectrics and conductors. Reflection and refraction, polarization, Fresnel's law, interference, coherence, and diffraction. Dynamics of charged particles in static and uniform electromagnetic fields. Charged particles in inhomogeneous fields.

IV. Quantum Mechanics

Wave-particle duality. Schrödinger equation (time-dependent and time-independent). Eigenvalue problems (particle in a box, harmonic oscillator, etc.). Tunneling through a barrier. Wave-function in coordinate and momentum representations. Commutators and Heisenberg uncertainty principle. Dirac notation for state vectors. Motion in a central potential : orbital angular momentum, angular momentum algebra, spin, addition of angular momenta; Hydrogen aom. Stern-Gerlach experiment. Time-independent perturbation theory and applications. Variational method. Time dependent perturbation theory and Fermi's golden rule, selection rules. Identical particles, Pauli exclusion principle, spin-statistics connection.

V. Thermodynamics and Statistical Physics

Laws of thermodynamics and their significance. Thermodynamic potentials, Maxwell relations, chemical potential, phase equilibria. Phase space, micro-and macro-states. Micro-canonical, canonical and grand-canonical ensembles and partition functions. Free energy and its connection with thermodynamic quantities. Classical and quantum statistics. Bose and Fermi gases. Principle of detailed balance. Blackbody radiation and Planck's distribution law.

VI. Electronics

Semiconductors devices (diodes, junctions, transistors, field effect devices, homo- and hetero-junction devices), device structure, device characteristics, frequency dependence and applications. Opto-

electronic devices (solar cells, photo-detectors, LEDs). Operational amplifiers and their applications. Digital techniques and applications (Logic circuits, registers, counters and comparators). A/D and D/A converters. Microprocessor microcontroller basics. Fundamentals of communication electronics, modulation techniques.

VII. Atomic & Molecular Physics

Quantum states of an electron in an atom. Electron spin. Spectrum of helium and alkali atom. Relativistic corrections for energy levels of hydrogen atom, hyperfine structure and isotopic shift, width of spectrum lines, LS & JJ couplings. Zeeman, Paschen-Bach & Stark effects. Electron spin resonance. Nuclear magnetic resonance, chemical shift. Frank-Condon principle. Electronic, rotational, vibrational and Raman spectra of diatomic molecules, selection rules. Lasers : spontaneous and stimulated emission, Einstein A & B coefficients. Optical pumping, population inversion, rate equation. Modes of resonators and coherence length.

VIII. Condensed Matter Physics

Bravais lattices. Reciprocal lattice. Diffraction and the structure factor. Bonding of solids. Elastic properties, phonons, lattice specific heat. Free electron theory and electronic specific heat. Response and relaxation phenomena. Drude model of electrical and thermal conductivity. Hall effect and thermoelectric power. Electron motion in a periodic potential, band theory of solids : metals, insulators and semiconductors. Superconductivity : type-I and type-II superconductors. Josephson junctions. Superfluidity. Defects and dislocations. Ordered phases of matter : translational and orientational order, kinds of liquid crystalline order. Quasi crystals.

IX. Nuclear and Particle Physics

Basic nuclear properties ; size, shape and charge distribution, spin and parity. Binding energy, semi-empirical mass formula, liquid drop model. Nature of the nuclear force, form of nucleon-nucleon potential, charge-independence and charge-symmetry of nuclear forces. Deuteron problem. Evidence of shell structure, single-particle shell model, its validity and limitations. Elementary ideas of alpha, beta and gamma decays and their selection rules. Fission and fusion. Nuclear reactions, reaction mechanism, compound nuclei and direct reactions.

PART-B

I. Mathematical Methods of Physics

Green's function. Partial differential equations (Laplace, wave and heat equations in two and three dimensions). Elements of computational techniques : root of functions, interpolation, extrapolation, integration by trapezoid and Simpson's rule, Solution of first order differential equation using Runge-Kutta method. Finite difference methods. Tensors. Introductory group theory.

II. Classical Mechanics

Basic concepts of dynamical systems, Poisson brackets and canonical transformations. Symmetry, invariance and Noether's theorem. Hamilton-Jacobi theory.

III. Electromagnetic Theory

Dispersion relations in plasma. Lorentz invariance of Maxwell's equation. Transmission lines and wave guides. Radiation- from moving charges and dipoles and retarded potentials.

IV. Quantum Mechanics

Spin-orbit coupling, fine structure. WKB approximation. Elementary theory of scattering : phase shifts, partial waves, Born approximation. Relativistic quantum mechanics : Klein-Gordon and Dirac equations. Semi-classical theory of radiation.

V. Thermodynamics and Statistical Physics

First- and second-order phase transitions. Diamagnetism, paramagnetism, and ferromagnetism. Ising model. Bose-Einstein condensation. Diffusion equation. Random walk and Bronian motion. Introduction to nonequilibrium processes.

VI. Condensed Matter Physics

Electron spin resonance, Nuclear magnetic resonance, chemical shift and applications. X-ray diffraction technique, scanning electron micrscopy and transimission electron microscopy.

VII. Nuclear and Particle Physics

Classification of fundamental forces. Elementary particles and their quantum numbers (charge, spin, parity, isospin, strangeness, etc.). Quark model, baryons and mesons. C, P, and T invariance. Application of symmetry arguments to particle reactions. Parity non-conservation in weak interaction. Relativistic kinematics.

10. **TELUGU**

తెలుగు

1. (ఎ) సంప్రదాయ సాహిత్యకవుల అధ్యయనం – కాలం – రచనలు

నన్నయ, తిక్కన, ఎర్రన, శివకవులు (నన్నెచోడుడు, మల్లికార్జున పండితారాధ్యుడు, పాల్కురికి సోమనాథుడు), నాచనసోమన – భాస్కర రామాయణ కవులు, రంగనాథ రామాయణ కవి – శ్రీనాథుడు – పోతన – పిల్లలమర్రి పినవీరభద్రుడు – గౌరన – జక్కన – అనంతామాత్యుడు – కొరవి గోపరాజు – నంది మల్లన, ఘంట సింగన –అష్టదిగ్గజ కవులు – తాళ్ళపాక కవులు – శ్రీకృష్ణదేవరాయలు – పొన్నగంటి తెలగన్న – చేమకూర వెంకటకవి – తంజావూరు రాజకవులు – కవయిత్రులు – కూచిమంచి తిమ్మకవి – జగ్గకవి.

(బి) వేమన తాత్త్వికత – సమకాలిక పరిశీలన, దృక్పథం – సమాజంపై వేమన కవిత్వ ప్రభావం.

2. సాహిత్య ధోరణుల అధ్యయనం – యుగప్రభావం – రూపాలు – మొదలైనవి. ఇతిహాసం – పురాణం ప్రబంధం – శతకం – సంకీర్తన సాహిత్యం – చారిత్రక కావ్యం – సంప్రదాయ, ఆధునిక గద్య రచనలు – నవల – కథానిక – వ్యాసం – ఏకాంకిక మొదలైనవి – వాదాలు (దళిత, హేతు, స్త్రీ, ప్రాంతీయ)

3. జానపద విజ్ఞానం – గేయాలు – కథాగేయాలు – గద్యాఖ్యానాలు – (పురాణగాథలు – ఇతిహ్యాలు– కథలు), సామెతలు – పొడుపుకథలు – జానపద కళలు – (వీధి నాటకాలు, యక్షగానాలు, బొమ్మలాటలు, పగటివేషాలు, చిందు, గంగ జాతర కళారూపాలు.

4. ఆధునిక కవుల అధ్యయనం – ఆధునిక ధోరణులు వారి రచనలు – గురజాడ – రాయప్రోలు – వీరేశలింగం – చిలకమర్తి – పానుగంటి – విశ్వనాథ – దేవులపల్లి – బసవరాజు – పింగళి – కాటూరి – దువ్వూరి – పుట్టపర్తి – శ్రీశ్రీ – ప్రసిద్ధ ఆధునిక కవులు – భావ అభ్యుదయ – దిగంబర.

5. తెలుగు వ్యాకరణ, ఛందస్సు అధ్యయనం :

వ్యాకరణం – బాల వ్యాకరణం (సంజ్ఞ, సంధి, క్రియా, తత్సమ, ఆచ్చిక ప్రకరణాలు)
ప్రౌఢ వ్యాకరణ (సంజ్ఞ, సంధి, కారక, శబ్ద వాక్య పరిచ్ఛేదాలు)

ఛందస్సు – వృత్తాలు, జాతులు, ఉపజాతులు
(ఉత్పలమాల, చంపకమాల, శార్దూలం, మత్తేభం, ద్విపద, తరువోజ, సీసం, కందం, స్రగ్ధర, పంచచామరం)

అలంకారాలు – అర్థాలంకారాలు, శబ్దాలంకారాలు

1. తెలుగు భాషా చరిత్ర పరిణామం – (ప్రాఙ్నన్నయ యుగం నుండి నేటి వరకు)– ద్రావిడ భాషా కుటుంబాలలో తెలుగు స్థానం – భౌగోళిక విభజన – మాండలికాలు.

7. భాషా విజ్ఞాన అధ్యయనం – భాషా శాస్త్రం, అర్థ విపరిణామం – ఆధునిక కాలం : శాసన భాష నుండి సాహిత్య భాష వరకు (వ్యావహారిక భాషా ఉద్యమం వంటివి)

8. తెలుగు సాహిత్య పరిణామం – (ప్రాఙ్నన్నయ యుగం నుండి నేటి వరకు)

9. సౌందర్య, సాహిత్య విమర్శ అధ్యయనం (ప్రాక్, పశ్చిమ) ఆధునిక తెలుగు సాహిత్య విమర్శ.

10. సంస్కృత వ్యాకరణం, కావ్యాలు – సంస్కృత వ్యాకరణం ప్రాథమిక విజ్ఞానం, సామాన్య ప్రామాణిక గద్య, పద్య పాఠ్యాంశాలు – హితోపదేశం, కాళిదాసుని కృతులు, సంస్కృత పంచకావ్యాల పరిచయం.

11. ZOOLOGY

General Concepts :

1. Levels of structural organization :
   Unicellular, colonial and multicellular forms. Prokaryotic and Eukaryotic cells. Levels of organization of tissues, organs & systems.
2. Acoelomata, Pseudocoelomata, Coelomata, Proterostomia and Dueterostornia.
3. Concepts of species and hierarchical taxa, biological nomenclature, classical methods of taxonomy of animals.

Non-Chordata :

1. General characteristics and classification of invertebrates up to class level.
2. Protozoa: Locomotion, Nutrition and Reproduction in protozoa, Protozoan diseases of man.
3. Porifera: Canal system in porifera, skeleton in porifera, Reproduction in sponges.
4. Coelenterata : Polymorphism, Metagenesis, coral formation,Etenophora.
5. Hemlinths: Common Helminthic parasites of Man – *Taenia solium, Schistosoma sp., Ascaris, Ancylostoma, Oxyuris, Loa, Trichinella, Strongyloides* – their life cycles. Parasitism and parasitic adaptations.
6. Annelida: Excretory system, Coelom formation, coelom and coelomoducts.
7. Arthropoda: Mouthparts of Insects, useful and harmful insects, Metamorphosis in insects. Apiculture and sericulture in India, crustacean larvae.
8. Mollusca: Respiritation, Torsion and De-torsion, pearl formation and Pearl industry.
9. Echinodermata: Echinoderm larvae, Water vascular system.

CHORDATA :

1. General Characters and classification of chordates upto class, Origin of Chordates, phylogeny and affinities of Hemichordata, Retrogressive metamorphosis.
2. Vertebrate integument and derivatives, Comparative account of Digestive, Respiratory, Circulatory, Excretory and Reproductive systems of Vertebrates.
3. Pisciculture in India, Common edible fishes of Andhra Pradesh.
4. Origin and evolution of Amphibia, Paedogenesis, Neotony.
5. Important Snakes of India, Dinosaurs.
6. Flight adaptations and Migration in birds. Archeopteryx, Poultry in India.
7. Adaptive radiation and Dentition in Mammals.

CELL BIOLOGY :

1. Prokaryotic and Eukaryotic cell, Plasma Membrane-Ultrastructure, Permeability, intercellular communication, Endocytosis, Exocytosis, Phagocytosis, Active transport, membrane pumps.
2. Structure & function of Intracellular organelles - Nucleus, Mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, Cell wall, Cytoskeleton and its role in motility.
3. Organization of genes and chromosomes - Operon, unique and repetitive DNA, structure of chromatin and chromosomes, heterochromatin, euchromatin, transposons.
4 Cell division and cell cycle - Mitosis and meiosis, their regulation, steps in cell cycle, regulation and control of cell cycle.
5. DNA replication, repair and recombination - Unit of replication, replication origin and replication fork, Recombinant technology, Transgenic and cloned animals, DNA damage and repair mechanisms.
6. Protein synthesis - initiation, elongation and termination of Genetic code.
7. Regulation of gene expression - Lac operon, Lambda operan.

GENETICS :

1. Mendel's law of inheritance - Critical review and Linkage.
2. Gene mapping methods : Linkage-complete and Incomplete linkage; Linkage maps, Recombination, mapping with molecular markers, somatic cell hybrids.
3. Crossing over : Types (Somatic or mitotic crossing over and Germinal or meiotic crossing over), theories about the mechanism of crossing over, tetrad analysis, and cytological detection of crossing over.
4. Mutations : Types (Spontaneous and Induced), causes and detection, mutant types (lethal, conditional, biochemical, loss of function, gain of function, germinal versus somatic mutants), Molecular basis of mutations.
5. Chromosomal aberrations (deletion, duplication, inversion and translocation, ploidy and their genetic implications); Autosomal abnormalities (Down's syndrome, Trisomy-13, -18); Sex anamolies (Turner's syndrome, Klinefelter's syndrome, Hermaphroditism).
6. Human genetics : Human karyotyping, Genetic disorders due to mutant genes (Huntington's chorea), Inborn errors of metabolism-Pheynylketonuria, alkaptonuria, Sickle cell anemia.

SYSTEM AND CELL PHYSIOLOGY :

1. Blood and circulation - Blood corpuscles, haemopoiesis, plasma function, blood groups, haemoglobin, haemostasis.
2. Cardiovascular System : Neurogenic, myogenic hearts, cardiac cycle, heart as a pump, neural and chemical regulation of all above.
3. Respiratory system - Transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration.
4. Nervous system - Neurons, action potential, Conduction of nerve impulse, synapse, Neurotransmitters.
5. Muscle : Ultraa structure and mechanism of muscle contraction.
6. Sense organs – Eye, Ear.
7. Excretory system - Comparative physiology of excretion, urine formation, micturition.
8. Osmaregulation – Osmoregulation in fishes, Hormonal control of osmoregulation.
9. Digestive system - Digestion, absorption, assimilation and egestion.
10. Endocrinology and reproduction - Endocrine glands, basic mechanism of hormone action, hormones and diseases, reproduction in mammals.
11. Chemical bonds (Covalent, Hydrogen and Ionic bonds, Van der waals interactions).
12. Outline classification of organic compounds (carbohydrates, proteins and lipids).
13. Order of protein structure, primary, secondary, tertiary and quaternary; Ramachandran plot.
14. Glycolysis, TCA cycle and their Biomedical importance. Pentose phosphate pathway, Gluconeogenesis. Redox Potentials, Mitochondrial electron transport system, Oxidative phosphorylation.

EVOLUTION :

1. Origin of life - Modern concepts, theories of Evolution.
2. Isolation, Speciation, Natural Selection.
3. Hardy weinberg' Law.
4. Population Genetics (Gene pool, Gene frequency), Genetic drift and convergent evolution, Adaptive radiation.
5. Evolution of Man.
6. Zoogeographical realms of the world.

DEVELOPMENTAL BIOLOGY :

1. Speamatogenesis, oogenesis.
2. Fertilization, cleavage, gastrulation formation of germ layers, parthenogenesis.
3. Embryogenesis in vertebrates.
4. Formation and function of foetal membranes.
5. Types of Placenta.
6. Regualtion, genetic control of development.
7. Development of Frog and chick.

HISTOLOGY :

1. Histology of Mammalian tissues and organs - Epithelial, connective, blood, bone, cartilage, skin, stomach, intestine, liver, pancreas, kidney, Testis and Ovary.

ECOLOGY :

1. Concept of Ecosystem.
2. Biogeochemical cycles (Carbon, Nitrogen and Phosphorous).
3. Influence of environmental factors on animals, energy flow in Ecosystem, food chains, food web and trophic levels.
4. Community and population ecology. Ecological succession.
5. Environmental pollution-Air, water, land, noise, radioactive, thermal and visual, effects of pollution on ecosystem, prevention of pollution.
6. Wildlife in India-conservation, Chipko movement.
7. Biodiversity-Economic significance, conservation, hot spots of India.

IMMUNOLOGY :

1. Cells of the immune system : Lymphoid cells, Mononuclear cells, granulocytic cells, Mast cells.
2. Organs of the immune system - primary and secondary lymphoid organs, lymphatic system.
3. Antigens: Antigenic determinants or epitopes, immunogenicity, Haptens.
4. Innate (Non-specific immunity): Anatomical barriers, phagocytosis, NK cells, interferon.
5. Humoral immunity: Immunoglobulins (fine structure of immunoglobulins and immunoglobulin classes); the complement system, Classical and alternate pathway, inflammation.
6. Cell mediated immunity : Mechanism of cell mediated immunity; Brief account on Antigen presentation, Major histocompatability complex.
7. Antigen-Antibody interactions : Affinity, Avidity, Cross-reactivity, precipitation reactions, and Agglutination reactions and ELISA.
8. Brief account on immunological Hypersensitivity disorders :

    a) Tolerance and Autoimmunity
    b) Transplantation.
    c) Immunodeficiency diseases - HIV.
    d) Immunization (Active and passive immunity).

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