BOTANY

BIODIVERSITY
Microbes, Algae, Fungi and introduction to Archegoniate, Bryophytes, pteridophytes, Gymnosperms

PLANT ECOLOGY AND TAXONOMY
Introduction, Ecological factors, Plant communities, Ecosystem , Phytogeography, Introduction to plant taxonomy, Identification, Taxonomic evidences from palynology, cytology, phytochemistry and molecular data, Taxonomic hierarchy, Botanical nomenclature, Classification, Biometrics, numerical taxonomy and cladistics

PLANT ANATOMY AND EMBRYOLOGY
Meristematic and permanent tissues, Organs, Secondary Growth, Adaptive and protective systems, Structural organization of flower, Pollination and fertilization, Embryo and endosperm, Apomixis and polyembryony

PLANT PHYSIOLOGY AND METABOLISM
Plant-water relations, Mineral nutrition, Translocation in phloem, Photosynthesis, Respiration, Enzymes, Nitrogen metabolism, Plant growth regulators, Plant response to light and temperature

CELL AND MOLECULAR BIOLOGY
Techniques in Biology (Principles of microscopy, Light Microscopy etc.), Cell as a unit of Life, Cell Organelles (Mitochondria, Chloroplast, ER, Golgi body & Lysosomes, Peroxisomes and Glyoxisomes, Nucleus), Cell Membrane and Cell Wall, Cell Cycle, Genetic Material (DNA, DNA replication (Prokaryotes and Eukaryotes), Transcription (Prokaryotes and Eukaryotes), Regulation of gene expression
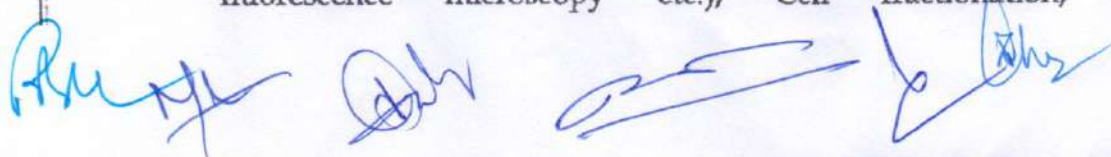
ECONOMIC BOTANY AND BIOTECHNOLOGY
Origin of Cultivated Plants, Cereals, Legumes, Spices, Beverages, Oils and Fats, Fibre Yielding Plants, Introduction to Biotechnology, Plant tissue culture, Recombinant DNA Techniques

GENETICS AND PLANT BREEDING
Heredity(Brief life history of mendel, terminologies, laws of inheritance etc.), Sex-determination and Sex-Linked Inheritance Linkage and Crossing over, Mutations and Chromosomal Aberrations, Plant Breeding, Methods of crop improvement, Quantitative inheritance, Inbreeding depression and heterosis, Crop improvement and breeding

ANALYTICAL TECHNIQUES IN PLANT SCIENCES
Imaging and related techniques (principles of microscopy, light microscopy, fluorescence microscopy etc.), Cell fractionation, Radioisotopes,

Spectrophotometry, Chromatography, Characterization of proteins and nucleic acids, Biostatistics

BIOINFORMATICS
Introduction to Bioinformatics, Databases in Bioinoformatics, Biological Sequence Databases, Sequence Alighments, Molecular Phylogeny, Applications of Bioinformatics

RESEARCH METHODOLOGY
Basic concepts of research, General laboratory practices, Data collection and documentation of observations, Overview of biological problems, methods to study plant cell/tissue structure, plant microtechniques, the art of scientific writing and its presentation

ZOOLOGY

ANIMAL DIVERSITY

Kingdom Protista, Phylum Porifera, Phylum Cnidaria, Phylum Platyhelminthes, Phylum Nemathelminthes, Phylum Annelida, Phylum Arthropoda, Phylum Mollusca, Phylum Echinodermata, Protochordates, Agnatha, Pisces, Amphibia, Reptiles, Aves, Mammals

COMPARATIVE ANATOMY AND DEVELOPMENTAL BIOLOGY OF VERTEBRATES

Integumentary System (derivatives of integument w.r.t. glands and digital tips), Skeletal System (evolution of visceral arches), Digestive System (brief account of alimentary canal and digestive glands) , Respiratory System (gills, lungs, air sacs and swim bladder), Circulatory System (evolution of heart and aortic arches), Urinogenital System (Succession of kidney, Evolution of urino-genital ducts), Nervous System (comparative account of brain), Sense Organs (Types of receptors), Early Embryonic Development (Gametogenesis, fertilization etc), Late Embryonic Development (implantation of embryo in humans, formation of human placenta and functions etc), Control of Development (Fundamental processes in development- gene activation, determination etc.)

PHYSIOLOGY AND BIOCHEMISTRY

Nerve and muscle, Digestion, Respiration, Excretion, Cardiovascular system, Reproduction and Endocrine Glands, Carbohydrate Metabolism, Lipid Metabolism, Protein metabolism, enzymes

GENETICS AND EVOLUTIONARY BIOLOGY

Introduction to Genetics, Mendelian Genetics and its Extension, Linkage, Crossing over and Chromosomal Mapping, Mutations, Sex Determination, History of Life, Introduction to Evolutionary Theories, Direct Evidences of Evolution, Processes of Evolutionary Change, Species concept, Macro evolution, Extinction

ANIMAL BIOTECHNOLOGY

Introduction (concept and scope of biotechnology), Molecular Techniques in Gene manipulation (cloning vectors, restriction enzymes, transformation techniques etc.), Genetically Modified Organisms (production of cloned and transgenic animals, applications of transgenic animals, production of transgenic plants, applications of transgenic plants), Culture Techniques and Applications

APPLIED ZOOLOGY

Introduction to Host-Parasite Relationship, Epidemiology of Diseases, Rickettsiae and Spirochaetes, Parasitic Protozoa, Parasitic Helminthes,

Insects of Economic Importance, Insects of Medical Importance, Animal Husbandry, Poultry Farming, Fish Technology

AQUATIC BIOLOGY
Aquatic Biomes (brief introduction of the aquatic biomes etc.), Freshwater Biology (Lakes: origin and classification etc., Streams: Different stages of stream development etc.), Marine Biology (salinity and density of sea water etc.), management of Aquatic Resources (causes of pollution, Water quality assessment-BOD and COD etc.)

IMMUNOLOGY
Overview of the Immune System, Cells and Organs of the Immune System, Antigens, antibodies, Working of the immune system, Immune system in health and disease, vaccines.

REPRODUCTIVE BIOLOGY
Reproductive endocrinology (gonadal hormones and mechanism of hormone action, steroids etc.), Functional anatomy of male reproduction (outline and histological of male reproductive system in rat and human, testis, germcell etc.), Functional anatomy of female reproduction (outline and histological of female reproductive system in rat and human, ovary, ovulation etc.), Reproductive Health (Infertility in male and female, Assisted reproductive technology, etc.)

INSECT, VECTORS AND DISEASES
Introduction to Insects, concept of vectors, Insects as vectors, dipteran as disease vectors, siphonaptera as disease vectors, Siphuculata as disease vectors, hempitera as disease vectors

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Syllabus of Forestry

SILVICULTURE

General Silvicultural Principles -Ecological and physiological factors influencing vegetation, natural and artificial regeneration of forests; methods of propagation, grafting techniques; site factors; nursery and planting techniques nursery beds, containers and maintenance, grading and hardening of seedlings; establishment and tending. Silviculture of some of the economically important species in India. Silviculture systems (Clear felling, uniform shelter wood selection, coppice and conversion systems), Management of silviculture systems of temperate, subtropical, humid tropical, dry tropical and coastal tropical forests; Thinning.

AGROFORESTRY

Agroforestry- Scope and necessity; Agro forestry systems under different agroecological zones; selection of species and role of multipurpose trees and NTFP's, techniques, food, fodder and fuel security. Social/Urban Forestry: Objectives, scope and necessity. JFM-Principles, objectives, Methodology, scope and benefits, National agroforestry policy.

FOREST SOILS AND WATERSHED MANAGEMENT

Forests Soils: Classification, factors affecting soil formation; physical, chemical and biological properties. Soil conservation-definition, causes for erosion; types-wind and water erosion; conservation and management of eroded soils/areas, wind breaks, shelter belts; sand dunes; water logged and other waste lands. Role of forests in conserving soils. Role of micro-organisms in ameliorating soils; N and C cycles. Watershed Management-Concepts of water shed; forest hydrology, landslide controls, rehabilitation of degraded areas; water harvesting and conservation;ground water recharge and watershed management.

ENVIRONMENTAL CONSERVATION AND BIODIVERSITY

Environment- Components and importance, principles of conservation, impact of deforestation; forest fires and various human activities like mining, construction and developmental projects, population growth on environment. Pollution-Types, Global warming, green house effects, ozone layer depletion, acid rain, impact and control measures, environmental monitoring; concept of sustainable development. Control and prevention of air, water and noise pollution. Environmental impact Assessment.

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TREE IMPROVEMENT

General concept of tree improvement, methods and techniques, variation and its use, provenance. seed source, exotics; quantitative aspects of forest tree improvement, seed production and seed orchards, progeny tests, use of tree improvement in natural forest and stand improvement, forest genetic resources and gene conservation in situ and ex-situ, application of DNA technology in foresty.

FOREST MANAGEMENT AND MENSURATION

Objective and principles; techniques; stand structure and dynamics, sustained yield relation; rotation, normal forest, growing stock; regulation of yield; management of forest plantations, commercial forests, forest cover monitoring. Forest Divisional Working plans. Methods of measuring –diameter, girth, height and volume of trees; form-factor; volume estimation of stand, current annual increment; mean annual increment, Sampling methods and sample plots. Yield calculation; yield and stand tables, forest cover monitoring through remote sensing; Geographic information Systems for management and modeling. Forest Surveying different methods of surveying.

FOREST ECOLOGY

Biotic and abiotic components, forest eco-systems; forest community concepts; vegetation concepts, ecological succession and climax, primary productivity, nutrient cycling and water relations. Forest types in India, identification of species. composition and associations; dendrology, taxonomic classification, principles and establishment of herbaria and arboreta conservation of forest ecosystems.

FOREST RESOURCES AND UTILIZATION

Logging and extraction techniques and principles, transportation systems, storage and sale of Timber; Non-Timber Forest Products (NTFPs)- definition and scope; gums, resins. oleoresins, fibres, oil seeds nuts, rubbers, canes, bamboos, medicinal plants, charcoal, lac and shellac, katha and Bidi leaves, need and importance of wood seasoning and preservation general principles of seasoning, air and kiln seasoning, composite wood; plywood, fibre boards, particle boards, wood substitution.
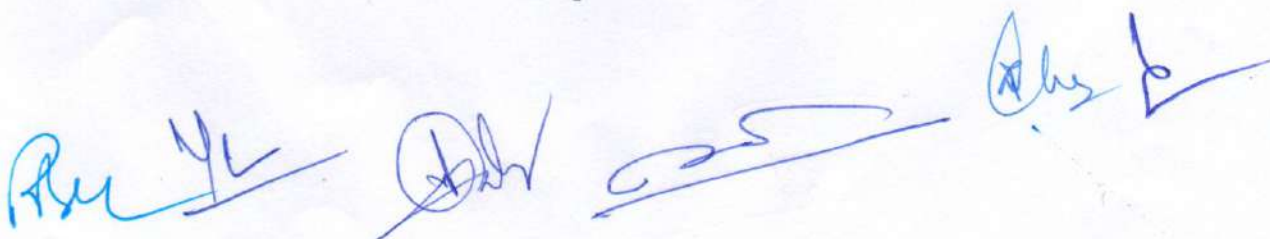
FOREST PROTECTION & WILDLIFE

Injuries to forest, insect-pests and disease, General forest protection against fire, equipment and methods, controlled use of fire. Rotational and controlled grazing, different methods of control against grazing and browsing animals; effect of wild animals on forest regeneration; encroachment, poaching, shifting cultivation and control.

FOREST ECONOMICS AND LEGISLATION

Fundamental principles, cost-benefit analyses; estimation of demand and supply: Socioeconomic analysis of forest productivity and attitudes; valuation of forest goods and service. National Forest Policy, Forest laws, necessity; general principles, Indian Forest Act 1927, Forest Conservation Act, 1980, Wildlife Protection Act 1972 and their amendments.

FORESTS AND PEOPLE

Forests and its importance, forest societies, interactions with people, social and cultural factors, afforesation programmes, forest conflicts, wildlife and human conflicts, important forest movements, gender dimension, tribal economy, pastoralists, management of commons and Common Property Resources (CRPS) and open access resources, sustainable livelihood, food security, eco-tourism, land use change. Forest rights, customary rights of people, community participation, biodiversity and ethnobotany, global environmental change and land use, resettlement, poverty alleviation and forests, role of NGOs and other CBOs community based organizations.

PHYSICS

MECHANICS

Vectors, Ordinary Differential Equations, Laws of Motion, Momentum and Energy, Rotational Motion, Gravitation, Oscillations, Elasticity, Special Theory of Relativity.

ELECTRICITY AND MAGNETISM

Vector Analysis, Electrostatics, Magnetism, Electromagnetic Induction, Maxwell's Equations and Electromagnetic wave propagation

THERMAL PHYSICS AND STATISTICAL MECHANICS

Laws of Thermodynamics, Thermodynamic Description of system, Thermodynamic Potentials, Kinetic Theory of Gases, Theory of Radiation, Statistical Mechanics

WAVES AND OPTICS

Superposition of Two Collinear Harmonic Oscillations, Superposition of Two Perpendicular Harmonic Oscillations, Waves Motion- General, Fluids, Sound, Wave Optics, Interference, Michelson's Interferometer, Diffraction, Polarization

DIGITAL AND ANALOG CIRCUITS AND INSTRUMENTATION

Digital Circuits, Semiconductor Devices and Amplifiers, Operational Amplifiers (Black Box Approach), Sinusoidal Oscillators, Instrumentations (introduction to CRO, power supply- half-wave rectifiers, timer IC etc.)

ELEMENTS OF MODERN PHYSICS

Planck's quantum, Planck's constant and light as a collection of photons; Photo-electric effect and Compton Scattering, De Broglie wavelength and matter waves, Davisson- Germer experiment, Problems with Rutherford model- instability of atoms and observation of discrete atomic spectra; Bohr's quantization rule and atomic stability; calculation of energy levels for hydrogen like atoms and their spectra, position measurement- gamma ray microscope thought experiment, wave-particle duality, Heisenberg uncertainty principle, two slit interference experiment with photons, atoms and particles, matter waves and wave amplitude, schrodinger equation for non relativistic particles, one dimensional infinitely rigid box- energy eigenvalues and eigen functions normalization, size and structure of atomic nucleus and its relation with atomic weight, nature of nuclear force, semi empirical mass formula and binding, radioactivity- stability of nucleus, law of radioactive decay, mean life & half life, a decay, B decay, Fission and fusion etc.

SOLID STATE PHYSICS

Crystal Structure, Elementary Lattice Dynamics, Magnetic Properties of Matter, Dielectric Properties of Materials, Elementary band theory, Super conductivity)

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QUANTUM MECHANICS

Time dependent schrodinger equation, Time independent Schrodinger equation, General discussion of bound states in an arbitrary potential, Quantum theory of hydrogen-like atoms, Atoms in electric and magnetic fields, Atoms in External Magnetic Fields, Many electron atoms (pauli's exclusion principle, symmetric and antisymmetric wave functions etc.)

EMBEDDED SYSTEM: INTRODUCTION TO MICROCONTROLLERS

Embedded system introduction, Review of microprocessors, 8051 microcontroller, 8051 I/O port programming, Programming of 8051, Timer and counter programming Serial port programming with and without interrupt, Interfacing 8051 microcontroller to peripherals, Programming Embedded Systems, Embedded system design and development

NUCLEAR & PARTICLE PHYSICS

General Properties of Nuclei, Nuclear Models, Radioactivity decay, Nuclear Reactions, Interaction of nuclear radiation with matter, Detector for Nuclear Radiations, Particle Accelerators, Particle physics

CHEMISTRY

INORGANIC

Atomic structure (review of bhor's theory and its limitations, dual behavious of matter and radiation, de broglie's relation, Heisenberg uncertainty principle, hydrogen atom spectra etc.), Chemical Bonding and Molecular Structure (Ionic bonding , Covalent bonding, Molecular Orbital (MO) Approach) , Transition Elements 3d series (General group trends with special reference to electronic configuration, variable valency colour, lanthanoids and actinoids etc.), Coordination Chemistry (Valence bond theory, drawbacks of VBT etc.), Crystal Field Theory

ORGANIC

Fundamentals of Organic Chemistry (Physical Effects, Electronic Displacements etc., Structure, Shape and Reactivity of Organic Molecules, Reactive Intermediates, Strength of Organic Acids and Bases etc.), Stereochemistry (conformation with respect to ethane, butane, cyclohexane, newmann, sawhorse and fischer representations, geometrical and optical isomerism, enantiomerism etc.), Aliphatic Hydrocarbons (preparation and reactions of Alkanes, Alkenes, Alkynes- upto 5 carbons), Reactions - Formation of metal acetylides, addition of bromine and alkaline $KMnO_4$ ozonolysis and oxidation with hot alkaline $KMnO_4$.

Functional group approach for the following reactions - preparation & reactions - Aromatic hydrocarbons (case benzene), Alkyl Halides (upto 5 carbons), Aryl Halides (preparation: from phenol, sandmeyer & gattermann reactions, Reactions-Cholrobenzene), Alcohols, Phenols and Ethers (Upto 5 Carbons), Aldehydes, Ketones and Carboxylic acids and their derivatives (aliphatic and aromatic), Caboxylic acid derivatives (aliphatic upto 5 carobons), Amines (Aliphatic and Aromatic upto 5 Carbons) and Diazonium Salts, Amino Acids, Peptides and Proteins, Carbohydrates

PHYSICAL

Chemical Energetics (review of thermodynamics and the laws of thermodynamics), Chemical Equilibrium, Ionic Equilibria, Solutions, Phase Equilibrium, Conductance, Electrochemistry, Kinetic Theory of Gases, Liquids, Solids, Chemical Kinetics

NOVEL INORGANIC SOLIDS

Synthesis and modification of inorganic solids, Inorganic solids of technological importance, Nanomaterials, Introduction to engineering materials for mechanical construction, Composite materials, Specialty polymers.

POLYMER CHEMISTRY

Introduction and history of polymeric materials, Functionality and its importance, Kinetics of polymerization, Crystallization and Crystallinity, nature and structure of polymers, Determination of molecular weight of polymers, Glass transition temperature (Tg) and determination of (Tg).

Polymer Solution, Properties of Polymers (Physical, thermal, flow & mechanical properties)

RESEARCH METHODOLOGY FOR CHEMISTRY

Literature Survey (Print, Digital, Information Technology and Library Resources, methods of Scientific Research and Writing Scientific Papers, Chemical Safety and Ethical Handling of Chemicals, Data Analysis, Electronics)

GREEN CHEMISTRY

Introduction to Green chemistry (What is Green Chemistry? Need for Green Chemistry, Goals of Green Chemistry, Limitations/Obstacles in the pursuit of the goals of Green Chemistry)

Principles of Green Chemistry and Designing a Chemical synthesis (Twelve principles of Green Chemistry with their explanations and examples), Examples of Green Synthesis/Reactions and some real world cases, Future Trends in Green Chemistry.

INDUSTRIAL CHEMICALS AND ENVIRONMENT

Industrial Gases and Inorganic Chemicals, Industrial Metallurgy, General Principles of Metallurgy, Environment and its segments (Ecosystems, Biogeochemical cycles of carbon, nitrogen and sulphur, Air Pollution, Water pollution), Energy & Environment (Sources of energy:- coal, petrol and natural gas, Nuclear fusion/Fission, Solar Energy, Hydrogen, Geothermal, tidal and hydel etc., Nuclear pollution), Biocatalysis (Introduction to biocatalysis: Importance in " Green Chemistry and Chemical Industry)

QUANTUM CHEMISTRY, SPECTROSCOPY & PHOTOCHEMISTRY

Quantum Chemistry (Postulates of quantum mechanics, Schordinger equation and its application to free particle, Heinseberg Uncertainty principle, wavefunctions etc., Angular Momentum, Chemical bonding etc.), Molecular Spectroscopy (Interaction of electromagnetic radiation with molecules and various types of spectra, Rotation spectroscopy, Vibrational Spectroscopy, Raman spectroscopy, Electronic Spectroscopy, Nuclear Magnetic Resonance (NMR) Spectroscopy, Electron spin Resonance (ESR) Spectroscopy), Photochemistry (Characteristics of electromagnetic radiation, lambert-beer's law and its limitations, laws of photochemistry, actinometry, photostationary states, chemiluminescence)

ORGANOMETALLICS, BIOINORGANIC CHEMISTRY, POLYNUCLEAR HYDROCARBONS AND UV, IR SPECTROSCOPY

Inorganic Chemistry:- Chemistry of 3d metals, Organometallic Compounds, Bio-Inorganic Chemistry

Organic Chemistry:- Polynuclear and heteronuclear aromatic compounds (Properties of the following compounds with reference to electrophilic and nucleophilic substitution: Naphthalene, Anthracene, Furan, Pyrrole, thiophene, and Pyridine), Active methylene compounds (Preparation and

Reactions upto 6 carbon), application of spectroscopy to Simple Organic Molecules.

MOLECULES OF LIFE

Carbohydrates, Amino acids, Peptides and Proteins, Enzymes and correlation with drug action, Nucleic acids, Lipids, Concept of energy in biosystems.

DIFFERENTIAL CALCULUS

Limit and Continuity (ε and δ definition), Types of discontinuities, Differentiability of functions, Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem on homogeneous functions, Tangents and normals, Curvature, Asymptotes, Singular points, Tracing of curves. Parametric representation of curves and tracing of parametric curves, Polar coordinates and tracing of curves in polar coordinates, Rolle's theorem, Mean Value theorems, Taylor's theorem with Lagrange's and Cauchy's forms of remainder, Taylor's series, Maclaurin's series of sin x, cos x, e^x, log(1+x), $(1+x)^m$, Maxima and Minima, Indeterminate forms

DIFFERENTIAL EQUATIONS

First order exact differential equations, Integrating factors, rules to find an integrating factor, First order higher degree equations solvable for x, y, p. Methods for solving higher-order differential equations, basic theory of linear differential equations, Wronskian, and its properties, Solving a differential equation by reducing its order, Linear homogenous equations with constant coefficients, Linear non-homogenous equations, the method of variation of parameters, the Cauchy-Euler equation, Simultaneous differential equations, Total differential equations, Order and degree of partial differential equations, Concept of linear and non-linear partial differential equations, Formation of first order partial differential equations, Linear partial differential equation of first order, Lagrange's method, Charpit's method, Classification of second order partial differential equations into elliptic, parabolic and hyperbolic through illustrations only

REAL ANALYSIS

Finite and infinite sets, examples of countable and uncountable sets, Real line, bounded sets, suprema and infima, completeness property of R, Archimedean property of R, intervals, Concept of cluster points and statement of Bolzano-Weierstrass theorem, Real Sequence, Bounded sequence, Cauchy convergence criterion for sequences, Cauchy's theorem on limits, order preservation and squeeze theorem, monotone sequences and their convergence (monotone convergence theorem without proof), Infinite series, Cauchy convergence criterion for series, positive term series, geometric series, comparison test, convergence of p-series, Root test, Ratio test, alternating series, Leibnitz's test (Tests of Convergence without proof), Definition and examples of absolute and conditional convergence, Sequences and series of functions, Pointwise and uniform convergence, M_n-test, M-test, Statements of the results about uniform convergence and integrability and differentiability of functions, Power series and radius of convergence

ALGEBRA

Definition and examples of groups, examples of abelian and non-abelian groups, the group Z_n of integers under addition modulo n and the group U(n) of units under multiplication modulo n, Cyclic groups from number systems,

complex roots of unity, circle group, the general linear group GL_n (n,R), groups of symmetries of (i) an isosceles triangle, (ii) an equilateral triangle, (iii) a rectangle, and (iv) a square, the permutation group Sym (n), Group of quaternions, Subgroups, cyclic subgroups, the concept of a subgroup generated by a subset and the commutator subgroup of group, examples of subgroups including the center of a group, Cosets, Index of subgroup, Lagrange's theorem, order of an element, Normal subgroups: their definition, examples, and characterizations, Quotient groups, Definition and examples of rings, examples of commutative and non-commutative rings: rings from number systems, Z_n the ring of integers modulo n, ring of real quaternions, rings of matrices, polynomial rings, and rings of continuous functions. Subrings and ideals, Integral domains and fields, examples of fields: Z_p, Q, R, and C. Field of rational functions.

MATRICES
R, R^2, R^3 as vector spaces over R, Standard basis for each of them, Concept of Linear Independence and examples of different bases, Subspaces of R^2, R^3, Translation, Dilation, Rotation, Reflection in a point, line and plane, Matrix form of basic geometric transformations, Interpretation of eigen values and eigen vectors for such transformations and eigen spaces as invariant subspaces, Types of matrices, Rank of a matrix, Invariance of rank under elementary transformations, Reduction to normal form, Solutions of linear homogeneous and non-homogeneous equations with number of equations and unknowns upto four, Matrices in diagonal form. Reduction to diagonal form upto matrices of order 3, Computation of matrix inverses using elementary row operations, Rank of matrix, Solutions of a system of linear equations using matrices, Illustrative examples of above concepts from Geometry, Physics, Chemistry, Combinatorics and Statistics

MECHANICS
Conditions of equilibrium of a particle and of coplanar forces acting on a rigid body, Laws of friction, problems of equilibrium under forces including friction, centre of gravity, work and potential energy, velocity and acceleration of a particle along a curve: radial and transverse components (plane curve), tangential and normal components (space curve), Newton's laws of motion, simple harmonic motion, simple pendulum, projectile motion.

LINEAR ALGEBRA
Vector spaces, subspaces, algebra of subspaces, quotient spaces, linear combination of vectors, linear span, linear independence, basis and dimension, dimension of subspaces, linear transformations, null space, range, rank and nullity of a linear transformation, matirix representation of a linear transformation, algebra of linear transformations, dual space, dual basis, double dual, eigen values and eigen vectors, characteristic polynomial, isomorphisms, isomorphism theorems, invertibility and isomorphisms, change of coordinate matrix.

NUMERICAL METHODS

Algorithms, Convergence, Bisection method, False position method, Fixed point iteration method, Newton's method, secant method, LU decomposition, Gauss-Jacobi, Gauss-Siedel and SOR iterative methods, Lagrange and Newton interpolation: linear and higher order, finite difference operators, Numerical differentiation: forward difference, backward difference and central difference integration: trapezoidal rule, simpson's rule, Euler's method.

COMPLEX ANALYSIS

Limits, Limits involving the point at infinity, continuity, Properties of complex numbers, regions in the complex plane, functions of complex variable, mappings, Derivatives, differentiation formulas, Cauchy-Riemann equations, sufficient conditions for differentiability, Analytic functions, examples of analytic functions, exponential function, Logarithmic function, trigonometric function, derivatives of functions, definite integrals of functions, Contours, Contour integrals and its examples, upper bounds for moduli of contour integrals, Cauchy- Goursat theorem, Cauchy integral formula, Liouville's theorem and the fundamental theorem of algebra, Convergence of sequences and series, Taylor series and its examples, Laurent series and its examples, absolute and uniform convergence of power series

LINEAR PROGRAMMING

Linear programming problems, Graphical approach for solving some linear programs, convex sets, Supporting and separating Hyperplanes, Theory of simplex method, optimality and unboundedness, the simplex algorithm, simplex method in tableau format, introduction to artificial variables, two-phase method, Big-M method and their comparison, Duality, formulation of the dual problem, primal-dual relationships, economic interpretation of the dual, sensitivity analysis

To be used against General Awareness & Reasoning, General English & General Science and Arithmetic of framework elaborated at Para 2.2 of Appendix – X1 of ICFRE TSR-2013 for all functional Groups viz. Field/Lab Research, Maintenance, Workshop, General Service and Para Medical.

A. General Awareness & Reasoning (20 MCQ):

I. General Awareness:-

Questions in this opponent will be aimed at testing the candidate's general awareness of the environment around him and its application to society. Questions will also be designed to test knowledge of current events and of such matters of everyday observation and experience in their scientific aspects as may be expected from an educated person. The test will also include questions relating to India and its neighbouring countries especially pertaining to history, culture, geography, economic scene, general policy and scientific research etc. These questions will be such that they do not require a special study of any discipline.

II. Reasoning:-

Questions of reasoning would include questions of both verbal and non-verbal type. This component will include questions of analogies, similarities and differences, spatial visualization, spatial orientation, problem solving, analysis, judgment, decision making, visual memory, discrimination, observation, relationship concepts, arithmetic reasoning, verbal and figure classification, arithmetical number series, non-verbal series, coding and decoding, statement, conclusion, syllogistic reasoning etc.

B. General English & General Science (20MCQ)

i. General English:-

Questions in this component will be designed to test the candidate's understanding and knowledge of English language and will be based on spot the error, fill in the blanks, synonyms, antonyms, spelling/detecting misspelled words, idioms & phrases, One word substitution, improvement of sentences, Active/Passive Voice of Verbs, conversion into direct/indirect narration, comprehension Passage etc.

ii. General Science:-

Basic understanding of science expected of a high school student

C. Arithmetic (20 MCQ)

The questions will be designed to test the ability of appropriate use of numbers and number sense of the candidate. The part will include questions on problems relating to numbers system, computation of whole numbers, decimals and fractions, relationships between numbers, fundamental arithmetical operations, percentage, ratio and proportion, average, interest, profit and loss, discount, use of tables and graphs, mensuration time and distance ratio and time etc.