SYLLABUS FOR JET EXAM

AGRICULTURE

UNIT – 1

General proficiency and general knowledge in Agriculture :-

General knowledge of the physiographic conditions of Rajasthan. Contribution of major arable crops and livestock to state exchequer, major endowments of Rajasthan and relief measures provided in the successive plans; Major handicaps to agricultural and horticultural production.

Elements of climate and weather and their effect on crop growth. Agroclimatic zones of Rajasthan. Soil fertility and productivity. Saline and alkaline soils, acidic soils and their management.Soil types of Rajasthan. Soil erosion, methods of soil and water conservation.

Essential plant nutrients, their functions, availability and sources. Importance and types of organic manures and fertilizers, nitrogen, phosphorus and potassium fertilizers, straight, mixed and compound fertilizers. Methods of fertilizer application.

Importance of irrigation in crop production, sources of irrigation, water requirement of crops and factors affecting it, scheduling of irrigation. Drainage and its importance, types of drainage. Characteristics of weeds, classification of weeds, weed- crop interference, prevention, control and eradication of weeds, methods of weed control. Use of herbicides for weed control in crops.

Study of the following crops with reference to climate and soil requirements, land preparation, varieties, seed treatment, seed rate, time of sowing, fertilizer application, irrigation, intercultural operations, plant protection, harvesting and threshing, yield, storage and crop rotations keeping in view the Agro-climatic conditions of Rajasthan.

Cereals - Paddy, maize, sorghum, pearl millet,wheat and barley
Pulses - Green gram, cowpea, red gram, black gram, kidney bean, gram and pea.
Oil seeds - Groundnut, sesame, soybean, mustard,linseed, safflower, sunflower and taramira.
Cash crop - Sugarcane, potato and tobacco.
Fiber crops - Cotton and Sunhemp.
Fodder crops - Berseem, lucerne, oat, clusterbean and pearl millet.
Spices - Fenugreek, cumin and coriander.

Characteristics of quality seed, seed germination and factors affecting it. Seed production-nucleus, foundation and certified seeds. Dry farming- importance, characteristics and principles. Crop production technology in dry farming areas. Mixed cropping, its types and benefits. Crop rotation, its

principles and advantages. Tillage: objectives, primary and secondary tillage. Sowing methods. Seed treatment, seed dormancy and ways to remove it.

UNIT – 2

Importance of fruits and vegetables production, present status and future scope. Nursery management, propagation and transplanting of saplings. Selection of site and planning for fruit orchard. Different layout systems of orchard. Effect of adverse weather conditions like frost, hot, winds, hail, storm, drought, dust storms, heavy rainfall and their protective measures. Problems of unfruitfulness and its remedial measures. Use of plant growth regulators.

Study of following important horticultural crops with reference to climate and soil, improved varieties, propagation methods, manures & fertilizers, irrigation, harvesting, yield and important insect-pest and diseases control: Mango, citrus (orange, lime), guava, pomegranate, papaya, ber, datepalm, aonla, tomato, onion, cauliflower, okra, cucurbits (melons, bottle gourd) and Rose.

Importance, present position and scope of fruits and vegetable preservation, principles and methods of fruit preservation. Techniques of canning, drying and dehydration. Preparation of Jam, Jelly, Ketchup, Squash, pickles and sauce.

Cultivation of medicinal plants namely: Safed musli, Aswagandha, Aloevera, Jatropha, Senna & Isabgol.

UNIT – 3

Importance of livestock in agriculture, importance of management in dairy animals for milk production, habitat, characteristics and utility of following breeds:

Cow - Gir,Tharparkar, Nagori, Rathi, Jersey and Holstein Friesian
Buffalo - Murrah,Surti and Nili-Ravi
Goat - Jamunapari, Barbari, Sirohi, Marwari
Shee - Marwari, Chokla, Malpura, Merino, Karakul, Sonadi
Poultry - Rhode Island Red, White Leghorn and hybrids

Poultry farming and camel management

Judging of cattle and determination of age.

Types, uses, doses and method of administration of following common medicines:

Antiseptics - Phenyl,carbolic acid, Potassium Permagnate, Lysol.
Purgative - Magnesium sulphate, castor oil
Simulators - Alcohol,camphor

Anthelminitics - Copper sulphate, phenovis

Astringengts - Tincture of iodine, alum

Bodymassage oil - Terpentine oil.

Causes, symptoms, treatment and control of following diseases:

Rinderpest, Foot and Mouth, Black quarter, Anthrax, Haemorraagic septicemia, Tick fiver.

Milk production, composition of milk and colostrum, clean milk production, milk preservation, milk analysis, quality control of milk. Determination of fat, apparent density, acidity and separation of cream and equipments required for separation, curd and ghee. Cleaning and sterilization of dairy utensils and equipments.

BIOLOGY

SECTION- I BOTANY

UNIT- A

UNITY OF LIFE :

Structural organization of the cell. Electron Microscopic structure of cell. Prokaryotic and eukaryotic cells. Plant and animal cells. Cell organelles and their functions-nucleus (including DNA and RNA structure), mitochondria, chloroplast, endoplasmic reticulum, golgi complex, lysosomes, microbodies, microfilaments, ribosomes, centriole, cell wall, cilia and flagella, vacuoles, cell inclusions-starch grains, mineral crystals. Cell division : amitosis, mitosis and meiosis. Comparison of mitosis and meiosis. Significance of meiosis, cell cycle.

CONTINUITY OF LIFE :

Mendel's experiments with pea and the reasons for his success. Mendel's laws of inheritance, Mono and dihybrid crosses. Chromosome structure and morphology, chromosomes and genes, chromosome hypothesis. Linkages and crossing over. Mutations. Sex determination, genetic code, transcription and translation.

PLANT PHYSIOLOGY :

(i) Plant water relation, semipermeable membranes, osmosis, diffusion, diffusion pressure deficit (DPD), water potential, plasmolysis. Transpiration-types, factors affecting rate of transpiration. Guttation. Absorption of water, root as organ for absorption. Active and passive absorption of water and minerals. (ii) Ascent of sap, path of ascent of sap, theories explaining ascent of sap (iii) Mineral nutrition-role of minerals in plant growth, macro and micro elements for plant growth, trace elements. (iv) Enzymes-introduction, enzymes as bio-catalysts, nature, classification and mode of enzyme action. (v)

Respiration-definition, comparison of respiration and fire. Types of respiration-aerobic, anaerobic and fermentation processes. Respiratory substrate, respiratory quotient, respiration sites. Mechanism of aerobic and anaerobic respiration. Glycolysis, Kreb cycle and alcoholic fermentation, Electron transport chain and Oxidative phosphorylation. Energy yield (Kilo calories). Factors affecting respiration. (vi) Photosynthesis-definition, role of water, chlorophyll and carbon-di-oxide. Light and dark reactions, photophosphorylation, Hill reaction, Red drop, two pigment system, Calvin cycle, Photorespiration, chemosynthesis (brief account). Factors affecting photosynthesis. (vii) Growth-definition, phases of growth, plant hormones (Auxins, Gibberellins, Cytokinin and ethylene) and growth regulation, action on various physiological processes. Factors affecting growth. (viii) Vernalization and Photoperiodism. (ix) Plant movements : a brief account of various types of plant movements with suitable examples.

UNIT – B

ENVIRONMENTAL BIOLOGY :

Definition of ecology and environment. Environmental factors climatic, edaphic and biotic. Plant communities and their characteristics (Density, frequency and abundance), Plant adaptations in relation to water-xerophytes, mesophytes, hydrophytes etc. Interaction between environment and organism, Ecosystem concept, trophic levels producers, consumers, decomposers. Food chain and food web. Ecological pyramids, Environmental Pollution-air and water sources and major pollutants, their effects and methods of control of pollution including nuclear fallout and waste disposal. Noise pollution-sources and effects. Natural resources and their conservation, waste land their improvement and forest conservation. Causes for the extinction of wild life. Conservation of wild life and concept of endangered species (Red data book). Indian examples.

UNIT – C

BOTANY AND HUMAN WELFARE :

Domestication of plants-historical account, improvement of crop plants-Plant breeding and plant introduction. Use of bio-fertilizers, economic and ecological aspects. Use of pesticides : advantages and hazards, Economic botany (Botanical name, family, plant parts used and uses) of the following:

Cereals   - Wheat and price
Millets   - Bajra,jowar
Pulses   - Gram,urd and mung
Fibres   - Cotton and sunnhemp
Oil seeds   - Groundnut, rapeseed & mustard and castor
Sugar   - Sugarcane
Fruits   - Mango and banana
Medicinal plants - Guggal, serpgandha, belladonna, opium and isabgol.

SECTION –II: ZOOLOGY

(A) INVERTEBRATES :

1. Description of animals and their economical importance with special reference to Agriculture;

(i) Protozoa – Amoeba
(ii) Helminthes – Soil Nematod
(iii) Annelida – Earthworm
(iv) Platy helminthes – Liver fluke
(v) Mollusca – Snail & Slug
(vi) Arthropoda (various classes)
<(a) Arachnida –Mites , (b) Crustacea – Prawns, Lobsters
(c) Diplopoda – Millipede , (d) Chilopoda-Centipedes , (e) Insecta –Cockroach

2. Important insects of crops and storage (General introduction, importance, host plants, losses, life cycle and their control).

(i) Red hairy caterpillar
(ii) White grub
(iii) Termites
(iv) Locust
(v) Pod borers
(vi) Khapra beetle

3. Methods of insect control (Insect control: General introduction)

(i)   Physical and mechanical control
(ii)   Cultural control
(iii) Chemical control (pesticides, insecticide formulation, classification of insecticides, miticides, nematicides, rodenticides) and safe use of chemicals
(iv)   Bio-control (Natural enemies of insects: Predators and parasitoids, pheromone traps, Trichoderma, NPV, botanical Insecticides.
(v)   Integrated pest management
(vi)   Sprayers and Dusters

(B) VERTEBRATES :

(i) Nutrition in animals – Nutritive elements of food, energy yielding chemicals, minerals and vitamins, balance diet.
(ii) Respiration in animals – Gaseous exchange.
(iii) Circulation in animals – Blood – Composition, Blood groups, Rh-factor, Blood coagulation.

(iv) Reproductive system – male and female reproductive system.

(v) Reproduction & development

  (a) Asexual & sexual reproduction in animals

  (b) Gametogenesis: Spermatogenesis, structure of sperm, oogenesis and type of Ovum, female reproductive cycle

  (c) Fertilization: External and internal fertilization.

  (d) Mechanism of fertilization.

CHEMISTRY

UNIT - A

STRUCTURE OF ATOM :

Development of Classical model of an atom: (i) Bohr's model of atom: Calculation of radius of Bohr's orbit and energy of an electron, (ii) Dual nature of matter and radiation: Quantization of electronic energy levels. Spectral evidence for quantization, (iii) Sommerfield's extension (no mathematical treatment), (iv) De-Broglie's Relationship, (v) Uncertainty Principle, (vi) Orbitals and quantum numbers : Shapes of orbitals, spatial distribution of atomic orbitals, (vii) Distribution of extra nuclear electrons, Aufbau principle, Pauli's exclusion principle, Hund's rule, n+l Rule, variation in relative energies of orbitals with increase in atomic number, electronic configuration of elements (s, p, d, f, block elements). Stability of half-filled and completely filled orbitals.

PERIODIC TABLE AND PERIODICITY IN PROPERTIES :

(i) Electronic configuration and periodic Table: The long form of periodic table and s, p, d, f, block elements. Advantages over Mendeleev's periodic table, (ii) Electronic configuration and Periodicity in properties, periodic perspectives, (iii) Detailed study of periodicity in physical and chemical properties with special reference to: Density, Melting and boiling points of elements. Atomic and ionic radii, Ionization potential, Electron affinity. Electro negativity, variation of effective nuclear charge in a period, metallic character, diagonal relationship.

CHEMICAL BONDING AND MOLECULAR STRUCTURE :

(i) Lewis structure – Octet rule and its limitations, (ii) ionic bond: Characteristics of ionic compounds, Solubility of ionic compounds, (iii) Covalent bond, introductory concept of over-lapping of orbitals and bonds, valence bond theory: Characteristics of covalent compounds. Coordinate bond, partial covalent character in ionic bond, partial ionic character in covalent bond. Fajan's rule, Polarities of covalent molecules, (iv) Bond length, bond angle and bond-energy general consideration, (v) Hybridization of orbitals illustrated with example of compounds of first and second row elements in periodic table: Shapes of common molecules – VSEPR Theory, (vi) Hydrogen bond , (vii) Vander Waals forces of attraction.

REDOX REACTION :

(i) Concept of formal charge on ions, (ii) Oxidation number, (iii) Oxidation reduction electron transfer concept with examples, (iv) Redox reaction- examples, (v) Balancing of equations by ion-electron method.

CHEMICAL EQUILIBRIUM :

(i) Concept of reversibility equilibrium constant, (ii) Law of mass action- generalized expression, (iii) Experimental method for verification of the law of mass action. Factors affecting equilibrium (concentration, pressure, temperature), (iv) Application to systems such as $N_2 + 3H_2 \leftrightarrow 2NH_3$, $PCl_5 \leftrightarrow PCl_3 + Cl_2$, $N_2 + O_2 \leftrightarrow 2NO$ (v) Le Chatelier's Principle-Application.

CHEMICAL KINETICS :

(i) Rate of a reaction, (ii) Instantaneous rate of a reaction and order of reaction (Zero and I order), (iii) Factors affecting the rate of reaction, concentration of reactant molecule, effect of temperature on the reaction rate, concept of activation energy, Catalysis, (iv) Effect of light on rate of reaction, (v) How fast are chemical reactions?

IONIC EQUILIBRIA :

(i) Electrolytes and non-electrolytes, (ii) Arrhenius theory: Evidence in favour of dissociation theory, (iii) Ionic product of water, (iv) Hydrolysis, degree of hydrolysis, hydrolysis constant, (v) Relation between Hydrolysis constant, Ionic product of water and dissociation constant, (vi) Common ion effect, (vii) Solubility product and its application to qualitative analysis.

ACIDS AND BASES :

(i) Hydrogen and hydroxyl ion in aqueous solution, (ii) Bronsted-Lowey concept of acids and bases, (iii) Lewis concept (iv) Dissociation of acids, (v) pH value, (vi) Buffer solutions, (vii) Theory of indicators of acid-alkali titrations, (viii) Choice of indicators.

ENERGETICS :

(i) Energy changes during a chemical reaction, (ii) Internal energy and enthalpy (Internal energy, enthalpy and enthalpy change. Origin of enthalpy change in a reaction, Hess's law of constant heat summation), (iii) Heats of reactions (Heat of neutralization, heat of combustion, heat of fusion and vaporization), (iv) What decides the direction of spontaneous change in a chemical reaction (an elementary idea of entropy and free energy change).

UNIT – B

COLLOIDAL STATE OF MATTER :

(i) Crystalloid and colloids, (ii) Classification of colloids : Emulsion, Preparation of colloids, Lyophilic and lyophobic colloids, (iii) Properties: Electrophoresis, Dialysis, Tyndall phenomenon, Brownian movement, Coagulation-Hardy and Schulze's law, Peptisation, Absorption, Applications.

METALS :

(i) Nature of metallic state : Structural packing of atom in metals. Metallic Bond-Valence bond concept, (ii) Occurrence of metals in nature, (iii) General principles of metallurgy: Activity series of metals, Standard Electrode Potential, Metallurgical Processes, (iv) Extraction of metals : Copper, silver, Aluminum and iron.

'S'- BLOCK ELEMENTS :

(i) General characteristics, (ii) Trends in variation of properties in periodic table of alkali and alkaline earth metals, (iii) General principles of extraction of the elements, (iv) General chemistry of their compounds.

D-BLOCK ELEMENTS :

(i) General characteristics, (ii) Elementary idea about paramagnetism and diamagnetism, (iii) Different oxidation states, (iv) Chemistry of transition elements as illustrated by different oxidation states of the following metals : Silver, Gold, Chromium, Manganese and Iron. Note: Numerical problems on principles involved in topics included in syllabus and on the volumetric exercises would be set.

UNIT – C

VALENCY OF CARBON AND HYBRIDISATION :

(i) Tetra-Valency of carbon atom, Kekule, Vant-Hoff and Le-Bell theories, (ii) Orbital representation of covalent bond, multiple bonding (sigma bond: Pi bond), (iii) Hybridization (sp, sp^2, sp^3 Hybridization), (iv) Orbital structure of acetylene, ethyhlene and methane, (v) Concept of bond length, bond strength and bond angle, (vi) Electronegetivity inductive effect, polarity of covalent bond, formal charge, polarity of carbon, Halogen bond.

STRUCTURE AND REACTIVITY :

(i) Bond fission, Free radicals, Ions (Carbocations and carbanion), (ii) Acids and bases, Arrhenius concept, Bronsted-Lowry concept, Lewis concept, (iii) Nucleophilic and Electrophilic reagents, (iv) Types of Organic Reactions and their mechanism : Substitution Rearrangement Reaction, (v) Markvnikov's Rule and Peroxide effect.

PYROLYSIS :

(i) Petroleum as a source of Hydrocarbons, (ii) Origin of Petroleum, (iii) Mining of Petroleum, (iv) Refinning of petroleum, (v) Artificial production of petrol (a) cracking(b) isomerization (c) synthetic method, (vi) Knocking , (vii) Octane number, (viii) Flash point.

(GRIGNARD REAGENTS) ORGANO METALLIC COMPOUNDS :

(i) Organometallic compounds, definition, and preparation of Grignard reagents, (ii) Properties and synthetic uses of Grignard reagents.

SATURATED HYDROCARBONS (UPTO 5 CARBON ATOMS) :

(i) Nomenclature and isomerism, (ii) General methods of preparation of alkanes, (iii) General properties and uses of alkanes, (iv) Individual members Propane, Butane, Pentane, (v) Interconversions of alkanes.

UNSATURATED HYDROCARBONS :

(i) Nomenclature and isomerism, (ii) General methods of preparation of Alkenes and Alkynes, (iii) General properties and uses of alkenes and alkynes with reaction mechanism, (iv) Individual members, Propene, Butene, Propyne and Butyne.

ORGANIC CHEMISTRY BASED ON FUNCTIONAL GROUPS A :

(i) Halides, Nomenclature and isomerism, General methods of preparation of mono alkyl halides: General properties of mono alkyl halides with reaction mechanism. Preparations and properties of dihalogen derivatives, Synthetic uses of alkyl halides, (ii) Hydroxy compounds: Nomenclature and Isomerism; Classification of Monohydric alcohols; General methods of preparation of Monohydric alcohols; General properties and uses of Monohydric alcohols; Hydrogen bonding in alcohol and its effect on boiling point and solubility; Test for alcoholic groups; Inter conversion of methanol and ethanol.

ORGANIC CHEMISTRY BASED ON FUNCTIONAL GROUPS B :

(i) Carbonyl groups : Nomenclature and isomerism of aldehydes and ketones, General preparations of aldhydes and ketones, General properties and uses of aldehydes and ketones with reaction mechanism; Polarity of carbon-oxygen double bond; Test for adlehydes and ketones, (ii) Carboxylic group, Nomenclature and isomerism. General preparations of monocarboxylic acids, general properties and uses of carboxylic acid, hydrogen bonding in carboxylic acids, resonance.

DERIVATIVES OF MONOCARBOXYLIC ACIDS :

(i) Kinds of acid derivatives (a) Acid chloride (b) Acid-anhydride (c) Acid amides (d) Esters (ii) Effect of carbonyl group in acid derivatives, (iii) Properties and uses of (a) Acetyl chlorides (b) Acetic anhydride (c) Acetamide (d) Ethyl acetate.

ALIPHATIC AMINES :

(i) Nomenclature and Isomerism, (ii) General methods of preparation of primary amines, (iii) General properties and uses of primary amines, (iv) Laboratory method of preparation of methyl amine and ethylamine, (v) Properties and uses of methylamine and ethylamine, (vi) Tests for amines.

DERIVATIVES OF CARBONIC ACID UREA :

 (i) Methods of preparations of urea,
(ii) Properties and uses of urea.

AROMATIC COMPOUNDS :

(i)Characteristics of Aromatic compounds, (ii) Nomenclature and isomerism, (iii) Substitution in Benzene ring, (iv) Preparations, properties and uses of Benzene (with reaction mechanism), (v) Preparation of Nitro benzene, (vi) Properties and uses of Nitrobenzene, Test for Nitrobenzene, (vii) Methods of preparation properties and uses of aniline, (viii) Test of aniline, (ix) Methods of preparation, properties and uses of phenol, (x) Test of phenol, (xi) Difference between alcohols and phenols.

SYNTHETIC AND NATURAL POLYMERS :

(i) Classification of polymers,
(ii)Some important natural and synthetic polymers with their general methods of preparation.

CHEMISTRY IN ACTION :

(i) Dyes,
(ii) Chemicals in medicines,
(iii) Plant growth hormones, Pheromones,
(iv) Fertility contraceptives, materials-chemo-sterilints.

HOME SCIENCE

UNIT - I

INTRODUCTION :

Concept, objectives and scope of Home Science. Areas of Home Science. Causes, effects and prevention of environmental pollution. Major Community Developmental Programmes - Integrated Child

Development Services (ICDS), Immunization, Midday Meal, Indra Awas Yojana, National Rural Employment Guarantee Scheme.

UNIT - II

FOODS AND NUTRITION :

Functions of food.Functions and sources of carbohydrates, protein, fat, vitamins and minerals. Malnutrition and causes. Deficiency of nutrients - causes, symptoms, dietary management. Nutritive value of important cereals, pulses, vegetables, fruits and milk and its products. Preservation of fruits and vegetables.

UNIT - III

HUMAN DEVELOPMENT AND FAMILY STUDIES :

Concept and importance of Human Development. Principles of Human Development, stages of human development and major characteristics of each stage, basic needs and rights of children, importance of mother and child care, role of parents and community in child's development, meaning and importance of Early Childhood Education.

UNIT - IV

FAMILY RESOURCE MANAGEMENT :

Human and non-human resources, Management process, decision making process, importance of consumer education. General principles, selection and use of household equipments-pressure cooker, churner, blender-mixer, refrigerator. Elements and principles of design.

UNIT - V

TEXTILES AND APPAREL DESIGNING :

Classification of fibres, properties of cotton, wool, silk and man made fibres. Care of clothes, removal of common stains-ink, vegetable, shoe polish, paint, nail polish, lipstick, rust, tea/coffee, fruits.

PHYSICS

UNIT – A

DYNAMICS OF A PARTICLE :

Conservative and non-conservative force, Motion of a particle under different types of forces or potentials : constant, linearly varying and variable conservation of linear momentum and energy.

Application, direct and oblique collision between particles, elastic and inelastic collisions. Static and dynamical problems involving forces and conservation laws.

ROTATIONAL MOTION :

Centre of mass and its calculation for a two or more particle system and for rigid body. Genera motion of a rigid body, nature of rotational motion, rotational motion of single particle in a plane torque, angular momentum and its geometrical and physical meaning, conservation of angular momentum. Examples of circular motion : car on a level circular road, car on a banked road, pendulum or particle swinging in a vertical plane. Rigid body rotation and conservation of its angular momentum. Comparison of linear and rotational motions. Definition of moment of inertia, parallel axis theorem, Perpendicular axis theorem for a plane lamina. Calculation of M. I. in case of ring disc, cylinder and sphere, Motion of a rigid body on an inclined plane.

UNIT – B

HEAT & TERMODYNAMICS :

Heat & Temperature, Zeroth law of thermodynamics, mechanical equivalent of heat, First law of thermodynamics, thermodynamics state isothermals and adiabatics. Pressure temperature and pressure volume indicator diagrams. Work done during isothermal and adiabatic process, equilibrium process and phase changes, Evaporation. Thermal expansion, variation of volume and pressure of a gas with temperature, Transter of heat conduction, convection and radiation.

THERMODYNAMICS :

Reversible and irreversible thermodynamics processes, Carnot cycle, Second law of thermodynamics, efficiency of heat engine, Heat engines; external and internal combustion engines (description only).

RADIATION :

Nature of heat radiation emissive and absorptive powers of body, black body, emissivity. Kirchoff's law with illustrations, Stefan's law and Newton's law of cooling, distribution of energy in Black body spectrum, Wien's displacement Law, idea of Plank's law of radiation.

UNIT – C

WAVES :

Wave motion, longitudinal and transverse waves, wave length, frequency, time period, amplitude of a wave. Sound waves, velocity of sound waves. Equation of a simple harmonic wave displacement, velocity and acceleration of a particle during propagation of a wave. Reflection and refraction of a wave. Superposition of waves, interference of sound waves, beats stationary waves, nodes and antinodes.

Stationary waves in pipes and strings, Resonance tube, Elementary ideas of musical scale and acoustic of buildings. Doppler effect in sound waves.

WAVE OPTICS :

Interference phenomenon; conditions of sustained interference, Young's double slit experiment, Fresnel's Bi-Prism, Fringe-width and determination of wave length, Diffraction: diffraction phenomena Fresnel's and Fraunhofer class of diffraction, Fresnel's half period zone theory, Diffraction due to a circular obstacle and circular aperture on axial points. Diffraction due to a single silt (qualitative). Resolving power of telescope and microscope, Polarization: polarized and unpolazisedwaves. Plane polarized, circulary polarized and elliptically polarized light. Identification of polarized and unpolarized light by-polaroid. Methods of obtaining the plane polaring length.

RELATIVITY :

Necessivity of the theory of relativity, Postulates of special theory of relativity, consequences, qualitative information about length contraction, time dilation and mass energy relation.

UNIT – D

ELECTROSTATICS :

Electric field vector, Free and bound changes in conductors and insulators, Behaviour of electric field and potential inside and on the surface of a conductor and a dielectric flux, Gauss's theorem and its applications in calculating electric field at any point due to a uniformly charged spherical shell (inside and outside), spherical conductor, sphere made up of volume distribution of charge, sheet of uniform charge density of infinite dimensions made up of a dielectric or of a conducting material, a line charge of infinite length. Force on the surface of a charged conductor Energy density in an electric field. Capacitors: Combination and types. Capacity: capacity of a parallel plate and spherical condenser, condensers in series and parallel, Energy of a charged condenser.

KIRCHOFF'S LAWS :

Kirchoff's Laws of electrical circuits and its application to electrical circuits. Potentiometer: Principal of potentiometer, Measurement of EMF and small potential difference, calibration of voltmeter and ammeter and measurement of internal resistance of a primary cell.

MAGNETIC EFFECTS OF CURRENT :

: Ampere's law and its applications: Magnetic induction at any point due to a long straight current carrying wire, magnetic induction inside a long solenoid, magnetic induction inside a toroid.

ELECTROMAGNETIC INDUCTION :

Magnetic flux, induced EMF. Faraday's law Lenz's law. Induced current and energy balance in a rectangular loop moving in a non uniform magnetic induction with a constant velocity, Back EMF developed when a uniform magnetic induction between them, potential difference developed across a conducting rod moving with a conducting wire moves two parallel conducting rails carrying current with a uniform velocity across a uniform magnetic induction, a conducting rod rotating in a uniform magnetic induction with a constant angular velocity and a metal disc rotating in a uniform magnetic induction with a constant angular velocity, Rectangular coil rotating in a uniform magnetic induction, Self and Mutual induction.

ALTERNATING CURRENTS :

Direct current alternating current, fluctuating D. C. and sinusoidal currents, Instantaneous, Average and root mean square value for A. C. Phase relationship between current and EMF in sinusoidal A. C., circuit containing (i) Pure resistance (ii) a resistance and an inductance, (iii) resistance and a capacitor, Impedance, resistance, reactance and susceptance. Series – L. C. R. resonant circuit, Q factor & Band with power in an A. C. circuit wattles current Electrical devices & machines: transformers, induction coil, A. C. and D. C. generators and motors, choke and starter.

ELECTROMAGNETIC WAVES :

Short history of EM waves (Maxwell, Hertz, Bose, Marconi), Basic concepts of electromagnetic oscillations, electromagnetic spectrum (radio-microwaves, infra red, optical, ultra violet, X-rays, gamma rays.

PHOTO ELECTRIC EFFECT AND MATTER WAVES :

Photo electric effect, Einstein's explanation, Photo electric equation, photo cells. De Broglie's concept of matter waves Davisson and Germer experiment. Thompsons experiment.

SEMICONDUCTING ELECTRONIC DEVICES :

Electrons in solids, classification of metals, semi-conductors and insulators, Intrinsic and extrinsic semi-conductors. P-type and N-type semi conductors. Semi conducting p-n junction diode and its characteristic. P-n-p and n-p-n junction transistors thir characteristics and parameters. Application in simple ideas and working of C.R.O. radio television and computer (explanation of working with block diagrams)

MATHEMATICS

UNIT – A

ALGEBRA OF COMPLEX NUMBERS :

Meaning of the symbol iota, definition of a complex number algebra of complex number, cube roots of unity. General and principal value, geometrical representation of a complex number (Argand diagram), modulus and amplitude of a complex number, some properties of modulus of a complex number, De movire's theorem and its applications. Circular and inverse circular functions of real and complex quantities, hyperbolic and inverse hyperbolic functions, separation of complex quantities, (circular hyperbolic logarithmic, exponential function and their inverses) into real and imaginary parts.

RELATIONS AND FUNCTIONS :

Concept of a relation, kinds of relation, equivalence relation, order relation and inverse of a relation. Function: Injuctive, surjective and bijective mappings, inverse of a function composite function and their properties.

MATRICES :

Transpose of a matrix, adjoint and inverse of a square matrix, definition and ranks of a matrix, Application of matrix in solving simultaneous equations in three variables, consistency and inconsistency of linear equations in three variables

VECTOR :

Scaler (dot) and vector (cross) product of two vectors, their geometric significance, scalar triple product, vectors triple product; Application of vector in the use of establishment of various geometrical results and problems of mechanics.

UNIT – B

CO-ORDINATE GEOMETRY:CIRCLE :

Parametric co-ordinates, Pair of tangents, chord of contact, equation of common chord of two circles, Pole and polar system of circles, circles passing through points of intersection of two given circles, one circle and one line, condition for orthogonality of two circles, definition and equation of radical axis of two circles.

PARABOLA :

Definition, its standard equation, equation of the tangent and normal from a given point, chord of contact, diameter, pair of tangents, pole and polar and simple properties connected with parabola.

THREE DIMENSIONAL GEOMETRY :

Concept of co-ordinates, distance between two points, division of the join of two points in a given ratio, direction cosines and direction ratios of a line, Cartesian equation of a line and plane in three

dimensions. Angle between two lines, between a line and a plane also between two planes; distance of a point from a line and from a plane skew lines & shortest distance between them.

PROBABILITY :

Concept of probability, Mathematical formulae for finding the probability of an event, mutually exclusive events and independent events, use of the following formulae:

(i) P (A+B)= P(A) + P (B) for any two mutually exclusive events A and B
(ii)P (A+B)= P(A) + P (B) – P (AB) for any two events A and B
(iii)P (not A)= 1-P(A)
(iv)P (AB)= P(A) P (B) for any two independent events A and B. Conditional probability.

UNIT – C

FUNCTION :

Definition of function, variables, domain, range, explanation of the terms "undefined" "indeterminate", definition of even functions, odd functions, periodic functions, increasing and decreasing functions, monotonic functions, composite functions, discussion of the graphs of exponential, logarithmic trigonometric and inverse trigonometric functions.

LIMIT AND CONTINUITY :

Definition of the limit of a function, left and right hand limit, existence of limit, discussion of problems of limits of various functions, mathematical definition of continuity discussion of continuity and discontinuities at a given point.

DIFFERENTIABILITY :

Definition, left hand and right hand derivative, existence of derivative at a point, differentiability is a sufficient condition for contuinity.

DERIVATIVES :

Derivatives of standard functions from the definition (Ab-initio), Derivative of sum difference, product, quotient and function of a function, logarithmic, exponential function derivatives of implicit and explicit functions and of Parametric functions, derivative of one function with respect to the other.

APPLICATION OF DERIVATIVES :

Geometrical significance of dy/dx and its application in finding equation of tangent and normal at a point to a curve in Cartesian and Parametric forms, orthogonal curves, use of dy/dx in determining intervals in which a function is monotonic or strictly monotonic and as a rate measures. Statement and

geometrical illustration of Rolle's theorem, statement, proof and geometrical, significance of Lagrange's mean value theorem.

SUCCESSIVE DIFFERENTIATION :

Successive differentiation, expansion of functions by Maclaurin's and Taylor'a theorems, Maxima and Minima of one variable and of two variables connected by a relation.

METHODS OF INTEGRATION :

Definition of integration as the inverse of differentiation, elementary integration, integration of sum and difference function, integration by substitution and by parts.

INTEGRATION OF FUNCTIONS :

Integration of rational and irrational, algebraic functions, integration of trigonometric functions.

DEFINITE INTEGRAL :

Definite integrals and their properties, definite integral as the limit of a sum.

QUADRATURE :

Application of definite integrals in finding the area of a region bounded by a curve in Cartesian coordinates and x-axis or y-axis, area of the region included between two curves. Application of Simpson rule in finding area in Cartesian form.