Annexure III

Syllabus for LPUNEST 2014

For Class 10th Students					
CLASS	**STREAM CODES**	**SUBJECTS**	**TOTAL QUESTIONS**	**REMARKS**	**QUALIFYING CRITERIA FOR**
X	A	English (01) Math (02) Science (03)	90	All subjects are compulsory. 30 questions per subject	Only Scholarship
For Class 12th Students					
XII-Science	B	Chemistry (04) Physics (05) Mathematics(06) Biology(07) Computer Science(08)	90	Students can opt for any 3 subjects	Eligibility and Scholarship
XII-Commerce	C	English(09) Economics(10) Accountancy(11) Business studies(12)	90	English compulsory. Choose any 2 out of other subjects	Eligibility and Scholarship
XII-Humanities	D	English (09) Economics(10) History (13) Sociology (14) Geography (15) Psychology (16) Political science (17) Philosophy (18)	90	English compulsory. Choose any 2 out of other subjects	Eligibility and Scholarship

Syllabus for NEST-Junior (Stream Code: A)

ENGLISH (Subject Code: 01)

Gender, Noun, Antonyms, Synonyms, One word Substitution, Active & Passive voice, Auxiliary verbs, Completing Statements, Spelling Bee, Singular/Plural, Idiomatic expressions, Conjunctions, Figurative expressions, Verbs types, Collective Phrases.

MATHEMATICS (Subject Code: 02)

Unit 1: Number Systems:

Real Numbers: Euclid's division lemma, Fundamental Theorem of Arithmetic - statements after reviewing work done earlier and after illustrating and motivating through examples, Proofs of results - irrationality of $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$, decimal expansions of rational numbers in terms of terminating/non-terminating recurring decimals.

Unit 2: Algebra:

Polynomials: Zeros of a polynomial. Relationship between zeros and coefficients of quadratic polynomials. Statement and simple problems on division algorithm for polynomials with real coefficients.

Pair of linear equations in two variables: Pair of linear equations in two variables and their graphical solution. Geometric representation of different possibilities of solutions/inconsistency. Algebraic conditions for number of solutions. Solution of a pair of linear equations in two variables algebraically- by substitution, by elimination and by cross multiplication. Simple situational problems must be included. Simple problems on equations reducible to linear equations may be included.

Quadratic Equations: Standard form of a quadratic equation $ax^2 + bx + c = 0$, $(a \neq 0)$. Solution of the quadratic equations (only real roots) by factorization, by completing the quare and by using quadratic formula. Relationship between discriminant and nature of roots. Problems related to day to day activities to be incorporated.

Arithmetic Progressions: Motivation for studying AP. Derivation of standard results of finding the nth term and sum of first n terms and their application in solving daily life problems.

Unit 3: Geometry:

Triangles: Definitions, examples, counter examples of similar triangles.

1. (Prove) If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.
2. (Motivate) If a line divides two sides of a triangle in the same ratio, the line is parallel to the third side.
3. (Motivate) If in two triangles, the corresponding angles are equal, their corresponding sides are proportional and the triangles are similar.
4. (Motivate) If the corresponding sides of two triangles are proportional, their corresponding angles are equal and the two triangles are similar.
5. (Motivate) If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional, the two triangles are similar.
6. (Motivate) If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, the triangles on each side of the perpendicular are similar to the whole triangle and to each other.
7. (Prove) The ratio of the areas of two similar triangles is equal to the ratio of the squares on their corresponding sides.
8. (Prove) In a right triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides.
9. (Prove) In a triangle, if the square on one side is equal to sum of the squares on the other two sides, the angles opposite to the first side is a right traingle.

Circles: Tangents to a circle motivated by chords drawn from points coming closer and closer to the point.

1. (Prove) The tangent at any point of a circle is perpendicular to the radius through the point of contact.
2. (Prove) The lengths of tangents drawn from an external point to circle are equal.

Constructions:

1. Division of a line segment in a given ratio (internally)
2. Tangent to a circle from a point outside it.
3. Construction of a triangle similar to a given triangle.

Unit 4: Trigonometry & Co-Ordinate Geometry:

Introduction to Trigonometry: Trigonometric ratios of an acute angle of a right-angled triangle. Proof of their existence (well defined); motivate the ratios, whichever are defined at 0^o & 90^o. Values (with proofs) of the trigonometric ratios of 30^o, 45^o & 60^o. Relationships between the ratios.

Trigonometric Identities: Proof and applications of the identity $\sin^2 A + \cos^2 A = 1$. Only simple identities to be given. Trigonometric ratios of complementary angles.
Heights and Distances: Simple and believable problems on heights and distances. Problems should not involve more than two right triangles. Angles of elevation / depression should be only 30^o, 45^o and 60^o.
Co-ordinate Geometry: Lines (In two-dimensions): graphs of linear equations. Geometrical representation of quadratic polynomials. Distance between two points and section formula (internal). Area of a triangle.

Unit 5: Statistics and Probability:

Statistics: Mean, median and mode of grouped data (bimodal situation to be avoided). Cumulative frequency graph.
Probability: Classical definition of probability. Simple problems on single events, not using set notation.

Unit 6: Mensuration:

Areas Related to Circles: Motivate the area of a circle; area of sectors and segments of a circle. Problems based on areas and perimeter / circumference of the above said plane figures. (In calculating area of segment of a circle, problems should be restricted to central angle of 60^o, 90^o & 120^o only. Plane figures involving triangles, simple quadrilaterals and circle should be taken.)
Surface areas and Volumes: (i) Problems on finding surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres and right circular cylinders/cones. Frustum of a cone.
(ii) Problems involving converting one type of metallic solid into another and other mixed problems. (Problems with combination of not more than two different solids are taken.)

SCIENCE (Subject code: 03)

Unit 1: Chemical Substances I - Nature and Behaviour:

Chemical reactions: Chemical Equation, Balanced chemical equation, implications of a balanced chemical equation, types of chemical reactions: combination, decomposition, displacement, doubles displacement, precipitation, neutralization, oxidation and reduction.
Acids, bases and salts: Their definitions in terms of furnishing of H^+ and OH^- ions, General properties, examples and uses, concept of pH scale(Definition relating to logarithm not required), importance of pH in everyday life; preparation and uses of sodium hydroxide, Bleaching powder, Baking soda,

washing soda and Plaster of Paris. **Metals and non metals:** Properties of metals and non-metals, reactivity series, formation and properties of ionic compounds, basic metallurgical processes, corrosion and its prevention.

Unit 2: Chemical Substances II:

Carbon compounds: Covalent bonding in carbon compounds. Versatile nature of carbon. Homologous series Nomenclature of carbon compounds containing functional groups (halogens, alcohol, ketones, aldehydes, alkanes and alkynes), difference between saturated hydrocarbons and unsaturated hydrocarbons. Chemical properties of carbon compounds (combustion, oxidation, addition and substitution reaction). Ethanol and Ethanoic acid (only properties and uses), soaps and detergents. Periodic classification of elements: Need for classification, modern Periodic table, gradation in properties, valency, atomic number, metallic and non-metallic properties.

Unit 3: World of Living:

Life Processes: "living being". Basic concept of nutrition, respiration, transport and excretion in plants and animals. **Control and Co-ordination in Animals and Plants:** Tropic movements in plants; Introduction to plant hormones; control and co-ordination in animals: nervous system; voluntary, involuntary and reflex action, chemical co-ordination: animal hormones.
Reproduction: Reproduction in animal and plants (asexual and sexual) reproductive health-need for and methods of family planning. Safe sex vs. HIV/AIDS. Child bearing and women's health.
Heredity and evolution: Heredity; Mendel's contribution- Laws for inheritance of traits: Sex determination: brief introduction; Basic concepts of evolution.

Unit 4: Effects of Current:

Electric current, potential difference and electric current. Ohm's law; Resistance, Resistivity, Factors on which the resistance of a conductor depends. Series combination of resistors, parallel combination of resistors and its applications in daily life. Heating effect of Electric current and its applications in daily life. Electric Power, Inter relation between P, V, I and R.
Magnetic effects of current: Magnetic field, field lines, field due to a current carrying conductor, field due to current carrying coil or solenoid; Force on current carrying conductor, Fleming's left hand rule. Electromagnetic induction. Induced potential difference, Induced current. Fleming's Right Hand Rule,

Direct current. Alternating current: frequency of AC. Advantage of AC over DC. Domestic electric circuits.

Unit 5: Natural Resources:

Sources of energy: Different forms of energy, conventional and non-conventional sources of energy: fossil fuels, solar energy; biogas; wind, water and tidal energy; nuclear energy. Renewable versus non-renewable sources.
Conservation of natural resources Management of natural resources. Conservation and judicious use of natural resources. Forest and wild life, coal and petroleum conservation. Examples of People's participation for conservation of natural resources.
The Regional environment: Big dams: advantages and limitations; alternatives if any. Water harvesting. Sustainability of natural resources. Our environment: Eco-system, Environmental problems, Ozone depletion, waste production and their solutions. Biodegradable and non-biodegradable, substances.
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Unit 6: Natural Phenomena:

Reflection of light at curved surfaces, Images formed by spherical mirrors, centre of curvature, principal axis, principal focus, and focal length. Mirror Formula (Derivation not required), Magnification.
Refraction; laws of refraction, refractive index. Refraction of light by spherical lens, Image formed by spherical lenses, Lens formula (Derivation not required), Magnification. Power of a lens; Functioning of a lens in human eye, defects of vision and their corrections, applications of spherical mirrors and lenses. Refraction of light through a prism, dispersion of light, scattering of light, applications in daily life.

SYLLABUS FOR NEST-Sr. (Science) (Stream Code: B)

CHEMISTRY (Subject code: 04)

Unit 1: Atomic Structure & States of Matter:

Atomic structure: Bohr model, spectrum of hydrogen atom, quantum numbers; Wave-particle duality, de Broglie hypothesis; Uncertainty principle; Qualitative quantum mechanical picture of hydrogen atom, shapes of s, p and d orbitals; Electronic configurations of elements (up to atomic number 36); Aufbau principle; Pauli's exclusion principle and Hund's rule; Orbital overlap and covalent bond; Hybridisation (involving s, p and d orbitals only); Orbital energy diagrams for homonuclear diatomic species; Hydrogen bond; Polarity in molecules, dipole moment (qualitative aspects only); VSEPR model and shapes of molecules (linear, angular, triangular, square planar, pyramidal, square pyramidal, trigonal bipyramidal, tetrahedral and octahedral).
Concept of atoms and molecules; Dalton's atomic theory; Mole concept; Chemical formulae; Balanced chemical equations; Calculations (based on mole concept) involving common oxidation reduction, neutralisation, and displacement reactions; Concentration in terms of mole fraction, molarity, molality and normality.
Gaseous and liquid states: Absolute scale of temperature, ideal gas equation; Deviation from ideality, van-der Waals equation; Kinetic theory of gases; Average, root mean square and most probable velocities and their relation with temperature; Law of partial pressures; Vapour pressure; Diffusion of gases.
Solid state: Classification of solids, crystalline state, seven crystal systems (cell parameters a, b, c, α ,β ,γ), close packed structure of solids (cubic), packing in fcc, bcc and hcp lattices; Nearest neighbours, ionic radii, simple ionic compounds, point defects.

Unit 2: Chemical Energetics and Kinetics:

Energetics: First law of thermodynamics; Internal energy, work and heat, pressure volume work; Enthalpy, Hess's law; Heat of reaction, fusion and vapourization; Second law of thermodynamics; Entropy; Free energy; Criterion of spontaneity.
Chemical equilibrium: Law of mass action; Equilibrium constant, Le Chatelier's principle (effect of concentration, temperature and pressure); Significance of ΔG and ΔG^o in chemical equilibrium; Solubility product, common ion effect, pH and buffer solutions; Acids and bases (Bronsted and Lewis concepts); Hydrolysis of salts.

Electrochemistry: Electrochemical cells and cell reactions; Standard electrode potentials; Nernst equation and its relation to ΔG; Electrochemical series, emf of galvanic cells; Faraday's laws of electrolysis; Electrolytic conductance, specific, equivalent and molar conductivity, Kohlrausch's law; Concentration cells.
Chemical kinetics and Solutions: Rates of chemical reactions; Order of reactions; Rate constant; First order reactions; Temperature dependence of rate constant (Arrhenius equation).
Raoult's law; Molecular weight determination from lowering of vapour pressure, elevation of boiling point and depression of freezing point.
Surface chemistry and Nuclear Chemistry**:** Elementary concepts of adsorption (excluding adsorption isotherms); Colloids: types, methods of preparation and general properties; Elementary ideas of emulsions, surfactants and micelles (only definitions and examples).
Radioactivity: isotopes and isobars; Properties of α, β *and* γ rays; Kinetics of radioactive decay (decay series excluded), carbon dating; Stability of nuclei with respect to proton-neutron ratio; Brief discussion on fission and fusion reactions.

Unit 3: Isolation/preparation and properties of Elements:

Boron, silicon, nitrogen, phosphorus, oxygen, sulphur and halogens; Properties of allotropes of carbon (only diamond and graphite), phosphorus and sulphur.
Transition elements: Definition, general characteristics, oxidation states and their stabilities, colour (excluding the details of electronic transitions) and calculation of spin only magnetic moment; Coordination compounds: nomenclature of mononuclear coordination compounds, *cis-trans* and ionisation isomerisms, hybridization and geometries of mononuclear coordination compounds (linear, tetrahedral, square planar and octahedral).

Unit 4: Preparation and properties of the compounds & Metallurgy:

Oxides, peroxides, hydroxides, carbonates, bicarbonates, chlorides and sulphates of sodium, potassium, magnesium and calcium; Boron: diborane, boric acid and borax; Aluminium: alumina, aluminium chloride and alums; Carbon: oxides and oxyacid (carbonic acid); Silicon: silicones, silicates and silicon carbide; Nitrogen: oxides, oxyacids and ammonia; Phosphorus: oxides, oxyacids (phosphorus acid, phosphoric acid) and phosphine; Oxygen: ozone and hydrogen peroxide; Sulphur: hydrogen sulphide, oxides, sulphurous acid, sulphuric acid and sodium thiosulphate; Halogens: hydrohalic acids, oxides and oxyacids of chlorine, bleaching powder; Xenon fluorides.

Oxides and chlorides of tin and lead; Oxides, chlorides and sulphates of Fe^{2+}, Cu^{2+} and Zn^{2+}; Potassium permanganate, potassium dichromate, silver oxide, silver nitrate, silver thiosulphate.
Ores, minerals and Extractive metallurgy: Commonly occurring ores and minerals of iron, copper, tin, lead, magnesium, aluminium, zinc and silver. Chemical principles and reactions only (industrial details excluded); Carbon reduction method (iron and tin); Self reduction method (copper and lead); Electrolytic reduction method (magnesium and aluminium); Cyanide process (silver and gold).
Principles of qualitative analysis: Groups I to V (only Ag+, Hg^{2+}, Cu^{2+}, Pb^{2+}, Bi^{3+}, Fe^{3+}, Cr^{3+}, Al^{3+}, Ca^{2+}, Ba^{2+}, Zn^{2+}, Mn^{2+} and Mg^{2+}); Nitrate, halides (excluding fluoride), sulphate and sulphide.

Unit 5: Concepts of Organic Chemistry:

Hybridisation of carbon; Sigma and pi-bonds; Shapes of simple organic molecules; Structural and geometrical isomerism; Optical isomerism of compounds containing up to two asymmetric centres, (*R,S* and *E,Z* nomenclature excluded); IUPAC nomenclature of simple organic compounds (only hydrocarbons, mono-functional and bifunctional compounds); Conformations of ethane and butane (Newman projections); Resonance and hyperconjugation; Keto-enol tautomerism; Determination of empirical and molecular formulae of simple compounds (only combustion method); Hydrogen bonds: definition and their effects on physical properties of alcohols and carboxylic acids; Inductive and resonance effects on acidity and basicity of organic acids and bases; Polarity and inductive effects in alkyl halides; Reactive intermediates produced during homolytic and heterolytic bond cleavage; Formation, structure and stability of carbocations, carbanions and free radicals.

Unit 6: Preparation, properties and reactions:

Alkanes: Homologous series, physical properties of alkanes (melting points, boiling points and density); Combustion and halogenation of alkanes; Preparation of alkanes by Wurtz reaction and decarboxylation reactions.
Alkenes and Alkynes: Physical properties of alkenes and alkynes (boiling points, density and dipole moments); Acidity of alkynes; Acid catalysed hydration of alkenes and alkynes (excluding the stereochemistry of addition and elimination); Reactions of alkenes with $KMnO_4$ and ozone; Reduction of alkenes and alkynes; Preparation of alkenes and alkynes by elimination reactions; Electrophilic addition reactions of alkenes with X2, HX, HOX and H_2O (X=halogen); Addition reactions of alkynes; Metal acetylides.

Benzene: Structure and aromaticity; Electrophilic substitution reactions: halogenation, nitration, sulphonation, Friedel- Crafts alkylation and acylation; Effect of *o*-, *m* and *p*-directing groups in mono substituted benzenes.
Phenols: Acidity, electrophilic substitution reactions (halogenation, nitration and sulphonation); Reimer-Tiemann reaction, Kolbe reaction.
Alkyl halides: rearrangement reactions of alkyl carbocation, Grignard reactions, nucleophilic substitution reactions; Alcohols: esterification, dehydration and oxidation, reaction with sodium, phosphorus halides, $ZnCl_2$/concentrated HCl, conversion of alcohols into aldehydes and ketones; Ethers: Preparation by Williamson's Synthesis; Aldehydes and Ketones: oxidation, reduction, oxime and hydrazone formation; Aldol condensation, Perkin reaction; Cannizzaro reaction; Haloform reaction and nucleophilic addition reactions (Grignard addition); Carboxylic acids: formation of esters, acid chlorides and amides, ester hydrolysis; Amines: basicity of substituted anilines and aliphatic amines, preparation from nitro compounds, reaction with nitrous acid, azo coupling reaction of diazonium salts of aromatic amines, Sandmeyer and related reactions of diazonium salts; carbylamines reaction; Haloarenes: nucleophilic aromatic substitution in haloarenes and substituted haloarenes (excluding Benzyne mechanism and Cine substitution).
Biomolecules: Carbohydrates: Classification; mono- and disaccharides (glucose and sucrose); Oxidation, reduction, glycoside formation and hydrolysis of sucrose.
Amino acids and peptides: General structure (only primary structure for peptides) and physical properties. Properties and uses of some important polymers: Natural rubber, cellulose, nylon, teflon and PVC.

PHYSICS (Subject Code: 05)

Unit 1: General Concepts in Physics:

Units and dimensions, dimensional analysis; least count, significant figures; Methods of measurement and error analysis for physical quantities pertaining to the following experiments: Experiments based on using Vernier calipers and screw gauge (micrometer), Determination of g using simple pendulum, Young's modulus by Searle's method, Specific heat of a liquid using calorimeter, focal length of a concave mirror and a convex lens using u-v method, Speed of sound using resonance column, Verification of Ohm's law using voltmeter and ammeter, and specific resistance of the material of a wire using meter bridge and post office box.

Unit 2: Mechanics I:

Kinematics in one and two dimensions (Cartesian coordinates only), projectiles; Uniform Circular motion; Relative velocity. Newton's laws of motion; Inertial and uniformly accelerated frames of reference; Static and dynamic friction; Kinetic and potential energy; Work and power; Conservation of linear momentum and mechanical energy. Systems of particles; Centre of mass and its motion; Impulse; Elastic and inelastic collisions. Law of gravitation; Gravitational potential and field; Acceleration due to gravity; Motion of planets and satellites in circular orbits; Escape velocity. Rigid body, moment of inertia, parallel and perpendicular axes theorems, moment of inertia of uniform bodies with simple geometrical shapes.

Unit 3: Mechanics II:

Angular momentum; Torque; Conservation of angular momentum; Dynamics of rigid bodies with fixed axis of rotation; Rolling without slipping of rings, 14 cylinders and spheres; Equilibrium of rigid bodies; Collision of point masses with rigid bodies Linear and angular simple harmonic motions. Hooke's law, Young's modulus. Pressure in a fluid; Pascal's law; Buoyancy; Surface energy and surface tension, capillary rise; Viscosity (Poiseuille's equation excluded) Stoke's law; Terminal velocity, Streamline flow, equation of continuity, Bernoulli's theorem and its applications. Wave motion (plane waves only), longitudinal and transverse waves, superposition of waves; Progressive and stationary waves; Vibration of strings and air columns; Resonance; Beats; Speed of sound in gases; Doppler effect (in sound).

Unit 4: Thermal physics:

Thermal expansion of solids, liquids and gases; Calorimetry, latent heat; Heat conduction in one dimension; Elementary concepts of convection and radiation; Newton's law of cooling; Ideal gas laws; Specific heats (C_v and C_p for monoatomic and diatomic gases); Isothermal and adiabatic processes, bulk modulus of gases; Equivalence of heat and work; First law of thermodynamics and its applications (only for ideal gases); Blackbody radiation: absorptive and emissive powers; Kirchhoff's law; Wien's displacement law, Stefan's law.

Unit 5: Electricity and magnetism:

Coulomb's law; Electric field and potential; Electrical potential energy of a system of point charges and of electrical dipoles in a uniform electrostatic field; Electric field lines; Flux of electric field; Gauss's law and its application in

simple cases, such as, to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell. Capacitance; Parallel plate capacitor with and without dielectrics; Capacitors in series and parallel; Energy stored in a capacitor. Electric current; Ohm's law; Series and parallel arrangements of resistances and cells; Kirchhoff's laws and simple applications; Heating effect of current. Biot–Savart's law and Ampere's law; Magnetic field near a current-carrying straight wire, along the axis of a circular coil and inside a long straight solenoid; Force on a moving charge and on a current-carrying wire in a uniform magnetic field. Magnetic moment of a current loop; Effect of a uniform magnetic field on a current loop; Moving coil galvanometer, voltmeter, ammeter and their conversions. Electromagnetic induction: Faraday's law, Lenz's law; Self and mutual inductance; RC, LR and LC circuits with d.c. and a.c. sources.

Unit 6: Optics and Modern Physics:

Rectilinear propagation of light; Reflection and refraction at plane and spherical surfaces; Total internal reflection; Deviation and dispersion of light by a prism; Thin lenses; Combinations of mirrors and thin lenses; Magnification. Wave nature of light: Huygens's principle, interference limited to Young's double-slit experiment.

Modern physics: Atomic nucleus; Alpha, beta and gamma radiations; Law of radioactive decay; Decay constant; Half-life and mean life; Binding energy and its calculation; Fission and fusion processes; Energy calculation in these processes. Photoelectric effect; Bohr's theory of hydrogen like atoms; Characteristic and continuous X-rays, Moseley's law; de Broglie wavelength of matter waves.

MATHEMATICS (Subject: 06)

Unit 1: Algebra:

Algebra of complex numbers, addition, multiplication, conjugation, polar representation, properties of modulus and principal argument, triangle inequality, cube roots of unity, geometric interpretations. Quadratic equations with real coefficients, relations between roots and coefficients, formation of quadratic equations with given roots, symmetric functions of roots. Arithmetic, geometric and harmonic progressions, arithmetic, geometric and harmonic means, sums of finite arithmetic and geometric progressions, infinite geometric series, sums of squares and cubes of the first n natural numbers. Logarithms and their properties. Permutations and combinations, Binomial theorem for a positive integral index, properties of binomial coefficients. Solutions of

simultaneous linear equations in two or three variables. Addition and multiplication rules of probability, conditional probability, Baye's Theorem, independence of events, computation of probability of events using permutations and combinations.

Unit 2: Trigonometry:

Trigonometric functions, their periodicity and graphs, addition and subtraction formulae, formulae involving multiple and submultiple angles, general solution of
trigonometric equations. Relations between sides and angles of a triangle, sine rule, cosine rule, half-angle formula and the area of a triangle, inverse trigonometric functions (principal value only).

Unit 3: Analytical geometry (2 and 3 dimensions):

Cartesian coordinates, distance between two points, section formulae, shift of origin. Equation of a straight line in various forms, angle between two lines, distance of a point from a line; Lines through the point of intersection of two given lines, equation of the bisector of the angle between two lines, concurrency of lines; Centroid, orthocentre, in centre and circumcentre of a triangle. Equation of a circle in various forms, equations of tangent, normal and chord. Parametric equations of a circle, intersection of a circle with a straight line or a circle, equation of a circle through the points of intersection of two circles and those of a circle and a straight line. Equations of a parabola, ellipse and hyperbola in standard form, their foci, directrices and eccentricity, parametric equations, equations of tangent and normal. Locus Problems.

Analytical geometry (3 dimensions):

Direction cosines and direction ratios, equation of a straight line in space, equation of a plane, distance of a point from a plane.

Unit 4: Differential calculus:

Real valued functions of a real variable, into, onto and one-to-one functions, sum, difference, product and quotient of two functions, composite functions, absolute value, polynomial, rational, trigonometric, exponential and logarithmic functions. Limit and continuity of a function, limit and continuity of the sum, difference, product and quotient of two functions, L'Hospital rule of evaluation of limits of functions. Even and odd functions, inverse of a function, continuity of composite functions, intermediate value property of continuous functions. Derivative of a function, derivative of the sum, difference, product and quotient of two functions, chain rule, derivatives of polynomial, rational, trigonometric, inverse trigonometric, exponential and logarithmic functions. Derivatives of

implicit functions, derivatives up to order two, geometrical interpretation of the derivative, tangents and normal's, increasing and decreasing functions, maximum and minimum values of a function, Rolle's Theorem and Lagrange's Mean Value Theorem.

Unit 5: Integral calculus:

Integration as the inverse process of differentiation, indefinite integrals of standard functions, definite integrals and their properties, Fundamental Theorem of Integral Calculus. Integration by parts, integration by the methods of substitution and partial fractions, application of definite integrals to the determination of areas involving simple curves. Formation of ordinary differential equations, solution of homogeneous differential equations, separation of variables method, linear first order differential equations.

Unit 6: Vectors and Matrices:

Addition of vectors, scalar multiplication, dot and cross products, scalar triple products and their geometrical interpretations.
Matrices as a rectangular array of real numbers, equality of matrices, addition, multiplication by a scalar and product of matrices, transpose of a matrix, determinant of a square matrix of order up to three, inverse of a square matrix of order up to three, properties of these matrix operations, diagonal, symmetric and skew-symmetric matrices and their properties.

BIOLOGY (Subject Code: 07)

Unit 1: Diversity & Structural Organisation:

• What is living? ; Biodiversity; Need for classification; Three domains of life; Taxonomy & Systematics; Concept of species and taxonomical hierarchy; Binomial nomenclature; Tools for study of Taxonomy – Museums, Zoos, Herbaria, Botanical gardens.
• Five kingdom classification; salient features and classification of Monera; Protista and Fungi into major groups; Lichens; Viruses and Viroids.
• Salient features and classification of plants into major groups-Algae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms (three to five salient and distinguishing features and at least two examples of each category); Angiosperms- classification up to class, characteristic features and examples).
• Salient features and classification of animals-nonchordate up to phyla level and chordate up to classes level (three to five salient features and at least two examples).

Structural Organisation in Animals and Plants

• Morphology and modifications; Tissues; Anatomy and functions of different parts of flowering plants: Root, stem, leaf, inflorescence- cymose and recemose, flower, fruit and seed (To be dealt along with the relevant practical of the Practical Syllabus).

• Animal tissues; Morphology, anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of an insect (cockroach). (Brief account only)

Cell Structure and Function

• Cell theory and cell as the basic unit of life; Structure of prokaryotic and eukaryotic cell; Plant cell and animal cell; Cell envelope, cell membrane, cell wall; Cell organelles-structure and function; Endomembrane system-endoplasmic reticulum, Golgi bodies, lysosomes, vacuoles; mitochondria, ribosomes, plastids, micro bodies; Cytoskeleton, cilia, flagella, centrioles (ultra structure and function); Nucleus-nuclear membrane, chromatin, nucleolus. • Chemical constituents of living cells: Biomolecules-structure and function of proteins, carbodydrates, lipids, nucleic acids; Enzymes-types, properties, enzyme action.

• B Cell division: Cell cycle, mitosis, meiosis and their significance.

Unit 2: Plant Physiology:

• Transport in plants: Movement of water, gases and nutrients; Cell to cell transport-Diffusion, facilitated diffusion, active transport; Plant – water relations – Imbibition, water potential, osmosis, plasmolysis; Long distance transport of water – Absorption, apoplast, symplast, transpiration pull, root pressure and guttation; Transpiration-Opening and closing of stomata; Uptake and translocation of mineral nutrients-Transport of food, phloem transport, Mass flow hypothesis; Diffusion of gases (brief mention).

• Mineral nutrition: Essential minerals, macro and micronutrients and their role; Deficiency symptoms; Mineral toxicity; Elementary idea of Hydroponics as a method to study mineral nutrition; Nitrogen metabolism-Nitrogen cycle, biological nitrogen fixation.

• Photosynthesis: Photosynthesis as a means of Autotrophic nutrition; Site of photosynthesis take place; pigments involved in Photosynthesis (Elementary idea); Photochemical and biosynthetic phases of photosynthesis; Cyclic and non cyclic and photophosphorylation; Chemiosmotic hypothesis; Photorespiration C3 and C4 pathways; Factors affecting photosynthesis.

• Respiration: Exchange gases; Cellular respiration-glycolysis, fermentation (anaerobic), TCA cycle and electron transport system (aerobic); Energy relations-Number of ATP molecules generated; Amphibolic pathways; Respiratory quotient.

• Plant growth and development: Seed germination; Phases of Plant growth and plant growth rate; Conditions of growth; Differentiation, dedifferentiation and redifferentiation; Sequence of developmental process in a plant cell; Growth regulators-auxin, gibberellin, cytokinin, ethylene, ABA; Seed dormancy; Vernalisation; Photoperiodism.

Unit 3: Human Physiology:

• Digestion and absorption; Alimentary canal and digestive glands; Role of digestive enzymes and gastrointestinal hormones; Peristalsis, digestion, absorption and assimilation of proteins, carbohydrates and fats; Caloric value of proteins, carbohydrates and fats; Egestion; Nutritional and digestive disorders – PEM, indigestion, constipation, vomiting, jaundice, diarrhea.
• Breathing and Respiration: Respiratory organs in animals (recall only); Respiratory system in humans; Mechanism of breathing and its regulation in humans-Exchange of gases, transport of gases and regulation of respiration Respiratory volumes; Disorders related to respiration-Asthma, Emphysema, Occupational respiratory disorders.
• Body fluids and circulation: Composition of blood, blood groups, coagulation of blood; Composition of lymph and its function; Human circulatory system-Structure of human heart and blood vessels; Cardiac cycle, cardiac output, ECG, Double circulation; Regulation of cardiac activity; Disorders of circulatory system-Hypertension, Coronary artery disease, Angina pectoris, Heart failure.
• Excretory products and their elimination: Modes of excretion- Ammonotelism, ureotelism, uricotelism; Human excretory system-structure and fuction; Urine formation, Osmoregulation; Regulation of kidney function-Renin-angiotensin, Atrial Natriuretic Factor, ADH and Diabetes insipidus; Role of other organs in excretion; Disorders; Uraemia, Renal failure, Renal calculi, Nephritis; Dialysis and artificial kidney.
• Locomotion and Movement: Types of movement- ciliary, fiagellar, muscular; Skeletal muscle- contractile proteins and muscle contraction; Skeletal system and its functions (To be dealt with the relevant practical of Practical syllabus); Joints; Disorders of muscular and skeletal system-Myasthenia gravis, Tetany, Muscular dystrophy, Arthritis, Osteoporosis, G_{out}.
• Neural control and coordination: Neuron and nerves; Nervous system in humans- central nervous system, peripheral nervous system and visceral nervous system; Generation and conduction of nerve impulse; Reflex action; Sense organs; Elementary structure and function of eye and ear.
• Chemical coordination and regulation: Endocrine glands and hormones; Human endocrine system-Hypothalamus, Pituitary, Pineal, Thyroid, Parathyroid, Adrenal, Pancreas, Gonads; Mechanism of hormone action (Elementary Idea); Role of hormones as messengers and regulators, Hypo-and hyperactivity and related disorders (Common disorders e.g. Dwarfism,

Acromegaly, Cretinism, goiter, exopthalmic goiter, diabetes, Addison's disease).

Unit 4: Reproduction, Genetics and Evolution:

• Reproduction in organisms: Reproduction, a characteristic feature of all organisms for continuation of species; Modes of reproduction – Asexual and sexual; Asexual reproduction; Modes-Binary fission, sporulation, budding, gemmule, fragmentation; vegetative propagation in plants.
• Sexual reproduction in flowering plants: Flower structure; Development of male and female gametophytes; Pollination-types, agencies and examples; Outbreeding devices; Pollen-Pistil interaction; Double fertilization; Post fertilization events-Development of endosperm and embryo, Development of seed and formation of fruit; Special modes-apomixis, parthenocarpy, polyembryony; Significance of seed and fruit formation.
• Human Reproduction: Male and female reproductive systems; Microscopic anatomy of testis and ovary; Gametogenesis-spermatogenesis & oogenesis; Menstrual cycle; Fertilisation, embryo development upto blastocyst formation, implantation; Pregnancy and placenta formation (Elementary idea); Parturition (Elementary idea); Lactation (Elementary idea).
• Reproductive health: Need for reproductive health and prevention of sexually transmitted diseases (STD); Birth control-Need and Methods, Contraception and Medical Termination of Pregnancy (MTP); Amniocentesis; Infertility and assisted reproductive technologies – IVF, ZIFT, GIFT (Elementary idea for general awareness).

Genetics and Evolution

• Heredity and variation: Mendelian Inheritance; Deviations from Mendelism-Incomplete dominance, Co-dominance, Multiple alleles and Inheritance of blood groups, Pleiotropy; Elementary idea of polygenic inheritance; Chromosome theory of inheritance; Chromosomes and genes; Sex determination-In humans, birds, honey bee; Linkage and crossing over; Sex linked inheritance-Haemophilia, Colour blindness; Mendelian disorders in humans-Thalassemia; Chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.
• Molecular basis of Inheritance: Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; Transcription, genetic code, translation; Gene expression and regulation-Lac Operon; Genome and human genome project; DNA finger printing.
• Evolution: Origin of life; Biological evolution and evidences for biological evolution from Paleontology, comparative anatomy, embryology and molecular evidence); Darwin's contribution, Modern Synthetic theory of Evolution; Mechanism of evolution-Variation (Mutation and Recombination) and Natural

Selection with examples, types of natural selection; Gene flow and genetic drift; Hardy-Weinberg's principle; Adaptive Radiation; Human evolution.

Unit 5: Biology, Biotechnology and Human Welfare:

• Health and Disease; Pathogens; parasites causing human diseases (Malaria, Filariasis, Ascariasis. Typhoid, Pneumonia, common cold, amoebiasis, ring worm); Basic concepts of immunology-vaccines; Cancer, HIV and AIDS; Adolescence, drug and alcohol abuse.
• Improvement in food production; Plant breeding, tissue culture, single cell protein, Biofortification; Apiculture and Animal husbandry.
• Microbes in human welfare: In household food processing, industrial production, sewage treatment, energy generation and as biocontrol agents and biofertilizers.

Biotechnology and Its Applications

• Principles and process of Biotechnology: Genetic engineering (Recombinant DNA technology).
• Application of Biotechnology in health and agriculture: Human insulin and vaccine production, gene therapy; Genetically modified organisms-Bt crops; Transgenic Animals; Biosafety issues-Biopiracy and patents.

Unit 6: Ecology and environment:

• Organisms and environment: Habitat and niche; Population and ecological adaptations; Population interactions-mutualism, competition, predation, parasitism; Population attributes-growth, birth rate and death rate, age distribution.
• Ecosystem: Patterns, components; productivity and decomposition; Energy flow; Pyramids of number, biomass, energy; Nutrient cycling (carbon and phosphorous); Ecological succession; Ecological Services-Carbon fixation, pollination, oxygen release.
• Biodiversity and its conservation: Concept of Biodiversity; Patterns of Biodiversity; Importance of Biodiversity; Loss of Biodiversity; Biodiversity conservation; Hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves, National parks and sanctuaries.
• Environmental issues: Air pollution and its control; Water pollution and its control; Agrochemicals and their effects; Solid waste management; Radioactive waste management; Greenhouse effect and global warning; Ozone depletion; Deforestation; Any three case studies as success stories addressing environmental issues.

COMPUTER SCIENCE (Subject Code: 08)

Unit 1: Computer Fundamentals:

Evolution of computers; Basics of computer and its operation: Functional Components and their interconnections, concept of Booting. **Software Concepts:** Types of Softwares.
System Software: Operating System, Compiler, Interpreter and Assembler; Need and functions of operating system, Processor Management, Memory Management, File Management and Device Management, Types of operating system, Commonly used operating systems: UNIX, LINUX, Windows, Solaris, BOSS (Bharat Operating System Solutions); Mobile OS - Android, Symbian. Illustration and practice of the following tasks using any one of the above Operating Systems: Opening/Closing Windows, creating/moving/deleting files/Folders, Renaming Files/Folders, Switching between Tasks.
Utility Software: Anti Virus, File Management tools, Compression tools and Disk Management tools. **Application software:** Office Tools - Word Processor, Presentation Tool, Spreadsheet Package, Database Management System; Domain specific tools - School Management System, Inventory Management System, Payroll System, Financial Accounting, Hotel Management, Reservation System and Weather Forecasting System. **Number System:** Binary, Octal, Decimal, Hexadecimal and conversion between two different number systems. **Internal Storage encoding of Characters:** ASCII, ISCII (Indian scripts Standard Code for Information Interchange), and UNICODE (for multilingual computing). **Microprocessor:** Basic concepts, Clock speed , 16 bit, 32 bit, 64 bit processors; Types - CISC, RISC. **Memory Concepts:** Units: Byte, Kilo Byte, Mega Byte, Giga Byte, Tera Byte, Peta Byte. Cache, RAM, ROM, Fixed and Removable Storage. **Input Output Ports/Connections:** Serial, Parallel and Universal Serial Bus, PS-2 port, Infrared port, Bluetooth, Firewire.
Boolean Algebra: Role of Logical Operations in Computing. Binary-valued Quantities, Logical Variable, Logical Constant and Logical Operators: AND, OR, NOT; Truth Tables; Closure Property, Commutative Law, Associative Law, Identity law, Inverse law, Principle of Duality, Idem potent Law, Distributive Law, Absorption Law, Involution law, DeMorgan's Law and their applications; Obtaining Sum of Product (SOP) and Product of Sum (POS) form from the Truth Table, Reducing Boolean Expression (SOP and POS) to its minimal form, Use of Karnaugh Map for minimization of Boolean expressions (up to 4 variables);
Application of Computing Logic: Building up logic circuits using basic Logic Gates (NOT, AND, OR, NAND, NOT) Use of Boolean operators (NOT, AND,

OR) in SQL SELECT statements Use of Boolean operators (AND, OR) in search engine queries.

Unit 2: Programming Methodology and Introduction to C++:

General Concepts; Modular approach; Clarity and Simplicity of Expressions, Use of proper Names for identifiers, Comments, Indentation; Documentation and Program Maintenance; Running and
Debugging programs, Syntax Errors, Run-Time Errors, Logical Errors
Problem Solving Methodologies: Understanding of the problem, Identifying minimum number of inputs required for output, Writing code to optimizing execution time and memory storage, step by step solution for the problem, breaking down solution into simple steps, Identification of arithmetic and logical operations required for solution, Control Structure: Conditional control and looping (finite and infinite)
Getting Started with C++ : C++ character set, C++ Tokens, Structure of a C++ Program, reading and writing data, Use of endl and setw (), Cascading of I/O operators, Error Messages; Use of editor, basic commands of editor, compilation, linking and execution.
Data Types, Variables and Constants: Concept of Data types, Constants, Access modifier: **const;** Variables of built-in data types, Declaration/Initialisation of variables, Assignment statement; Type modifier: signed, unsigned, long
Operator and Expressions: Operators: Arithmetic operators, Unary operator, Increment and Decrement Operators, Relation operator, Logical operators, Conditional operator, Precedence of Operators; Automatic type conversion in expressions, Type casting; C++ shorthand's (+=, -=, *=, /=, %=)

Unit 3: Programming in C++ and Object Oriented Programming in C++:

Flow of control: Conditional statements, Loop statements**,** break statement, Inbuilt Functions, Header file Categorization Header Function, File Standard input/output functions Character Functions, String Functions Mathematical Functions, Other Functions stdlib.h randomize (), random (), itoa (), atoi ()
User Defined Functions:
Defining a function; function prototype, Invoking/calling a function, passing arguments to function, specifying argument data types, default argument, constant argument, call by value, call by reference, returning values from a function, calling functions with arrays, scope rules of functions and variables local and global variables. Relating the Parameters and return type concepts in built-in functions.

Structured Data Type: Arrays: Introduction, Advantages. One Dimensional and Two dimensional Array : Declaration/initialisation of One-dimensional array, Inputting array elements, Accessing array elements, Manipulation of Array elements, Declaration/Initialization of a String, string manipulations.

User-defined Data Types:

Structure: Defining a Structure, Declaring structure variables, Accessing structure elements, Passing structure to Functions as value and reference argument/parameter, Function returning structure, Array of structures, passing an array of structure as an argument/ a parameter to a function

Defining a symbole name using **typedef** keyword and defining a macro using **#define** directive.

Object Oriented Programming:

Concept of Object Oriented Programming - Data hiding, Data encapsulation, Class and Object, abstract class and Concrete class, Polymorphism; Inheritance, Advantages of Object Oriented Programming over earlier programming methodologies,

Implementation of Object Oriented Programming concepts in C++:

Definition of a class, Members of a class - Data Members and Member Functions (methods), Using Private and Public visibility modes, Member function definition: inside class definition and outside class definition using scope resolution operator; Declaration of objects as instances of a class; accessing members from object(s), Objects as function arguments - pass by value and pass by reference;

Constructor and Destructor: Special Characteristics, Declaration and Definition, Types of constructor, **Inheritance (Extending Classes):** Concept, Defining derived classes, protected visibility mode; Types of inheritance and access specifiers, accessibility of members from objects and within derived class (es);

Data File Handling: Need, Types of data files, **Text File: Basic file operations on text file:** Creating/Writing, Reading and Manipulation; **Binary File:** Creation of file, Writing data, Searching, Appending data to a file, Insertion, Deletion, Modification;

Pointers: Introduction to Printer**,** Declaration and Initialization; Dynamic memory allocation/ deallocation operators: **new, delete;** Pointers and Arrays: Array of Pointers, Pointer to an array (1 dimensional array), Function returning a pointer, Reference variables and use of alias; Function call by reference. Pointer to structures: Deference operator: *, ->; self referencial structures;

Unit 4: Data Structures:

Introduction to data structure, primitive and non-primitive data structure, linear and non-linear structure, static and dynamic data structure.

Arrays: One and two Dimensional arrays: Sequential allocation and address calculation: One dimensional array: Traversal, Searching (Linear, Binary Search), Insertion of an element in an array, deletion of an element from an array, Sorting (Insertion, Selection, Two-dimensional arrays: Traversal, Finding sum/difference of two N x M arrays containing numeric values, Interchanging Row and Column elements in a two dimensional array;
Stack (Array and Linked implementation of Stack): Operations on Stack (PUSH and POP) and its Implementation in C++, Converting expressions from INFIX to POSTFIX notation and evaluation of Postfix expr**ession; Queue: (Circular Array and Linked Implementation):** Introduction to Queue (FIFO - First in First out operations) Operations on Queue (Insert and Delete) and its Implementation in C++.

Unit 5: Databases and SQL:

Database Concepts: Introduction to data base concepts and its need. **Relational data model:** Concept of domain, tuple, relation, key, primary key, alternate key, candidate key; **Relational algebra:** Selection, Projection, Union and Cartesian product; **Structured Query Language: General Concepts:** Advantages of using SQL, Data Definition Language and data manipulation language; **data types:** number/decimal, character/varchar/varchar2, date; **sql commands:** create table, drop table, alter table, update...set..., insert, delete; select, distinct, from, where, in, between, group by, having, order by; sql functions: sum, avg, count, max and min; obtaining results (select query) from 2 tables using equi-join, cartesian product and union

Unit 6: Communication and Open Source Concepts:

Communication Technologies
Evolution of Networking: ARPANET, Internet, Interspace Different ways of sending data across the network with reference to switching techniques (Circuit, Message and Packet switching)
Data Communication terminologies: Concept of Channel, Baud, Bandwidth (Hz, KHz, MHz) and Data transfer rate (bps, kbps, Mbps, Gbps, Tbps)
Transmission media: Twisted pair cable, coaxial cable, optical fiber, infrared, radio link, microwave link and satellite link. **Network devices:** Modem, RJ45 connector, Ethernet Card, Hub, Switch, Gateway. **Network Topologies and types:** Bus, Star, Tree; PAN, LAN, WAN, MAN. **Network Protocol:** TCP/IP, File Transfer Protocol (FTP), PPP, Remote Login (Telnet), Internet Wireless/Mobile Communication protocol such as GSM, CDMA, GPRS, WLL,

1G, 2G and 3G. Electronic mail protocols such as SMTP, POP3. Protocols for Chat and Video Conferencing VoIP protocols such as Wi-Fi and WiMax.

Network Security Concepts:

Threats and prevention from Viruses, Worms, Trojan horse, Spams Use of Cookies, Protection using Firewall; India IT Act, Cyber Law, Cyber Crimes, IPR issues, Hacking.

Web Services:

WWW, Hyper Text Mark-up Language (HTML), extensible Mark-up Language (XML); Hyper Text Transfer Protocol (HTTP); Domain Names; URL; Protocol Address; Website, Web browser, Web Servers; Web Hosting, Web Scripting - Client side (VB Script, Java Script, PHP) and Server side (ASP, JSP, PHP), Web 2.0 (for social networking)

Open Standards: Introduction to open standards and its advantage in development of inter-operable environment. **Open Source Concepts:** Proprietary and Open Source Software, Freeware, Shareware, FLOSS/FOSS, GNU,FSF, OSI, W3C

SYLLABUS FOR NEST-Sr. (Commerce) (Stream Code: C)

ENGLISH (Subject Code: 09)

Noun, Present Tense, Adjectives, Punctuation marks, Prepositions, Conjunctions, Modals, Adverbs, Antonyms, Narration, Scrambled sentences, Transformation of Sentence, Subject Verb Agreement, Identify the error, Future Tense, Active and passive, Synonyms, Misspelt words, Idioms/Phrasal verbs, One word Substitute, Past Tense, Sentence Correction, Letter/Message/Notice, Comprehension, Auxiliary verbs, Compound Words, Prefix, Pronouns, Gerunds/Progressive/Infinitive, Quantifiers/Determiner.

ECONOMICS (Subject Code: 10)

Unit 1: Statistics for Economics:

Introduction: What is Economics? Meaning, scope and importance of statistics in Economics

Collection, Organisation and Presentation of data: Collection of data - sources of data - primary and secondary; how basic data is collected; methods of collecting data; Some important sources of secondary data: Census of India and National Sample Survey Organisation. Organisation of Data: Meaning and types of variables; Frequency Distribution. Presentation of Data: Tabular Presentation and Diagrammatic Presentation of Data: (i) Geometric forms (bar diagrams and pie diagrams), (ii) Frequency diagrams (histogram, polygon and ogive) and (iii) Arithmetic line graphs (time series graph).

Statistical Tools and Interpretation: Measures of Central Tendency- mean (simple and weighted), median and mode Measures of Dispersion - absolute dispersion (range, quartile deviation, mean deviation and standard deviation); relative dispersion (co-efficient of quartile-deviation, co-efficient of mean deviation, co-efficient of variation); Lorenz Curve: Meaning and its application. Correlation - meaning, scatter diagram; Measures of correlation - Karl Pearson's method (two variables ungrouped data) Spearman's rank correlation. Introduction to Index Numbers - meaning, types - wholesale price index, consumer price index and index of industrial production, uses of index numbers; Inflation and index numbers. Some Mathematical tools used in Economics: Equation of a line, stope of a line, stope of a curve.

Unit 2: Indian Economic Development:

Development Policies and Experience (1947-90): A brief introduction of the state of Indian economy on the eve of independence. Common goals of Five Year Plans. Main features, problems and policies of agriculture (institutional

aspects and new agricultural strategy, etc.), industry (industrial licensing, etc,) and foreign trade.

Economic Reforms since 1991: Need and main features - liberalisation, globalisation and privatisation; an appraisal of LPG policies

Current challenges facing Indian Economy: Poverty- absolute and relative; Main programmes for poverty alleviation: A critical assessment; Rural development: Key issues - credit and marketing - role of cooperatives; agricultural diversification; alternative farming - organic farming Human Capital Formation: How people become resource; Role of human capital in economic development; Growth of Education Sector in India Employment: Formal and informal, growth and other issues: Problems and policies. Inflation: Problems and Policies Infrastructure: Meaning-and Types: Case Studies: Energy and Health: Problems and Policies- A critical assessment; Sustainable Economic Development: Meaning, Effects of Economic Development on Resources and Environment, including global warming.

Development Experience of India: A comparison with neighbours a) India and Pakistan b) India and China Issues: growth, population, sectoral development and other developmental indicators.

Unit 3: Microeconomics I:

Introduction: Meaning of microeconomics and macroeconomics what is an economy? Central problems of an economy: what, how and for whom to produce; concepts of production possibility frontier and opportunity cost.

Consumer Equilibrium and Demand: Consumer's equilibrium – meaning of utility, marginal utility, law of diminishing marginal utility, conditions of consumer's equilibrium using marginal utility analysis. Indifference curve analysis of consumer's equilibrium-the consumer's budget (budget set and budget line), preferences of the consumer (indifference curve, indifference map) and conditions of consumer's equilibrium. Demand, market demand, determinants of demand, demand schedule, demand curve, movement along and shifts in the demand curve; price elasticity of demand - factors affecting price elasticity of demand; measurement of price elasticity of demand – (a) percentage-change method and (b) geometric method (linear demand curve); relationship between price elasticity of demand and total expenditure.

Unit 4: Microeconomics II:

Producer Behaviour and Supply: Production function: Total Product, Average Product and Marginal Product. Returns to a Factor. Cost and Revenue: Short run costs - total cost, total fixed cost, total variable cost; Average fixed cost, average variable cost and marginal cost-meaning and their relationship.

Revenue - total, average and marginal revenue. Producer's equilibrium-meaning and its conditions in terms of marginal revenue-marginal cost. Supply, market supply, determinants of supply, supply schedule, supply curve, movements along and shifts in supply curve, price elasticity of supply; measurement of price elasticity of supply – (a) percentage change method and (b) geometric method.

Forms of Market and Price Determination

Perfect competition - Features; Determination of market equilibrium and effects of shifts in demand and supply. Other Market Forms - monopoly, monopolistic competition, oligopoly - their meaning and features.

Unit 5: Macroeconomics I:

National Income and related aggregates: Some basic concepts: consumption goods, capital goods, final goods, intermediate goods; stocks and flows; gross investment and depreciation. Circular flow of income; Methods of calculating National Income – Value Added or Product method, Expenditure method, Income method. Aggregates related to National Income: Gross National Product (GNP), Net National Product (NNP), Gross and Net Domestic Product (GDP and NDP) - at market price, at factor cost; National Disposable Income (gross and net), Private Income, Personal Income and Personal Disposable Income; Real and Nominal GDP. GDP and Welfare.

Money and Banking: Money – its meaning and functions. Supply of money – Currency held by the public and net demand deposits held by commercial banks. Money creation by the commercial banking system. Central bank and its functions (example of the Reserve Bank of India).

Unit 6: Macroeconomics II:

Determination of Income and Employment: Aggregate demand and its components. Propensity to consume and propensity to save (average and marginal). Short–run equilibrium output; investment multiplier and its mechanism. Meaning of full employment and involuntary unemployment. Problems of excess demand and deficient demand; measures to correct them - change in government spending, availability of credit.

Government Budget and the Economy: Government budget - meaning, objectives and components. Classification of receipts - revenue receipts and capital receipts; classification of expenditure – revenue expenditure and capital expenditure. Measures of government deficit - revenue deficit, fiscal deficit, primary deficit: their meaning. Fiscal Policy and its role.

Balance of Payments: Balance of payments account-meaning and components; balance of payments deficit-meaning. Foreign exchange rate – meaning of fixed

and flexible rates and managed floating. Determination of exchange rate in a free market.

ACCOUNTANCY (Subject Code: 11)

Unit 1: Financial Accounting – I:

Introduction to Accounting: Accounting - objectives, advantages and limitations, types of accounting information; Accounting Cycle, users of accounting information and their needs. Basic accounting terms: business transaction, account, Proprietor, capital, drawings, liability (internal & external, long term & short term) asset (tangible & intangible, fixed, current, liquid and fictitious) receipts (capital & revenue), expenditure (capital, revenue & deferred), expense, income, profits, gains and losses, purchases, sales, stock, debtors, bills receivable, creditors, bills payable, goods, cost, vouchers, discount - trade and cash.

Theory Base of Accounting: Fundamental accounting assumptions: going concern, consistency, objectivity and accrual. Accounting principles: accounting entity, money measurement, revenue recognition, accounting period, full disclosure, materiality, prudence, cost concept, matching concept and dual aspect. Double entry system- Advantages and disadvantages. Basis of accounting - cash basis and accrual basis. Accounting standards: concept & objective. IFRS (International Financial Reporting Standards).

Recording of Transactions: Accounting equation: analysis of transactions using accounting equation. Rules of debit and credit: for assets, liabilities, capital, revenue and expenses. Origin of transactions- source documents (invoice, cash memo, pay in slip, cheque), preparation of vouchers - cash (debit & credit) and non cash (transfer). Books of original entry: format, recording and application of debit and credit rules - Journal.

Posting in Ledger and Cash Book: Ledger - format, posting from journal and balancing of Accounts. Cash book: simple, cash book with bank column, cash book with bank & discount column, petty cash book, other books: purchases book, sales book, purchases returns book, sales returns book, bills receivable book, bills payable book and journal proper - format, posting from journal and balancing of Accounts.

Preparation of Trial Balance: Trial balance: objectives, preparation and types of errors revealed & not revealed by trial balance.

Unit 2: Financial Accounting-II:

Depreciation, Provisions and Reserves: Depreciation: Concept, need and factors affecting depreciation; methods of computation of depreciation: straight line method, written down value method (excluding change in method). Accounting treatment of depreciation: by charging to asset account, by creating provision for depreciation accumulated depreciation account, treatment of disposal of asset. Provisions and reserves: concept, objectives and difference between provisions and reserves; types of reserves- revenue reserve, capital reserve, general reserve, specific reserves and secret reserves.

Accounting for Bills of Exchange: Bills of exchange and promissory note: definition, features, parties, specimen and distinction. Important terms : term of bill ,due date, days of grace, date of maturity, bill at sight, bill after date, discounting of bill, endorsement of bill, bill sent for collection, dishonour of bill, noting of bill , retirement and renewal of a bill, insolvency of acceptor. Accounting treatment of bill transactions.

Rectification of Errors: Errors: types-errors of omission, commission, principles, and compensating; Their effect on Trial Balance. Detection and rectification of errors; preparation of suspense account.

Financial Statements of Sole proprietorship: Financial Statements: objective and importance. Trading and profit and loss account: gross profit, operating profit and net profit. Balance Sheet: need, grouping, marshalling of assets and liabilities. Adjustments in preparation of financial statements: with respect to closing stock, outstanding expenses, prepaid expenses, accrued income, income received in advance, depreciation, interest on capital, interest on drawings, bad debts, provision for doubtful debts, provision for discount on debtors, manager's commission, abnormal loss, goods taken for personal use, goods distributed as free sample, goods sent on approval basis, goods in transit and dishonour of cheques. Preparation of Trading and Profit & Loss Account and Balance Sheet of sole proprietorship.

Unit 3: Financial Accounting-III:

Financial Statements of not-for-Profit Organizations: Not-for-profit organizations: concept. Receipts and payment account: features. Income and expenditure account: features. Preparation of income and expenditure account and balance sheet from the given receipt and payment account with additional information.

Accounts from Incomplete Records: Incomplete records: use and limitations. Ascertainment of profit/loss by statement of affairs method.

Preparation of Bank Reconciliation Statement: Bank reconciliation statement: need and preparation. Corrected cash book balance.

Unit 4: Accounting for Partnership Firms:

Accounting for Partnership firms – Fundamentals: Partnership: features, Partnership deed. Provisions of the Indian Partnership Act 1932 in the absence of partnership deed. Fixed v/s fluctuating capital accounts, division of profit among partners, guarantee of profits, past adjustments (relating to interest on capital, interest on drawing, salary and profit sharing ratio), preparation of P&L Appropriation account. Goodwill: nature, factors affecting and methods of valuation - average profit, super profit, and capitalization.

Accounting for Partnership firms - Reconstitution and Dissolution: Change in the Profit Sharing Ratio among the existing partners - sacrificing ratio, gaining ratio. Accounting for revaluation of assets and re-assessment of liabilities and distribution of reserves and accumulated profits. Admission of a partner - effect of admission of a partner on change in the profit sharing ratio, treatment of goodwill (as per AS 26), treatment for revaluation of assets and re-assessment of liabilities, treatment of reserves and accumulated profits, adjustment of capital accounts and preparation of balance sheet. Retirement and death of a partner: effect of retirement /death of a partner on change in profit sharing ratio, treatment of goodwill, treatment for revaluation of assets and re-assessment of liabilities, adjustment of accumulated profits and reserves. Calculation of deceased partner's share of profit till the date of death. Preparation of deceased partner's capital account, executor's account and preparation of balance sheet, Dissolution of partnership firms: types of dissolution of firm. Settlement of accounts -preparation of realization account, and other related accounts (excluding piecemeal distribution, sale to a company and insolvency of partner's firm).

Unit 5: Accounting for Companies:

Accounting for share Capital: Share and share capital: nature and types, Accounting for share capital: issue and allotment of equity shares, private placement of shares, Public subscription of shares - over subscription and under subscription of shares; Issue at par and at premium and at discount, calls in advance and arrears, issue of shares for consideration other than cash. Accounting treatment of forfeiture and re-issue of shares. Disclosure of share capital in company's Balance Sheet only.

Accounting for Debentures: Debentures: Issue of debentures at par, `at premium and at discount. Issue of debentures for consideration other than cash, debentures as collateral security, inter interest on debentures. Redemption of debentures: Lump sum, draw of lots and conversion.

Unit 6: Financial Statement Analysis and Computerised Accounting:

Analysis of financial Statements: Financial statements of a company: balance sheet of a company in the prescribed form with major headings and sub headings (as per schedule VI to the Companies Act 1956). Financial Statement Analysis: objectives and limitations. Tools for Financial Statement Analysis: comparative statements, common size statements, tend analysis, cash flow analysis and ratio analysis. Accounting Ratios: objectives and classification. Liquidity ratios: current ratio, quick ratio and absolute liquid ratio. Solvency Ratios: Debt to Equity Ratio. Activity ratios: Stock Turnover Ratio, Debtors Turnover Ratio, Creditors Turnover Ratio, Working Capital Turnover Ratio. Profitability Ratios: Gross Profit Ratio, Operating Ratio, Operating Profit Ratio, Net Profit Ratio.

Cash Flow Statement: Meaning, objectives and preparation (as per AS 3 revised) (Indirect Method)

Overview of Computerised Accounting System: Introduction: Application in Accounting. Features of Computerised Accounting System.

Computers in Accounting: Introduction to Computer and Accounting Information system {AIS}, Application of computers in Accounting: automation of accounting process, designing accounting reports and MIS reporting. Comparison of manual and computerized accounting.

BUSINESS STUDIES (Subject Code: 12)

Unit 1: Foundations of Business I:

Nature and purpose of business: Concept and characteristics of business. Objectives of business- economic and social, role of profit in business. Classification of business activities: Industry and Commerce. Industry - types: primary, secondary, tertiary. Commerce - trade: types (internal, external, wholesale and retail; and auxiliaries to trade: banking, insurance, transportation, warehousing, communication, and advertising. Business risks - nature and causes.

Forms of Business Organisations: Sole Proprietorship- meaning, features, merits and limitations. Partnership- Features, types, merits and limitations of partnership and partners, registration of a partnership firm, partnership deed. Type of partners. Hindu Undivided Family Business features. Cooperative Societies- features, types, merits and limitations. Company: private and public

company -features, merits and limitations. Formation of a company- stages. Starting a business - basic factors.

Public, Private & Global Enterprises: Private sector and public sector enterprises. Forms of public sector enterprises: features, merits and limitations of departmental undertakings, statutory corporation and Government Company. Changing role of public sector enterprises. Global enterprises, Joint ventures, Public Private Partnership – features

Unit 2: Foundations of Business II:

Business Services: Banking: types of bank accounts- savings, current, recurring, fixed deposit and multiple option deposit accounts. Banking services with particular reference to issue of bank draft, banker's cheque (Pay order), NEFT (National Electronic Funds Transfer), bank overdraft, cash credits and e-banking. Insurance: principles, concept of life, health, fire and marine insurance.

Emerging Modes of Business: E-Business - scope and benefits, resources required for successful e-business implementation, online transactions, payment mechanism, security and safety of business transactions. Outsourcing- concept need and scope of BPO (business process outsourcing) and KPO (knowledge process outsourcing).

Social Responsibility of Business and Business Ethics: Concept of social responsibility. Case for social responsibility. Responsibility towards owners, investors, consumers, employees, government and community. Environment protection and business. Business ethics and elements.

Unit 3: Finance and Trade:

Sources of business finance: Concept of business finance. Owner's funds - equity shares, preference shares and retained earnings. Borrowed funds- debentures and bonds, loan from financial institutions, loans from commercial banks.

Small Business: Small scale enterprise as defined by MSMED Act 2006 (Micro, Small and Medium Enterprise Development Act). Role of small business in India with special reference to Rural Areas. Government schemes and agencies for small scale industries:

International Trade: Services rendered by a wholesaler and a retailer, Types of retail trade- itinerant and small scale fixed shops, Large scale retailers- departmental stores, chain stores, mail order business.

Unit 4: Principles and Functions of Management I:

Nature and significance of Management: Management - concept, objectives and importance. Management as Science, Art and Profession. Levels of management. Management functions - planning, organising, staffing, directing and controlling. Coordination - concept, characteristics and importance.
Principles of Management: Principles of Management - concept, nature and significance, Fayol's principles of management, Taylor's Scientific Management - principles and techniques
Management and Business Environment: Business Environment - concept and importance, Dimensions of Business Environment - Economic, Social, Technological, Political and Legal, Impact of Government policy changes on business with special reference to liberalization, privatization and globalisation in India.

Unit 5: Principles and Functions of Management II:

Planning: Concept, importance and limitations, Planning process, Single use and Standing Plans - Objectives, Strategy, Policy, Procedure, Method, Rule, Budget and Programme.
Organising: Concept and importance. Organizing Process. Structure of organization - functional and divisional. Formal and informal organization. Delegation: concept, elements and importance. Decentralization: concept and importance.
Staffing: Concept and importance of staffing, Staffing as a part of Human Resource Management, Staffing process: Recruitment – sources, Selection – process, Training and Development - Concept and importance. Methods of training - on the job and off the job- Induction training, vestibule training, apprenticeship training and internship training.
Directing: Concept and importance, Elements of Directing - Supervision - concept, functions of a supervisor. Motivation - concept, Maslow's hierarchy of needs; Financial and non-financial incentives. Leadership - concept, styles - authoritative, democratic and laissen faire. Communication - concept, formal and informal communication; barriers to effective communication, how to overcome the barriers.
Controlling: Concept, nature and importance, Relationship between planning and controlling, Steps in the process of control.

Unit 6: Business Finance and Marketing

Financial Management: Concept and objectives of financial management. Financial decisions: investment, financing and dividend and factors affecting. Financial planning - concept and importance. Capital Structure - concept and

factors affecting. Fixed and Working Capital - concept and factors affecting their requirements.

Financial Markets: Financial Markets: concept and types. Money market and its instruments. Capital market and its types (primary and secondary). Stock Exchange - functions and training procedure. Depository Services and D'mat Account. Securities and Exchange Board of India (SEBI) - objectives

Marketing Management: Marketing - concept and functions. Marketing management philosophies. Marketing Mix – concept, Product - concept, branding, labeling and packaging.

SYLLABUS FOR NEST-Sr. (Humanities) (Stream Code: D)

ENGLISH (Subject Code: 09)

Noun, Present Tense, Adjectives, Punctuation marks, Prepositions, Conjunctions, Modals, Adverbs, Antonyms, Narration, Scrambled sentences, Transformation of Sentence, Subject Verb Agreement, Identify the error, Future Tense, Active and passive, Synonyms, Misspelt words, Idioms/Phrasal verbs, One word Substitute, Past Tense, Sentence Correction, Letter/Message/Notice, Comprehension, Auxiliary verbs, Compound Words, Prefix, Pronouns, Gerunds/Progressive/Infinitive, Quantifiers/Determiner.

ECONOMICS (Subject Code: 10)

Unit 1: Statistics for Economics:

Introduction: What is Economics? Meaning, scope and importance of statistics in Economics

Collection, Organisation and Presentation of data: Collection of data - sources of data - primary and secondary; how basic data is collected; methods of collecting data; Some important sources of secondary data: Census of India and National Sample Survey Organisation. Organisation of Data: Meaning and types of variables; Frequency Distribution. Presentation of Data: Tabular Presentation and Diagrammatic Presentation of Data: (i) Geometric forms (bar diagrams and pie diagrams), (ii) Frequency diagrams (histogram, polygon and ogive) and (iii) Arithmetic line graphs (time series graph).

Statistical Tools and Interpretation: Measures of Central Tendency- mean (simple and weighted), median and mode Measures of Dispersion - absolute dispersion (range, quartile deviation, mean deviation and standard deviation); relative dispersion (co-efficient of quartile-deviation, co-efficient of mean deviation, co-efficient of variation); Lorenz Curve: Meaning and its application. Correlation - meaning, scatter diagram; Measures of correlation - Karl Pearson's method (two variables ungrouped data) Spearman's rank correlation. Introduction to Index Numbers - meaning, types - wholesale price index, consumer price index and index of industrial production, uses of index numbers; Inflation and index numbers. Some Mathematical tools used in Economics : Equation of a line, stope of a line, stope of a curve.

Unit 2: Indian Economic Development:

Development Policies and Experience (1947-90): A brief introduction of the state of Indian economy on the eve of independence. Common goals of Five Year Plans. Main features, problems and policies of agriculture (institutional aspects and new agricultural strategy, etc.), industry (industrial licensing, etc,) and foreign trade.
Economic Reforms since 1991: Need and main features - liberalisation, globalisation and privatisation; an appraisal of LPG policies
Current challenges facing Indian Economy: Poverty- absolute and relative; Main programmes for poverty alleviation: A critical assessment; Rural development: Key issues - credit and marketing - role of cooperatives; agricultural diversification; alternative farming - organic farming Human Capital Formation: How people become resource; Role of human capital in economic development; Growth of Education Sector in India Employment: Formal and informal, growth and other issues: Problems and policies. Inflation: Problems and Policies Infrastructure: Meaning-and Types: Case Studies: Energy and Health: Problems and Policies- A critical assessment; Sustainable Economic Development: Meaning, Effects of Economic Development on Resources and Environment, including global warming.
Development Experience of India: A comparison with neighbours a) India and Pakistan b) India and China Issues: growth, population, sectoral development and other developmental indicators.

Unit 3: Microeconomics I:

Introduction: Meaning of microeconomics and macroeconomics what is an economy? Central problems of an economy: what, how and for whom to produce; concepts of production possibility frontier and opportunity cost.
Consumer Equilibrium and Demand: Consumer's equilibrium – meaning of utility, marginal utility, law of diminishing marginal utility, conditions of consumer's equilibrium using marginal utility analysis. Indifference curve analysis of consumer's equilibrium-the consumer's budget (budget set and budget line), preferences of the consumer (indifference curve, indifference map) and conditions of consumer's equilibrium. Demand, market demand, determinants of demand, demand schedule, demand curve, movement along and shifts in the demand curve; price elasticity of demand - factors affecting price elasticity of demand; measurement of price elasticity of demand – (a) percentage-change method and (b) geometric method (linear demand curve); relationship between price elasticity of demand and total expenditure.

Unit 4: Microeconomics II:

Producer Behaviour and Supply: Production functions: Total Product, Average Product and Marginal Product. Returns to a Factor. Cost and Revenue: Short run costs - total cost, total fixed cost, total variable cost; Average fixed cost, average variable cost and marginal cost-meaning and their relationship. Revenue - total, average and marginal revenue. Producer's equilibrium-meaning and its conditions in terms of marginal revenue-marginal cost. Supply, market supply, determinants of supply, supply schedule, supply curve, movements along and shifts in supply curve, price elasticity of supply; measurement of price elasticity of supply – (a) percentage change method and (b) geometric method.

Forms of Market and Price Determination

Perfect competition - Features; Determination of market equilibrium and effects of shifts in demand and supply. Other Market Forms - monopoly, monopolistic competition, oligopoly - their meaning and features.

Unit 5: Macroeconomics I:

National Income and related aggregates: Some basic concepts: consumption goods, capital goods, final goods, intermediate goods; stocks and flows; gross investment and depreciation. Circular flow of income; Methods of calculating National Income – Value Added or Product method, Expenditure method, Income method. Aggregates related to National Income: Gross National Product (GNP), Net National Product (NNP), Gross and Net Domestic Product (GDP and NDP) - at market price, at factor cost; National Disposable Income (gross and net), Private Income, Personal Income and Personal Disposable Income; Real and Nominal GDP. GDP and Welfare

Money and Banking: Money – its meaning and functions. Supply of money – Currency held by the public and net demand deposits held by commercial banks. Money creation by the commercial banking system. Central bank and its functions (example of the Reserve Bank of India).

Unit 6: Macroeconomics II:

Determination of Income and Employment: Aggregate demand and its components. Propensity to consume and propensity to save (average and marginal). Short–run equilibrium output; investment multiplier and its mechanism. Meaning of full employment and involuntary unemployment. Problems of excess demand and deficient demand; measures to correct them - change in government spending, availability of credit.

Government Budget and the Economy: Government budget - meaning, objectives and components. Classification of receipts - revenue receipts and

capital receipts; classification of expenditure – revenue expenditure and capital expenditure. Measures of government deficit - revenue deficit, fiscal deficit, primary deficit: their meaning. Fiscal Policy and its role

Balance of Payments: Balance of payments account - meaning and components; balance of payments deficit-meaning. Foreign exchange rate – meaning of fixed and flexible rates and managed floating. Determination of exchange rate in a free market.

HISTORY (Subject Code: 13)

Unit 1: World History I: Early Societies & Empires:

Introduction, **From the Beginning of Time**: Focus: Africa, Europe till 15000 BC. (a) Views on the origin of human beings. (b) Early societies. (c) Historians' views on present-day hunting gathering societies. **Early Cities**: Focus: Iraq, 3rd millennium BC (a) Growth of towns. (b) Nature of early urban societies. (c) Historians' Debate on uses of writing.

Empires: Introduction, An Empire across Three Continents Focus: Roman Empire, 27 B.C to A.D 600. (a) Political evolution (b) Economic expansion (c) Religion (d) Late Antiquity. (e) Historians' views on the institution of Slavery.

Central Islamic Lands: Focus: 7th to 12th centuries. (a) Polity (b) Economy (c) Culture. (d) Historians' viewpoints on the nature of the crusades. **Nomadic Empires**: Focus: the Mongol, 13th to 14th century (a) the nature of nomadism. (b) Formation of empires. (c) Conquests and relations with other states. (d) Historians' views on nomadic societies and state formation.

Unit 2: World History II:

Introduction. Three Orders: Focus: Western Europe, 13th-16th century. (a) Feudal society and economy. (b) Formation of states. (c) Church and Society. (d) Historians' views on decline of feudalism. **Changing Cultural Traditions:** Focus on Europe, 14th to 17th century. (a) New ideas, and new trends in literature and arts. (b) Relationship with earlier ideas (c) The contribution of West Asia. (d) Historians' viewpoints on the validity of the notion 'European Renaissance'. **Confrontation of Cultures:** Focus on America, 15th to 18th century. (a) European voyages of exploration. (b) Search for gold; enslavement, raids, extermination. (c) Indigenous people and cultures - the Arawaks, the Aztecs, the Incas. (d) The history of displacements. (e) Historians' viewpoints on the slave trade.

Paths to Modernization: Introduction. The Industrial Revolution: Focus on England, 18th and 19th century. (a) Innovations and technological change (b) Patterns of growth. (c) Emergence of a working class.

(d) Historians' viewpoints, Debate on 'Was there an Industrial Revolution?' **Displacing Indigenous People:** Focus on North America and Australia, I8th-20th century. (a) European colonists in North America and Australia. (b) Formation of white settler societies. (c) Displacement and repression of local people. (d) Historians' viewpoints on the impact of European settlement on indigenous population. **Paths to Modernization:** Focus on East Asia, late 19th and 20th century.
(a) Militarization and economic growth in Japan. (b) China and the Communist alternative. (c) Historians' Debate on the meaning of modernization.

Unit 3: Indian History I:

The Story of the First Cities: Harappan Archaeology: Broad overview: Early urban centres. Story of discovery: Harappan civilization Excerpt: Archaeological report on a major site. Discussion: How it has been utilized by archaeologists/historians. **Political and Economic History: How Inscriptions tell a story:** Broad overview: Political and economic history from the Mauryan to the Gupta period. Story of discovery: Inscriptions and the decipherment of the script. Shifts in the understanding of political and economic history. Excerpt: Asokan inscription and Gupta period land grant. Discussion: Interpretation of inscriptions by historians. **Social Histories: Using the Mahabharata :** Broad overview: Issues in social history, including caste, class, kinship and gender. Story of discovery: Transmission and publications of the Mahabharata. Excerpt: from the Mahabharata, illustrating how it has been used by historians. Discussion: Other sources for reconstructing social history. **A History of Buddhism: Sanchi Stupa:** Broad overview: (a) A brief review of religious histories of Vedic religion, Jainism, Vaisnavism, Saivism. (b) Focus on Buddhism. Story of discovery: Sanchi stupa Excerpt: Reproduction of sculptures from Sanchi. Discussion: Ways in which sculpture has been interpreted by historians, other sources for reconstructing the history of Buddhism.

Unit 4: Indian History II:

Agrarian Relations: The Ain-i- Akbari: Broad overview: (a) Structure of agrarian relations in the 16th and 17^{th} centuries. (b) Patterns of change over the period. Story of Discovery**:** Account of the compilation and translation of Ain-i-Akbari. Excerpt: from the Ain-i-Akbari Discussion: Ways in which historians have used the text to reconstruct history.
The Mughal Court: Reconstructing: Histories through Chronicles: Broad overview**:** (a) Outline of political history 15th-17th centuries. (b) Discussion of the Mughal court and politics. Story of Discovery: Account of the production of

court chronicles, and their subsequent translation and transmission. Excerpts: from the Akbarnama and Padshahnama.
Discussion: Ways in which historians have used the texts to reconstruct political histories.
New Architecture: Hampi: Broad overview: (a) Outline of new buildings during Vijayanagar period-temples, forts, irrigation facilities. (b) Relationship between architecture and the political system. Story of Discovery: Account of how Hampi was found. Excerpt: Visuals of buildings at Hampi. Discussion: Ways in which historians have analyzed and interpreted these structures. **Religious Histories: The Bhakti-Sufi Tradition:** Broad overview: (a) Outline of religious developments during this period. (b) Ideas and practices of the Bhakti-Sufi saints. Story of Transmission: How Bhakti-Sufi compositions have been preserved. Excerpt: Extracts from selected Bhakti-Sufi works. Discussion: Ways in which these have been interpreted by historians. **Medieval Society through Travelers'Accounts:** Broad overview: Outline of social and cultural life as they appear in travelers' accounts. Story of their writings: A discussion of where they travelled, why they travelled, what they wrote, and for whom they wrote. Excerpts: from Alberuni, Ibn Batuta, Bernier. Discussion**:** What these travel accounts can tell us and how they have been interpreted by historians.

Unit 5: Indian History III:

Colonialism and Rural Society: Evidence from Official Reports: Broad overview: (a) Life of zamindars, peasants and artisans in the late 18th century. (b) East India Company, revenue settlements and surveys. (c) Changes over the nineteenth century. Story of official records: An account of why official investigations into rural societies were undertaken and the types of records and reports produced. Excerpts: From Firminger's Fifth Report, Accounts of Frances Buchanan-Hamilton, and Deccan Riots Report. Discussion: What the official records tell and do not tell, and how they have been used by historians. **Representations of 1857:** Broad overview: (a) The events of 1857-58. (b) How these events were recorded and narrated. Focus: Lucknow. Excerpts: Pictures of 1857. Extracts from contemporary accounts. Discussion: How the pictures of 1857 shaped British
opinion of what had happened. **Colonialism and Indian Towns: Town Plans and Municipal Reports:** Broad overview: The growth of Mumbai, Chennai, hill stations and cantonments in the 18^{th} and 19^{th} centuries. Excerpts: Photographs and paintings. Plans of cities. Extract from town plan reports. Focus on Kolkata town planning. Discussion: How the above sources can be used to reconstruct the history of towns. What these sources do not reveal.

Unit 6: Indian History IV:

Mahatma Gandhi through Contemporary Eyes: Broad overview: (a) The Nationalist Movement 1918 - 48. (b) The nature of Gandhian politics and leadership. Focus: Mahatma Gandhi in 1931. Excerpts: Reports from English and Indian language newspapers and other contemporary writings. Discussion: How newspapers can be a source of history. **Partition through Oral Sources:** Broad overview: (a) The history of the 1940s. (b) Nationalism, Communalism and Partition. Focus: Punjab and Bengal. Excerpts: Oral testimonies of those who experienced partition. Discussion: Ways in which these have been analyzed to reconstruct the history of the event. **The Making of the Constitution:** Broad overview: (a) Independence and the new nation state. (b) The making of the Constitution. Focus: The Constitutional Assembly debates. Excerpts: from the debates. Discussion: What such debates reveal and how they can be analyzed.

SOCIOLOGY (Subject Code: 14)

Unit 1: Introducing Sociology:

Society & Sociology and Relationship with other social sciences: Introducing Society: Individuals and collectivities. Plural Perspectives. Introducing Sociology: Emergence. Nature & Scope. Relationship to other disciplines. **Basic Concepts**: Social Groups, Status and Role, Social Stratification, Social Control. **Social Institutions**: Family and Kinship, Political and Economic Institutions, Religion as a Social Institution, Education as a Social Institution. **Culture And Society:** Culture. Values and Norms: Shared, Plural, Contested. Socialization: Conformity, Conflict and the Shaping of Personality. **Practical Sociology: Methods & Techniques**. Tools and Techniques: Observation, Survey, Interview. The Significance of Field Work in Sociology

Unit 2: Understanding Society:

Structure, Process and Stratification: Social Structure, Social Processes: Cooperation, Competition, Conflict, Social Stratification: Class, Caste, Race, Gender. **Social Change:** Types and Dimensions; Causes and Consequences. Social Order: Domination, Authority & Law; Contestation, Crime & Violence. Village, Town & City: Changes in Rural & Urban Society. **Environment And Society** : Ecology and Society, Environmental Crises and Social Responses. **Western Social Thinkers:** Karl Marx on Class Conflict, Emile Durkheim on Division of Labour, Max Weber on Bureaucracy. **Indian Sociologists:** G.S.

Ghurye on Race and Caste, D.P. Mukerji on Tradition and Change, A.R. Desai on the State, M.N. Srinivas on the Village.

Unit 3: Indian Society I:

Introducing Indian Society**:** Colonialism, Nationalism, Class and Community. **Demographic Structure and Indian Society:** Rural-Urban Linkages and Divisions. S**ocial Institutions: Continuity & Change:** Family and Kinship, The Caste System. Market as A Social Institution

Unit 4: Indian Society II:

Pattern of Social Inequality & Exclusion: Caste Prejudice, Scheduled Castes and Other Backward Classes. Marginalization of Tribal Communities. The Struggle for Women's Equality. The Protection of Religious Minorities. Caring for the Differently Abled. **The Challenges Of Cultural Diversity:** Problems of Communalism, Regionalism, Casteism & Patriarchy. Role of the State in a Plural and Unequal Society.

Unit 5: Change and Development in India I:

Structural Change: Colonialism, Industrialization, Urbanization. **Cultural Change:** Modernization, Westernization, Sanskritisation, Secularization. Social Reform Movements & Laws. **The Story Of Democracy:** The Constitution as an instrument of Social Change. Parties, Pressure Groups and Democratic Politics. Panchayati Raj and the Challenges of Social Transformation. **Change And Development In Rural Society:** Land Reforms, Green Revolution and Agrarian Society.

Unit 6: Change and Development in India II:

C**hange And Development In Industrial Society:** From Planned Industrialization to Liberalization, Changes in the Class Structure. Globalisation and Social Change. Mass Media and Communication Process. **Social Movements:** Class-Based Movements: Workers, Peasants. Caste-Based Movements: Dalit Movement, Backward Castes, Trends in Upper Caste Responses. Women's Movements in Independent India. Tribal Movements. Environmental Movements.

GEOGRAPHY (Subject Code: 15)

Unit 1: Fundamentals of Physical Geography:

Geography as a Discipline: Geography as an integrating discipline, as a science of spatial attributes; Branches of geography; importance of physical geography.**The Earth:** Origin and evolution of the earth; Interior of the earth; Wegener's continental drift theory and plate tectonics; Earthquakes and volcanoes. **Landforms:** Rocks: major types of rocks and their characteristics; Landforms and their evolution. Geomorphic processes: weathering, mass wasting, erosion and deposition; soil-formation. **Climate:** Atmosphere-composition and structure; elements of weather and climate. Insolation-angle of incidence and distribution; heat budget of the earth-heating and cooling of atmosphere (conduction, convection, terrestrial radiation and advection); temperature factors controlling temperature; distribution of temperature-horizontal and vertical; inversion of temperature. Pressure-pressure belts; winds-planetary, seasonal and local; air masses and fronts; tropical and extratropical cyclones. Precipitation-evaporation; condensation-dew, frost, fog, mist and cloud; rainfall-types and world distribution. World climates-classification (Koeppen and Thornthwaite), greenhouse effect, global warming and climatic changes. **Water (Oceans):** Hydrological Cycle. Oceans - distribution of temperature and salinity; movements of ocean water-waves, tides and currents; submarine reliefs. **Life on the Earth:** Biosphere - importance of plants and other organisms; biodiversity and conservation; ecosystem and ecological balance.

Unit 2 India - Physical Environment:

Introduction: Location-space relations and India's place in the world. **Physiography:** Structure and Relief; Drainage systems: concept of watershed; the Himalayan and the Peninsular; Physiographic divisions. **Climate, Vegetation and Soil:** Weather and climate — spatial and temporal distribution of temperature, pressure winds and rainfall, Indian monsoon: mechanism, onset and withdrawal, variability of rainfalls : spatial and temporal; Climatic types (Koeppen). Natural vegetation-forest types and distribution; wild life; conservation; biosphere reserves; Soils - major types (ICAR's classification) and their distribution, soil degradation and conservation. **Natural Hazards and Disasters: Causes, Consequences and Management:** Floods, Clouds bursts and droughts, Earthquakes and Tsunami. Cyclones, Landslides.

Unit 3: Fundamentals of Human Geography I:

Human Geography: Nature and Scope, People: Population — distribution, density and growth, Population change-spatial patterns and structure; determinants of population change; Age-sex ratio; rural-urban composition; Human development - concept; selected indicators, international comparisons. **Human Activities:** Primary activities - concept and changing trends; gathering, pastoral, mining, subsistence agriculture, modern agriculture; people engaged in agricultural and allied activities – some examples from selected countries. Secondary activities-concept; manufacturing: types – household, small scale, large scale; agro based and mineral based industries; people engaged in secondary activities – some examples from selected countries. Tertiary activities-concept; trade, transport and communication; services; people engaged in tertiary activities - some examples from selected countries. Quaternary activities-concept; knowledge based industries; people engaged in quaternary activities - some examples from selected countries.

Unit 4: Fundamentals of Human Geography II:

Transport, Communication and Trade: Land transport - roads, railways; trans-continental railways. Water transport - inland waterways; Major ocean routes. Air transport - Intercontinental air routes. Oil and gas pipelines. Satellite communication and cyber space. International trade-Bases and changing patterns; ports as gateways of international trade, role of WTO in International trade. **Human Settlements:** Settlement types - rural and urban; morphology of cities (case study); distribution of mega cities; problems of human settlements in developing countries.

Unit 5: India: People and Economy I:

People: Population: distribution, density and growth; composition of population - linguistic, religious; sex, rural-urban and occupational– population change through time and regional variations; Migration: international, national-causes and consequences; Human development: selected indicators and regional patterns; Population, environment and development.
Human Settlements: Rural settlements - types and distribution; urban settlements - types, distribution and functional classification. **Resources and Development:** Land resources- general land use; agricultural land use, Geographical conditions and distribution of major crops (Wheat, Rice, Tea, Coffee, Cotton, Jute, Sugarcane and Rubber), agricultural development and problems.

Unit 6: India: People and Economy II:

Resources and Development: Water resources-availability and utilization-irrigation, domestic, industrial and other uses; scarcity of water and conservation methods-rain water harvesting and watershed management. Mineral and energy resources- distribution of metallic (Iron ore, Copper, Bauxite, Manganese); non-metallic (Mica, Salt) minerals; conventional (Coal, Petroleum, Natural gas and Hydro electricity) and non-conventional energy sources (solar, wind, biogas) and conservation. Industries - types, factors of industrial location; distribution and changing pattern of selected industries-iron and steel, cotton textiles, sugar, petrochemicals, and knowledge based industrial clusters. Planning in India- target area planning (case study); idea of sustainable development (case study). **Transport, Communication and International Trade:** Transport and communication-roads, railways, waterways and airways: oil and gas pipelines; national electric grids; communication networkings - radio, television, satellite and internet. International trade- changing pattern of India's foreign trade; sea ports and their hinterland and airports.
Environmental pollution; urban-waste disposal. Urbanisation, rural-urban migration; problems of slums. Land Degradation.

PSYCHOLOGY (Subject Code: 16)

Introduction to Psychology and Methods of Psychology: Nature of psychology; Psychology as a science, Development of psychology as a modern discipline, Contemporary approaches in psychology; Psychology in relation to other disciplines**:** Some important methods: Observation, Naturalistic, Experimental; Correlational study; Interview, Case study; Psychological tools: Tests, Questionnaires Ethical issues in the study of psychological processes.
The Bases of Human Behaviour and Human Development: Evolutionary perspective on human behaviour; Biological and cultural roots; Nervous system and endocrine system: Structure and relationship of with behaviour and experience; Brain and behaviour, Genetic bases of behaviour; Culture and human behaviour: Meaning of development; Factors influencing development; Contexts of development; Overview of developmental stages: Prenatal development, Infancy, Childhood, Adolescence (particularly issues of identity, health, social participation and moral development), Adulthood and Old age.

Sensory and Perceptual Processes: Knowing the world; Nature of stimuli; Nature and functioning of sense modalities; Attention : Nature and determinants; Selective and sustained attention; Principles of perceptual

organization; Role of perceiver , characteristics in perception; Perceptual constancy, Illusions,

Learning and memory: Nature of learning and learning curve: Paradigms of learning: Classical and Operant Conditioning, Observational Learning, Cognitive learning, Verbal learning, Concept learning, skill-learning; Factors facilitating learning; Transfer of learning: Types and Applications, Nature of memory; Information Processing Approach; Levels of processing; Memory systems - Sensory memory, Short-term memory, Long -term memory; Nature and causes of forgetting; Enhancing memory;

Motivation and Emotion: Human existence and nature of motivation; Biological needs; Social and psychological motives: Achievement, Affiliation and Power, Maslow's hierarchy of needs; Emerging concepts: Competence, Self efficacy and Intrinsic Motivation; Nature of emotions; Physiological, cognitive and cultural bases of emotions; Expression of emotions; Positive emotions: Happiness, Optimism, Empathy and Gratitude; Development of positive emotions; Managing negative emotions such as anger and fear.

Intelligence and Personality: Individual differences in intelligence: Theories of intelligence; Culture and Intelligence; Emotional intelligence; Personality: Concept; Approaches to Personality: Type and Trait, Psychodynamic, Humanistic, Behavioural and Cultural; Assessment of Personality: Self-report Measures, Behavioural Analysis, and Projective Measures.

POLITICAL SCIENCE (Subject Code: 17)

Unit 1: Indian Constitution at work:

The Constitution: Why and How? Why do we need a constitution? The authority of a Constitution

Rights in the Indian Constitution: The Importance of Rights, Fundamental Rights in the Indian Constitution, Directive Principles of State Policy, Relationship between Fundamental Rights and Directive Principles. **Election and Representation:** Elections and Democracy, Election System in India, Reservation of Constituencies, Free and Fair Elections, Electoral Reforms. E**xecutive:** What is an Executive? Different Types of Executive. Parliamentary Executive in India, Prime Ministers and Council of Ministers. Permanent Executive : Bureaucracy. **Legislature:** Why do we need a Parliament? Two Houses of Parliament. Functions and Power of the Parliament, Legistative functions, control over executive. Parliamentary committees. Self-regulation. **Judiciary:** Why do we need an Independent Judiciary? Structure of the Judiciary, Judicial Activism, Judiciary and Rights, Judiciary and Parliament. **Federalism:** What is Federalism? Federalism in the Indian Constitution,

Federalism with a strong Central Government, conflicts in India's federal system, Special Provisions. **Local Governments:** Why do we need Local Governments? Growth of Local Government in India, 73rd and74th Amendments, implementation of 73rd and 74th Amendments. **Constitution as a Living Document:** Are Constitutions static? The procedure to amend the Constitution. Why have there been so many amendments? Basic Structure and Evolution of the Constitution. Constitution asa Living Document. **The Philosophy of the Constitution:** What is meant by Philosophy of the Constitution? The Political philosophy of our Constitution, Procedural Achievements, Criticisms.

Unit 2: Political Theory:

Political Theory: An Introduction: What is Politics? What do we study in Political Theory? Putting Political Theory to practice. Why should we study Politial Theory? **Freedom:** The Ideal of Freedom. What is Freedom? Why do we need constraints? Harm principle. Negative and Positive Liberty. **Equality:** Significance of Equality. What is Equality? Various dimensions of Equality. How can we promote Equality? **Social Justice:** What is Justice? Just Distribution. Justice as fairness. Pursuing Social Justice. **Rights:** What are Rights? Where do Rights come from? Legal Rights and the State. Kinds of Rights. Rights and Responsibilities. **Citizenship:** What is citizenship? Citizen and Nation, Universal Citizenship, Global Citizenship. **Nationalism:** Nations and Nationalism, National Self-determination, Nationalism and Pluralism. **Secularism:** What is Secularism? What is Secular State? The Western and the Indian approaches to Secularism. Criticisms and Rationale of Indian Secularism.
Peace: What is Peace? Can violence ever promote peace? Peace and the State. Different Approaches to the pursuit of peace. Contemporary challenges to peace. **Development:** What is development? Criticism of the dominant. Development Model. Alternative conceptions of development.

Unit 3: Cold war and World Politics:

Cold War Era: Emergence of two power blocs after the second world war. Arenas of the cold war. Challenges to Bipolarity: Non Aligned Movement, quest for new international economic order. India and the cold war. **The End of Bipolarity:** New entities in world politics: Russia, Balkan states and Central Asian states, Introduction of democratic politics and capitalism in post-communist regimes. India’s relations with Russia and other post-communist countries.
US Hegemony in World Politics: Growth of unilateralism: Afghanistan, first Gulf War, response to 9/11 and attack on Iraq. Dominance and challenge to the

US in economy and ideology. India's renegotiation of its relationship with the USA.

Unit4: Contemporary World Politics:

Alternative Centres of Power: Rise of China as an economic power in post-Mao era, creation and expansion of European Union, ASEAN. India's changing relations with China. **Contemporary South Asia in the Post-Cold War Era:** Democratisation and its reversals in Pakistan and Nepal. Ethnic conflict in Sri Lanka, Impact of economic globalization on the region. Conflicts and efforts for peace in South Asia. India's relations with its neighbours. **International Organizations:** Restructuring and the future of the UN. India's position in the restructured UN. Rise of new international actors: new international economic organisations, NGOs. How democratic and accountable are the new institutions of global governance? **Security in Contemporary World:** Traditional concerns of security and politics of disarmament. Non-traditional or human security: global poverty, health and education. Issues of human rights and migration. **Environment and Natural Resources:** Environment movement and evolution of global environmental norms. Conflicts over traditional and common property resources. Rights of indigenous people. India's stand in global environmental debates. **Globalisation:** Economic, cultural and political manifestations. Debates on the nature of consequences of globalisation. Anti-globalisation movements. India as an arena of globalization and struggle against it.

Unit 5: Politics in India since Independence:

Challenges of Nation-Building: Nehru's approach to nation-building: Legacy of partition: challenge of 'refugee' resettlement, the Kashmir problem. Organisation and reorganization of states; Political conflicts over language. **Era of One-Party Dominance:** First three general elections, nature of Congress dominance at the national level, uneven dominance at the state level, coalitional nature of Congress. Major opposition parties. **Politics of Planned Development:** Five year plans, expansion of state sector and the rise of new economic interests. Famine and suspension of five year plans. Green revolution and its political fallouts.

India's External Relations: Nehru's foreign policy. Sino-Indian war of 1962, Indo-Pak war of 1965 and 1971.India'snuclear programme and shifting alliances in world politics. **Challenges to the Congress System:** Political succession after Nehru. Non-Congresses and electoral upset of 1967, Congress split and reconstitution, Congress' victory in 1971 elections, politics of 'garibihatao'. **Crisis of the Democratic Order:** Search for 'committed'

bureaucracy and judiciary. Navnirman movement in Gujarat and the Bihar movement. Emergency: context, constitutional and extra-constitutional dimensions, resistance to emergency. 1977 elections and the formation of Janata Party. Rise of civil liberties organisations.

Unit 6: Developments in Indian Politics:

Rise of New Social Movements: Farmers' movements, Women's movement, Environment and Development-affected people's movements. Implementation of Mandal Commission report and its aftermath. **Regional Aspirations: R**ise of regional parties. Punjab crisis and the anti-Sikh riots of 1984. The Kashmir situation. Challenges and responses in the North East. **Recent Developments in Indian politics:** Participatory upsurge in 1990s. Rise of the JD and the BJP. Increasing role of regional parties and coalition politics. UF and NDA governments. Elections 2004, 2009 and UPA government.

PHILOSOPHY (Subject Code: 18)

Unit 1: Scientific Methods:

Methods of Natural and Social Sciences: Value of Science. Nature and aim of Scientific Methods: Difference between Scientific induction, and Induction by simple enumeration. Difference between methods of Natural Sciences and Social Sciences. **Observation and Experiment:** Their Differences; fallacies of observation. **Science and Hypothesis:** The place of hypothesis in scientific method. Formulation of relevant hypothesis. Formal conditions of valid hypothesis. Hypothesis and crucial experiments. **Mill's methods of Experimental Inquiry:** The method of agreement; the method of difference; The joint method of agreement and difference; The method of concomitant variation; The method of residue. **Nyaya Theory of Knowledge:** General Survey – Prama, Pramana, Pramanya, Pratyaksa, Anumana, Upamana, Sabda.

Unit 2: Logic:

The nature and scope of logic: What is Logic? Use and application of Logic. Difference between Truth and Validity. **Terms and Propositions:** Definition of Term; Denotation and Connotation of Terms. Definition of Proposition and traditional classification of Propositions. Distribution of Terms. **Relation between Propositions: T**raditional Square of Propositions

Categorical Syllogism: Its definition: Rules of valid syllogism and Fallacies. **Elements of Symbolic Logic:** Value of using symbols in Logic Basic Truth-tables. **Buddhist Formal Logic :** Theory of Anuman.

Unit 3: Indian Philosophy I:

Nature and Schools of Indian Philosophy: Some basic issues Rta, Karma, Four Purusarthas: Dharma, Artha, Kama and Moksa**. Philosophy of the Bhagavad Gita:** Karma Yoga (Anasakta Karma), Svadharama, Lokasamgraha. **Buddhism, Jainism:** Four noble truths and eight-fold path; Theory of dependent origination. Anekantavada and syadvada.

Unit 4: Indian Philosophy II:

Nyaya - Vaisesika and Samkhya – Yoga: (1) Nyaya theory of Pramanas, (2) Vaisesika Theory of Padarthas, (3) Samkhya Theory of Three Gunas, (4) Yoga-The Eight-fold Practice. **Advaita Vedanta:** The nature of Atman, Brahman and the world.

Unit 5: Western Philosophy:

Knowledge and truth: Rationalism, Empiricism and Kant's Critical Philosophy. **The Causal Principle: Nature of Cause.** Aristotle's theory of four-fold causation cause-effect relationship: entailment, regularity and succession. Theories of causation. **Nature of Reality** Proofs for the existence of God. Ontological, Teleological and Cosmological arguments. **Realism and Idealism:** Mind-Body Problem.

Unit 6: Applied Philosophy: Environmental Ethics: (a) Study of Physical, Mental and Spiritual Environments. (b) Professional Ethics. (c) Philosophy of Education