

माध्यमिक शिक्षा मण्डल मध्यप्रदेश, भोपाल



NCERT अभिग्रहित हायर सेकेण्डरी परीक्षा पाठ्यक्रम

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- रसायन शास्त्र
- भौतिक शास्त्र
- जीवविज्ञान
- गणित
- अर्थशास्त्र
- व्यवसायिक अध्ययन
- बुककीपिंग एण्ड अकाउन्डेन्सी

सर्वाधिकार सुरक्षित मूल्यांकन इकाई, माध्यमिक शिक्षा मण्डल मध्यप्रदेश
भोपाल

CHEMISTRY

(CLASSES XI-XII)

Rationale

Higher Secondary Stage is the most crucial stage of school education because at this stage specialised discipline based, content oriented courses are introduced. Students reach this stage after 10 years of general education and opt for Chemistry with a purpose of mostly for pursuing their career in basic sciences or professional courses like medicines, engineering, technology and studying courses in applied areas of science and technology at tertiary level. Therefore, at this stage, there is a need to provide learners with sufficient conceptual background of Chemistry, which will make them competent to meet the challenges of academic and professional courses after the higher secondary stage.

National Curriculum Framework for School Education – 2005 recommends a disciplinary approach with appropriate rigour and depth with the care that syllabus is not heavy and at the same time it is comparable to the international level. It emphasizes a coherent focus on important ideas within the discipline that are properly sequenced to optimize learning. It recommends that theoretical component of Higher Secondary Science should emphasize on problem solving methods and the awareness of historical development of key concepts of science be judiciously integrated into content. The present exercise of syllabus development in Chemistry at Higher Secondary Stage is based on this framework.

Salient features of the present syllabus are thus:

- Some background of Chemistry from secondary stage is assumed; however, no specific knowledge of topics in Chemistry is pre-supposed.
- The course is self-contained and broadly covers fundamental concepts of Chemistry.
- Attempt has been made to see discipline of Chemistry does not remain only the science of facts but becomes related to modern applications in the world around us.
- The syllabus provides logical sequencing of the 'Units' of the subject matter with proper placement of concepts with their linkages for better understanding.
- Emphasis has been on promoting process – skills, problem solving abilities and applications of concepts of Chemistry useful in real life situation for making learning of Chemistry more relevant, meaningful and interesting.
- An effort has been made on the basis of feedback, to remove repetition besides reducing the content by suitably integrating the different content areas.
- Practical syllabus has two components. There are core experiments to be undertaken by the students in the classroom and will be part of examination while each student will carry out one investigatory project and submit the report for the examination.

With this background, the Chemistry curriculum at the higher secondary stage attempts to

- promote understanding of basic principles in Chemistry while retaining the excitement in Chemistry;
- develop an interest in students to study Chemistry as discipline;
- strengthen the concepts developed at the secondary stage and to provide firm foundation for further learning of Chemistry at tertiary level more effectively;

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- develop positive scientific attitude, and appreciate contribution of Chemistry towards the improvement of quality of human life;
- develop problem solving skills and nurture curiosity, aesthetic sense and creativity;
- inculcate values of honesty, integrity, cooperation, concern for life and preservation of the environment;
- make the learner realise the interface of Chemistry with other disciplines of science such as Physics, Biology, Geology, etc;
- equip students to face challenges related to health, nutrition, environment, population, whether industries and agriculture.

CHEMISTRY CLASS XI

Theory

Total Periods 180

Unit I: *Some Basic Concepts of Chemistry*

(Periods 14)

General Introduction: Importance and scope of chemistry.

Historical approach to particulate nature of matter, laws of chemical combination, Dalton's atomic theory, concept of elements, atoms and molecules.

Atomic and molecular masses. Mole concept and molar mass, percentage composition and empirical and molecular formula; chemical reactions, stoichiometry and calculations based on stoichiometry.

Unit II: *Structure of Atom*

(Periods 16)

Discovery of electron, proton and neutron; atomic number, isotopes and isobars. Thompson's model and its limitations, Rutherford's model and its limitations, Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, de Broglie's relationship, Heisenberg uncertainty principle, concept of orbitals, quantum numbers, shapes of *s*, *p*, and *d* orbitals, rules for filling electrons in orbitals – Aufbau principle, Pauli exclusion principle and Hund's rule, electronic configuration of atoms, stability of half filled and completely filled orbitals.

Unit III: *Classification of Elements and Periodicity in Properties*

(Periods 8)

Significance of classification, brief history of the development of periodic table, modern periodic law and the present form of periodic table, periodic trends in properties of elements – atomic radii, ionic radii, inert gas radii, ionization enthalpy, electron gain enthalpy, electronegativity, valence.

Unit IV: *Chemical Bonding and Molecular Structure*

(Periods 16)

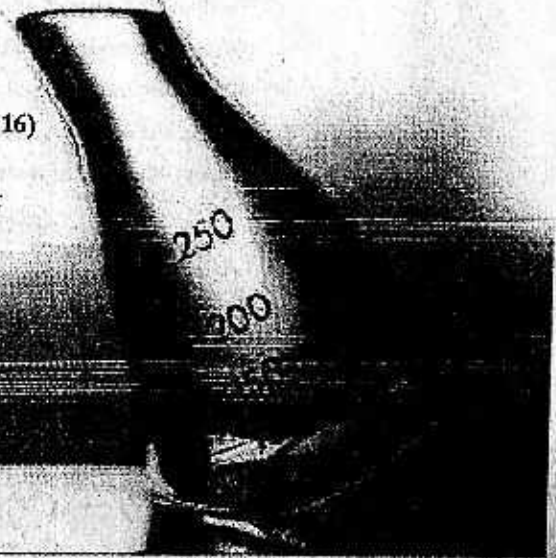
Valence electrons, ionic bond, covalent bond, bond parameters, Lewis structure, polar character of covalent bond, covalent character of ionic bond, valence bond theory, resonance, geometry of covalent molecules, VSEPR theory, concept of hybridization involving *s*, *p* and *d* orbitals and shapes of some simple molecules.



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molecular orbital theory of homonuclear diatomic molecules (qualitative idea only), hydrogen bond.

Unit V: States of Matter: Gases and Liquids

(Periods 14)

Three states of matter, intermolecular interactions, type of bonding, melting and boiling points, role of gas laws in elucidating the concept of the molecule, Boyle's law, Charles' law, Gay Lussac's law, Avogadro's law, ideal behaviour, empirical derivation of gas equation, Avogadro's number, ideal gas equation, deviation from ideal behaviour, liquefaction of gases, critical temperature.

Liquid State – Vapour pressure, viscosity and surface tension (qualitative idea only, no mathematical derivations).

Unit VI: Thermodynamics

(Periods 16)

Concepts of system, types of systems, surroundings, work, heat, energy, extensive and intensive properties, state functions.

First law of thermodynamics – internal energy and enthalpy, heat capacity and specific heat, measurement of ΔU and ΔH , Hess's law of constant heat summation, enthalpy of: bond dissociation, combustion, formation, atomization, sublimation, phase transition, ionization, and dilution.

Introduction of entropy as a state function, free energy change for spontaneous and non-spontaneous process, equilibrium.

Unit VII: Equilibrium

(Periods 16)

Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium – Le Chatelier's principle; ionic equilibrium – ionization of acids and bases, strong and weak electrolytes, degree of ionization, concept of pH. Hydrolysis of salts (elementary idea), buffer solutions, solubility product, common ion effect (with illustrative examples).

Unit VIII: Redox Reactions

(Periods 6)

Concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions, applications of redox reactions.

Unit IX: Hydrogen

(Periods 8)

Position of hydrogen in periodic table, occurrence, isotopes, preparation, properties and uses of hydrogen; hydrides – ionic, covalent and interstitial; physical and chemical properties of water, heavy water; hydrogen peroxide – preparation, reactions and structure; hydrogen as a fuel.

Unit X: s-Block Elements (Alkali and Alkaline Earth Metals)

(Periods 14)

Group 1 and Group 2 elements:

General introduction, electronic configuration, occurrence, anomalous properties of the first element of each group, diagonal relationship, trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii), trends in chemical reactivity with oxygen, water, hydrogen and halogens; uses.

Preparation and properties of some important compounds:

Sodium carbonate, sodium chloride, sodium hydroxide and sodium hydrogen carbonate, biological importance of sodium and potassium.

CaO , CaCO_3 , and industrial use of lime and limestone, biological importance of Mg and Ca.

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Unit XI: Some p-Block Elements

(Periods 16)

General Introduction to p-Block Elements

Group 13 elements: General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous properties of first element of the group; **Boron** – physical and chemical properties, some important compounds: borax, boric acids, boron hydrides. **Aluminium:** uses, reactions with acids and alkalies.

Group 14 elements: General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous behaviour of first element. **Carbon** – catenation, allotropic forms, physical and chemical properties; uses of some important compounds: oxides.

Important compounds of silicon and a few uses: silicon tetrachloride, silicones, silicates and zeolites.

Unit XII: Organic Chemistry – Some Basic Principles and Techniques (Periods 14)

General introduction, methods of purification, qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds.

Electronic displacements in a covalent bond: inductive effect, electromeric effect, resonance and hyper conjugation.

Homolytic and heterolytic fission of a covalent bond: free radicals, carbocations, carbanions; electrophiles and nucleophiles, types of organic reactions

Unit XIII: Hydrocarbons

(Periods 16)

Classification of hydrocarbons

Alkanes: Nomenclature, isomerism, conformations (ethane only), physical properties, chemical reactions including free radical mechanism of halogenation, combustion and pyrolysis.

Alkenes: Nomenclature, structure of double bond (ethene), geometrical isomerism, physical properties, methods of preparation; chemical reactions: addition of hydrogen, halogen, water, hydrogen halides (Markovnikov's addition and peroxide effect), ozonolysis, oxidation, mechanism of electrophilic addition.

Alkynes: Nomenclature, structure of triple bond (ethyne), physical properties, methods of preparation, chemical reactions: acidic character of alkynes, addition reaction of – hydrogen, halogens, hydrogen halides and water.

Aromatic hydrocarbons: Introduction, IUPAC nomenclature; **Benzene:** resonance, aromaticity; chemical properties: mechanism of electrophilic substitution – nitration, sulphonation, halogenation, Friedel Craft's alkylation and acylation; directive influence of functional group in mono-substituted benzene; carcinogenicity and toxicity.

Unit XIV: Environmental Chemistry

(Periods 6)

Environmental pollution: Air, water and soil pollution, chemical reactions in atmosphere, smogs, major atmospheric pollutants; acid rain, ozone and its reactions, effects of depletion of ozone

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layer, greenhouse effect and global warming – pollution due to industrial wastes; green chemistry as an alternative tool for reducing pollution, strategy for control of environmental pollution.

CHEMISTRY CLASS XII

Theory

Total Periods 60

Unit I: *Solid State*

(Periods 12)

Classification of solids based on different binding forces: molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea), unit cell in two dimensional and three dimensional lattices, calculation of density of unit cell, packing in solids, voids, number of atoms per unit cell in a cubic unit cell, point defects, electrical and magnetic properties.

Unit II: *Solutions*

(Periods 12)

Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, colligative properties – relative lowering of vapour pressure, elevation of B.P., depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass.

Unit III: *Electrochemistry*

(Periods 14)

Redox reactions; conductance in electrolytic solutions, specific and molar conductivity variations of conductivity with concentration, Kohlrausch's Law, electrolysis and laws of electrolysis (elementary idea), dry cell – electrolytic cells and Galvanic cells; lead accumulator, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, fuel cells; corrosion.

Unit IV: *Chemical Kinetics*

(Periods 12)

Rate of a reaction (average and instantaneous), factors affecting rates of reaction: concentration, temperature, catalyst, order and molecularity of a reaction; rate law and specific rate constant, integrated rate equations and half life (only for zero and first order reactions); concept of collision theory (elementary idea, no mathematical treatment).

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Unit V: Surface Chemistry

(Periods 8)

Adsorption: Physisorption and chemisorption; factors affecting adsorption of gases on solids; catalysis: homogenous and heterogeneous, activity and selectivity; enzymic catalysis; colloidal state: distinction between true solutions, colloids and suspensions; lyophilic, lyophobic multimolecular and macromolecular colloids; properties of colloids; Tyndall effect, Brownian movement, electrophoresis, coagulation; emulsions – types of emulsions

Unit VI: General Principles and Processes of Isolation of Elements (Periods 8)

Principles and methods of extraction: concentration, oxidation, reduction electrolytic method and refining; occurrence and principles of extraction of aluminium, copper, zinc and iron

Unit VII: p-Block Elements

(Periods 14)

Group 15 elements: General introduction, electronic configuration, occurrence, oxidation states, trends in physical and chemical properties; nitrogen – preparation, properties and uses; compounds of nitrogen: preparation and properties of ammonia and nitric acid, oxides of nitrogen (structure only); Phosphorous – allotropic forms; compounds of phosphorous: preparation and properties of phosphine, halides (PCl_3 , PCl_5) and oxoacids (elementary idea only).

Group 16 elements: General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; dioxygen: preparation, properties and uses; simple oxides; ozone Sulphur – allotropic forms; compounds of sulphur: preparation, properties and uses of sulphur dioxide; sulphuric acid: industrial process of manufacture, properties and uses, oxoacids of sulphur (structures only).

Group 17 elements: General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; compounds of halogens: preparation, properties and uses of chlorine and hydrochloric acid, interhalogen compounds, oxoacids of halogens (structures only).

Group 18 elements: General introduction, electronic configuration, occurrence, trends in physical and chemical properties, uses

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Unit VIII: *d and f Block Elements*

(Period 14)

General introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first row transition metals – metallic character, ionization enthalpy, oxidation states, ionic radii, colour, catalytic property, magnetic properties, interstitial compounds, alloy formation. Preparation and properties of $K_2Cr_2O_7$ and $KMnO_4$.

Lanthanoids: electronic configuration, oxidation states, chemical reactivity and lanthanoid contraction.

Actinoids: Electronic configuration, oxidation states.

Unit IX: *Coordination Compounds*

(Period 12)

Coordination compounds: Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds, bonding; isomerism, importance of coordination compounds (in qualitative analysis, extraction of metals and biological systems).

Unit X: *Haloalkanes and Haloarenes*

(Periods 12)

Haloalkanes: Nomenclature, nature of C-X bond, physical and chemical properties, mechanism of substitution reactions

Haloarenes: Nature of C-X bond, substitution reactions (directive influence of halogen for monosubstituted compounds only).

Uses and environmental effects of – dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, DDT.

Unit XI: *Alcohols, Phenols and Ethers*

(Periods 12)

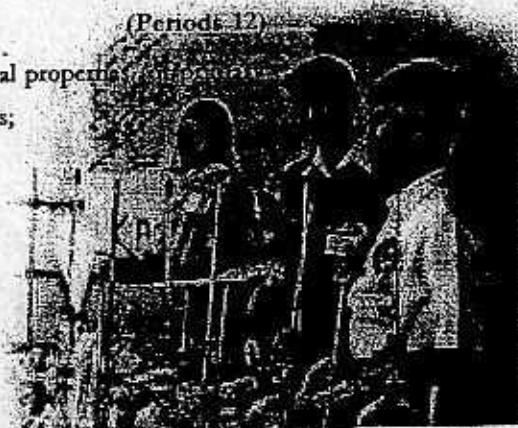
Alcohols: Nomenclature, methods of preparation, physical and chemical properties (primary alcohols only); identification of primary, secondary and tertiary alcohols; mechanism of dehydration, uses, some important compounds – methanol and ethanol.

Phenols: Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophillic substitution reactions, uses of phenols

Ethers: Nomenclature, methods of preparation, physical and chemical properties, uses.



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**Unit XII: Aldehydes, Ketones
and Carboxylic Acids (Periods 12)**

Aldehydes and Ketones: Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties and mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes; uses.

Carboxylic Acids: Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses.

Unit XIII: Organic Compounds Containing Nitrogen (Periods 10)

Amines: Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary secondary and tertiary amines.

Cyanides and Isocyanides will be mentioned at relevant places in context.

Diazonium salts: Preparation, chemical reactions and importance in synthetic organic chemistry.

Unit XIV: Biomolecules (Periods 12)

Carbohydrates: Classification (aldoses and ketoses), monosaccharides (glucose and fructose), oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen); importance.

Proteins: Elementary idea of α - amino acids, peptide bond, polypeptides, proteins, primary structure, secondary structure, tertiary structure and quaternary structure (qualitative idea only), denaturation of proteins; enzymes.

Vitamins: Classification and functions.

Nucleic Acids: DNA and RNA.

Unit XV: Polymers (Periods 8)

Classification: Natural and synthetic, methods of polymerization (addition and condensation), copolymerization. Some important polymers: natural and synthetic like polythene, nylon, polyesters, bakelite, rubber.

Unit XVI: Chemistry in Everyday Life (Periods 8)

1. Chemicals in medicines – analgesics, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines.
2. Chemicals in food – preservatives, artificial sweetening agents.
3. Cleansing agents – soaps and detergents, cleansing action.

PHYSICS

(CLASSES XI–XII)

The proposed syllabus for Physics at the Higher Secondary Stage has been developed with a view that this stage of school education is crucial and challenging as it is a transition from general science to discipline-based curriculum. The recommendations of National Curriculum Framework–2005 have been followed, keeping the disciplinary approach with rigour and depth, appropriate to the comprehension level of learners. Due care has been taken that the syllabus is not heavy and at the same time it is comparable to the international standards. The syllabus provides logical sequencing of the subject matter with proper placement of concepts with their linkages for better understanding.

It is expected that the syllabus will help to develop an interest in the learners to study Physics as a discipline and inculcate in learners the abilities, useful concepts of Physics in real-life situations for making learning of Physics relevant, meaningful and interesting. The learner is expected to realize and appreciate the interface of Physics with other disciplines.

Rationale

The higher secondary stage is crucial and challenging stage of school education as it is a transition from general science to discipline-based curriculum. Physics is being offered as an elective subject at the higher secondary stage of school education. At this stage, the students take up Physics, as a discipline, with a purpose of pursuing their future careers in basic sciences or professional courses like medicine, engineering, technology and studying courses in applied areas of science and technology at tertiary level. There is a need to provide the learners with sufficient conceptual background of Physics which would eventually make them competent to meet the challenges of academic and professional courses after the higher secondary stage.

The present effort of reforming and updating the Physics curriculum is an exercise based on the feedback received from the school system about existing syllabus and curricular material, large expansion of Physics knowledge, and also the educational and curricular concerns and issues provided in the National Curriculum Framework–2005.

The recommendations of National Curriculum Framework–2005 have been followed, keeping the disciplinary approach with rigour and depth, appropriate to the comprehension level of learners. Due care has been taken that the syllabus is not heavy and at the same time, it is comparable to the international standards. Also, it is essential to develop linkages with other disciplines for better learning of Physics concepts and establishing relationship with daily-life situations and life-skills.

Salient Features

- Emphasis on basic conceptual understanding of content.
- Promoting process-skills, problem-solving abilities and applications of Physics concepts/content, useful in real-life situations for making Physics learning more relevant, meaningful and interesting.
- Emphasis on use of SI Units, Symbols, nomenclature of physical quantities and formulations as per international standards.

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- Emphasis on Physics-related technological/industrial aspects to cope up with changing demand of society committed to the use of Physics, technology and informatics.
- Providing logical sequencing of the 'Units' of the subject matter and proper placement of concepts with their linkages for better learning and matching the concepts/content with comprehension level of the learners.
- Reducing the curriculum load by eliminating overlapping of concepts/content within the discipline of Physics or with other disciplines; reducing the descriptive portion and providing suitable formulation/depth of treatment appropriate to the comprehension level of learners, making room for contemporary core – topics and emerging curricular areas in Physics.
- The syllabus is arranged in Units spread over two years duration. The Units are so sequenced as to provide different dimensions of Physics as a discipline. The time allocation for learning Physics content per Unit in terms of instructional periods have been mentioned for each Unit to help the Textbook Development Team members to develop the instructional material so as to cover it within the time frame. Each Unit has been arranged with a topic, content related practical work (one core experiment, two activities to be evaluated) and suggested investigatory projects (one project to be evaluated). There is an imperative need for evaluating the learners through Continuous and Comprehensive Evaluation of various concepts covered in a Unit.

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With this background, the Physics curriculum at the higher secondary stage attempts to:

- Strengthen the concepts developed at the secondary stage to provide firm ground work and foundation for further learning Physics at the tertiary level more effectively and learning the relationship with daily-life situations;
- Develop conceptual competence in the learners and make them realize and appreciate the interface of Physics with other disciplines;
- Expose the learners to different processes used in Physics-related industrial and technological applications;
- Develop process-skills and experimental, observational, manipulative, decision-making and investigatory skills in the learners;
- Promote problem-solving abilities and creative thinking to develop interest in the learners in the study of Physics as a discipline;
- Understand the relationship between nature and matter on scientific basis, develop positive scientific attitude, and appreciate the contribution of Physics towards the improvement of quality of life and human welfare;
- Physics teaching-learning at the higher secondary stage enables the learners to comprehend the contemporary knowledge and develop aesthetic sensibilities and process skills. The experimental skills and process-skills developed together with conceptual Physics knowledge prepare the learners for more meaningful learning experiences and contribute to the significant improvement of quality of life. The learners would also appreciate the role and impact of Physics and technology, and their linkages with overall national development.

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PHYSICS CLASS XI

Theory

Unit I: *Physical World and Measurement* (Periods 10)

Physics: Scope and excitement; nature of physical laws; Physics, technology and society.

Need for measurement: Units of measurement; systems of units; SI units, fundamental and derived units. Length, mass and time measurements; accuracy and precision of measuring instruments; errors in measurement; significant figures.

Dimensions of physical quantities, dimensional analysis and its applications.

Unit II: *Kinematics* (Periods 30)

Frame of reference. Motion in a straight line: Position-time graph, speed and velocity. Uniform and non-uniform motion, average speed and instantaneous velocity.

Uniformly accelerated motion, velocity-time and position-time graphs, relations for uniformly accelerated motion (graphical treatment).

Elementary concepts of differentiation and integration for describing motion.

Scalar and vector quantities: Position and displacement vectors, general vectors and notation, equality of vectors, multiplication of vectors by a real number; addition and subtraction of vectors. Relative velocity.

Unit vectors. Resolution of a vector in a plane – rectangular components. Motion in a plane. Cases of uniform velocity and uniform acceleration – projectile motion. Uniform circular motion.

Unit III: *Laws of Motion* (Periods 16)

Intuitive concept of force. Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion. Law of conservation of linear momentum and its applications.

Equilibrium of concurrent forces. Static and kinetic friction, laws of friction, rolling friction, lubrication.

Dynamics of uniform circular motion: Centripetal force, examples of circular motion (vehicle on level circular road, vehicle on banked road).

Unit IV: *Work, Energy and Power* (Periods 16)

Scalar product of vectors. Work done by a constant force and a variable force; kinetic energy, work-energy theorem, power.

Notion of potential energy, potential energy of a spring, conservative forces; conservation of mechanical energy (kinetic and potential energies); non-conservative forces; elastic and inelastic collisions in one and two dimensions.

Unit V: *Motion of System of Particles and Rigid Body* (Periods 18)

Centre of mass of a two-particle system, momentum conservation and centre of mass motion. Centre of mass of a rigid body; centre of mass of circular ring, disc, rod and sphere.

Vector product of vectors; moment of a force, torque, angular momentum, conservation of angular momentum with some examples.

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Equilibrium of rigid bodies, rigid body rotation and equation of rotational motion, comparison of linear and rotational motions; moment of inertia, radius of gyration. Values of M.I. for simple geometrical objects (no derivation). Statement of parallel and perpendicular axes theorems and their applications.

Unit VI: Gravitation

(Periods 14)

Kepler's laws of planetary motion. The universal law of gravitation.

Acceleration due to gravity and its variation with altitude and depth.

Gravitational potential energy, gravitational potential. Escape speed, orbital velocity of a satellite. Geostationary satellites

Unit VII: Properties of Bulk Matter

(Periods 28)

Elastic behaviour, Stress-strain relationship, Hooke's law, Young's modulus, bulk modulus, shear modulus of rigidity.

Pressure due to a fluid column; Pascal's law and its applications (hydraulic lift and hydraulic brakes). Effect of gravity on fluid pressure.

Viscosity, Stokes' law, terminal velocity, Reynold's number, streamline and turbulent flow. Bernoulli's theorem and its applications

Surface energy and surface tension, angle of contact, application of surface tension ideas to drops, bubbles and capillary rise.

Heat, temperature, thermal expansion; specific heat capacity – calorimetry; change of state – latent heat.

Heat transfer – conduction, convection and radiation, thermal conductivity, Newton's law of cooling.

Unit VIII: Thermodynamics

(Periods 12)

Thermal equilibrium and definition of temperature (zeroth law of thermodynamics). Heat, work and internal energy. First law of thermodynamics.

Second law of thermodynamics: Reversible and irreversible processes. Heat engines and refrigerators.

Unit IX: Behaviour of Perfect Gas and Kinetic Theory

(Periods 8)

Equation of state of a perfect gas, work done on compressing a gas.

Kinetic theory of gases: Assumptions, concept of pressure. Kinetic energy and temperature; rms speed of gas molecules; degrees of freedom, law of equipartition of energy (statement only) and application to specific heat capacities of gases; concept of mean free path, Avogadro's number

Unit X: Oscillations and Waves

(Periods 28)

Periodic motion – period, frequency, displacement as a function of time. Periodic functions. Simple harmonic motion (SHM) and its equation; phase; oscillations of a spring – restoring force and force constant; energy in SHM – kinetic and potential energies; simple pendulum – derivation of expression for its time period; free, forced and damped oscillations (qualitative ideas only), resonance.

Wave motion. Longitudinal and transverse waves, speed of wave motion. Displacement relation for a progressive wave. Principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics. Beats. Doppler effect.

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Unit I: Electrostatics

(Periods 25)

Electric charges and their conservation. Coulomb's law – force between two point charges, forces between multiple charges; superposition principle and continuous charge distribution.

Electric field, electric field due to a point charge, electric field lines; electric dipole, electric field due to a dipole; torque on a dipole in a uniform electric field.

Electric flux, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside).

Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges; equipotential surfaces, electrical potential energy of a system of two point charges and of electric dipoles in an electrostatic field.

Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarisation, capacitors and capacitance, combination of capacitors in series and in parallel; capacitance of a parallel plate capacitor with and without dielectric medium between the plates; energy stored in a capacitor, Van de Graaff generator.

Unit II: Current Electricity

(Periods 22)

Electric current, flow of electric charges in a metallic conductor, drift velocity and mobility, and their relation with electric current; Ohm's law, electrical resistance, V-I characteristics (linear and non-linear), electrical energy and power, electrical resistivity and conductivity. Carbon resistors, colour code for carbon resistors; series and parallel combinations of resistors; temperature dependence of resistance.

Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel.

Kirchhoff's laws and simple applications. Wheatstone bridge, metre bridge.

Potentiometer – principle and applications to measure potential difference, and for comparing emf of two cells; measurement of internal resistance of a cell.

Unit III: Magnetic Effects of Current and Magnetism

(Periods 25)

Concept of magnetic field, Oersted's experiment.

Biot - Savart law and its application to current carrying circular loop

Ampere's law and its applications to infinitely long straight wire, straight and toroidal solenoids.

Force on a moving charge in uniform magnetic and electric fields. Cyclotron.

Force on a current-carrying conductor in a uniform magnetic field. Force between two parallel current-carrying conductors – definition of ampere. Torque experienced by a current loop in a magnetic field; moving coil galvanometer – its current sensitivity and conversion to ammeter and voltmeter.

Current loop as a magnetic dipole and its magnetic dipole moment. Magnetic dipole moment of a revolving electron. Magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis. Torque on a magnetic dipole (bar magnet) in a uniform magnetic field; bar magnet as an equivalent solenoid, magnetic field lines; Earth's magnetic field and magnetic elements. Para-, dia- and ferro- magnetic substances, with examples. Electromagnets and factors affecting their strengths. Permanent magnets.

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Unit IV: Electromagnetic Induction and Alternating Currents (Periods 20)

Electromagnetic induction; Faraday's law, induced emf and current; Lenz's Law, Eddy currents. Self and mutual inductance.

Need for displacement current.

Alternating currents, peak and rms value of alternating current / voltage; reactance and impedance; LC oscillations (qualitative treatment only), LCR series circuit, resonance; power in AC circuits, wattless current.

AC generator and transformer.

Unit V: Electromagnetic Waves (Periods 4)

Electromagnetic waves and their characteristics (qualitative ideas only). Transverse nature of electromagnetic waves.

Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, x-rays, gamma rays) including elementary facts about their uses.

Unit VI: Optics (Periods 30)

Reflection of light, spherical mirrors, mirror formula. Refraction of light, total internal reflection and its applications, optical fibres, refraction at spherical surfaces, lenses, thin lens formula, lens-maker's formula. Magnification, power of a lens, combination of thin lenses in contact. Refraction and dispersion of light through a prism.

Scattering of light – blue colour of the sky and reddish appearance of the sun at sunrise and sunset.

Optical instruments: Human eye, image formation and accommodation, correction of eye defects (myopia, hypermetropia, presbyopia and astigmatism) using lenses. Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers.

Wave optics: Wavefront and Huygens' principle, reflection and refraction of plane wave at a plane surface using wavefronts. Proof of laws of reflection and refraction using Huygens' principle. Interference, Young's double slit experiment and expression for fringe width, coherent sources and sustained interference of light. Diffraction due to a single slit, width of central maximum. Resolving power of microscopes and astronomical telescopes. Polarisation, plane polarised light; Brewster's law, uses of plane polarised light and Polaroids.

Unit VII: Dual Nature of Matter and Radiation (Periods 8)

Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation – particle nature of light.

Matter waves – wave nature of particles, de Broglie relation. Davisson-Germer experiment.

Unit VIII: Atoms and Nuclei (Periods 18)

Alpha - particle scattering experiment; Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum.

Composition and size of nucleus, atomic masses, isotopes, isobars, isotones. Radioactivity – alpha, beta and gamma particles/rays and their properties; radioactive decay law. Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number; nuclear fission and fusion.

Unit IX: Electronic Devices (Periods 18)

Semiconductors; semiconductor diode – I-V characteristics in forward and reverse bias, diode as a rectifier; I-V characteristics of LED, photodiode, solar cell, and Zener diode; Zener diode as



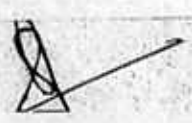
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a voltage regulator. Junction transistor, transistor action, characteristics of a transistor; transistor as an amplifier (common emitter configuration) and oscillator. Logic gates (OR, AND, NOT, NAND and NOR). Transistor as a switch.

Unit X: Communication Systems

(Periods 10)

Elements of a communication system (block diagram only); bandwidth of signals (speech, TV and digital data); bandwidth of transmission medium. Propagation of electromagnetic waves in the atmosphere, sky and space wave propagation. Need for modulation. Production and detection of an amplitude-modulated wave.



BIOLOGY

(CLASSES XI – XII)

In the present attempt of the NCERT to revise the Biology syllabus of the Classes XI and XII, several documents like 'Learning without Burden', the National Curriculum Framework- 2005, the report of the 'National Focus Group on Teaching of Science' as well as reports of several external and internal reviews carried out, helped to decide the main focus of the revision. Hence, the revised syllabus aims primarily at reducing the information load while ensuring at the same time that ample opportunities and scope for learning and appreciating basic concepts of Biology continues to be available within the framework.

The Biology Syllabus reinforces the ideas introduced in the lower classes while the children learn new concepts besides getting an exposure to contemporary areas of Biology. This syllabus aims also at emphasising the underlying principles that are common to both animals and plants, as well as highlighting the interrelationships of Biology with other areas of knowledge. The format of the syllabus allows a simple, clear, sequential flow of concepts without any jarring jumps. The empirical experience gained and practical exercises carried out during the course would prepare the student to handle Biology easily at higher levels in case she/he opts to continue further studies in this area.

The revised syllabus stresses the connection of the study of Biology to real life problems – use of biological discoveries/innovations in everyday life – in environment, industry, medicine, health and agriculture.

Since it was important that the quality of Biology education at the higher secondary level was not compromised in any way, the reduction in load from the syllabus required a very careful selection of topics to be taught. The Committee chose to leave topics out if the question about why the child needs to study the topic at the particular stage could not be answered; if the topic had no direct relevance to the child i.e. was not contextual; if the content was repetitive across stages with no change in expected understanding, and if any topic was in isolation with no evident horizontal or vertical linkages. The need for a network of ideas and cross-linking between the areas being identified was deemed very important. While deciding on the units/topics and the depth of each topic for the higher secondary level, a holistic view of the syllabus across all stages from the primary to the higher secondary and beyond was taken. Reducing the use of too many technical terms and avoiding very large numbers of examples will also help to make the content a little lighter. The importance of careful selection of illustrations and their use to make the concepts more explicit was stressed; in Biology the quality of illustrations can make or mar any attempt at good textbooks/teaching.

The principal objective at this stage would be to explore the variations amongst the living and developing respect for the diversities, and to appreciate that the most complex biological phenomena are also built on essentially simple processes. Learning Biology should uncover these elementary aspects and illustrate their linkage to more complex phenomena. It was also felt that the contributions of scientists (women scientists in particular) that led to critical and important discoveries in Biology should be highlighted, not merely through a chronological listing, but through brief biographical

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discussions, in an effort to bring out the processes that led to the discovery of principles and ideas in Biology. These would stimulate critical and creative thinking. Besides, the proposed course at the higher secondary stage provides substantial orientation to the students to professional/career opportunities available in medicine, agriculture, research, teaching and industry.

The syllabus also takes up issues pertaining to environment, health and other ethical issues that arise with any interference of human beings in the natural processes, which have great relevance from the societal point of view. A discussion on these in the prescribed syllabus would help tackle prevalent misconceptions and empower the student to play a rational, responsible and informed role in society.

In each unit after giving the various sub topics, "key points for developing subject matter" are given in the form of bulleted sentences. These, we believe, will serve as a guide for the flow of concepts while developing the unit in the class as well as in the textbook. The teaching time in terms of number of periods available is indicated for each unit (total 180 periods). These key points, along with the number of classes allocated for each unit, provide a reasonable guide to the depth at which each unit is to be taught. These should be especially considered at the book writing stage to avoid overburdening and expansion beyond available teaching time.

Each unit in the theory course carries suggestions for practicals. It is expected that the practical aspects will be integrated into the chapters in the textbook such that the rationale for doing them is evident and the understanding gained from them would help in furthering the understanding of the concepts. These experiments should be in the form of investigative reporting and be given along with the text.

The young student would get an exposure to the various branches of Biology in a more contextual and friendly manner as they studied various units in the syllabus; each unit could also provide a glimpse of the career opportunities in the particular area. After studying any unit, the child gets an opportunity to think more deeply and to form informed opinions. The description of the diverse/various tools and techniques used in the study of Biology have not been collated to form a distinct unit in the syllabus. It is envisaged that the teachers who teach this syllabus and the textbooks prepared based on it, will discuss techniques in a contextual manner rather than distanced from real experimental situations.

The committee faced a dilemma while considering the topic of animal physiology: whether to deal with 'animal' or 'human' physiology. But the moment the focus of discussion shifted - from the 'subject' dictated one to the child - and the available time was considered, it was evident that 'human' physiology was more appropriate at this stage. The student is closest to herself and is curious about the functioning of the human body. The 'science' understood after a study of human physiology could be meaningfully applied to other organisms.

The students should be encouraged to do at least one project which may be in Class XI. The basic objective of these projects should be to provide the child with an exposure to what it means to carry out an investigation, what research methodology is involved.

how data is analysed and presented and, how to interpret data and draw conclusions. The project should provide space for the child to choose a theme in the area of her interest, think independently, allow autonomous working and also provide freedom to present the project in any format of her/his choice, thus improving her/his communication skills.

The syllabus committee hopes that the spirit of the exercise is carried forward to the textbooks and the classrooms, across the country, ultimately meeting our objective of reducing the burden on the child while making learning Biology exciting. Teaching should emphasise on ways of acquiring knowledge rather than on conveying knowledge.

BIOLOGY CLASS XI

I. Diversity in Living World

Diversity of living organisms

Classification of the living organisms (five kingdom classification, major groups and principles of classification within each kingdom).

Systematics and binomial system of nomenclature.

Salient features of animal (non chordates up to phylum level, and chordates up to class level) and plant (major groups; Angiosperms up to subclass) classification.

Botanical gardens, herbaria, zoological parks and museums.

(Periods 25)

Key points for developing subject matter

- The meaning of being 'alive'.
- Living organisms show a very large diversity in form and structure ranging from unicellular to very large multicellular well-differentiated bodies.
- For ease of study, they have been organized into categories and this is called classification.
- Principally, all living organisms can be placed in one or the other of five kingdoms.
- Each kingdom is further subdivided; there are several levels of organisation, the lowest in the hierarchy being the species.
- The Binomial system, literally 'two names', of classification is followed, where each organism has a Latin generic name with a specific epithet.
- Zoological parks, Botanical gardens, Herbaria and Natural museums serve as Taxonomical aids.



II. *Structural Organisation in Animals and Plants*

Tissues in animals and plants.

Morphology, anatomy and functions of different parts of flowering plants: Root, stem, leaf, inflorescence, flower, fruit and seed.

Morphology, anatomy and functions of different systems of an annelid (earthworm), an insect (cockroach) and an amphibian (frog).
(Periods 30)

Key points for developing subject matter

- Light and electron microscopes are used as tools for the study of tissues, cells and cell organelles.
- Higher organisation of animals and plants is achieved through assembly of thousands/millions of cells into specialised tissues that in turn form organs and organ systems.
- The organisation of the living body shows division of labour.
- Organisms show increasing complexity in structure and function as we move from the lower to the higher levels.
- Plants and animals exhibit a wide range of organisation from a simple level to the complex.
- Floral characteristics form the basis of classification and identification of Angiosperms. This can be illustrated through semi-technical descriptions of families using suitable examples of wild and cultivated plants.
- The structure of the animal body shows a wide range in morphology and anatomy.

III. *Cell: Structure and Function*

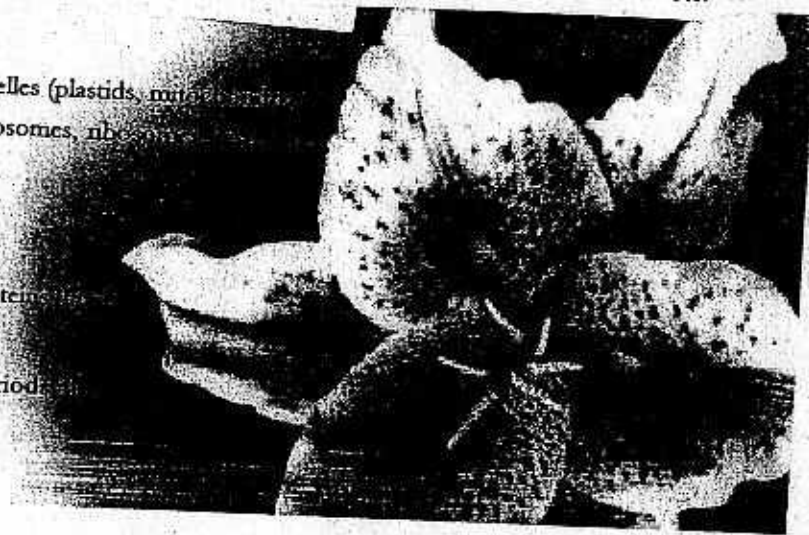
Cell: Cell wall, cell membrane and cell organelles (plastids, mitochondria, endoplasmic reticulum, Golgi bodies/ dictyosomes, ribosomes, vacuoles, centrioles) and nuclear organisation.

Mitosis, meiosis, cell cycle.

Basic chemical constituents of living bodies.

Structure and functions of carbohydrates, proteins and nucleic acids.

Enzymes: Types, properties and function. (Periods 30)



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Key points for developing subject matter

- The cell organelles are designed to perform tasks such as synthesis, breakdown, respiration and transport.
- Essential processes of cell division – mitosis and meiosis are similar in animals and plants.
- Living bodies contain different categories of micro and macro-molecules.
- Macromolecules are of four broad categories.
- Proteins, the major macro group besides providing structural support, mediate many physiological functions like catalysis, defence, transport, and sensing.
- Enzymes are an important class of proteins responsible for all metabolic activities of the cell.
- Carbohydrates are major energy reserves, and also serve the function of providing structural support to majority of living organisms.
- Lipids serve as major components of membranes, as energy reserves and some hormones.
- The DNA has a double helical structure.
- Nucleic acids are the genetic material, and are responsible for determining the protein synthesis.

IV. Plant Physiology

Movement of water, food, nutrients and gases

Plants and water.

Mineral nutrition.

Respiration.

Photosynthesis

Plant growth and development.

(Periods 40)

Key points for developing subject matter

- Cell to cell movement of water, food, gas and nutrients is dependent principally on concentration gradients and diffusion.
- Substances are moved against a concentration gradient through active transport.
- The plants lose water through their stomata.
- Transport of water over larger distances in plants depends on transpiration pull.
- Root pressure is responsible for movement of water up short distances and for guttation.
- Plants require a variety of mineral nutrients for their growth and development.
- Some plants are able to fix atmospheric nitrogen.
- Green plants use the C₃ pathway to fix carbon dioxide and synthesize simple sugars in the presence of sunlight.

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- Some plants have the C₄ pathway.
- Sugars are oxidised by all living organisms to release energy.
- Some organisms derive energy from food anaerobically.
- This energy is trapped as ATP and utilised for all metabolic activities.
- Growth regulators regulate growth and development in plants.

V. Human Physiology

Digestion and absorption.

Breathing and respiration.

Body fluids and circulation.

Excretory products and elimination.

Locomotion and movement.

Control and coordination.

(Periods 45)

Key points for developing subject matter

- Food is broken down enzymatically in stages and nutrients absorbed as they pass through the alimentary canal.
- The process of exchange of gases takes place at organ, tissue, cell and organelle levels leading to oxidation of sugars in the cells.
- Gases, nutrients as well as waste products are transported in the body through the vascular system.
- The various components of the blood are involved in diverse functions.
- Metabolic wastes produced in the body are eliminated by excretory system.
- The kidneys play an important role in osmoregulation.
- Movement and locomotion involves interaction of the skeletal and muscular system; the skeleton also protects many parts of the body.
- Control and coordination require functional integration of neural and endocrine systems in the body.
- Sense organs are specialised to receive different stimuli and transmit them to the brain.

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VI. Sexual Reproduction

Pollination and fertilisation in flowering plants.

Development of seeds and fruits.

Human reproduction: Reproductive system in male and female, menstrual cycle.

Production of gametes, fertilisation, implantation, embryo development, pregnancy and parturition.

Reproductive health – birth control, contraception and sexually transmitted diseases.

(Periods 35)

Key points for developing subject matter

- Plants show vegetative, asexual and sexual reproduction.
- In Angiosperms, the flowers contain the reproductive organs. They may be unisexual or bisexual.
- There are multitudes of ways of bringing together pollen and the carpel (pollination).
- In nature, pollination is subject to many uncertainties; often barriers to pollination and incompatibility have to be overcome for successful pollination and fertilisation.
- The male gametes are produced in the pollen tube, while the female gamete is produced in the embryo sac.
- Double fertilisation leads to the formation of embryo and the endosperm.
- The ovules in the ovary turn into seed after fertilisation. The ovary turns into a fruit.
- In animals, testes produce sperms and ovaries produce ova.
- Both male and female gametes production is under hormonal regulation; production of ova is a cyclic process.
- During fertilization, sperms migrate through the genital tract to fuse with the ova.
- The genetic makeup of the sperm determines the sex of the unborn child.
- The fertilised egg implants in the uterine wall where it remains connected with the mother till birth.
- The zygote undergoes cleavage, and then passes through different stages of development leading to the formation of three germinal layers.
- After completion of the gestation period, a fully developed baby is delivered.
- Contraceptive methods interfere with one or more of the following: gamete production, ovulation, sperm delivery, fusion of gametes and implantation. These methods of birth control thus help in family planning.
- In IVF the ova is fertilised using a donor sperm outside the body and the fertilised ova is implanted in the female body for further development.
- Abortion is legal, but not recommended for birth control. prenatal sex determination (usually associated with selective female foeticide) is illegal.
- Safe sex can help to prevent sexually transmitted diseases and AIDS.

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VII. Genetics and Evolution

Mendelian inheritance.

Chromosome theory of inheritance, deviations from Mendelian ratio (gene interaction- Incomplete dominance, co-dominance, complementary genes, multiple alleles).

Sex determination in human beings: XX, XY.

Linkage and crossing over.

Inheritance pattern of haemophilia and blood groups in human beings.

DNA: replication, transcription, translation.

Gene expression and regulation.

Genome and Human Genome Project.

DNA fingerprinting.

Evolution: Theories and evidences.

(Periods 45)

Key points for developing subject matter

- Plants and animals show Mendelian inheritance.
- Organisms may also show cytoplasmic inheritance.
- DNA carries information from one generation to the next.
- Human inheritance pattern can be exemplified by pattern of inheritance of blood groups and haemophilia.
- Genes on the same chromosomes show linkage and are inherited together unless crossing over occurs.
- The *Lac* operon exemplifies a typical model of gene regulation.
- Sequencing of Human DNA under the Human Genome Project aims at finding solutions for genetic disorders and several health problems.
- DNA fingerprinting is also used for identification and crime detection.
- Diversity in animals and plants arises out of variations in the genetic material.
- Mutation is an important source of variation.
- Further, variations in genetic material would affect the entire population over generations to give rise to new species and, therefore, lead to evolution.
- The process of evolution is explained by various theories (Lamarckism, Darwinism and Neo-Darwinism). Different types of evidences support the theories.

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VIII. Biology and Human Welfare

Animal husbandry.

Basic concepts of immunology, vaccines.

Pathogens, Parasites.

Plant breeding, tissue culture, food production.

Microbes in household food processing, industrial production, sewage treatment and energy generation.

Cancer and AIDS.

Adolescence and drug/alcohol abuse.

(Periods 35)

Key points for developing subject matter

- Traditionally farm animals have been bred for increased productivity, disease and pest resistance.
- The human body has its own defence mechanism.
- The defence system is constantly under attack from diverse sources – pollutants, chemicals and infectious organisms.
- Our body is capable of producing millions of types of antibodies to trap/remove and overcome the adverse effects of these foreign bodies/chemicals.
- However, against some infectious organisms we need to develop antibodies in advance, i.e. acquired immunity.
- Vaccination can help in developing immunity to specific diseases.
- Genetically engineered micro organisms are serving as bioreactors for production of vaccines and drugs.
- Infectious organisms like helminths (*Ascariasis, Filaria*), protozoa (*Amoebiasis, Malaria*), bacteria (*Typhoid, Pneumonia*), viruses (common cold, AIDS) and fungi (*Ring worm*) attacks specific systems of our body and produce characteristic symptoms.
- Each infectious organism, therefore, requires individual preventive measures.
- Some of these preventive measures demand improved personal hygiene and living conditions.
- Traditional plant breeding has been the method of creating varieties that are high on yield, resistance to pests and diseases and adapted to a given climatic condition. This has been the source of green revolution in India.
- New methods of propagation using tissue culture and genetic alteration using rDNA technology provide novel methods of crop improvement, horticulture, pest resistance.
- Microbes thrive by degradation/conversion of organic and inorganic compounds.

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can be exploited to produce household products (yoghurt/cheese) and for the treatment of sewage and energy generation. HIV is the major cause of death in the modern world – need adequate blood transfusion measures. Some people who are unable to handle the emotional stress and strain of growing up find apparent self-medication like drinking alcohol consumption; in reality a non-solution since it leads to severe repercussions like physiological and emotional disorders.

IX. Biotechnology and its Applications

Recombinant DNA technology.
Applications in Health, Agriculture and Industry
Genetically modified (GM) organisms; biosafety issues.
Insulin and Bt cotton.

(Periods 30)

Key points for developing subject matter

- DNA is a long polymer that can be edited by cutting and joining in any desired way. The edited DNA molecule (recombinant DNA) can be reintroduced into microbes, animals or plants to create genetically modified (GM) organisms or transgenics.
- rDNA technology is the very basis of many applications in biotechnology – for example to produce desired drugs and for gene therapy.
- rDNA technology has also played a major role in production of GM foods which have the advantage of high yields, pest and disease resistance.
- Use of GM food and crops has raised several questions regarding its bio-safety from the point of human consumption, environment and other social issues.
- A combination of classical breeding with rDNA technology and genetic modification has great potential for animal breeding.
- While cloning has been in use for plants since several decades, use of the technique in animals, particularly human cloning, raises several ethical and other issues.
- rDNA technology (gene therapy) can provide effective remedies for several genetic disorders.
- Bioreactors have been developed for production of vaccines and drugs.

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MATHEMATICS
-(CLASSES IX-XII)

Units

- I. Sets and Functions
- II. Algebra
- III. Coordinate Geometry
- IV. Calculus
- V. Mathematical Reasoning
- VI. Statistics and Probability

- Appendix:** 1. Infinite Series,
2. Mathematical Modelling

Chapters with Time Allocation

1.1 Sets	Periods 5
1.2 Relations and Functions	Periods 14
1.3 Trigonometric Functions	Periods 18
2.1 Principle of Mathematical Induction	Periods 05
2.2 Complex Numbers and Quadratic Equations	Periods 16
2.3 Linear Inequalities	Periods 10
2.4 Permutations and Combinations	Periods 12
2.5 Binomial Theorem	Periods 08
2.6 Sequence and Series	Periods 10
3.1 Straight Lines	Periods 09
3.2 Conic Sections	Periods 12
3.3 Introduction to Three-dimensional Geometry	Periods 08
4.1 Limits and Derivatives	Periods 18
5.1 Mathematical Reasoning	Periods 08
6.1 Statistics	Periods 10
6.2 Probability	Periods 15
Total Periods	180

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Unit I: Sets and Functions

1. Sets

Sets and their representations. Empty set. Finite and Infinite sets. Equal sets. Subsets. Subsets of the set of real numbers especially intervals (with notations). Power set. Universal set. Venn diagrams. Union and Intersection of sets. Difference of sets. Complement of a set.



2. Relations and Functions

Ordered pairs, Cartesian product of sets. Number of elements in the cartesian product of two finite sets. Cartesian product of the reals with itself (upto $R \times R \times R$).

Definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Function as a special kind of relation from one set to another. Pictorial representation of a function, domain, co-domain and range of a function. Real valued function of the real variable, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum and greatest integer functions with their graphs. Sum, difference, product and quotients of functions.

3. Trigonometric Functions

Positive and negative angles. Measuring angles in radians and in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unit circle. Truth of the identity $\sin^2 x + \cos^2 x = 1$, for all x . Signs of trigonometric functions and sketch of their graphs. Expressing $\sin(x+y)$ and $\cos(x+y)$ in terms of $\sin x$, $\sin y$, $\cos x$ and $\cos y$. Deducing the identities like following:

$$= \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}, \cot(x \pm y) = \frac{\cot x \cot y \mp 1}{\cot y \pm \cot x}$$

$$\sin x + \sin y = 2 \sin \frac{x+y}{2} \cos \frac{x-y}{2}, \cos x + \cos y = 2 \cos \frac{x+y}{2} \cos \frac{x-y}{2},$$

$$\sin x - \sin y = 2 \cos \frac{x+y}{2} \sin \frac{x-y}{2}, \cos x - \cos y = -2 \sin \frac{x+y}{2} \sin \frac{x-y}{2}.$$

Identities related to $\sin 2x$, $\cos 2x$, $\tan 2x$, $\sin 3x$, $\cos 3x$ and $\tan 3x$. General solution of trigonometric equations of the type $\sin \theta = \sin \alpha$, $\cos \theta = \cos \alpha$ and $\tan \theta = \tan \alpha$. Proofs and simple applications of sine and cosine formulae.

Unit II: Algebra

1. Principle of Mathematical Induction

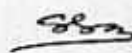
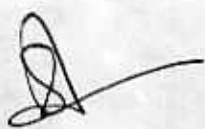
Processes of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers. The principle of mathematical induction and simple applications.

2. Complex Numbers and Quadratic Equations

Need for complex numbers, especially $\sqrt{-1}$, to be motivated by inability to solve every quadratic equation. Brief description of algebraic properties of complex numbers. Argand plane and polar representation of complex numbers. Statement of Fundamental Theorem of Algebra, solution of quadratic equations in the complex number system.

3. Linear Inequalities

Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables. Solution of system of linear inequalities in two variables – graphically.



4. *Permutations and Combinations*

Fundamental principle of counting. Factorial n . Permutations and combinations, derivation of formulae and their connections, simple applications.

5. *Binomial Theorem*

History, statement and proof of the binomial theorem for positive integral indices. Pascal's triangle, general and middle term in binomial expansion, simple applications.

6. *Sequence and Series*

Sequence and Series. Arithmetic progression (A.P.), arithmetic mean (A.M.). Geometric progression (G.P.), general term of a G.P., sum of n terms of a G.P., geometric mean (G.M.), relation between A.M. and G.M. Sum to n terms of the special series: $\sum n$, $\sum n^2$ and $\sum n^3$.

Unit III: **Coordinate Geometry**

1. *Straight Lines*

Brief recall of 2D from earlier classes. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axes, point-slope form, slope-intercept form, two-point form, intercepts form and normal form. General equation of a line. Distance of a point from a line.

2. *Conic Sections*

Sections of a cone: Circles, ellipse, parabola, hyperbola, a point, a straight line and pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle.

3. *Introduction to Three-dimensional Geometry*

Coordinate axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points and section formula.

Unit IV: **Calculus**

Limits and Derivatives

Derivative introduced as rate of change both as that of distance function and geometrically, intuitive idea of limit. Definition of derivative, relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions.

Unit V: **Mathematical Reasoning**

Mathematically acceptable statements. Connecting words/phrases — consolidating the understanding of "if and only if (necessary and sufficient) condition", "implies", "and/or", "implied by", "and", "or", "there exists" and their use through variety of examples related to real life and Mathematics. Validating the statements involving the connecting words — difference between contradiction, converse and contrapositive.



Unit VI: Statistics and Probability

1. Statistics

Measure of dispersion; mean deviation, variance and standard deviation of ungrouped/grouped data. Analysis of frequency distributions with equal means but different variances.

2. Probability

Random experiments: Outcomes, sample spaces (set representation). Events: Occurrence of events, 'not', 'and' & 'or' events, exhaustive events, mutually exclusive events. Axiomatic (set theoretic) probability, connections with the theories of earlier classes. Probability of an event, probability of 'not', 'and' & 'or' events.

Appendix

1. Infinite Series

Binomial theorem for any index, infinite geometric series, exponential and logarithmic series.

2. Mathematical Modelling

Consolidating the understanding developed up to Class X. Focus on modelling problems related to real-life (like environment, travel, etc.) and connecting with other subjects of study where many constraints may really need to be ignored, formulating the model, looking for solutions, interpreting them in the problem situation and evaluating the model.

CLASS XII

Units

- I. Relations and Functions
- II. Algebra
- III. Calculus
- IV. Vectors and Three-Dimensional Geometry
- V. Linear Programming
- VI. Probability

- Appendix:** 1. Proofs in Mathematics
2. Mathematical Modelling

Chapters with Time Allocation

- | | |
|-------------------------------------|------------|
| 1.1 Relations and Functions | Periods 10 |
| 1.2 Inverse Trigonometric Functions | Periods 12 |



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2.1	Matrices	Periods 18
2.2	Determinants	Periods 20
3.1	Continuity and Differentiability	Periods 15
3.2	Applications of Derivatives	Periods 16
3.3	Integrals	Periods 20
3.4	Applications of the Integrals	Periods 10
3.5	Differential Equations	Periods 10
4.1	Vectors	Periods 10
4.2	Three-dimensional Geometry	Periods 12
5.1	Linear Programming	Periods 12
6.1	Probability	Periods 18
Total Periods		180

Unit I: Relations and Functions

1. Relations and Functions

Types of relations: Reflexive, symmetric, transitive and equivalence relations. One to one and onto functions, composite functions, inverse of a function. Binary operations.

2. Inverse Trigonometric Functions

Definition, range, domain, principal value branches. Graphs of inverse trigonometric functions. Elementary properties of inverse trigonometric functions.

Unit II: Algebra

1. Matrices

Concept, notation, order, equality, types of matrices, zero matrix, transpose of a matrix, symmetric and skew symmetric matrices. Addition, multiplication and scalar multiplication of matrices, simple properties of addition, multiplication and scalar multiplication. Non-commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Concept of elementary row and column operations. Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries).

2. Determinants

Determinant of a square matrix (up to 3×3 matrices), properties of determinants, minors, cofactors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear



equations by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

Unit III: Calculus

1. Continuity and Differentiability

Continuity and differentiability derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit function. Concept of exponential and logarithmic functions and their derivatives. Logarithmic differentiation. Derivative of functions expressed in parametric forms. Second order derivatives. Rolle's and Lagrange's Mean Value Theorems (without proof) and their geometric interpretations.

2. Applications of Derivatives

Applications of derivatives: Rate of change, increasing/decreasing functions, tangents and normals, approximation, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real-life situations).

3. Integrals

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, only simple integrals of the type

$$\int \frac{dx}{x^2 \pm a^2}, \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{\sqrt{a^2 - x^2}}, \int \frac{dx}{ax^2 + bx + c}, \int \frac{dx}{\sqrt{ax^2 + bx + c}},$$

$$\int \frac{(px+q)}{ax^2+bx+c} dx, \int \frac{(px+q)}{\sqrt{ax^2+bx+c}} dx, \int \sqrt{a^2 \pm x^2} dx \text{ and } \int \sqrt{x^2 - a^2} dx \text{ to be evaluated.}$$

Definite integrals as a limit of a sum. Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

4. Applications of the Integrals

Applications in finding the area under simple curves, especially lines, arcs of circles/parabolas/ellipses (in standard form only), area between the two above said curves (the region should be clearly identifiable).

5. Differential Equations

Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given. Solution of differential equations by method of separation of variables, homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type:

$$\frac{dy}{dx} + P y = Q, \text{ where } P \text{ and } Q \text{ are functions of } x.$$



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Unit IV: Vectors and Three-Dimensional Geometry

1. Vectors

Vectors and scalars, magnitude and direction of a vector. Direction cosines/ratios of vectors. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Scalar (dot) product of vectors, projection of a vector on a line. Vector (cross) product of vectors.

2. Three-dimensional Geometry

Direction cosines/ratios of a line joining two points. Cartesian and vector equation of a line, coplanar and skew lines, shortest distance between two lines. Cartesian and vector equation of a plane. Angle between (i) two lines, (ii) two planes, (iii) a line and a plane. Distance of a point from a plane.

Unit V: Linear Programming

Introduction, related terminology such as constraints, objective function, optimization, different types of linear programming (L.P.) problems, mathematical formulation of L.P. problems, graphical method of solution for problems in two variables, feasible and infeasible regions, feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

Unit VI: Probability

Multiplication theorem on probability. Conditional probability, independent events, total probability, Baye's theorem. Random variable and its probability distribution, mean and variance of haphazard variable. Repeated independent (Bernoulli) trials and Binomial distribution.

Appendix

1. Proofs in Mathematics

Through a variety of examples related to mathematics and already familiar to the learner, bring out different kinds of proofs: direct, contrapositive, by contradiction, by counter-example.

2. Mathematical Modelling

Modelling real-life problems where many constraints may really need to be ignored (continuing from Class XI). However, now the models concerned would use techniques/results of matrices, calculus and linear programming.

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Syllabus
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ECONOMICS

ECONOMICS (CLASSES XI-XII)

Rationale

Economics is one of the social sciences which has a lot of influence on every human being yet was received little attention in the school curriculum in India. As economic life and the economy go through changes, the need to ground education in children's own experience becomes essential. While doing so, it is imperative to provide them with opportunities to acquire analytical skills to observe and understand the economic realities. Bringing in economics as an abstract knowledge in the early stages of school education would promote rote learning of the subject.

At the higher secondary stage, learners are in a position to understand abstract ideas, exercise the power of thinking and to develop their own perception. It is at this stage that learners are exposed to the rigour of the discipline of economics in a systematic way.

Economics courses are being introduced in such a way that, in the initial stage, the learners are introduced to the economic realities that the nation is facing today along with some basic statistical tools to understand these broader economic realities. In the later stage, the learners are to be introduced to economics as a theory of abstraction.

The economics courses also contain many projects and activities. These will provide opportunities for the learners to explore various economic issues both from their day-to-day



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life and also issues which are broader and invisible in nature. The academic skills that they acquire in these courses would help to develop the projects and activities. The syllabus is also expected to provide opportunities to use information and communication technologies to facilitate their learning process.

Objectives

1. Understanding of some basic economic concepts and developing economic reasoning which the learners can apply in their day-to-day life as citizens, workers and consumers.
2. Realisation of learners' role in nation building and sensitise them to the economic issues that the nation is facing today.
3. To equip learners with basic tools of economics and statistics to analyse economic issues. This is pertinent for even those who may not pursue this course beyond the higher secondary stage.
4. To develop an understanding that there can be more than one view on any economic issue and to develop the skills to argue logically with reasoning.

The economics subject would be taught in four semesters at the higher secondary stage. The details of course for each semester are as follows:

Class XI

1. Statistics for Economics
2. Indian Economic Development

Class XII

1. Introductory Microeconomics
2. Introductory Macroeconomics

CLASS XI

Course I: Statistics for Economics

In this course, the learners are expected to acquire skills in collection, organisation of quantitative and qualitative information pertaining to various, but simple, economic aspects systematically. It also intends to provide some basic statistical tools to analyse and interpret any economic information and draw appropriate inferences. In this process, the learners are also expected to understand the behaviour of various economic data.

Unit I: Introduction

- What is Economics?
- Meaning, scope and importance of statistics in Economics.

Unit II: Collection and Organisation 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 of data and diagrammatic presentation of data:

- Geometric forms (bar diagrams and pie diagrams),
- Frequency diagrams (histogram, polygon and ogive) and
- Arithmetic line-graphs (time series graph).

Unit III: *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 and 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) and 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.
(For all the numerical problems and solutions, the appropriate economic interpretation may be attempted. This means that students need to solve the problems and provide interpretations for the results derived.)

Unit IV: *Developing Projects in Economics*

The students may be encouraged to develop projects which have primary data, secondary data or both. Case studies of a few organisations/outlets may also be encouraged. Some of the examples of the projects are as follows (they are not mandatory but suggestive):

- A report on the demographic structure of your neighbourhood;
- Consumer awareness amongst households;
- Changing prices of a few vegetables in your market;
- Study of a cooperative institution: milk cooperatives.

The idea behind introducing this unit is to enable the students to acquire ways and means by which a project can be developed by using the skills learned in the course. This includes all the steps involved in designing a project: choosing a title, exploring the information relating to the title, collecting primary and secondary data, analysing the data, presenting the project and using various statistical tools and their interpretation and conclusion.

Instructions to the textbook writers (i) examples will have to be provided from simple economic data. The learners should not have any problem in understanding the economic data provided in those examples. Besides arriving at results using formulae of various statistical tools, the learners are also expected to interpret the results. So care must be taken to provide very simple

economic information, which the learners can understand without knowing the conceptual meaning in depth (ii) many multiple choice questions can be used in the textbook.

Course II: Indian Economic Development

One of the objectives of this course is to provide the learners with a background discussion on some of the key issues relating to the Indian economy. In this process, they are, as citizens, expected to be sensitised about those issues, appreciate and critically assess the role of the government in various economic spheres. This course also gives opportunities for knowing the economic resources available and how these resources are being utilised in different sectors. By exposing them to quantitative data on various economic aspects and policies, the learners would also be able to use their analytical skills, interpret the economic events and visualise the economic future of India. Nevertheless, this would not tantamount to burdening the child with concepts and data. By comparing India's economic performance with our neighbouring nations, this course also provides opportunities for knowing where we stand today – as a nation. With regard to various economic issues and trends, this course also provides the scope for alternative views and creates opportunities for the learners to debate. When they complete the course, the learners should be able to understand the economic realities that appear in various media.

Unit I: *Development Policies and Experience (1947-90)*

- A brief introduction of the state of the 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

Unit II: *Economic Reforms since 1991*

- Need and main features — liberalisation, globalisation and privatisation
- An appraisal of LPG policies

Unit III: *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 a resource; role of human capital in economic development; growth of education sector in India

Employment: Growth, informalisation and other issues: problems and policies.

Infrastructure: Meaning and types; case studies: energy and health — problems and policies — a critical assessment.

Environment: Sustainable economic development; limited availability of resources; environmental degradation.



Unit IV: Development Experience of India: A Comparison with Neighbours

- India and Pakistan
- India and China

Issues: Growth, population, sectoral development and other developmental indicators

Note to textbook writers: Since this course is expected to create opportunities for learners to know about various aspects of the Indian economy, there is a need to provide information in an interesting manner.

To the extent possible, data in long tabular form should be avoided. Instead, different forms of diagrams and charts, pictures and maps could be used. Since the learners study this course for the first time, those economic concepts which are used in this course, could be explained in a simple manner. Sensitising the learner towards various issues such as poverty, environmental degradation and gender concerns also forms a part of this course; many real examples in simple ways could be used.

CLASS XII (Business Economics)
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Course I: Introductory Microeconomics

This course introduces the learner to economics as a science of abstraction and reasoning. It introduces some basic concepts and tools to understand economic issues of an individual or a firm and how decisions are taken in variety of markets. It also intends to provide exposure to the learners on how choices are made and how a variety of statistical tools are used to optimally allocate the resources.

✓ **Unit I: Introduction**

- What is microeconomics?
- Central problems of an economy, production possibility curve and opportunity cost.

✓ **Unit II: Consumer Behaviour and Demand**

- *Consumer's Equilibrium:* meaning and attainment of equilibrium through Utility Approach: One and two commodity cases.
- *Demand:* market demand, determinants of demand, demand schedule, demand curve, movement along and shifts in demand curve, price elasticity of demand, measurement of price elasticity of demand – percentage, total expenditure and geometric methods

✓ **Unit III: Producer Behaviour and Supply**

- *Production function:* returns to factor and returns to scale
- *Supply:* market supply, determinants of supply, supply schedule, supply curve movement along and shifts in supply curve, price elasticity of supply, measurement of price elasticity of supply – percentage and geometric methods
- *Cost and Revenue:* Concepts of costs; short-run cost curves (fixed and variable costs; total, average and marginal costs); concepts of revenue – total, average and marginal revenue and their relationship. Producer's equilibrium – with the help of MC and MR.

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Unit IV: Forms of Market and Price Determination

Forms of market – perfect competition, monopoly, monopolistic competition – their meaning and features.

- Price determination under perfect competition – equilibrium price, effects of shifts in demand and supply.

Unit V: Simple Applications of Tools of Demand and Supply Curves

The teachers can be given the flexibility to choose the issues: rationing, floors and ceilings and Food Availability Decline (FAD) Theory (the teachers may also choose alternative examples that are simple and easy to understand)

Note to textbook writers: More examples from day-to-day context could be given. More numerical examples (solved) will have to be given. Use of pictures, charts and simple tables is essential.

Course II: Introductory Macroeconomics

The overall working of an economy and some of its economic theorisation are introduced in this course. The learners will get some basic idea of how the government regulates the functioning of economic aspects of a country through accounting of the production activities, running financial institutions, budgeting and the accounting of its economic interaction with other countries. The impact it will have on citizens is also briefly introduced.

Unit I: National Income and Related Aggregates — Basic Concepts and Measurement

- *Macroeconomics:* meaning
- Circular flow of income, concepts of GDP, GNP, NDP, NNP (at market price and factor cost), National Disposable Income (gross and net); Private Income, Personal Income and Personal Disposable Income
- Measurement of National Income – Value Added method, Income method and Expenditure method

Unit II: Determination of Income and Employment

- Aggregate demand, aggregate supply and their components
- Propensity to consume and propensity to save (average and marginal)
- Meaning of involuntary unemployment and full employment
- Determination of income and employment: two sector model
- Concept of investment multiplier and its working
- Problems of excess and deficient demand
- Measures to correct excess and deficient demand – availability of credit, change in government spending

Unit III: Money and Banking

- *Money:* meaning, evolution and functions
- *Central bank:* meaning and functions

- Commercial banks: meaning and functions
- Recent significant reforms and issues in Indian Banking System: privatisation and modernisation

VIII **Unit IV: Government Budget and the Economy**

- Government budget – meaning and its components
- Objectives of government budget
- Classification of receipts – revenue and capital; classification of expenditure – revenue and capital, plan and non-plan, and developmental and non-developmental
- Balanced budget, surplus budget and deficit budget: meaning and implications
- Revenue deficit, fiscal deficit and primary deficit: meaning and implications; measures to contain different deficits
- Downsizing the role of government: meaning and implications

IX **Unit V: Balance of Payments**

- Foreign exchange rate – meaning (fixed and flexible), merits and demerits; determination through demand and supply
- Balance of payments accounts – meaning and components
- A brief analysis about recent exchange rate issues

Note to textbook writers: Since this course will take the learner to a higher level of abstraction, there is a need to provide more examples from day-to-day context. More numerical examples (solved) will have to be given. Use of pictures, charts and simple tables is essential.

Syllabus for Secondary and Higher Secondary Levels



ASSISTANT



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BUSINESS STUDIES (CLASSES XI-XII)

Rationale

The courses in Business Studies and Accountancy are introduced at +2 stage of Higher Secondary Education as formal commerce education is provided after first ten years of schooling. Therefore, it becomes necessary that instructions in these subjects are given in such a manner that students have a good understanding of the principles and practices bearing in business (trade and industry) as well as their relationship with the society.

Business is a dynamic process that brings together technology, natural resources and human initiative in a constantly changing global environment. To understand the framework in which a business operates, a detailed study of the organisation and management of business processes and its interaction with the environment is required. Globalisation has changed the way firms transact their business. Information Technology is becoming a part of business operations in more and more organisations. Computerised systems are fast replacing other systems. E-business and other related concepts are picking up fast which need to be emphasized in the curriculum.

The course in Business Studies will prepare students to analyse, manage, evaluate and respond to changes which affect business. It provides a way of looking at and interacting with the business environment. It recognizes the fact that business influences and is influenced by social, political,

legal and economic forces. It allows students to appreciate that business is an integral component of society and develops an understanding of many social and ethical issues.

Therefore, to acquire basic knowledge of the business world, a course in Business Studies would be useful. It also informs students of a range of study and work options and bridges the gap between school and work.

Objectives

- To develop in students an understanding of the processes of business and its environment;
- To acquaint students with the dynamic nature and inter-dependent aspects of business;
- To develop an interest in the theory and practice of business trade and industry;
- To familiarise candidates with theoretical foundations of organising managing and handling operations of a business firm;
- To help students appreciate the economic and social significance of business activity and the social costs and benefits arising therefrom;
- To acquaint students with the practice of managing the operations and resources of business;
- To prepare students to function more effectively and responsibly as consumers, employers, employees and citizens;
- To help students in making the transition from school to the world of work including self-employment;
- To develop in students a business attitude and skills to be precise and articulate.

Course Structure

The Business Studies syllabus has been divided into 4 semester courses at the higher secondary stage. Each semester would be for about six months duration.

CLASS XI

Semester I

Foundations of Business

Semester II

Corporate Organisation, Finance and Trade

CLASS XII

Semester III

Principles and Functions of Management

Semester IV

Business Finance and Marketing



Syllabus for secondary and higher secondary levels
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CLASS XI

Semester I

Foundations of Business

(Total Periods 104)

Unit I: *Nature and Purpose of Business*

(Periods 20)

- Concept and characteristics of business.
- Business, profession and employment – distinctive features.
- 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 and Auxiliaries.
- Business risks – nature and causes.

Unit II: *Forms of Business Organisation*

(Periods 24)

- Sole Proprietorship; Joint Hindu Family Business – meaning, features, merits and limitations.
- Partnership – meaning, types, registration, merits, limitations, types of partners.
- Cooperative Societies – types, merits and limitations.
- Company: Private Ltd., Public Ltd – merits, limitations.
- Choice of form of business organisations.
- Starting a business – Basic factors.

Unit III: *Private, Public and Global Enterprises*

(Periods 14)

- Private Sector and Public Sector.
- Forms of Organising public sector enterprises:
 - Departmental Undertaking
 - Statutory Corporation
 - Government Company
- Changing role of public sector.
- Global Enterprises (Multinational Companies): meaning and features.
- Joint ventures — meaning, benefits.

Unit IV: *Business Services*

(Periods 18)

- Nature and types of Business services — Banking, Insurance, Transportation, Warehousing, Communication.
- Banking — types of Banks, Functions of Commercial banks, E-banking.
- Insurance: principles, types: life, fire and marine.
- Postal and Telecom services.
- Warehousing: types and functions.



Unit V: *Emerging Modes of Business* (Periods 14)

- E-Business — Meaning, scope and benefits, Resources required for successful e-business implementation, On-line transactions, payment mechanism, security and safety of business transactions.
- Outsourcing — concept, need and scope.

Unit VI: *Social Responsibility of Business and Business Ethics* (Periods 14)

- Concept of social responsibility;
- Case for social responsibility;
- Responsibility towards different interest groups: owners, investors, employees, consumers, government, community and public in general;
- Business and environmental protection;
- Business ethics: concept and elements.

Semester II

Corporate Organisation, Finance and Trade (Total Periods 104)

Unit VII: *Formation of a Company* (Periods 16)

Stages in the formation of a company:

- Promotion,
- Incorporation, and
- Commencement of business.

Unit VIII: *Sources of Business Finance* (Periods 24)

- Nature and significance
- Financial requirements and sources: owners funds and borrowed funds
- Methods of raising Finance:
 - Equity and Preference shares
 - Debentures and Bonds
 - Retained profits
 - Public deposits
 - Loan from Commercial Banks
 - Loan from Financial Institution
 - Trade Credit
 - Discounting of Bills of Exchange
 - Global Depository Receipt, American Depository Receipt

Unit IX: *Small Business* (Periods 20)

- Small Scale Industry; Tiny Sector; cottage and rural industry;
- Role of small business in rural India;
- Problems of small business in India.
- Government Assistance and Special Schemes for Industries in rural, backward and hilly areas.







Unit X: Internal Trade

(Periods 20)

- Meaning and types of internal trade: wholesale and retail;
- Services of a wholesaler and a retailer.
- Types of Retail Trade:
 - Itinerant retailers and fixed shops.
 - Departmental store, super market, malls, chain store, mail order business, consumer's cooperative store
 - Automatic Vending Machine
- Role of Chambers of Commerce and Industry in promotion of internal trade.

Unit XI: International Business

(Periods 24)

- Nature, Importance, scope and complexities involved in International Business;
- Basic information about ways of entering into International Business;
- Contract manufacturing; licensing; franchising; Joint ventures and Setting up Wholly Owned Subsidiaries;
- Export-Import procedures and Documentation;
- Foreign Trade Promotion: Organisational Support and Incentives; Nature and Importance of Export Processing Zone/Special Economic Zones;
- International Trade Institutions and Agreement: WTO, UNCTAD, World Bank/IMF.

CLASS XII

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Semester III

Principles and Functions of Management

(Total Periods 104)

Unit I: Nature and Significance of Management

(Periods 10)

- Management – concept, objectives, importance.
- Nature of management; Management as Science, Art, Profession.
- Levels of management – top, middle supervisory (First level).
- Management functions – planning, organising, staffing, directing and controlling
- Coordination – nature and importance.

Unit II: Principles of Management

(Periods 10)

- Principles of Management – meaning, nature and significance.
- Fayol's principles of management.
- Taylor's Scientific Management – Principles and Techniques.

Unit III: Business Environment

(Periods 10)

- Business Environment – meaning and importance.
- Dimensions of Business Environment – Economic, Social, Technological, Political and Legal.

- Economic Environment in India; Impact of Government policy changes on business and industry, with special reference to adoption of the policies of liberalization privatization and globalisation.

Unit IV: **Planning**

(Periods 14)

- Meaning, features, importance, limitations.
- Planning process.
- Types of Plans – Objectives, Strategy, Policy, Procedure, Method, Rule, Budget, Programme.

Unit V: **Organising**

(Periods 16)

- Meaning and importance.
- Steps in the process of organising
- Structure of organization – functional, and divisional.
- Formal and informal organisation.
- Delegation: meaning elements and importance.
- Decentralization: meaning and importance.
- Difference between delegation and decentralisation.

Unit VI: **Staffing**

(Periods 16)

- Meaning, need and importance of staffing.
- Staffing as a part of Human Resources Management.
- Steps in staffing process.
- Recruitment – meaning and sources.
- Selection – meaning and process.
- Training and Development – meaning, need, methods – on the job and off the job methods of training.

Unit VII: **Directing**

(Periods 16)

- Meaning, importance and principles.
- Elements of Direction:
 - Supervision – meaning and importance
 - Motivation – meaning and importance, Maslow's hierarchy of needs; Financial and non-financial incentives.
 - Leadership – meaning, importance; qualities of a good leader.
 - Communication – meaning and importance, formal and informal communication; barriers to effective communication.

Unit VIII: **Controlling**

(Periods 12)

- Meaning and importance.
- Relationship between planning and controlling.
- Steps in the process of control.
- Techniques of controlling.



Semester IV

Business Finance and Marketing

(Total Periods 104)

Unit IX: *Business Finance*

(Periods 20)

- Business finance – meaning, role, objectives of financial management.
- Financial planning – meaning and importance.
- Capital Structure – meaning and factors.
- Fixed and Working Capital – meaning and factors affecting their requirements.

Unit X: *Financial Markets*

(Periods 20)

- Concept of Financial Market: Money Market – nature instruments;
- Capital market: nature and types – primary and secondary market.
- Distinction between capital market and money market.
- Stock Exchange – meaning, functions, NSEI, OCTEI, Trading Procedure.
- Securities and Exchange Board of India (SEBI) – Objectives, Functions.

Unit XI: *Marketing*

(Periods 30)

- Marketing – meaning, functions, role.
- Distinction between marketing and selling.
- Marketing mix – concept and elements:
 - Product – nature, classification, branding, labeling and packaging
 - Physical distribution: meaning, role; Channels of distribution, – meaning, types, factors, determining choice of channels.
 - Promotion – meaning and role, promotion mix, Role of Advertising and personal selling; objections to Advertising
 - Price: factors influencing pricing.

Unit XII: *Consumer Protection*

(Periods 16)

- Importance of consumer protection.
- Consumer rights.
- Consumer responsibilities.
- Ways and means of consumer protection – Consumer awareness and legal redressal with special reference to Consumer protection Act.
- Role of consumer organizations and NGOs.

Unit XIII: *Entrepreneurship Development*

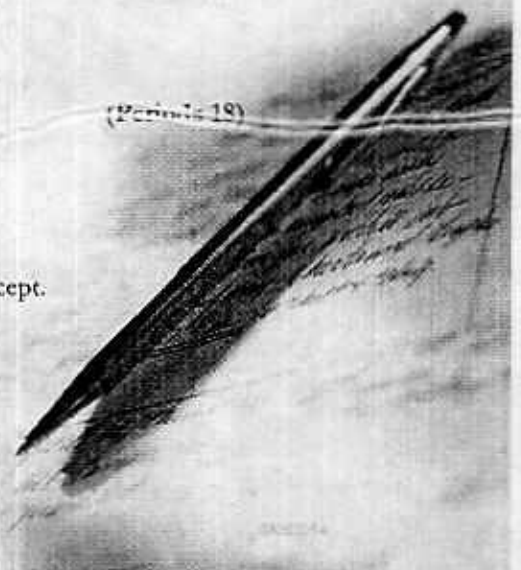
(Periods 18)

- Concept, Functions and Need.
- Entrepreneurship Characteristics and Competencies.
- Process of Entrepreneurship Development.
- Entrepreneurial Values, Attitudes and Motivation – Meaning and Concept.



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ACCOUNTANCY (CLASSES XI-XII)

Rationale

The course in 'Accountancy' is introduced at + 2 stage of Senior Secondary education, as formal commerce education is provided after first ten years of schooling.

With the fast changing economic scenario and business environment in a state of continuous flux, elementary business education along with accountancy as the language of business and as a source of financial information has carved out a place for itself at the Senior Secondary stage. Its syllabus content should give students a firm foundation in basic accounting principles and methodology and also acquaint them with the changes taking place in the presentation and analysis of accounting information, keeping in view the development of accounting standards and use of computers.

Against this background, the course puts emphasis on developing basic understanding about the nature and purpose of the accounting information and its use in the conduct of business operations. This would help to develop among students' logical reasoning, careful analysis and considered judgement.

Accounting as an information system aids in providing financial information. The emphasis at Class XI is placed on basic concepts and the process of accounting leading to the preparation of accounts for a sole proprietorship firm. Computerised accounting is becoming more and more popular with increased awareness about use of computers in business. Keeping this in view, the students are exposed compulsorily to the basic knowledge about computers and its use in accounting in the same year.

In Class XII, Accounting for Not-for-Profit Organisations and Partnership Firms are to be taught as a compulsory part. Students will also be given an opportunity to understand further about Computerised Accounting System, as an optional course to Company Accounts and Analysis of Financial Statements.

Objectives

- To familiarise the students with accounting as an information system;
- To acquaint the students with basic concepts of accounting and accounting standards;
- To develop the skills of using accounting equation in processing business transactions;
- To develop an understanding about recording of business transactions and preparation of financial statements;
- To enable the students with accounting for reconstitution of partnership firms;
- To enable the students to understand and analyse the financial statements; and
- To familiarise students with the fundamentals of computerised system of accounting.

Course Structure

Accountancy syllabus has been divided into four-semester course at the higher secondary stage. Each semester would be for about six months duration.




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CLASS XI

Semester I: Financial Accounting-I

Semester-II: Financial Accounting-II

CLASS XII

Semester III: Accounting for Not-for-Profit Organisations and Partnership Firms

Semester IV: Company Accounts and Financial Statement Analysis

CLASS XI

Semester I: Financial Accounting - I

(Total Periods 104)

Unit I: *Introduction to Accounting*

(Periods 12)

- Accounting – Meaning, Objectives, Accounting as source of information, Internal and External users of accounting information and their needs.
- Qualitative Characteristics of Accounting Information – Reliability, Relevance, Understandability and Comparability.
- Basic Accounting Terms – Asset, Liability, Capital, Expense, Income, Expenditure, Revenue, Debtors, Creditors, Goods, Cost, Gain, Stock, Purchase, Sales, Loss, Profit, Voucher, Discount, Transaction, Drawings.

Unit II: *Theory Base of Accounting*

(Periods 12)

- Accounting Principles – Meaning and Nature.
- Accounting Concepts: Entity, Money Measurement, Going Concern, Accounting Period, Cost Concept, Dual Aspect, Revenue Recognition (Realisation), Matching, Accrual, Full Disclosure, Consistency, Conservatism, Materiality.
- Accounting Standards – Concept and List of Indian Accounting Standards.
- Accounting Mechanism – Single Entry and Double Entry.
- Bases of Accounting – Cash Basis, Accrual Basis.

Unit III: *Recording of Business Transactions*

(Periods 20)

- *Voucher and Transactions:* Origin of Transactions – Source documents and Vouchers, Preparation of vouchers; Accounting equation approach – Meaning and Analysis of transactions using accounting equation; Rules of debit and credit.
- *Recording of Transactions:* Books of original entry – Journal, Special purpose books: (i) Cash book – Simple, Cashbook with bank column and Petty cashbook, (ii) Purchases book, Sales book, Purchases returns book, Sale returns book; Ledger: Meaning, Utility, Format, Posting from journal and subsidiary books, Balancing of accounts.
- *Bank Reconciliation Statement:* Meaning, Need and Preparation, Correct cash balance.



Unit IV: Trial Balance and Rectification of Errors (Periods 20)

- Trial Balance: Meaning, Objectives and Preparation.
- Errors: Types of Errors; Errors affecting trial balance; Errors not affecting trial balance.
- Detection and Rectification of Errors (one sided and two sided); uses of suspense account.

Unit V: Depreciation, Provisions and Reserves (Periods 20)

- *Depreciation*: Meaning and Need for charging depreciation, Factors affecting depreciation, Methods of depreciation — Straight line method, Written down value method (excluding change in method), Method of recording depreciation — charging to asset account, creating provision for depreciation/accumulated depreciation account; Treatment of disposal of an asset.
- *Provisions and Reserves*: Meaning, Importance, Difference between provisions and reserves, Types of reserves: Revenue reserve, Capital reserve, General reserve, Specific reserve and Secret reserve.

Unit VI: Accounting for Bills of Exchange Transactions (Periods 20)

- Bills of exchange and Promissory note: Definition, Features, Parties, Specimen and Distinction.
- Important Terms: Term of Bill, Concept of Accommodation Bill, Days of grace, Date of maturity, Bill after date, Negotiation, Endorsement, Discounting of bill, Dishonour, Retirement and Renewal of a bill.
- Accounting treatment of bill transactions.

Semester II: Financial Accounting - II (Total Periods 104)

Unit VII: Financial Statements (Periods 38)

- Financial Statements: Meaning and Users.
- Distinction between capital expenditure and revenue expenditure.
- Trading and Profit and Loss Account: Gross profit, Operating profit, Net profit.
- Balance Sheet: Need, Grouping, Marshalling of assets and liabilities, Vertical presentation of financial statement.
- Adjustments in preparation of financial statements with respect to Closing stock, Outstanding expenses, Prepaid expenses, Accrued income, Income received in advance, Depreciation, Bad debts, Provision for doubtful debts, Provision for discount on debtors, Managers' commission.
- Preparation of trading and profit and loss account and balance sheet of sole proprietorship.

Unit VIII: Accounts from Incomplete Records (Periods 30)

- Incomplete Records: Meaning, Uses and Limitations.
- Ascertainment of profit/loss by Statement of Affairs method.
- Preparation of trading and profit and loss account and balance sheet.
- Ascertaining missing figures in Total debtors account, Total creditors account, Bill receivables, Bills payables and Cash book and Opening statement of affairs.



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Unit IX: Computers in Accounting

(Periods 18)

- Introduction to Computer and Accounting Information System (AIS).
- Applications of computers in accounting:
 - Automation of accounting process, designing accounting reports, MIS reporting, data exchange with other information systems.
- Comparison of accounting processes in manual and computerised accounting, highlighting advantages and limitations of automation.
- Sourcing of accounting system: Readymade and customised and tailor-made accounting system. Advantages and disadvantages of each option.

Unit X: Accounting and Database System

(Periods 18)

- Accounting and Database Management System.
- Concept of Entity and Relationship: Entities and relationships in an Accounting System: Designing and Creating Simple Tables, Forms, Queries and Reports in the context of accounting system.

CLASS XII

Semester III: Accounting for Not-for-Profit Organisations and Partnership Firms

(Total Periods 104)

Unit I: Accounting Not-for-Profit Organisation

(Periods 24)

- Not-for-profit organisation: Meaning and Examples.
- Receipts and Payments: Meaning and Concept of fund based and non-fund based accounting.
- Preparation of Income and Expenditure account and Balance sheet from receipt and payment account with additional information.

Unit II: Accounting for Partnership

(Periods 16)

- Nature of Partnership Firm: Partnership deed (meaning, importance).
- Final Accounts of Partnership: Fixed v/s Fluctuating capital, Division of profit among partners, Profit and Loss Appropriation account.

Unit III: Reconstitution of Partnership

(Periods 40)

Changes in profit sharing ratio among the existing partners – Sacrificing ratio and Gaining ratio.

- Accounting for Revaluation of Assets and Liabilities and Distribution of reserves and accumulated profits.
- Goodwill: Nature, Factors affecting and Methods of valuation: Average profit, Super profit, Multiplier and Capitalisation methods.
- Admission of a Partner: Effect of admission of partner, Change in profit sharing ratio, Accounting treatment for goodwill, Revaluation of assets and liabilities, Reserves (accumulated profits) and Adjustment of capitals.

- Retirement/Death of a Partner: Change in profit sharing ratio, Accounting treatment of goodwill, Revaluation of assets and liabilities, Adjustment of accumulated profits (Reserves).

Unit IV: *Dissolution of Partnership Firm*

(Periods 24)

- Meaning, Settlement of accounts: Preparation of realisation account and related accounts (excluding piecemeal distribution, sale to a company and insolvency of a Partner)

Semester IV: Company Accounts and Financial Statement Analysis

(Total Periods 104)

Unit V: *Accounting for Share and Debenture Capital*

(Periods 42)

- Share Capital: Meaning, Nature and Types.
- Accounting for Share Capital: Issue and Allotment of Equity and Preference Shares; Over subscription and Under subscription; Issue at par, premium and at discount; Calls in advance, Calls in arrears, Issue of shares for consideration other than cash.
- Forfeiture of Shares: Accounting treatment, Re-issue of forfeited shares.
- Presentation of shares and Debentures Capital in company's balance sheet.
- Issue of Debenture – At par, premium and discount; Issue of debentures for consideration other than cash.
- Redemption of debenture.
- Out of proceeds of fresh issue, accumulated profits and sinking fund.

Unit VI: *Analysis of Financial Statements*

(Periods 42)

- Financial Statements of a Company: Preparation of simple financial statements of a company in the prescribed form with major headings only.
- Financial Analysis: Meaning, Significance and Purpose, Limitations.
- Tools for Financial Analysis: Comparative statements, Common size statements.
- Accounting Ratios: Meaning and Objectives, Types of ratios:
 - Liquidity Ratios:* Current ratio, Liquidity ratio.
 - Solvency Ratio:* Debt to equity, Total assets to debt, Proprietary ratio
 - Activity Ratio:* Inventory turnover, Debtors turnover, Payables turnover, Working capital turnover, Fixed assets turnover, Current assets turnover.
 - Profitability Ratio:* Gross profit, Operating ratio, Net profit ratio, Return on Investment, Earning per Share, Dividend per Share, Profit Earning ratio.

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Unit VII: Statement of Changes in Financial Position (Periods 20)

- Cash Flow Statement: Meaning and Objectives, Preparation, Adjustments related to depreciation, dividend and tax, sale and purchase of non-current assets (as per revised standard issued by ICAI).

OR

Semester IV: Computerised Accounting System (Total Periods 104)

Unit I: Overview of Computerised Accounting System (Periods 10)

- Concept and Types of Computerised Accounting System (CAS).
- Features of a Computerised Accounting System.
- Structure of a Computerised Accounting System.

Unit II: Using Computerised Accounting System (Periods 30)

- Steps in installation of CAS, Preparation of chart of accounts, Codification and Hierarchy of account heads.
- Data entry, Data validation and Data verification.
- Adjusting entries, Preparation of financial statements, Closing entries and Opening entries.
- Security of CAS and Security features generally available in CAS (Students are expected to understand and practise the entire accounting process using an accounting package.)

Unit III: Accounting Using Database Management System (DBMS) (Periods 34)

- Concepts of DBMS.
- Objects in DBMS: Tables, Queries, Forms, Reports.
- Creating data tables for accounting.
- Using queries, forms and reports for generating accounting information. Applications of DBMS in generating accounting information such as shareholders' records, sales reports, customers' profile, suppliers' profile payroll, employees' profile, petty cash register.

Unit IV: Accounting Applications of Electronic Spreadsheet (Periods 30)

- Concept of an Electronic Spreadsheet (ES).
- Features offered by Electronic Spreadsheet.
- Applications of Electronic Spreadsheet in generating accounting information, preparing depreciation schedule, loan repayment schedule, payroll accounting and other such applications.



2018-19

SYLLABUS

INFORMATICS PRACTICES COURSE DESIGN : CLASS - XI

Learning Outcomes :

- Sound knowledge of computer system.
- Ability to develop application using simple IDEs.
- Ability to use, develop & debug programs independently.
- Ability to store and retrieve data using an RDBMS.

Unit 1 : Introduction To Computer Systems

Hardware Concepts :

- Computer organization (basic concepts): CPU, Memory (RAM and ROM), I/O devices, communication bus, ports (serial, parallel), device specific ports;
- Input devices: Keyboard, Mouse, Light pen, Touch Screen, Graphics Tablet, Joystick, Microphone, OCR, Scanner, Smart Card reader, Barcode reader, QRCode reader, Biometric sensor, web camera;
- Output Devices: Monitor/Visual Display Unit (VDU), LCD screen, Television, Printer (Dot Matrix printer, Deskjet/ Inkjet/ Bubble jet printer, Laser printer), Plotter, Speaker;
- Secondary Storage Devices: Floppy Disk, Hard Disk, Compact Disk, Magnetic Tape, Digital Versatile Disk (DVD), Flash Drive, Memory cards. Comparative properties of storage media;

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- Memory Units : bit, Byte (Kilobyte, Megabyte, Gigabyte, Terabyte, Petabyte)
- Encoding scheme : ASCII, ISCI & UNICODE
- E-waste disposal.

Security of computer system :

- Sources of attack and possible damages, malware – virus, worms, spyware and co as security threat, malware detection using a tool. Computer security, digital certifi digital signature, firewall, password, file access permissions

Types of Software :

(a) System Software:

- (i) Operating systems : Need for operating system, major functions of Operating System. Examples of OS for mainframe (eg: Linux etc), PC/Server (eg: Windows, Ubuntu) and mobile devices eg: Android, ios and Symbian.
- (ii) Language Processors : Assembler, Interpreter, and Compiler

(b) Utility Software: Compression tools, disk defragmenter, anti-virus

(c) Application Software :

- (i) General Purpose Application Software : Word Processor, Presentation Tool, Spreadsheet, Package, Database Management System, Integrated Development Environment (IDE)
- (ii) Specific Purpose Application Software : Inventory Management System, Purchasing System, Human Resource Management System, Payroll System, Financial Accounting System, Hotel Management and Reservation System etc.

Unit 2 : Introduction To Programming

Getting started with Programming using IDE

- Introduction, Rapid Application Development using IDE (Integrated Development Environment) such as Netbeans; Familiarization of IDE using basic Interface components- Label, Text Field, Text Area, Button, Checkbox, Radio Button. (As per appendix A)
- Developing General Application (As per the guidelines at appendix B) - Getting Familiar with Java Swing User Interface components-Frame, Dialog, OptionPane, JPanel, ScrollPane, Label, TextField, PasswordField, TextArea, JButton, JCheckBox, JRadioButton, JComboBox, List
- Basic component handling methods and properties: setText(), getText(), isSelected(), setSelected()

Programming Fundamentals :

- Data Types: Concept of data types: Built-in data types - byte, short, int, long, float, double, char, string, boolean
- Variables : Need to use variable declaring variables, variable naming conventions, assigning value to variables;

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- Integer object method: `parseInt`
- Double object method: `parseFloat`, `parseFloat`
- **Control Structures:**
 - Decision Structure – if, if-else, switch;
 - Looping Structure- while, do . . while, for;

Programming Guidelines :

- General Concepts : Modular approach;
- Stylistic Guidelines: Clarity and simplicity of expressions and names; Comments, Indentation;
- Running and debugging programs, Syntax Errors, Run-Time Errors, Logical Errors;
- Problem Solving Methodology: Understanding of the problem, Identifying minimum number of inputs required for output, breaking down problem into simple logical steps.

Unit 3 : Relational Database Management System

Database Management System :

- Introduction to database concepts: Database, Relational database, Relation/Table, Attribute/Field, Tuple / Row;
- Data Types: Text (CHAR, VARCHAR), Number (DECIMAL, INT/INTEGER), Date and Time
- Keys: Candidate key, Primary key, Alternate key, Foreign key;
- Examples of common Database Management System: MySQL, Ingres, Postgres, Oracle, DB2, MS SQL, Sybase etc.; Common Database management tools for mobile devices (eg: SQL Lite, Postgres SQL).

Introduction to MySQL

(ANSI SQL 99 standard commands)

- *Classification of SQL Commands:*
DML - SELECT, INSERT, UPDATE, DELETE
DDL - CREATE, DROP, ALTER
- Creating and using a database: CREATE DATABASE command to create a database, USE command to select a database.
- *Creating a table:* CREATE TABLE command to create a table, DESC command to display a table structure, INSERT command for: inserting new rows, inserting new rows with NULL values and values of all the studied data types.
- Selection and Projection of a table.
- Displaying table data. SELECT command for: selecting all the columns, selecting specific column(s), use of arithmetic operators.
- Defining and using column alias

- Eliminating duplicate values from display using DISTINCT keyword
- Limiting rows during selection (using WHERE clause)
 - Using Comparison operators - =, <, >, <=, >=, <>, BETWEEN, IN, LIKE(%,_);
 - Logical Operators - AND, OR, NOT and corresponding operator precedence;
- Working with NULL values.
- ORDER BY clause: Sorting in Ascending/Descending order, sorting by column alias name, sorting on multiple columns;
- Manipulating Data of a Table/Relation: UPDATE command to change existing data of a table, DELETE command for removing row(s) from a table.
- Restructuring a table: ALTER TABLE for adding new column(s) and deleting column (s) and modifying column Structure. DROP command to delete a database or a table.

Functions in MySQL :

- String Functions: ASCII(), CHAR(), CONCAT(), INSTR(), LCASE(), UCASE(), LEFT(), LOWER(), LENGTH(), LTRIM(), MID(), RIGHT(), RTRIM(), SUBSTR(), TRIM(), UPPER().
- Mathematical Functions: - POWER(), ROUND(), TRUNCATE().
- Date and Time Functions: CURDATE(), DATE(), MONTH(), YEAR(), DAYNAME(), DAYOFMONTH(), DAYOFWEEK(), DAYOFYEAR(), NOW(), SYSDATE().

Unit 4 : IT Applications

- e-Governance: Definition, benefits to citizens, e-Governance websites and their salient features and societal impacts; e-Governance challenges.
- e-Business: Definition, benefits to customers and business, e-Business websites and their salient features and societal impacts; netbanking, mobile banking, e-Business challenges.
- e-Learning: Definition, benefits to students (learners), teachers (trainers) and school (Institution) management; MOOCs (Massive Open Online Courses) ; e-Learning websites and their salient features and societal impacts; e-Learning Challenges.

In each of the above domains, identify at least two real-life problems, list the input(s) required for the expected output(s), and describe the problem solving approach. Conceptualise the design of an ICT based national mission.

Impact of ICT on society – social environmental and economic benefits. Infomania.

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SYLLABUS**INFORMATICS PRACTICES****CLASS - XII****UNIT 1 : NETWORKING AND OPEN STANDARDS****Computer Networking :**

- **Networking** : a brief overview,
- **Communication Media** : Wired Technologies – Co-Axial, Ethernet Cable, Optical Fiber; Wireless Technologies – Blue Tooth, Infrared, Microwave, Radio Link, Satellite Link;
- **Network Devices** : Modem, Hub, Switch, Repeater, Gateway – and their functions
- **Types of network** : LAN, MAN, WAN, PAN;
- **Network Topologies** : Star, Bus, Tree
- **Network Protocols** : HTTP, TCP/IP, PPP, Remote access software such as Team Viewer;
- **Identifying computers and users over a network** : Basic concept of domain name, MAC (Media Access Control), and IP Address, domain name resolution
- **Network Security Concepts** : Cyber Law, Firewall, Cookies, Hackers and Crackers
- **Network security threats** : Denial of service, Intrusion problems, Snooping, Eavesdropping
- **Internet Applications** : SMS, Voice Mail, Electronic Mail, Chat, Video Conferencing
- **Wireless/Mobile Communication** : GSM, CDMA, WLL, 3G, 4G

Open Source Concepts :

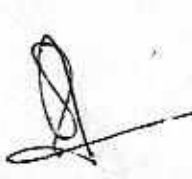
- **Open Source Software (OSS)**, common FOSS/FLOSS examples (GNU/Linux, Firefox, OpenOffice, Java, Netbeans, MySQL). Common open standards (HTML, XML, ODP, TCP/IP, CSS)
- **Indian Language Computing** : Character encoding, UNICODE, different types of fonts (open type vs true type, static vs dynamic), Entering Indian Language Text – phonetic and key map based, Inscript.

UNIT 2 : PROGRAMMING

- **Review of Class XI;**
Programming Fundamentals : (Refer to Appendix A for Swing Control Methods & Properties, and Appendix B for sample guidelines of GUI Programming)
- Basic concept of Class, Object, Inheritance and
- **Polymorphism Commonly used libraries :**
 - String class and methods: toString(), concat(), length(), toLowerCase(), toUpperCase(), trim(), substring()
 - Math class methods: pow(), round()
- **Accessing MySQL database using JDBC to connect with database.**
- **Web application development :** URL, Web server, Communicating with the web server, concept of Client and Server Side
- **HTML based web pages covering basic tags-** <HTML>, <TITLE>, <BODY>, <H1><H6>, ,<I>,<U>, <CENTER>, <COMMENT>, , ANCHOR <A>, Paragraph <P>, Line Break
, Horizontal Rule <HR>, , <TABLE>, <LIST> , , <FORM>
- Creating and accessing static pages using HTML and introduction to XML

UNIT 3 : RELATIONAL DATABASE MANAGEMENT SYSTEM

- **Review of RDBMS from Class XI**
Database Fundamentals
- Concept of Database transaction, Committing and revoking a transaction using COMMIT and ROLLBACK AND SAVEPOINT.
- **Grouping Records :** GROUP BY, Group functions - MAX(), MIN(), AVG(), SUM(), COUNT(); using COUNT(*), DISTINCT clause with COUNT; Group Functions in case of Null Values.
- Creating a Table with PRIMARY KEY, Foreign Key, Unique and NOT NULL constraints, Viewing Constraints, Using DESC command to view constraints.
- **Displaying Data From Multiple Tables :** Cartesian product, Union, Intersection and Equi-Join.



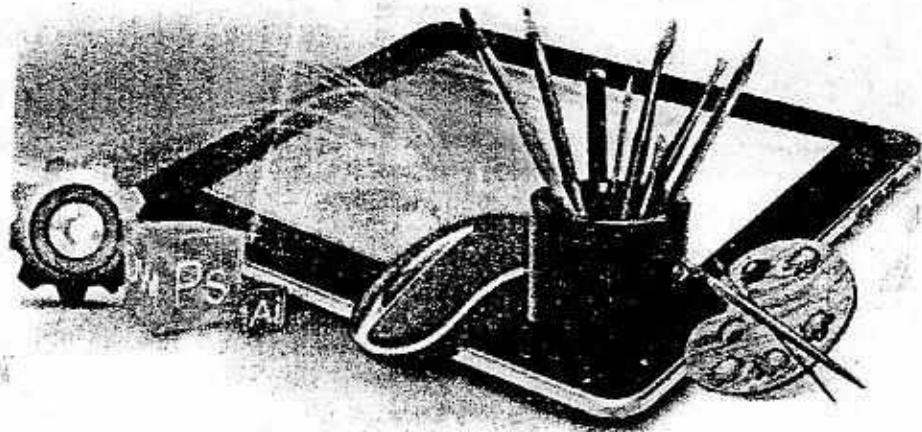
- **ALTER TABLE** for
 - Deleting column(s), modifying data type(s) of column(s),
 - Adding a constraint, enabling constraint, dropping constraints.
- **DROP Table** for deleting a table or a database.

UNIT 4 : IT APPLICATIONS

- **Front-end Interface** : Introduction; content and features; identifying and using appropriate component (Text Field, Radio Button, CheckBox, List etc. as learnt in Unit 2 (Programming)) for data entry, validation and display.
- **Back-end Database** : Introduction and its purpose, exploring the requirement of databases, tables and its essential attributes.
- **Front-End and Database Connectivity** : Introduction, requirement and benefits
- **Demonstration and development of appropriate Front-end interface and Back-end Database for e-Governance, e-Business and e-Learning applications**
- **Impact of ICT on society** : Social, Environmental and Economic benefits.

In each of the above domains, identify at least two real-life problems, list the expected outputs and the input(s) required for the output, and describe the problem solving approach and develop relevant front-end interface and back-end database.

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