Syllabus for Class XI

PHYSICS

Course Contents

Unit-1 Mechanics   70 Teaching Hours

1. Physical Quantities-Need for measurements; system of units; S.I. unit; Precision and significant figures; Dimensions; Main uses of dimensional equations.(3 hrs.)
2. Vectors-Graphical presentation of vectors; Addition and subtraction of vectors: Parallelogram, triangle and polygon laws of vectors; Resolution of vectors; Unit vectors;Scalar and Vector products (6hrs)
3. Kinematics- Uniform and non-uniform motion; average velocity and acceleration, Instantaneous velocity and acceleration; Equation of motion (graphical treatment); Motion of a freely falling body; Relative velocity; Projectile motion. (3 hrs.)
4. Laws of Motion-Newton's laws of motion; Inertia, force, linear momentum, impulse, Conservation of linear momentum; Free-body diagrams; Solid frictions: Laws of solid friction and their verifications; Application of Newton's laws: Particles in equilibrium,Dynamics of particles (8hrs)
5. Work, and Energy – Work; work done by a constant force and a variable force; Power; Energy: Kinetic energy; work-energy theorem, Potential energy; conservation of energy; Conservative and non-conservative forces; elastic and inelastic collision.   (4 hrs.)
6. Circular Motion-Angular displacement, velocity and acceleration; Relation between angular and linear velocity and acceleration; Centripetal acceleration, centripetal force; Conical pendulum; Motion in a vertical circle; Motion of cars and cyclist round a banked (5hrs)
7. Gravitation-Newton's laws of gravitation; acceleration due to gravity, g; Mass and weight; gravitational field strength, variation in value of 'g' due to altitude, depth and rotation of earth; Weightlessness; Motion of a satellites: Orbital velocity, height and time period of a satellite, geostationary satellite, potential and kinetic energy of a satellite; Gravitational potential: Gravitational potential energy; Escape velocity; Black holes(9hrs)
8. Equilibrium-Moment of forces; Torque; Torque due to a couple; Center of mass; Center of gravity, conditions of equilibrium (2hrs)
9. Rotational Dynamics- Rotation of rigid bodies; Equation of angular motion; Relation between linear and angular kinematics; Kinetic energy of rotation of rigid bodies; moment of inertia: Radius of gyration, Moment of inertia: Radius of gyration, Moment of Inertia of a uniform rod; Torque and angular acceleration for a rigid body; Work and power in rotational motion; angular momentum; Conservation of angular momentum.(8hrs)

10. Elasticity-Hooke's law: Force constant, Verification of Hooke's law; Stress; Strain, Elasticity and plasticity; Elastic modulus: Young modulus and its determination, Bulk modulus, Shear modulus, Poisson's ratio, Elastic potential energy.(6hrs)

11. Periodic Motion-Oscillatory motion; Circle of reference; Equation of Simple Harmonic Motion (SHM); Energy in SHM; Application of SHM; Motion of a body suspended from coiled spring, angular SHM; simple pendulum; Damped oscillation; Forced oscillation and resonance (6hrs)

12. Fluid mechanics- Fluid statics: Density; Pressure in a fluid; Archimedes Principle; Buoyancy Surface tension: Molecular theory of Surface tension; Surface energy; Angle of contact and capillarity; Measurement of coefficient of surface tension by capillary tube method.

    Fluid Dynamics: Newton's formula for viscosity in a liquid; Coefficient of viscosity; Laminar and turbulent flow; Poiseuille's formula (method of dimensions); Stokes Law and its applications; Measurement of viscosity of viscous liquid; Equation of continuity; Bernoulli's equation and its applications.(10 hrs)

Unit-2 Heat and Thermodynamics   40 Teaching Hours

1. Heat and temperature- Concept of temperature; Thermal equilibrium, Thermal expansion: linear expansion, cubical expansions and their relation: Measurement of linear expansivity, Liquid Expansion: Absolute and apparent expansion of liquid, Measurement of absolute expansivity by Dulong and Petit method.   (5 hrs.)

2. Quantity of heat: Heat capacity and specific heat capacity; Newton's law of cooling; Measurement of specific heat capacity of solids by the method cooling. Change of phases: Latent heat; Specific latent heat of fusion, and vaporization and their measurements by the method of mixture. (5 hrs.)

3. Thermal properties of matter- Equation of state: Ideal gas equation; P-V diagram; Molecular properties of matter; Kinetic-molecular model of an ideal gas: Derivation of pressure exerted by gas, average translational kinetic energy of a gas molecule; Boltzmann constant, Root mean square speed; Heat capacities: Heat capacities of gases and solids .(8 hrs)

4. Hygrometry- Saturated and unsaturated vapor pressure; Behavior of saturated vapor; Boiling point; Triple point and critical point; Dew point, Absolute humidity; Relative humidity and its determination.(3hrs)

5. Transfer of Heat-Conduction, Thermal conductivity and its determination by Searle's method; Convection: convective coefficient Radiation: Ideal radiator; Black body radiation; Stefan-Boltzmann law.(4hrs)

6. First law of thermodynamics- Thermodynamic systems: Work done during volume change, Heat and work; Internal energy and First law of thermodynamics; Thermodynamic processes: Adiabatic, Isochoric, Isothermal, Isobaric processes; Heat capacities of ideal gas at constant pressure and volume and relation between them; Isothermal and Adiabatic processes for an ideal gas.(9 hrs.)

7. Second law of thermodynamics- Direction of Thermodynamic processes; Second law of thermodynamics; Heat engines; Internal combustion engines: Otto Cycle, Diesel cycle; Carnot cycle; Kelvin temperature scale; Refrigerators; Entropy and disorder.(6hrs)

Unit-3 Geometrical Optics   20 Teaching Hours

1. Photometry, Reflection at curved mirrors- Convex and concave mirrors; Image in Spherical mirrors, Mirrors formula; Real and Virtual images.   (2 hrs.)
2. Refraction at plane surfaces- Laws of refraction Refractive index; Relation between refractive indices; Lateral shift; Total internal reflection and its applications; critical angle, optical fibre.(3hrs)
3. Refraction through prisms- Minimum deviation; Relation between Angle of prism, minimum deviation and refractive index; Deviation in small angle prism.(3hrs)
4. Lenses- Spherical lenses; thin lens formula; Lens maker's formula; Power of a lens: Combination of thin lenses in contact.   (4 hrs)
5. Dispersion- Spectrum; Spectrometer; Pure spectrum; Dispersive power; Achromatic lenses; Condition for achromatic lenses in contact, Chromatic aberration Spherical aberration; Scattering of light-blue color of the sky. (3 hrs)
6. Optical instruments- The human eye; Defects of vision and their correction; Visual angle; Angular magnification; Magnifier; Camera; Compound microscope. Astronomical Telescope (reflection and refractive type).   (5 hrs)

Unit-4 Electrostatics   20 Teaching Hours

1. Electrostatics- Electric charge: Electric charges; Conductors and insulators; Charging by induction, Coulomb's Law-Force between two point charges, Force between multiple electric charges. (3 hrs)
2. Electric field- Electric fields; Calculation of electric field due to point charges; Field lines. Gauss Law; Electric Flux; Gauss Law and its application: Field of a charged sphere, line charge, plane sheet of charge.(7hrs)
3. Potential: Potential and potential difference, Potential due to a point charge; Equipotential lines and surfaces; Potential gradient; Potential energy, Electron volt.(3hrs)
4. Capacitance and dielectrics- Capacitance and capacitor, Charging and discharging of capacitor through a resistor; Parallel plate capacitor; Combination of capacitors; Energy of charged capacitor; Effect of a dielectric; Molecular theory of induced charges; Polarization and displacement.(7 hrs)

CHEMISTRY

Course Contents

Unit 1: Language of Chemistry (Review Lectures)   3 Teaching Hours

1. Chemical equations, their significances and limitations
2. Balancing chemical equations by:
i. Hit and Trial method   ii. Partial equation method
3. Types of chemical reaction

Unit 2: Chemical Arithmetic   17 Teaching Hours

2.1. Dalton's atomic theory and Laws of Stoichiometry:

1. Postulates of Dalton's atomic theory
2. Law of conservation of mass
3. Law of constant proportions
4. Law of multiple proportions
5. Law of reciprocal proportions
6. Law of gaseous volumes
7. Chemical calculations based on stoichiometry

2.2. Atomic Mass and Molecular Mass:

1. Definition of atomic mass and molecular mass
2. Mole concept
3. Mole in term of mass, volume, number and ions
4. Calculation based on mole concept

2.3. Empirical, Molecular Formula and Limiting Reactants:

1. Percentage compositions
2. Derivation of empirical and molecular formula from percentage composition
   - Limiting reactants
   - Mass- mass relationship
   - Volume- volume relationship
   - Mass volume relationship
   - (Solving reacted numerical problems)

2.4. Avogadro's Hypothesis and Its Applications:

1. Development of Avogadro's hypothesis
2. Definition of Avogadro's hypothesis
3. Application of Avogadro's hypothesis
   - Deduction of atomicity of elementary gas
   - Deduction of relationship between molecular mass and vapour density
   - Deduction of molar volume of gases
   - Deduction of molecular formula from its volumetric composition (Solving related numerical problems)

2.5. Equivalent Mass:

1. Concept of equivalent mass
2. Equivalent weight of elements, and compounds (Salt, acid, base, oxidizing agents, reducing agents)
3. Gram equivalent weight (GEW)
4. Relation between equivalent weight, valency and atomic weight
5. Determination of equivalent weight of metal by
   - Hydrogen displacement method
   - Oxide formation method (Solving related numerical problems)

Unit 3: State of Matter   **14 Teaching Hours**

4.1. Gaseous State:

1. Boyle's law
2. Charle's law and Kelvin scale of temperature
3. Application of Charle's law and Boyle's law
4. Combined Gas Law, Ideal Gas Equation and Universal Gas Constant
5. Dalton's Law of Diffusion and its applications
6. Mathematical derivation of Dalton's law and their applications
7. Graham's Law of Diffusion and its applications
8. Kinetic model of gas and its postulates
9. Deviation of gas from ideal behavior
   (Solving related numerical problems)

4.2. Liquid State:

1. Physical properties of Liquid
   - Evaporation and condensation
   - Vapour pressure of liquid and boiling
   - Surface tension
   - Viscosity
2. Solution and Solubility
   - Equilibrium in saturated solution
   - Solubility and solubility curve and its applications
   - (Solving related numerical problems)

4.3. Solid State:

1. Crystalline and amorphous solids
2. Water of crystallization
3. Efflorescence
4. Deliquescent
5. Hygroscopic
6. Seven types of crystal system
7. Simple cubic, face centered and body centered

Unit 4: Atomic Structure   10 Teaching Hours

1. Discovery of fundamental particles of atom (electron, proton and neutron)
2. Concept of atomic number, mass number, fractional atomic mass, isotopes, isobars
3. Rutherford's α ray scattering experiment and nuclear model of atom; limitation
4. Bohr's model of atom and explanation of hydrogen spectra
5. Limitation of Bohr's model of atom
6. Elementary idea of quantum mechanical model
   - Dual nature of electron (de-Broglie equation)
   - Heisenberg's uncertainty principle
   - Probability concept
7. Shape of atomic orbital (s and p orbitals only)
8. Quantum numbers
9. Pauli's exclusion principle
10. Hund's rule of maximum multiplicity
11. Aufbau's Principle and Bohr Bury rule
12. Electronic configuration of the atoms and ions (Z = 1 to 30)

Unit 5: Nuclear Chemistry   3 Teaching Hours

1. Concept radioactivity
2. Radioactive rays (Alpha ray, Beta ray & Gamma ray)
3. Meaning of natural and artificial radioactivity
4. Nuclear reactions, Nuclear energy (fission and fusion)
5. Nuclear isotopes and uses

Unit 6: Electronic Theory of Valency and Bonding   8 Teaching Hours

1. Basic assumption of electronic theory of valency
2. Octet rule
3. Ionic bonds, ionic compounds and characteristics of ionic compounds. Lewis symbol to represent the formation of ionic compounds
4. Covalent bonds, covalent compounds and characteristics of covalent compounds – Lewis structure of some typical co-ordinate covalent compounds

5. Co-ordinate covalent bonds. Lewis structures of some typical co-ordinate covalent compounds
6. Exception of the octet rule
7. Partial ionic characters of covalent compounds. Non-polar and polar covalent molecules
8. Dipole moments and its application
9. Some special types of bonds: hydrogen bond and its types, metallic bond, Van Der Waal's bond, Resonance and resonance hybrid structures of O_3, SO_3, SO_4, CO_3^{-2}, SO_4^{-2}, PO_4^{-2}, NO_3^-
10. Classification of crystalline solids
    - Ionic solid
    - Covalent solid
    - Molecular solid
    - Metallic solid

Unit 7: Periodic Classification of Elements   6 Teaching Hours

1. Introduction
2. Mendeleev's Periodic Law and Periodic Table
3. Anomalies of Mendeleev's Periodic Table
4. Modern Periodic Law, and Modern Periodic Table
5. Advantages of Modern Periodic Table
6. Division of elements into s.p, d and f blocks
7. Periodicity of physical properties: valency, atomic radii, ionic radii ionization energy, electron affinity and electronegativity (general trends only)

Unit 8: Oxidation and Reduction   6 Teaching Hours

1. Classical concept of oxidation and reduction
2. Electronic interpretation of oxidation and reduction
3. Oxidation number and rules for the assignment of oxidation number
4. Differentiate between oxidation and number and valency
5. Oxidizing and reducing agent
6. Redox reaction
7. Balancing redox reactions by
    - Oxidation Number method
    - Ion-Electron method

Unit 9: Equilibria   5 Teaching Hours

1. Introduction
2. Equilibrium involving in physical change
3. Chemical equilibrium
   - Reversible and irreversible reactions
   - Dynamic nature of chemical equilibrium and its characteristics
   - Law of mass action
   - Equilibrium constant (K_C) and its characteristics
   - Homogenous and heterogeneous equilibrium
   - Relation between K_P and K_C (Derivation)
   - Le-chatelier's principle and its application
   - (No numerical is required)

Inorganic Chemistry

Unit 10: Non – Metals I   12 Teaching Hours

10.1. Hydrogen:

1. Position in Periodic Table
2. Atomic Hydrogen, Nascent Hydrogen
3. Isotopes of Hydrogen
4. Ortho and Para Hydrogen
5. Applications

10.2. Oxygen:

1. Position in Periodic Table
2. Types of oxides
3. Uses of oxygen

10.3. Ozone:

1. Occurrence
2. Preparation from oxygen

3. Structure of Ozone
4. Important properties of Ozone
5. Ozone Layer and Ozone Hole
6. Uses of Ozone

10.4. Water:

1. Structure
2. Solvent property of water
3. Heavy water and uses
4. Uses

10.5. Nitrogen and Its Compounds:

1. Position of Nitrogen in Periodic Table
2. Uses of Nitrogen
3. Types of Nitrogen Oxides (Name and Lewis Structure)
4. Ammonia
   - Manufacture by Haber's Synthesis Method
   - Physical properties, Chemical properties and uses
5. Oxyacid of Nitrogen (Type)
6. Technical production of Nitric Acid by Ostwald Method
   - Properties of Nitric Acid and Uses
   - Test of Nitrate Ion

Unit 11: Non-Metals II   23 Teaching Hours

11.1. Halogens: (Chlorine, Bromine and Iodine)

1. Position in Periodic Table
2. Comparative study on: Preparation, Properties and Uses
3. Manufacture of Bromine from Carnalite process and manufacture of iodine from
   - Sea Weeds (Principle only)
   - Caliche (Principle only)

4. Uses of halogens
5. Comparative study on; Preparation, properties and uses of halo acids (HCl, HBr and HI)

11.2. Carbon:

1. Position in periodic table
2. Allotropes of carbon including fullerenes
3. Laboratory preparation, properties and uses of carbon monoxides

11.3. Phosphorous:

1. Occurrence, position in periodic table
2. Allotropes of phosphorous and uses of phosphorous
3. Preparation, properties and uses of phosphine
4. Oxides and oxy acids of phosphorous (structure and uses)
5. Preparation, properties and uses of orthophosphoric acid

11.4. Sulphur:

1. Position in periodic table and allotropes
2. Hydrogen Sulphide: (Laboratory methods and Kipp's apparatus), properties and uses of
3. Sulphur dioxide: Laboratory preparation, properties and uses
4. Sulphuric acid: Manufacture by contact process, properties and uses
5. Sodium thiosulphate (hypo): formula and uses

11.5. Boron and Silicon:

1. Occurrences, position in periodic table
2. Properties and uses
3. Formula and uses of Borax, Boric acid, Silicate and Silica

11.6. Noble gas:
1. Position in periodic table, occurrence and uses

11.7. Environmental Pollution:
1. Air pollution, photochemical smog
2. Acid rain, water pollution
3. Greenhouse effect

Unit 12: Metal and Metallurgical Principles   6 Teaching Hours

1. Characteristics of metals, non-metals and metalloids
2. Minerals and ores
3. Important minerals deposit in Nepal
4. Different process involved in metallurgical process
5. Concentration
6. Calcination and roasting
7. Smelting
8. Carbon Reduction process
9. Thermite process
10. Electrochemical reduction
11. Refining of metals: Poling, Electro-refinement, etc.

Unit 13: Alkali and Alkaline Earth Metals   10 Teaching Hours

1. Periodic discussion and general characteristics.
2. Sodium: Occurrence, Extraction from Down's Process; properties and uses.
3. Sodium hydroxide: Manufacture, properties and uses.
4. Sodium carbonate: Manufacture, properties and uses.

13.1. Alkaline Earth Metals:

1. Periodic discussion and general characteristics.
2. Preparation, properties and uses of
   - Quick Lime
   - Plaster of Paris
   - Bleaching Powder
   - Magnesia
   - Epsom Salt

Organic Chemistry

Unit 14: Introduction to Organic Chemistry

14.1. Fundamental Principles: 6 Teaching Hours

1. Definition of organic chemistry and organic compounds
2. Origin of organic compounds (Vital Force Theory)
3. Reasons for the separate study of organic compounds
4. Tetra covalency and catenation property of carbon
5. Classification of organic compounds
6. Functional groups and homologous series
7. Meaning of empirical formula, molecular formula, structural formula and contracted formula
8. Qualitative analysis of organic compounds. (Detection of N, S and Halogen by Lassaigne's Test)

14.2. Nomenclature of Organic Compounds: 6 Teaching Hours

1. Common names
2. IUPAC system and IUPAC rules of naming hydrocarbons, alcohols, ethers, aldehydes, ketones, carboxylic acid, amines, ester, acid derivative, halogen derivatives, nitriles, etc.)

14.3. Structure Isomerism in Organic Compounds: 2 Teaching Hours

1. Definition of structure isomerism
2. Types of structure isomerism: Chain isomerism, position, isomerism, functional isomerism and metamerism

14.3. Preliminary Idea of Reaction Mechanism   2 Teaching Hours

1. Concept of hemolytic and heterolytic fission
2. Electrophile, nucleophiles and free-radicals
3. Inductive effect, +I and –I effect

Unit 15: Hydrocarbons

15.1. Sources: **4 Teaching Hours**

Origin of coal and petroleum, hydrocarbon from petroleum cracking and reforming, aliphatic and aromatic hydrocarbon form coal, quality of gasoline, octane number and gasoline additive.

15.2. Alkanes (Saturated Hydrocarbons):

1. General methods of preparations:
   - Decarboxylation
   - Catalytic hydrogenation
   - Reduction of haloalkane
   - Kolbe's electrolysis method
   - Using Grignard's reagent
   - Wurtz reaction
   - From aldehydes and ketones
2. Physical properties
3. Chemical properties: Substitutions reaction, oxidation, pyrolysis or cracking aromatization

15.3. Alkenes: **4 Teaching Hours**

1. General methods of preparation
   - Dehydration of alcohol
   - Dehydrohalogenation
   - Catalytic hydrogenation of alkyne
   - Kolbe's electrolysis
2. Laboratory preparation of alkene
3. Chemical properties of alkene: Addition reaction (H_2, X_2, HX, H_2O, O_3, H_2SO_4)
4. Oxidation with alkaline $KMnO_4$ (Baeyer's reaction)
5. Polymerisation
6. Test of ethane and uses

15.4. Alkynes: **3 Teaching Hours**

1. Preparation form
    i.   Carbon and Hydrogen
    ii.   Kolbe's electrolysis
    iii.   1,2 dibromoethane
2. Lab Preparation of Ethyne
3. Physical properties
4. Chemical properties: Addition (H_2, X_2, HX, H_2O, O_3), Acidic nature (action with ammonical $AgNO_3$ and ammonical Cu_2Cl_2), Oxidation with alkaline $KMnO_4$), Polymerization, Uses of Ethyne

BIOLOGY

Section A – Botany

Unit 1: Introduction to Biology   5 hrs

Biochemically important organic and inorganic molecules (general concepts): Carbohydrate, protein, lipid, nucleic acid, minerals and water.

Unit 2: Cell Biology   15 hrs

The cell: The cell as a unit of life, structure of prokaryotic and eukaryotic cells, Structure and functions of cell organelles and inclusions.

Cell Division: Amitosis, mitosis and meiosis

Unit 3: Biodiversity   40 hrs

Definition and scope of biodiversity, floral diversity of Nepal, concept of taxonomy: classification, binomial nomenclature, shortcoming of two kingdom classification, hierarchic system in classification, phylogeny, Five kingdom classification: Monera, Protista, Mycota, Plantae and Animalia.

- **Monera**: General account, structure and function of bacterial cells, concept of autotrophic and heterotrophic life styles, economic importance of bacteria.
  Cyanobacteria: Nostoc-Structure, reproduction and economic importance.

- **Mycota**: Concept of Zygomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes. Structure and reproduction of Zygometes (Mucor), Ascomycetes (Yeast), Economic importance of fungi.

- **Plantae**:
  Algae: Introduction to green, red and brown algae, structure and reproduction of Spirogyra.

  Bryophyta: Marchantia and Funaria (morphology and life cycle)

Pteridophyta: Dryopteris (morphology and life cycle)

Gymnosperm: Brief morphological structure of Cycas and Pinus structure and its distribution.

Angiosperm: Morphology: root, stem, leaf, flower, fruit and seed relevant to the following families. Taxonomy and economic importance of the following families; Cruciferae (Brassicaceae), Solanaceae

Leguminosae – Papilionoidae only, Compositae (Asteraceae) and Gramineae (Poaceae).

Lichen: Introduction and economic importance.

Virus: Structure and economic importance.

Unit 4: Biota and their environment   15 hrs

- Ecology: Definition, abiotic, biotic factors and their interactions.
- Concept of ecosystem, Pond and grassland ecosystems: structural and functional aspects; food chain, trophic level, ecological pyramids, productivity, concept of community and succession.
- Bio-geochemical cycle: carbon cycle and nitrogen cycle.
- Ecological imbalance and its consequences: Green house effects, depletion of ozone layer and acid rain.
- Concept of mountain ecosystem (altitudinal and climatic changes).

Section B – Zoology

Unit 1: Introduction to Biology   5 hrs

- Nature and scope of Biology.
- Branch and relation with other sciences.
- General approach to understand life processes.

Unit 2: Origin and evolution of life   20 hrs

- Life and its origin.
- Theories of origin of life.
- Oparin and Haldane's Theory.
- Miller and Urey's experiment.
- Meaning of evolution, organic evolution.
- Evidences of evolution, structural, anatomical, Paleontological, Embryological & Biochemical.
- Lamarckism, Darwinism & concept of Neo Darwinism.
- Human Evolution.

Unit 3: Biodiversity   35 hrs

Meaning of biodiversity, faunal diversity of Nepal.

- **Protista**: Characteristics and classification of phylum Protozoa upto class with examples; Habit and habitat, structure, reproduction and lifecycle of Paramecium and Plasmodium vivax (a concept of P. falciparum).
- **Animalia**: General characters and classification of the following phyla (upto class) with examples – Porifera, Coelenterata (Cnidaria), Platyhelminthes, Aschelminthes (Nemathelminthes), Annelida, Arthropoda, Mollusca, Echinodermata, and Chordata.
  Earthworm (Pheretima posthuma): Habit and habitat, structure; digestive, excretory, reproduction and nervous systems. Economic importance.
  Frog (Rana tigrina): Habit and habitat, structure; digestive, circulatory, respiratory, Reproductive

Unit 4: Biota and their Environment   15 hrs

- Environmental pollution: Air, water and soil. Sources of pollution, their effects and control measures. Hazards of pesticides.
- Animal behaviour: Taxes, reflexes and reflex action, dominance and leadership, migratory behaviour of fish and bird.
- Adaptation: Animal: Aquatic, amphibious and terrestrial (arboreal and volan)
- Conservation:

  ◦ Wildlife conservation: Meaning of wildlife, importance of wildlife, meaning of rare, threatened, vulnerable and endangered species; few endangered species in Nepal.

  ◦ Conservation practices (National parks, wildlife reserves and hunting reserves), Ways of conservation and causes of extinction.

  ◦ Human responsibility for the protection of earth.

MATHEMATICS

Unit 1: Sets, Real Number System and Logic   10 hrs

Sets: Sets and set operations. Theorems based on set operations.

Real Number System: Real numbers. Field axioms. Order axioms. Interval. Absolute value. Geometrical representation of the real numbers.

Logic: Introduction to gates, Logical connectives. Truth tables. Basic laws of logic.

Unit 2: Relations, Functions and Graphs   12 hrs

Relations: Ordered pair. Cartesian product. Geometrical representation of Cartesian product relation. Domain and range of a relation. Inverse of a relation.

Functions: Definition. Domain and lunge of a function. Functions defined as mappings. Innis function. Composite function, functions of special type (Identity. Constant. Absol. Value. Greatest integer), Algebraic (Linear quadratic and cubic). Trigonometric. F. potential logarithmic functions and their graphs.

Unit 3: Curve Sketching   10 hrs

Odd and even functions, Periodicity of a function. Symmetry (about x – axis, y - axis and origin) of elementary functions. Monotonocity of a function. Sketching graphs of polynomial functions, trigonometric. Exponential, logarithmic functions (Simple cases only)

Unit 4: Trigonometry   10 hrs

Inverse circular functions. Trigonometric equations and general values, properties of a triangle (sine law, Cosine law, tangent law. Projection laws, half angle laws). The area of triangle. Solution of a triangle (simple cases)

Unit 5: Sequence and Series, and Mathematical Induction   12 hrs

Sequence and series: Sequence and series, type of sequence and series (arithmetic, geometric. Harmonic).

Properties of Arithmetic, Geometric and Harmonic Sequences. A.M. GM. and H.M.

Relation among A.M... GM. and H.M... Sum of infinite geometric series

Mathematical Induction: Sum of finite natural numbers. Sum of the squares of first n - natural numbers. Sum of cubes of first n - natural numbers. Intuition and induction. Principle of mathematical induction.

Unit 6: Matrices and Determinants   8 hrs

Matrices and operation on matrices (Review). Transpose of a matrix and its properties, none and cofactors. Adjoin. Inverse matrix. Determinant of a square matrix. Properties of determinants (Without proof) up to 3 x 3.

Unit 7: System of Linear Equations   8 hrs

Consistency of system of linear equations. Solution of a system of linear equations b: Cramer's rule. Matrix method (row - equivalent and Inverse) up to three variables.

Unit 8: Complex Number   12 hrs

Definition of a complex number. Imaginary unit. Algebra of complex numbers. Geometric representation of a complex number. Conjugate and absolute value (Modulus) of a complex numbers and their properties. Square root of a complex number. Polar form of a complex number. Product and Quotient of complex numbers. De Moivre's theorem and its application in finding the roots of a complex number. Properties of cube roots of unity.

Unit 9: Polynomial Equations   8 hrs

Polynomial function and polynomial equations. Fundamental theorem of algebra (without proof). Quadratic equation Nature and roots of a quadratic equation. Relation between roots and coefficients. Formation of a quadratic equation. Symmetric roots. One or both roots common.

Unit 10: Coordinate Geometry   12 hrs

Straight line: Reviews of various forms of equation of straight lines, Angle between two straight lines, condition for parallelism and perpendicularity, length of perpendicular from a given point to a given line, Bisectors of the angles between two straight lines.

Pair of lines: General equation of second degree in x and y, condition for representing a pair of lines. Homogeneous second degree equation in x and y, Angle between *pair* of lines, Bisectors of the angles between pair of lines

Unit 11: Circle   10 hrs

Equation of circle in various forms (centre at origin, centre at any point, general equation of circle, circle with a given diameter), condition of tangency of a line at a point to a circle, tangent and normal to a circle

Unit 12: Limits and Continuity   10 hrs

Limits of a function, Intermediate forms, algebraic properties of limit (without proof), theorem on limits of algebraic, trigonometric, exponential and logarithmic function, continuity of a function, types of discontinuity, graph of discontinuous functions

Unit 13: Derivatives   8 hrs

Derivate of a function, derivatives of algebraic, trigonometric, exponential and logarithmic function by definition (simple forms), rules of differentiation, derivatives of parametric and implicit functions, higher order derivatives

Unit 14: Application of Derivatives   12 hrs

Geometric interpretation of derivative, monotonocity of a function, interval of monotonocity, extema of a function, concavity, points of inflection, derivative as rate measure

Unit 15: Antiderivatives and its applications   10 hrs

Antiderivative, integration using basic integrals, integration by substitution and by parts method, the definite integral, as an area under the given curve, area between two curves

ENGLISH

Course Contents

The contents of this paper are:

a. A remedial or refresher course. It will be given at the beginning of the session. The contents include Basic English structures and the use of Dictionary.

b. Core English. The texts in this component primarily aim at teaching various language skills in an integrated manner. The emphasis is on providing tools for using language for communicative purposes, and for receiving as well as imparting information effectively.

The contents of this unit are:

Places, decisions and intentions, jobs and routine, direction, past event, talking about now, requests and offers, recent actions and activities, comparison, the past and the present, likes and dislikes, events and circumstance, leisure activities and skills, advice, origin and duration, location, similarities and differences, obligation, prediction, objects, degree, setting a scene, criticizing, explanations

c. Extensive Reading and Writing. The prescribed materials in this component expose students to various interesting and informative topics of global interest and common human concern. The contents include:

Poems

Arthur Guiterman, "On the Vanity of Earthly Greatness:
Dorothy Charles, "Concrete Cat"
Mark Strand, "Keeping Things Whole"
Cowper, "The Poplar Field"
W. Wordsworth, "My Heart Leaps Up When I Behold"

Essays

1. Barbara Holland, "Speaking of Children"
2. Joan Didion, "In Bed"
3. Issac Asimov, "The Nightmare Life Without Fuel"
4. Roger Rosenblatt, "Oops! How's That Again?"
5. Harold J. Morowitz, "The Six Million Dollar Man"
6. W.S. Merwin, "Unchopping a Tree"

Stories:

1. Stories of the Supernatural: "The Recurring Dream", "The Lost Doll", "The House Call", "Fear", "The Loving Mother"
2. Hemingway, "The Three-Day Blow"
3. R. Kipling, "The Gardener"
4. Patricia Hempl, "Look at a Teacup"
5. Eudora Welty, "A Worn Path"

Play

R.N. Tagore, "Malini" **V.**

COMPUTER SCIENCE

Unit 1: Introduction and evolution of computer   3 hrs

1.1 Concept and characteristics of computer

1.2 Application of computers

1.3 History of computer: mechanical calculating era, electro mechanical era, electronic computers era

1.4 Generation of computers: First, Second, Third, Fourth and Fifth generation (AI) and its features

1.5 Computer speed and measurement unit

Unit 2: Classification of computers   5 hrs

2.1 On the basis of working principle- Analog, digital and Hybrid Computer

2.2 On the basis of size- super, Mainframe, Mini and Micro computers

2.3 On the basis of brand- IBM PC, IBM compatible and Apple/ Macintosh

2.4 Mobile computing

Unit 3: Number System and their conversion   5 hrs

3.1 Decimal, Binary, Octal and Hexadecimal number system and conversion

3.2 9's and 10's complements decimal subtraction

3.3 Calculation in binary – addition, subtraction, 1's and 2's complement methods of binary subtraction

Unit 4: Logic function and Boolean algebra   10 hrs

4.1 Logic function and Boolean algebra

4.2 Introduction to truth table and Boolean expression

4.3 Logic gates: AND, OR, NOT, XOR, XNOR, NAND, NOR- it's definition, use, truth table, logic symbol

4.4 Duality Principle

4.5 Laws of Boolean algebra- Associative, Commutative, Distributive, Identity, complement Laws

4.6 De Morgan's theorem: Statement and logic expression

4.7 Venn diagram and its represent of logic gates (AND, OR, NOT)

Unit 5: Computer systems   15hrs (Th) + 2hrs (Practical)

5.1 Concept of computer architecture

5.2 Concept of computer organization

5.3 Components of computer system- input, output, processor and storage

5.4 Microprocessor- Concepts, components of processor, functions

5.5 Concepts of system buses: Data bus, Address bus, Control bus

5.6 Memory- Primary and secondary, Cached (L1, L2), Buffer, RAM, ROM

5.7 Storage Device- Definition, use, types: Hard disk, Floppy disk, Magnetic Tape, Flash memory, Optical disk (CD, VCD, DVD), external storage device

5.8 Input devices- Keyboard, mouse, scanner, light pen, OMR, OCR, BCR, scanner, touchpad kiosk, microphone and digital camera

5.9 Output devices – monitor, printer, plotter, speaker

5.10 Computer peripherals

5.11 Interfaces- Parallel port, Serial port, USB port, IEEE 1394 and slots

5.12 Identification of PC accessories and peripherals

5.13 Specification of PC

5.14 Software and classification

    5.14.1 System software: OS, Language processor

5.14.2 Application software including Utility software

5.14.3 Computer Virus

Unit 6: Operating System   10hrs (Th) + 20hrs (Practical)

6.1 Fundamental concepts

6.1.1 Introduction to operating system

6.1.2 Role of operating system

6.1.3 Function of an operating system

6.1.4 Types of an operating system: based on processing method (Batch, Multitasking, Multiprocessing, Time Sharing, Real-time), Based on User Interface (GUI, CLI), Based on Mode of Transfer (Single User and Multi User)

6.2 Disk Operating System (DOS)

6.2.1 Introduction to CUI and its features

6.2.2   Common   DOS   commands   (Internal   and   External   commands)
6.2.3 Concept of file directory

6.2.4 Wild cards and path names

6.2.5 System files: config.sys, io.sys, msdos.sys, autoexe.bat

6.3 Windows operating system

6.3.1 Introduction to GUI and its features

6.3.2 Working with window environment

6.3.3 Working with windows application programs

6.3.4 Working with files and folders

6.3.5 Customizing the task bar and the Desktop

6.3.6 Customizing windows

6.3.7 Use of Accessories

6.4 Concept of Open Source Operating System

6.4.1 Introduction to Open Source Operating System

6.4.2 Introduction of Linux, UNIX

Unit 7: Programming Concepts and Logic   10 hrs
7.1 Programming language (Low level, High level, 4GL)

7.2 Compiler, Interpreter and Assembler

7.3 List of high level programming languages

7.4 Difference between program and software

7.5 Concept of programming statement

7.6 Syntax and Semantic error

7.7 Program control structure: Sequence, Selection and Iteration

7.8 Program design tools: Algorithm, flowchart, pseudo code

7.9 Introduction to data type

7.10 Codes: Absolute binary, BCD, ASCII, EBCDIC, Unicode

Unit 8: Application Package   10 hrs (Th) + 22 hrs (Practical)
8.1 Word processor

8.1.1 Concept of word processor

8.1.2 Types of word processing

8.1.3 Basics terms of word processing

8.1.4 Working and editing text

8.1.5 Formatting characters and paragraphs

8.1.6 Formatting pages

8.1.7 Working with tables

8.1.8 Working with templates and styles

8.1.9 Drawing and working with graphics

8.1.10 performing a mail merges

8.1.11 Document collaboration

8.1.12 working with outlines and long documents

8.1.13 Working with Word art and charts

8.1.14 Project work on work processor

8.2 Spread sheet

8.2.1 Concept and use of spread sheet

8.2.2 Types of spread sheet

8.2.3 Basic fundamentals of spread sheet

8.2.4 Formatting a work sheet

8.2.5 Creating and working with charts

8.2.6 Managing workbooks

8.2.7 General functions and formulas

8.2.8 Data filter and sorting

8.2.9 Working with other objects

8.2.10 Data analysis and pivot tables

8.2.11 What-if Analysis

8.2.12 Project work on spread sheet

8.3 Presentation

8.3.1 Concept of presentation

8.3.2 Types and use of presentation program

8.3.4 Basic fundamental of presentation

8.3.5 Editing a presentation

8.3.6 Design and formatting presentation

8.3.7 Transition of presentation

8.3.8 Animation and custom animation

8.3.9 Working with tables, graphics and word art

8.3.10 Working with graphs and organization charts

8.3.11 Working with multimedia

8.3.12 Project work on presentation

Unit 9: Internet and Email   10 hrs (Th) + 16 hrs (Practical)

9.1 Internet

9.1.1 Introduction of Internet

9.1.2 Use of Internet

9.1.3 Concept of protocols

9.1.4 Web Browser, Web page, Web Server, Web Sites, URL, DNS

9.1.5 Search Engine, Messenger Services

9.1.6 Setting Browser properties

9.1.7 Set up network connection

9.2 Email

9.2.1 Concept of Email

9.2.2 Usage of Email

9.2.3 Different types of email accounts

9.2.4 Web based email and POP email

Unit 10: Webpage Designing   5 hrs (Th) + 7 hrs (Practical)

10.1 Introduction to HTML

10.2 Types of tags

10.3 Basic structure of HTML

10.4 Character formatting (Paragraphs, Heading, Text format)

10.5 Create and ordered and unordered list

10.6 Insert images and objects

10.7 Create hyperlink

10.8 Create table

10.9 Design frames and forms

10.10 Concept of CSS and Script languages

10.11 Web Design and editing tools

10.12 Project work on Web page

Unit 11: Final Project work

11.1 Project Work on Web page or Spread sheet

11.2 Documentation of the Project