Syllabus for Class XII

PHYSICS

Course Content

Unit-1 Waves and Optics 40 Teaching Hours

Waves (23 Hrs)
1. Wave motion- Wave motion; Longitudinal and transverse waves; Progressive and stationary waves; Mathematical description of a wave. (4 hrs.)
2. Mechanical waves- Speed of wave motion; Velocity of sound in solid and liquid; Velocity of sound in gas; Laplace’s correction; Effect of temperature, pressure, humidity on velocity of sound. (5 hrs.)
3. Wave in pipes and strings- Stationary waves in closed and open pipes; Harmonics and overtones in closed and open organ pipes; End correction in pipes; Resonance Tube experiment; Velocity of transverse waves along a stretched string; Vibration of string and overtones; Laws of vibration of fixed string. (6 hrs.)
4. Acoustic phenomena- Sound waves: Pressure amplitude; Characteristics of sound: Intensity; loudness, quality and pitch; Beats; Doppler’s effect; Infrasonic and ultrasonic waves; Noise pollution: Sources, health hazard and control. (8 hrs)

Physical Optics (17 Hrs)
1. Nature and propagation of Light- Nature and sources of light; Electromagnetic spectrum; Huygen’s principle, Reflection and Refraction according to wave theory; Velocity of light: Foucault’s method; Michelson’s method. (6 hrs.)
2. Interference- Phenomenon of Inferences; Coherent sources; Young’s two slit experiment; Newton’s ring. (4 hrs.)
3. Diffraction- Diffraction from a single slit; Diffraction pattern of image; Diffraction grating; resolving power of optical instruments. (4 hrs.)
4. Polarization- Phenomenon of polarization; Brewster’s law; transverse nature of light; Polaroid. (3 hrs.)
Unit- 2 Electricity and Magnetism

Current Electricity (20 Hrs.)

1. D.C. Circuit- Electric Currents; Drift velocity and its relation with current; Ohm’s law; Electrical Resistance; Resistivity; conductivity; Super conductors; Perfect Conductors; Current-voltage relations; Ohmic and Non-Ohmic resistance; Resistances in series and parallel, Potential Divider, Conversion of galvanometer into voltmeter and ammeter, Ohmmeter; Electromotive force: Emf of a source, internal resistance; Work and power in electrical circuits; Joule’s law and its verification. (9 hrs.)

2. Electrical circuits-Kirchhoff’s laws; Wheatstone bridge circuit; P.O. Box, Meter Bridge; Potentiometer; Comparison of e.m. f’s., measurement of internal resistance of a cell. (7 hrs.)

3. Thermoelectric Effect-Seebeck Effect; Thermocouples, Peltier effect: Variation of thermoelectric emf with temperature, Thermopile, Thomson effects. (2 hrs.)

4. Chemical effect of current- Faraday’s laws of electrolysis; Faraday’s constant, Verification of Faraday laws of electrolysis. (2 hrs.)

Magnetic Field of current (35 Hrs.)

1. Magnetic Field-Magnetic field lines and magnetic flux; Oersted's experiment; Force on moving charge, Force on Conductor; Force and Torque on rectangular coil, Moving coil galvanometer; Hall effect; Magnetic field of a moving charge; Biot and Savart law and its application to (i) a circular coil (ii) a long straight conductor (iii) a long solenoid; Ampere’s law and its application to (i) a long straight conductor a straight solenoid (iii) a toroidal solenoid; Forces between two parallel conductors carrying current- definition of ampere. (14 hrs.)

2. Magnetic properties of materials-Elements of earth magnetism and their variation; Dip and Dip circle; Flux density in magnetic material; Relative permeability; Susceptibility; Hysteresis, Dia, -Para- and Ferro-magnetic materials. (5 hrs.)

3. Electromagnetic Induction-Faraday's laws; Induced electric fields; Lenz's law, Motional electromotive force; AC generators; eddy currents; Self-inductance and Mutual inductance; Energy stored in an inductor; Transformer. (8 hrs.)

4. Alternating Currents- Peak and RMS Value of AC current and Voltages, AC through resistor, capacitor and inductor; Phasor diagram, Series circuits containing combination of resistor, capacitor and inductor; Series Resonance, Quality factor; Power in AC circuits: Power facto, choke coil. (8 hrs.)
Unit-3 Modern Physics

1. Electrons and Photons-Electrons: Millikan’s oil drop experiment, Gaseous discharge at various pressure; Cathode rays, Motion of electron beam in electric and magnetic fields; Thomson's experiment to determine specific charge of electrons. Photons: Quantum nature of radiation; Einstein's photoelectric equation Stopping potential; Measurement of Plank's constant, Millikan’s experiment. (10 hrs.)

2. Solids and Semiconductor devices- Structure of solids; Energy bands in solids (qualitative ideas only); Difference between metals, insulators and semi-conductors using band theory; Intrinsic and extrinsic semiconductors; P-N Junction; Semiconductor diode: Characteristics in forward and reverse bias; Full wave rectification; Filter circuit; Zener diode; Transistor: Common emitter characteristics, Logic gates; NOT, OR, AND, NAND and NOR., Nanotechnology (introductory idea) (11 hrs.)

3. Quantization of energy-Bohr's theory of hydrogen atom; Spectral series; Excitation and ionization potentials; Energy level; Emission and absorption spectra, De Broglie Theory; Duality; Uncertainly Principle.Lasers: He- Ne laser, Nature and production, properties and uses.X-rays: Nature and production; uses: X-rays, X-rays diffraction, Bragg's law. (8 hrs.)

4. Nuclear physics- Nucleus: Discovery of nucleus; Nuclear density; Mass number; Atomic number; Atomic mass; Isotopes; Einstein's mass-energy relation, Mass Defect; Binding energy; Fission and fusion. (6 hrs.)

5. Radioactivity- Alpha-particles, Beta-particles, Gamma rays; Laws of radioactive disintegration; Half-life and decay constant; Geiger-Muller Tube; Radio carbon dating; Medical use of nuclear radiation; Health hazards and safety precautions. (7 hrs.)

6. Nuclear energy and other sources of energy- Sources at energy; Conservation and degradation of energy; Transformation of energy’ Nuclear energy: Energy released from fission and fusion; Thermal and Hydroelectric power; Wind energy; Biofuels; Solar energy; Solar constant, Solar devices; Global energy consumption Pattern and demands; Energy use in Nepal. (7 hrs.)

7. Fuels and pollution: Global Warming; Acid rain. (9 hrs.)

8. Particle physics and cosmology- particles and antiparticles, Quarks and Leptons, baryons, mesons.
   a. Universe: Hubble law; Big Bang; Critical density; Dark matter. (3 hrs.)
CHEMISTRY

Course Contents

General & Physical Chemistry (Section A)

Unit 1: Chemical Bonding and Shape of Molecules 3 Teaching Hours
1. Hybridization and concept of sigma and pi bond.
2. Valence shell Electron Pair Repulsion (VSEPR) theory.
3. Prediction of Molecular Geometry (Shape of Molecules) on the basis of VSEPR and hybridization. (BeF$_2$, BF$_3$, NH$_3$, H$_2$O, CH$_4$, H$_2$O, CH$_4$, C$_2$H$_2$, C$_2$H$_4$, H$_2$S)

Unit 2: Volumetric Analysis 8 Teaching Hours
1. Different ways of expressing the concentration of solutions.
2. Titration:
   i. acid-base titration
   ii. Redox titration
3. Primary standard substances, primary standard solution, secondary standard solution, endpoint, equivalence point, neutral point, indicators
4. Derivation of normality equation
5. Relation between normality and morality.
6. Selection of indicators in acid-base titration and pH curve
7. Solving related numerical problems

Unit 3: Ionic Equilibrium 12 Teaching Hours
1. Introduction
2. Ionization of weak electrolyte (Ostwald’s dilution law)
3. Degree of ionization and ionization constant
4. Strength of acids and base in term of Ka, Kb and pKa, and pKb values
5. Acid-base concept
   - Arrhenius concept of acids and bases
   - Bronsted Lowry concept of acids and bases
   - Lewis concept of acids and bases
6. Ionization of water, pH and pH scale.
7. Hydrolysis of salts. (Qualitative concept)
8. Solubility product principle and its application
9. Common ion effects and its application
10. Application of solubility product principle in qualitative analysis
11. Buffer Solution
   (Solving numerical problems related with solubility, solubility product, pH and pOH)

Unit 4: Electrochemistry - 10 Teaching Hours
1. Introduction
2. Electrolysis; strong and weak electrolyte
3. Arrehenius theory of ionization
4. Faraday’s laws of electrolysis
5. Criteria of product formation during electrolysis
6. Electrolytic conduction, equivalent and molar conductivities
7. Variation of conductivity with concentration
8. Electrode potential, standard electrode potential, standard hydrogen electrode and its application
9. Electrochemical series and its use to predict the feasibility of redox reactions
10. Electrochemical cell (Galvanic cell)
11. EMF of electrochemical cell in the standard state
   (Solving related numerical problems)

Unit 5: Energetic of Chemical Reactions 8 Teaching Hours
1. Introduction, unit of energy
2. Some thermo dynamical terms: system, surrounding, boundary, universe different types of system, state function, state variables and internal energy
3. Exchange of energy between the system and surrounding
4. Different types of thermodynamic process
5. The first law of thermodynamics
6. Sign convention of heat summation
7. Enthalpy, enthalpy change in chemical reactions
8. Hess’s law of constant heat summation
   (Solving related numerical problems)

Unit 6: Chemical Thermodynamics 6 Teaching Hours
1. Spontaneous process
2. Second law of thermodynamics
3. Entropy and its physical concept
4. Entropy change in phase transformation
5. Entropy and spontaneity
6. Entropy changes and their calculation
7. Gibb’s free energy and prediction for the feasibility of reaction
8. Standard free energy change and equilibrium constant
9. Influence of temperature on spontaneous process
   (Calculation involving in standard free energy change and equilibrium constant)

Unit 7: Chemical Kinetics - 10 Teaching Hours
1. Concept of reaction rate
2. Average rate and instantaneous rate of reaction
3. Factors that influences the rate of reaction
4. Rate law equation, rate constant and its units
5. 1st order, 2nd order, 3rd order and zero order reactions
6. Order and molecularity of a reaction
7. Integrated rate law for a first order reaction
8. Half-life of a reaction (first order)
9. Explaining the increase in reaction rate with temperature or collision theory (qualitative concept only)
10. Concept of activation energy as the energy barrier, activated complex and effect of catalyst on the rate of reaction
   (Solving related numerical problems)

Organic Chemistry (Section B)

Unit 8: Aromatic Hydrocarbon - 3 Teaching Hours
1. Definition, characteristics of aromatic compounds, Huckel’s rule, structure of benzene, isomerism and orientation of benzene derivatives
2. Preparation of benzenes from
   i. Decarboxylation ii. Phenol iii. Ethyne iv. Chlorobenzene
3. Physical properties of benzene
4. Chemical properties of benzene
   i. Addition reaction: hydrogen, halogen and ozone
   ii. Electrophilic substitution reactions: nitration, sulphonation, halogenation, Friedel craft’s alkylation and acylation
   iii. Combustion of benzene and uses
Unit 9: Haloalkanes and Haloarenes  

8 Teaching Hours

9.1. Haloalkanes:

1. Introduction, classification and isomerism
2. Preparation of monohaloalkanes from alkanes, alkenes and alcohols
3. Physical properties of monohaloalkanes
4. Chemical properties
   - Substitution reactions
   - Elimination reaction (Dehydrohalogenation)
   - Grignard’s reactions
   - Reduction reactions
   - Wurtz’s reaction
5. Polyhaloalkane:
   - Laboratory preparation of trichloro methane from ethanol and propanone
   - Physical properties of trichloro methane
   - Chemical properties: Oxidation reduction, action on Silver powder, conc. Nitric acid, propanone, aqueous alkali, Carbylamines reaction, Reimer Tiemann reaction, Iodoform reaction, etc.

9.2. Haloarenes:

- Preparation of chlorobenzene from i. Benzene ii. Benzene diazonium chloride
- Physical properties
- Chemical properties
  - Low reactivity of haloarene as compound to haloalkane in term of nucleophilic substitution reaction
  - Reduction of chlorobenzene
  - Electrophilic substitution reactions
  - Action with Na, Mg and Chloral etc.
  - Uses

Unit 10: Alcohols and Phenols  

10 Teaching Hours

10.1. Alcohols:

1. Introduction, classification, nomenclature and isomerism
2. Distinction of primary, secondary and tertiary alcohol by Victor Mayer’s Method
3. Preparation of monohydric alcohols from i. haloalkane ii. Grignard’s reagents using aldehydes and ketones iii. primary amines iv. Ester
4. Industrial preparation ethanol form: i. Oxoprocess ii. Fermentation of sugar iii. hydroboration of ethane
5. Physical properties monohydric alcohols
6. Chemical properties of monohydric alcohols
   - Reaction with HX, PX₃, PCl₅, SOCl₂
   - Action with reactive metals like Na, K, Li
   - Esterification process
   - Dehydration of alcohols
   - Oxidation of primary, secondary and tertiary alcohol with oxidizing agents.
   - Reduction of alcohols (Catalytic dehydrogenation)
   - Laboratory test of ethanol
   - Absolute alcohol, methylated spirit, rectified spirit; alcoholic beverage.
7. Preparation and uses of ethan-1,2. diol(glycol)
8. Preparation and uses of Propan-1,2,3 triol(glycerol)

10.2. Phenols:
1. Introduction to phenol
2. Preparation of phenol from i. chlorobenzene ii. Diazonium salt and iii. benzene sulphonlic acid
3. Physical properties of phenol
4. Chemical properties
   - Acidic nature of phenol
   - Action with PCL₅, PX₃, NH₃, Zn, Na benzene diazonium chloride and phthalic anhydride
   - Acylation reaction, Kolbe’s reaction, Reimer Tiemann’s reaction
   - Electrophilic substitution: halogenation, nitration, sulphonation, bromination and Friedal Craft’s alkylation
   - Laboratory test of phenol
   - Uses of phenol

Unit 11: Ethers

11.1 Aliphatic Ethers:
1. Introduction, nomenclature classification, isomerism in ether
2. Preparation of ethers from i. alcohol ii. Williamson’s etherification process
3. Laboratory preparation of ethoxy ethane from ethanol
4. Physical properties of ether
5. Chemical properties of ethoxyethane
   - action with HI, PCL₅, HCl, Conc. H₂SO₄, air and Cl₂
   - users of ethoxy ethane
11.2 Aromatic Ether:
- Preparation of methoxy benzene (anisole)
- Halogenation, nitration and sulphonation reactions

Unit 12: Aldehydes and Ketones

12.1 Aliphatic Aldehydes and Ketones - 11 Teaching Hours
1. Introduction, structure of carbonyl group, nomenclature and isomerism in carbonyl compound
2. Preparation of aldehydes and ketones from
   i. Dehydration and oxidation of alcohol
   ii. Ozonolysis of alkenes
   iii. Acid chloride
   iv. Gem dihaloalkane
   v. Catalytic distillation of fatty acid
   vi. Distillation of salt of fatty acid
   vii. Catalytic hydration of alkynes
3. Physical properties
4. Chemical properties
   i. Addition reaction: addition of H₂, HCN, NaHSO₃ and Grignard’s reagents
   ii. Action with ammonia derivatives: NH₂OH, NH₂-NH₂, phenyl hydrazine, semi-carbazides and 2,4-DNP
   iii. Reduction properties of aldehydes
      - Oxidation with Tollén’s reagent, Fehling’s solution
   iv. Aldol or condensation reaction; Clemmenson’s reduction Wolf-Kischner reduction, Action with PCL₅, action with LiAlH₄
   v. Special reaction of methanol; Cannizzaro’s reaction, action with ammonia, action with phenol. Formalin and its uses.

12.2 Aromatic Aldehydes and Ketones:
- Preparation of benzaldehyde from toluene
- Properties of benzaldehyde
- Important reaction benzaldehyde different from aliphatic aldehydes:
  - Perkin condensation
  - Benzoin condensation
  - Electrophilic substitution reaction
  - Cannizzaro's reaction
- Preparation of acetophenone by Friedal Craft’s Acylation
Unit 13: Carboxylic Acids

10 Teaching Hours

13.1 Aliphatic Carboxylic Acids:
- Introduction, nomenclature, examples
- Preparation of monocarboxylic acids from
  i. Aldehydes
  ii. Nitriles
  iii. Grignard’s reagents
  iv. Dicarboxylic acid
  v. Sodium alkoxide
  vi. Trihaloalkanes
- Physical properties of monocarboxylic acids
- Chemical properties: Action with alkalies, metal oxides, metal carbonates, metal bicarbonates, PCL$_3$, LiAlH$_4$, and dehydration of carboxylic acid, esterification, halogenation
- Effect of constituents on the acidic strength of carboxylic acid
- Laboratory preparation of methanoic acid
- Abnormal behavior of methanoic acid
- Uses of carboxylic acid

13.2 Derivatives of Carboxylic Acid:
1. Nomenclature, preparation and properties of
   i. Acid halides
   ii. Acid amides
   iii. Acid anhydrides and
   iv. Esters

13.3 Aromatic carboxylic acid
   - Preparation of benzoic acid
   - Physical and chemical properties
   - Uses of benzoic acid

Unit 14: Nitrocompounds:

4 Teaching Hours

14.1 Aliphatic Nitrocompounds (Nitroalkanes):
1. Introduction and nomenclature
2. Preparation from haloalkane and alkane
3. Physical Properties
4. Reduction of nitroalkane
5. Uses

**14.2 Aromatic Nitrocompounds:**
1. Laboratory preparation of nitrobenzene
2. Physical Properties
3. Chemical Properties
   i. Reduction in different media
   ii. Electrophilic substitution reactions
   iii. Uses of nitrobenzene

**Unit 15: Amino Compounds (Amines and Aniline) 7 teaching hours**

**15.1. Aliphatic Amines:**
1. Introduction nomenclature and classification
2. Separation of primary, secondary and tertiary amines by Hoffman’s method
3. Preparation of primary amines form haloalkane, nitriles, nitroalkanes and amides
4. Physical properties
5. Chemical Properties: basicity of amines, comparative study of basic nature of 1<sup>0</sup>, 2<sup>0</sup> and 3<sup>0</sup> amines. Reaction of Primary amines with chloroform, conc. HCL, R-X, RCOX and nitrous acid (NaNO<sub>2</sub> / HCL)
6. Test of 1<sup>0</sup>, 2<sup>0</sup> and 3<sup>0</sup> amines, (nitrous acid test)

**15.2. Aromatic Amine (Aniline):**
1. Laboratory preparation of aniline
2. Physical properties
3. Chemical properties: basicity of aniline, comparisons of basic nature of aniline with aliphatic amines; alkylation, acylation, diazotization, carbamylamines and coupling reaction
4. Electrophilic substitution: Nitration sulphonation and bromination
5. Uses of aniline

**Unit 16: Molecules of Life 8 teaching hours**

1. Carbohydrates: definition, classification of carbohydrates, various example of carbohydrates of different class. Structure of glucose and fructose, function of carbohydrates, sugar and non-sugar
2. Nucleic acid: definition, basic components of nucleic acid; double helix, difference between RNA and DNA; biological function of nucleic acid
3. Lipid: definition, fatty acids, fat as ester of fatty acid and difference between fats and oils, function of lipid
4. Enzymes and their functions

Unit 17: Chemistry in Service to Mankind 10 teaching hours
1. Polymer: definition, natural and synthetic polymers, homopolymers and co-polymer
   a. Preparation of some polymers; PVC polyethylene polystyrene Teflon, Nylon-66, Bakelite and their uses
2. Dyes: definition, natural and synthetic dyes, names and structure of some common drug, drug addiction
3. Fertilizer: definition, chemical and organic fertilizers, nitrogen fertilizer, phosphatic fertilizer; fertilizer as pollution
4. Pesticides: insecticides, herbicides, weedicides and fungicides (examples and their uses)

Inorganic Chemistry (Section C)

Unit 18: Heavy Metals 18 Teaching hours

General Characteristics of Transition metals

18.1. Copper:
   1. Position in periodic table
   2. Occurrence and extraction of copper from copper pyrite
   3. Properties and uses
   4. Chemistry of (i) blue vitriol (ii) black oxide of copper (iii) red oxide of copper

18.2. Zinc:
   1. Positions in periodic table
   2. Occurrence and extraction of zinc from zinc blende
   3. Properties and uses of copper
   4. Preparation properties and uses of zinc white and white vitriol
   5. Galvanization
18.3. Mercury:

1. Occurrence and extraction of Hg from Cinnabar
2. Properties of Mercury
3. Mercury poisoning and uses of Hg
4. Preparation, properties and uses of (i) Calomel (ii) Corrosive Sublimate

18.4. Iron:

1. Occurrence and extraction
2. Varieties of Iron
3. Properties of Iron
4. Manufacture of Steel by
   i. Bessemer process
   ii. Open hearth process
5. Heat treatment of steel
6. Stainless steel
7. Rusting of iron and its prevention
8. Uses and biological importance of iron
9. Structure and uses of green vitriol, Ferric chloride Mohr’s salt

18.5. Silver:

1. Extraction of Silver by cyanide process
2. Preparation and uses of
   i. Silver chloride
   ii. Silver nitrate
Unit 1: Anatomy and Physiology of Organisms - 27 Teaching Hours

**Plant Anatomy:** Types of tissues, meristematic and permanent tissues; Internal structure of dicot and monocot root, system and leaf; Secondary growth of dicot stem.

**Plant Physiology:**

i. **Water relation:** Osmosis, diffusion, ascent of sap and transpiration.

ii. **Photosynthesis:** Site of photosynthesis, mechanism and factors affecting photosynthesis.

iii. **Respiration:** Types of respiration, mechanism and factors affecting respiration.

iv. **Growth:** Plant growth hormones: Auxins, Gibberellin, Cytokinins.

v. **Plant Movement:** Concept of growth and turgor movement.

Unit 2: Genetics - 32 Teaching Hours

Elements of heredity and variation; Genetic Material (DNA and RNA), Genetic code, Genetic pool, Genetic expression and its regulation; Basis of Mendelian genetics, Mendel’s laws of inheritance, Concept of incomplete dominance and co-dominance, Multiple gene, Linkages, Crossing Over, Mutation and its types and polyploidy. Sex-linked inheritance (X-linked gene for eye color of Drosophila and color-blindness in man).

Unit 3: Developmental Biology - 10 Teaching Hours

Reproduction and development of angiosperms – Asexual Reproduction, Pollination, Development of male and female gametophyte, Fertilization and development of embryo (dicot and monocot).

Unit 4: Application of Biology - 6 Teaching Hours

- Introduction to biotechnology, tissue culture, concept of breeding technique, disease resistant plants, green manures.
• Genetic engineering and its application
• Fermentation technology: alcoholic and antibiotic fermentation.

Section B (Zoology)

Unit 1: Animal Tissue 8 Teaching Hours
Epithelial, connective, muscular and nervous tissue.

Unit 2: Developmental Biology 6 Teaching Hours
i. Development of frog: Fertilization, cleavage, morulation, blastulation, gastrulation, formation of germinal layers, coelem and tissue formulation.
ii. Gametogenesis in animal.

Unit 3: Human Biology and Health 50 Teaching Hours
• Nutrition; digestive organs and digestion of food.
• Respiratory organs and mechanism.
• Circulation: Blood, heart and its action, arterial and venous systems (Major arteries and veins), Blood groups, Rh-factor, Blood Pressure and lymph (definition).
• Excretion: Excretory organs, mechanism of urine formulation, osmoregulation and homeostatic mechanism (temperature regulation, kidney and liver control system).
• Nervous co-ordination: Types of nervous system, structure and function of brain, Transmission of nerve impulse.
• Endocrinology: Structures, functions and disorders of pituitary, thyroid, parathyroid, pancreas and adrenal glands.
• Sense organs: Structure and function of eye and ear.
• Reproduction: Reproduction organs.
• Human population: Growth, problem and control strategies.
• Human Diseases:
a. Socially significant: Drug abuse, alcoholism and smoking
b. Communicable: Typhoid, Tuberculosis, Ascariasis and AIDS
c. Non-communicable: Cancer
d. Concept of Kalazar and hepatitis.
Unit 4: Application of Biology

- Antibiotics Vaccines (Types and Applications)
- Tissue and organs transplantation
- Test-tube baby
- Amniocentesis
- Introduction to poultry farming and fish farming
Course Contents:

Group ‘A’

Unit 1: Permutation and Combination 10 Hours

Basic principle of counting, Permutation of (a) set of objects all different (b) set of objects not all different (c) circular arrangement (d) repeated use of same object. Combination of things all different, Properties of Combination.

Unit 2: Binomial Theorem 10 Hours

Binomial Theorem for a positive integral index, general term. Binomial coefficients, Binomial Theorem for any index (Without Proof), Application to approximation, Euler’s Number. Expansion of \( e^x \), \( a^x \) and \( \log(1+x) \) (Without Proof).

Unit 3: Elementary Group Theory 8 Hours

Binary Operation, Binary operation on sets of integers and their properties, Definition of a group, Groups whose elements are not numbers, Finite and infinite groups, Uniqueness of identity, Uniqueness of inverse, Cancellation law, Abelian group.

Unit 4: Conic Sections 12 Hours

Standard equation of parabola, Ellipse and Hyperbola, Equations of tangent and normal to parabola at a given point.

Unit 5: Co-ordinates in Space 12 Hours

Co-ordinates axes, Co-ordinate planes, the octants, Distance between two points, External and internal points of division, Direction cosines and ratios, fundamental relation between direction cosines, Projections, Angle between two lines.
General equation of a plane, Equation of a plane in intercept and normal form, Plane through three given points, Plane through the intersection of two given planes, Parallel and perpendicular planes, angle between two planes distance of a point form a plane.

**Unit 6: Vectors and its applications**

14 Hours

Cartesian representation of vectors, Collinear and non-collinear vectors, Coplanar and non-planar vectors, Linear combination of vectors.


**Unit 7: Derivatives and its Application**

14 Hours

Derivative of inverse trigonometric, exponential and logarithmic functions by definition, Relationship between continuity and differentiability. Rules for differentiating hyperbolic function and inverse hyperbolic function, Composite function and function of the type.

L Hospital’s rule (for 0/0, /), Differentials, Tangent and Normal, Geometric interpretation and application of Rolle’s Theorem and Mean Value Theorem.

**Unit 8: Antiderivatives**

7 Hours

Antiderivatives, Standard integrals, Integrals reducible to standard forms, Integration of rational functions.
Bowley’s Coefficient of Skewness, Bivariate distribution, Correlation, Nature of correlation, Correlation coefficient by Karl Pearson’s method. Interpretation of correlation coefficient, Properties of correlation coefficient (Without Proof).

Regression equation, Regression line of $y$ on $x$ and $x$ on $y$.

**Unit 11: Probability**

Random experiment, sample space, Event, equally likely cases, mutually exclusive events, Exhaustive cases, Favorable cases, Independent and dependent cases, Mathematical and Empirical definition of probability, two basic laws of probability, Conditional Probability (without proof), Binomial distribution, Mean and Standard deviation of binomial distribution (Without Proof).

**Group ‘B’**

**Unit 12: Statistics**

Forces and resultant forces, Parallelogram of forces, Composition and resolution of forces, Resultant of coplanar forces acting at a point, Triangle of forces and Lami’s theorem.

**Unit 13: Statics (Continued)**

Resultant of like and unlike parallel forces, Moment of a force, Varignon’s theorem’ Couple and its properties (without proof)

**Unit 14: Dynamics**

Motion of particle in a straight line, Motion with uniform acceleration, Motion under gravity, Motion down a smooth inclined plane. The concepts and theorems be restated and formulated as application of calculus.

**Unit 15: Dynamics (Continued)**

Group ‘C’

Unit 16: Linear Programming 11 Hours

Introduction of a linear programming problem (LPP), Graphical solution of LPP in two variables, Solution of LPP by simplex method (two variables).

Unit 17: Computational Method 9 Hours

Introduction to Numerical computing (Characteristics of Numerical Computing Accuracy, Rate of Convergence, Numerical Stability, Efficiency); Number system (Decimal, Binary, Octal and Hexadecimal system conversion of one system into another), Approximations and error in computing Roots of nonlinear equation, Algebraic, Polynomial and transcendental equations and their solution by bisection and Newton-Raphson Methods.

Unit 18: Computational Method (Continued) 8 Hours

Solution of system of linear equations by Gauss Elimination Method, Gauss-Seidel method, Ill conditioned system, Matrix inversion method.

Unit 19: Numerical Integration 8 Hours

Trapezoidal and Simpson’s rules, estimation of errors
Course Contents

The contents of this paper can be divided into two components:
1. Core English
2. Extensive Reading and Writing

The text for languages skills has the following units:
- Experience
- Appearance
- Relating past events
- Duration
- Reporting
- Deduction and explanation
- Advantages and disadvantages
- Clarifying
- Wishes, and regrets
- Events and sequence
- Comparison
- Processes
- Prediction
- News

The texts for extensive reading are as follows:

Poems
1. William Stafford, “Travelling Through the Dark”
2. W.B. Yeats, “The Lamentation of the Old Pensioner”
3. William Shakespeare, “Full Fathom Five Thy Father Lies”
4. Ray Young Bear, “Grandmother”
5. Hopkins, “God’s Grandeur”
Essays
1. Moti Nissani, “Two Long Term Problems”
3. Martin Luther King, “I Have a Dream”
4. Ilene Kantrov, “Women’s Business”
5. Liila, M and Barry, C. Bishop, “Hurried Trip to Avoid a Bad Star”
6. Germaine Greer, “A Child is Born”

Stories
1. Poe, “The Tell-Tale Heart”
2. Dylan Thomas, “A Story”
3. James Joyce, ‘The Boarding House’
4. G. Garcia Marquez, “The Last Voyage of the Ghost Ship”
5. Chekhov, “About Love”
6. Brothers Grimm, “Hansel and Gretel” and its variations

Play
1. W.B. Yeats, “Purgatory”
अनिवार्य नेपाली

पाठ्यक्रम परिचय:

यो पाठ्यक्रम स्कूल वा विद्यालय सामान्य त्यसमय गर्ने विद्यार्थीहरूको नेपाली भाषासम्बन्धी आधारभूत शक्तिको विकासका निर्मित राखिएको हो। यस पाठ्यक्रममा मूलत विद्यार्थीहरूको पढाई र लेखाइ शक्तिको विकासका लागि आवश्यक पनि पाठ्यपुस्तक समावेश गरिएका छैन। यसका लागि रचनाहरू पठन र आस्वादन, व्याकरण, व्याख्यानीकृत र अन्तर्दृष्टिको सम्बन्धित गराउने प्रस्तुति हरू हाम्रो छ भने भाषाको प्रयोगहरू शुद्ध तथा परिपूर्ण तुल्याउन व्याकरण गरिएको छ। व्याख्यानी भाषाको चौको विकासका लागि आवश्यक पनि पाठ्यपुस्तकहरू राखिएको छैन।

साधारण उद्देश्य:

यस पाठ्यक्रमले विद्यार्थीहरूमा निम्नलिखित शक्तिको अभिवृद्धि गरेको छ:

(क) स्तरअनुसार विभिन्न प्रयोग श्रेणीमा प्रयोग हुने विचार प्रकृतिका कथा र लेखा सामान्यहरू पठन, बोध र अभिवृद्धि शक्तिको बढाउनेछ;

(ख) निर्धारित साहित्यका रचनाहरू पठन र आस्वादन गरी विशेषता पाठभूमि, परिवेश र उद्देश्यबारे कथा र लेखा अभिवृद्धि शक्तिको बढाउनेछ;

(ग) नेपाली लेखनका क्रममा हुने भाषाको वुढीहरूको प्रयोग बढाउने र भौगोलिक संदर्भालाई विश्वासपूर्वक ज्ञात गरेको भएको निराकरण गर्ने सीप प्रदान गरेको छ;

(घ) व्याख्यानीको लेखनमा सम्बन्धी अभिवृद्धि शक्तिको विकास गरेको छ। र

(ड) व्याकरणको माध्यमबाट शुद्ध र स्तरीय नेपाली भाषाको प्रयोग गर्न सक्षम तुल्याउनेछ।

विशिष्ट उद्देश्य:
यो पाठ्यक्रम पूरा गरेपछि विवाहीहरू निम्नलिखित कृरियाहरू सङ्क्यम हुनेछेद्वारा:

(क) नेपाली भाषाको उच्चारण प्रक्रियासंग परिचित भए गुढ़िसंग उच्चारण गरेदैः

(ख) ज्ञान विज्ञानका विभिन्न क्षेत्रमा प्रयुक्त गर्नेशहरू विभिन्न प्रयोजनका लागि पहिले उत्तर दिन

(ग) निर्धारित पाठ तथा रचनाहरूलाई विश्लेषण, भाव, पत्र, परिवेश र भाषाशैलीका आधारमा अध्ययन गरेदैः

(घ) नेपाली लेखनमा शुद्ध वर्णविन्यासको प्रयोग गरेदैः

(ङ) नेपाली शब्दहरूको वर्ण पहिचान गरी सो अनुरूप प्रयोग गरेदैः

(च) विभिन्न वर्णको शब्दहरूको रूपायन गरे र सो अनुरूप प्रयोग गरेदैः

(छ) विभिन्न प्रक्रियावर शब्दहरूको निर्माण गरेदैः

(ज) बाक्यका आधारभूत तत्वको पहिचान गरी बाक्य निर्माण गरेदैः

(भ) व्याख्यातिक प्रयोजनका लागि आवश्यक पनि पत्र, विज्ञापन, सूचना, पाठक प्रतिक्रिया, व्याख्यातिक विवरण (बापोडाटा), तयार गरेदैः र

(झ) स्वर अनुरूपका निवन्ध दिशानी र प्रतिवेदन लेखन।

<table>
<thead>
<tr>
<th>क्रम संख्या</th>
<th>पाठ</th>
<th>व्याकरण</th>
<th>बोध</th>
<th>अभिव्यक्ति</th>
<th>पाठ्य भार</th>
</tr>
</thead>
<tbody>
<tr>
<td>१. कविता</td>
<td>कविता</td>
<td>अ) नेपाली वर्ण (कथा र लेख्य) को पहिचान</td>
<td>सामाजिक विप्रज्ञ (भाषा, जालेति र संस्कृति)</td>
<td>- कविताको भाषाको लेखन</td>
<td>७</td>
</tr>
<tr>
<td>नेपाली हामी रहेको कहाँ नेपाली नम भाषा जिम्हाई</td>
<td>आ) (क) स्वर (ख) व्यज्ञन उच्चारण व्यज्ञन वर्णको वर्गीकरणस्थान, प्रयत्न, घोषचत्र र प्राप्तचत्र</td>
<td>सम्बन्धी अनुच्छेदको बोध</td>
<td>- सामाजिक/ सांस्कृतिक विप्रज्ञा अनुच्छेद लेखन</td>
<td></td>
<td></td>
</tr>
<tr>
<td>२.</td>
<td>कथा</td>
<td>कथा दिनको गुरुप्रसाद मैनाली</td>
<td>अ) नेपाली अक्षरको पहिचान आ) नेपाली अक्षरको प्रकार (स्व, स्वय, व्यस्त, व्यस्क, व्यस्क्य, व्यस्क्यक्य) इ) शब्दलाई अक्षरमा विभाजन</td>
<td>वतावण र स्वास्थ्यसम्बन्धी अनुच्छेदको बोध (प्रदुषण र मानवस्वास्थ्य विषयक) अनुच्छेदको पठन विपुलबुति तथा भाषा बोध</td>
<td>-कथासार लेखन</td>
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<tr>
<td>३.</td>
<td>निबन्ध</td>
<td>आइमाइंडो साथी श्यामप्रसाद जामा</td>
<td>अ) तत्सम र आगतक शब्दको वर्णावलिका प्रमुख समस्याहरू र बुझीरूको पहिचान तथा नराकरण आ) शब्दवर्ग: नाम, सवानाम, विशेषण र क्रियाको पहिचान इ) भाषाको वृद्धि निराकरणमा शब्दकोनिर्णय र अभास</td>
<td>निबन्धको अनुच्छेदवाट बोध र वुडाटपोट</td>
<td>-लेलिङ्क</td>
</tr>
<tr>
<td>४.</td>
<td>कथा</td>
<td>मधुमालतीको कथा रमेश बिकल</td>
<td>अ) लेख चिह्न र लिखको प्रयोग : पूर्णबिराम, अधबिराम, अस्तबिराम, कोष, विकल्पविभाग, प्रत्ययबिराम, उदगार, उद्देश, विशेषण, निर्देशक र योजक चिह्नको पहिचान र प्रयोग आ) शब्दवर्ग: नामयोगी, क्रियायोगी, संयोजक विश्वायविभागक र निर्माताको पहिचान</td>
<td>निबन्धको मुल विचार र आशयको बोध</td>
<td>-पात्रको परिचय लेखन</td>
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<tr>
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<td>निबन्ध</td>
<td>भिलादीलक्ष्मी प्रसाद</td>
<td>नेपाली शब्दको पहिचान, प्रकार र कार्य अ) शब्दको पहिचान</td>
<td>निबन्धको मुल विचार र आशयको बोध</td>
<td>-विषयको मूल भाव / विचारको प्रस्तुति</td>
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<td>देवकोटा</td>
<td>आ) शब्दको प्रकार (क) स्रीतको आधार- तत्सम, तद्भव (अनुकरणात्मक समेत) र आगामः (ख) संरचनाको आधार- मूल र व्युत्पन्न (ग) रूपायनको आधार- विकारी र अविकारी</td>
<td>सामाजिक, सांस्कृतिक विषयमा आधारित</td>
<td>6. कविता हर्कवहादुर दिनेश अधिकारी</td>
<td>क) उपसर्गःद्वारा शब्द निर्माण : अ) अ, अन, कु, वि, वे, बद, गैर, ना आ) अ, अन, अधि, अनु, अभि, अति, अब, अप, आ, उ, दु, दुर, दुम, नि, नि, निर, निस, परा, परि, प्र, प्रति, वि, सम, सु ख) द्वितेशः द्विप्रक्षःहारा शब्द निर्माण पूण, आशियक र आपरिभावित द्वितेशः शब्द निर्माण</td>
<td>शिक्षासम्बन्धी अनुच्छेदको बोध</td>
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<td>उपन्यासको अंश</td>
<td>एक प्रत्येक व्युत्पन्न शब्दको सिद्ध प्रणाली</td>
<td>निर्धारित अंश वर्गीकरण र सहजप्रकरण</td>
<td>पाठ परिचय लेखन</td>
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<td>अ) प्रत्येक व्युत्पन्न शब्दको निर्माण : अ) अल्फ, अत, अत, आइ, आई / याई, आउ, आर्ल, आल, आउट, आहा / याहा, इया, आ, यार, इलो, ई, उवा, ए, एली, ओ, ओएट, ओर्ली / यूर्ली, ती, पन / पना, ती, ले, इ, अक, अन, अनीय, इक, इत, ई, इन / इंप, ईव, क, तर, तम, तव, ता, तित, त्व, मय, मान, बान, य ख। समास : अव्ययी भाव तत्त्वरूप, कर्मधाराय, हिकू, वियह र समास दुवे।</td>
<td>उपन्यासको अंश वर्गीकरण लागेको व्युत्पन्न शब्दको खोजी गरी वप शब्द निर्माण तथा निर्धारित अंश र अनुच्छेदवाच समस्त शब्दको खोजी</td>
<td>१०</td>
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<td>नं.</td>
<td>कविता मानुषी पारिजात</td>
<td>पदकष</td>
<td>बाणिज्य क्षेत्रस्थल सम्बन्धित अनुच्छेदको वोध</td>
<td>&quot;सरल वाक्य&quot; (उद्देश्य, उद्देश्य विस्तार, विवेचन, विवेचन विस्तार भएका)मा कृति विश्रामको घटना आदिको वर्णन - विभिन्न काल र पक्षको प्रयोग गरी अनुच्छेद लेखन - विभिन्न भावका कविताको प्रयोग गरी अनुच्छेद लेखन।</td>
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<td></td>
<td>१०</td>
<td></td>
</tr>
</tbody>
</table>

*प्रो. कविता मानुषी पारिजात*
| पनि | कथा रातमैर हुरी चल्यो इल्लियो गाई (क) कारक र विषयक असरल र तिघंक कारण आ) कारक कणो, कर्म, करणसम्बन्ध, अपदं, अधिकरण ख) कारकीय अर्थ, विभासको प्रयोग र पहिचान ग) को, का, की, रो, रा, री, तथा नो, ना, नी को प्रयोग | कानुन तथा प्रावसंस्थान सम्बन्धित अनुच्छेदको बोध | सरल र तिघंक कारको प्रयोग गरी कृनै विषय प्रयोग घन्ना आविको वणन -विधिन कारकको प्रयोग गरी अनुच्छेद रचना -व्यक्तिगत विवरण (आयोडाटा) लेखन |}
|---|---|---|---|
| १२. | कविता मेरो देश भूपी शेरचन क) तदमब र तदसम शय्दको वर्णविवर्णाभूक्ल ख) निधित अनुच्छेदवाग्दत तदसम र तदमब शय्दहरुको पहिचान | समाजस्वस्तसम्बन्धी अनुच्छेदको बोध | पदपुर्ति सम्बन्धी विज्ञापन लेखन - व्यावसायिक विज्ञापन लेखन |}
| १३. | निवन्ध आलू भैरव अयाल क) श्लोक र तदसम शय्दको वर्णविवर्णाभूक्ल ख) निधित अनुच्छेदवाग्दत तदसम र तदमब कर्महरुको अध्ययन | निवन्धको निधित अनुच्छेदको बोध र प्रशणन | लिह, बचन, पुरुष, आदर मिलाउँ सूचना लेखन |}
| १४. | कथा श्लोक विश्वेश्वरप्रसाद कोइराहा क) सरल, समूह र मिध, बायको पहिचान र प्रयोग ख) निधित कथावाट सरल, मिध र समूह बायको पहिचान | सच्चारसंग सम्बन्धित अनुच्छेदको बोध | दिशापुर्ं लेखन / समावदकलाई विधीलेखन |}
<p>| १६. | उपनाम बायकाल्पण क) संचारनाग (सरल, मिध, समूह ।) ख) बायकाल्पण (कर्ता, कर्म, भाव) कृषि र वनस्पतिक अनुच्छेदको बोध | निवन्ध (स्वास्थ्य, विज्ञान र प्रविधि नागरिक अधिकार र दायित्व, आधिक |</p>
<table>
<thead>
<tr>
<th>पाठ</th>
<th>कथा हारिजित भवानी मिश्रु</th>
<th>वाक्य संरचनेपर (सरल वाक्यहरूलाई मिश्र बा संयुक्त वाक्यमा संरचनेपर)</th>
<th>कानून, न्याय तथा मानव अधिकारसंग सम्बन्धी अनुच्छेदको बोध</th>
<th>प्रतिवेदन लेखन (गोष्टी, भ्रमण, घटना आदि)</th>
</tr>
</thead>
<tbody>
<tr>
<td>१५.</td>
<td></td>
<td></td>
<td></td>
<td>१०</td>
</tr>
<tr>
<td>१६.</td>
<td>निवन्धः खाल संकट र जीविक विविधाता डा. तीर्थबहादुर खेर्द</td>
<td>शाब्दिकार (प्रबिधिक तथा पारिवर्तनिक शब्द)</td>
<td>ग्रामीण विकाससंग सम्बन्धी अनुच्छेदको बोध</td>
<td>विज्ञान र प्रबिधिक सम्बन्धित अनुच्छेद लेखन (जैविक विविधता, बालबीनकरणीय ऊर्जा, विषुवीकरण, अधिक विकास)</td>
</tr>
<tr>
<td>१७.</td>
<td>नाटकः नालालपादीमा बालकृष्ण सम</td>
<td>-कि्याका भाव</td>
<td>भाषा र साहित्यसंग सम्बन्धित अनुच्छेदको बोध</td>
<td>व्याख्यारिक लेखन (समवेदना, अध्याजनति, भाषाइ, शृङ्खलामना)</td>
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<td>१८.</td>
<td>कविता कानदी, भट्टी र देश कृष्ण सेन 'इन्दुकुक'</td>
<td>कि्याका काल र पक्ष</td>
<td>इन्ज्ञनिर्दरभेदम्बन्धी अनुच्छेदको बोध</td>
<td>-प्रति प्रतिहार (निवेदन व्याख्यातातिक निम्नलिङ्ग) -विज्ञापन</td>
</tr>
<tr>
<td>१९.</td>
<td>नाटक बहुला कांजीको सपना विजय मल्ल</td>
<td>वाक्यका प्रकार र वाक्यान्तरण</td>
<td>समाजशास्त्रसम्बन्धी अनुच्छेदको बोध</td>
<td>टिप्पणीलेखन (कानून र नागरिक अधिकार -संचार माध्यम र जिम्मेवारी -जनता, जाति र भाषा)</td>
</tr>
</tbody>
</table>

- पग 30
COMPUTER SCIENCE

Course Contents

Unit 1: System Development Concept
1.1 Introduction: System, Information System
1.2 Types of Information System
1.3 System Analyst – roles, responsibilities and characteristics
1.4 System Development Life Cycle (SDLC)
1.5 Importance and the necessity of SDLC
1.6 System Development Models: Waterfall, Prototype, Spiral
1.7 System Development Phase
   1.7.1 System Study
   1.7.2 System Analysis Feasibility Analysis
   1.7.3 Feasibility Study: Technical, Economical, Operational
   1.7.4 System Design
   1.7.5 System Development
   1.7.6 System Testing
   1.7.7 Implementation
   1.7.8 Maintenance and Reviews
1.8 Concept of System Design Tools (Context Diagram, DFD, E-R Diagram, System Flow Chart, Decision Table, Decision Tree, Use Case, UML)
1.9 Case Study

Unit 2: Database

2.1 Concept of Database
2.1.1 Introduction: Data, Information, Database and DBMS
2.1.2 Objectives of DBMS
2.1.3 Database Model: Relational Model, Network Model, Hierarchical Model, Entity Relational Data Model
2.1.4 Concept of Normalization
2.1.5 Types of Normalization 1NF, 2NF, 3NF
2.1.6 Structured Query Language
2.1.7 Centralized Vs. Distributed Database
2.1.8 Data Security

2.2 Design Database using DBMS Software

2.2.1 Create a Database
2.2.2 Create Tables and Fields and its properties
2.2.3 Create a Relational Database
2.2.4 Create and Run Queries
2.2.5 Working with Forms
2.2.6 Generate Reports
2.2.7 Formatting Forms and Reports

2.3 Project Work on DBMS Software

Unit 3: Communication and Networking

3.1 Introduction: Definition, Purpose of networking
3.2 Analog and Digital Signal, Modulation (AM, FM, PM)
3.3 Direction of communication flow (Simplex, Half duplex)
3.4 Types of Network: Peer-to-peer and Client/Server, LAN, MAN and WAN
3.5 LAN Topologies: Bus, Star, Ring, Tree, Mesh Topologies (Its definition, structure, advantages & disadvantages)
3.6 Transmission Media: Bound Media (Coaxial Cable, Twisted Pair Cable and Optical Fiber Cable – its description, structure, advantages and disadvantages), Unbounded Media (Satellite, Wireless Media, Microwave Transmission)
3.7 Network Connecting Device: Modem, NIC, Switch/Hub, Router, Gateway, Repeater, Bluetooth, IR, WIFI
3.8 OSI Reference Model – Layer wise use and function
3.9 Communication Protocol: TCP/IP, SMTP, POP3, FTP, HTTPs, Telnet protocol
3.10 Demonstration of communication Media and Connecting Devices
Unit 4: Programming in C

4.1 Introduction:
   4.1.1 Overview, History, Features, Advantages and Disadvantages of C Language
   4.1.2 Structure of C program
   4.1.3 Compiling Process
   4.1.4 C Preprocessor and Header Files

4.2 Fundamentals of C
   4.2.1 Character Set used in C
   4.2.2 Use of Comments
   4.2.3 Identifiers and Keywords and Tokens
   4.2.4 Data Types in C
   4.2.5 Constant and Variables
   4.2.6 Type of Specifier
   4.2.7 Statements – Simple and Compound Statements

4.3 Operators and Expressions
   4.3.1 Operators: Precedence & Associativity
   4.3.2 Expressions
   4.3.3 Type Casting and Conversions
   4.3.4 Introduction to Library functions

4.4 Input/output (I/O) Functions

4.5 Control Structures
   4.5.1 Decisions (if, if – else, else if, switch, ?: operator)
   4.5.2 Looping (while, do while, for)

4.6 Array and String
   4.6.1 Definition of array and string
   4.6.2 Types of array – One-Dimensional and Two-Dimensional (definition, declaration, and initialization)
   4.6.3 String Function: strlen(), strcat(), strcmp(), strrev(), strcpy(), strlwr(), strupr()

4.7 Functions
   4.7.1 Concept of Function, function definition, function prototype
   4.7.2 Return and Void statements of a function
   4.7.3 Accessing a Function – Function Call (by value, by reference)
   4.7.4 Concept of Recursion

4.8 Structures and Unions
   4.8.1 Definition and Difference between Structure and Union
4.8.2 Structure: Declaration, Initialization and Size of Structure

4.9 Pointers
4.9.1 Definition of Pointer
4.9.2 Address (&) and indirection (*) operator
4.9.3 Pointer Expression and Assignment

4.10 Working with Files
4.11 Concept of Data File
4.12 Sequential and Random File
4.13 Opening, Reading, Writing and Appending on/from Data File

Unit 5: Object-Oriented Programming (OOP)
5.1 Concept of OOP
5.2 Features of OOP: Class, Object, Polymorphism and Inheritance
5.3 Application of OOP
5.4 Difference between OOP and Structured Programming Language

Unit 6: Information Communication Technology and Cyber Law
6.1 Social Impact of the ICT
6.2 Digital Divide
6.3 Computer Ethics
6.4 Intellectual Properties Right
6.5 Privacy, Anonymity
6.6 Computer Crime
6.7 Concept of cyber Law
6.8 Area of Cyber Law
6.9 Cyber Law in Nepal
6.10 IT Policy in Nepal

Unit 7: Multimedia
7.1 Introduction to multimedia
7.2 Component of Multimedia: Text, Graphics, Audio, Video and Animation
7.3 Application of Multimedia

Unit 8: Artificial Intelligence
8.1 Concept of AI
8.2 Component of AI
8.3 Uses of AI
8.4 Ethical Aspect of AI

Unit 9: Contemporary Technology
9.1 e-Business
9.2 e-Learning
9.3 e-Governances
9.4 e-Medicine
9.5 Virtual Reality
9.6 Robotics

Unit 10: Final Project Work
10.1 Project Synopsis of the Project
10.2 Project Development using C Programming
10.3 Project Report
(Project should be assigned to individual students)