

# 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 Interferences; 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 factor, choke coil. (8 hrs.)

**Unit-3 Modern Physics**

**55 Teaching Hours**

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. *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. ( $\text{BeF}_2$ ,  $\text{BF}_3$ ,  $\text{NH}_3$ ,  $\text{H}_2\text{O}$ ,  $\text{CH}_4$ ,  $\text{H}_2\text{O}$ ,  $\text{CH}_4$ ,  $\text{H}_2\text{O}$ ,  $\text{CH}_4$ ,  $\text{C}_2\text{H}_2$ ,  $\text{C}_2\text{H}_4$ ,  $\text{H}_2\text{S}$ )

#### Unit 2: Volumetric Analysis 8 Teaching Hours

1. Different ways of expressing the concentration of solutions.
  - i. Molarity, ii. Normality iii. Molality, iv. Gram/Litre, v. Percentage
2. Titration:
  - i. acid-base titration
  - ii. Redox titration
3. Primary standard substances, primary standard solution, secondary standard solution, end point, 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  $K_a$ ,  $K_b$  and  $pK_a$ , and  $pK_b$  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)

- Solubility product principle and its application
- Common ion effects and its application
- Application of solubility product principle in qualitative analysis
- Buffer Solution  
(Solving numerical problems related with solubility, solubility product, pH and pOH)

#### **Unit 4: Electrochemistry**

**- 10 Teaching Hours**

- Introduction
- Electrolysis; strong and weak electrolyte
- Arrhenius theory of ionization
- Faraday's laws of electrolysis
- Criteria of product formation during electrolysis
- Electrolytic conduction, equivalent and molar conductivities
- Variation of conductivity with concentration
- Electrode potential, standard electrode potential, standard hydrogen electrode and its application
- Electrochemical series and its use to predict the feasibility of redox reactions
- Electrochemical cell (Galvanic cell)
- EMF of electrochemical cell in the standard state  
(Solving related numerical problems)

#### **Unit 5: Energetic of Chemical Reactions**

**8 Teaching Hours**

- Introduction, unit of energy
- Some thermo dynamical terms: system, surrounding, boundary, universe different types of system, state function, state variables and internal energy
- Exchange of energy between the system and surrounding
- Different types of thermodynamic process
- The first law of thermodynamics
- Sign convention of heat summation
- Enthalpy, enthalpy change in chemical reactions
- Hess's law of constant heat summation
- Heat of neutralization, heat of solution, heat of combustion, heat of vapourization, heat of formation and bond energy.  
(Solving related numerical problems)

#### **Unit 6: Chemical Thermodynamics**

**6 Teaching Hours**

- Spontaneous process
- 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. I<sup>st</sup> order, II<sup>nd</sup> order, III<sup>rd</sup> 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, Friedal 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,  $PX_3$ ,  $PCL_5SOCL_2$
  - 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 sulphonic acid
3. Physical properties of phenol
4. Chemical properties
  - Acidic nature of phenol
  - Action with  $PCL_5$ ,  $PX_3$ ,  $NH_3$ , 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

4 Teaching Hours

### 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,  $PCL_5$ , con. HCL, Conc.  $H_2SO_4$  air and  $CL_2$
  - 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  $H_2$ , HCN,  $NaHSO_3$  and Grignard's reagents
  - ii. Action with ammonia derivatives;  $NH_2OH$ ,  $NH_2-NH_2$ , phenyl hydrazine, semi carbazides and 2,4- DNP
  - iii. Reduction properties of aldehydes
    - Oxidation with Tollen's reagent, Fehling's solution
  - iv. Aldol or condensation reaction; clemenson's reduction Wolf-Kischner reduction, Action with  $PCl_5$ , action with  $LiAlH_4$
  - 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 alkalis metal oxides, metal carbonates, metal bicarbonates,  $\text{PCl}_3$ ,  $\text{LiAlH}_4$  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 from haloalkane, nitriles, nitroalkanes and amides
4. Physical properties
5. Chemical Properties: basicity of amines, comparative study of basic nature of  $1^{\circ}$ ,  $2^{\circ}$  and  $3^{\circ}$  amines. Reaction of Primary amines with chloroform, conc. HCL, R-X, RCOX and nitrous acid ( $\text{NaNO}_2 / \text{HCL}$ )
6. Test of  $1^{\circ}$ ,  $2^{\circ}$  and  $3^{\circ}$  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, carbylamines 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 polyethene 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



# BIOLOGY

## SECTION A (BOTANY)

### 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, Cytokinin.
- 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**

**11 Teaching Hours**

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



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# MATHEMATICS

## 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 from 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.

Scalar product of two vectors, Angle between two vectors, Geometric interpretation of scalar product, Properties of Scalar Product, Condition of perpendicularity.

Vector product of two vectors, Geometric interpretation of a vector product, Properties of Vector Product, Application of product of vectors in plane trigonometry.

### **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  $0/0$ ,  $\infty/\infty$ ), 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.

### **Unit 9: Differential Equations and their Applications**

**7 Hours**

Differential equation and its order and degree, Differential equations of first order and first degree, Differential equation with separate variables, homogeneous and exact differential equations.

### **Unit 10: Dispersion, Correlation and Regression**

**12 Hours**

Dispersion, Measures of dispersion (Range, Semi inter quartile range, Mean deviation, Standard Deviation) variance, Coefficient of variation, Skewness, Karl Pearson's and



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**

**8 Hours**

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**

**9 Hours**

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)**

**9 Hours**

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

#### **Unit 14: Dynamics**

**9 Hours**

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)**

**9 Hours**

Newton's laws of motion, Impulse, Work, Energy and Power, Projectile.

## **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

# ENGLISH

## 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”
2. Marsha Traugot, “The Children Who Wait”
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 उच्च माध्यमिक तहमा अध्ययन गर्ने विद्यार्थीहरूको नेपाली भाषासम्बन्धी आधारभूत क्षमताको विकासका निम्ति राखिएको हो । यस पाठ्यक्रममा मूलतः विद्यार्थीको पढाइ र लेखाइ क्षमताको विकासका लागि आवश्यक पर्ने पाठ्यवस्तुहरू समावेश गरिएका छन् । यसका लागि रचनाको पठन र आस्वादन, व्याकरण, बोध र अभिव्यक्तिलाई अन्तरसम्बन्धित गराई प्रस्तुत गरिएको छ । पाठान्तर्गत साहित्यक कृति रहेका छन् भने भाषाको प्रयोगलाई शुद्ध तथा परिष्कृत तुल्याउन व्याकरण राखिएको छ । बोध र अभिव्यक्तिमा पठनबोधसम्बन्धी विषय र अभिव्यक्ति सीपको विकासका लागि आवश्यक पर्ने पाठ्यवस्तुहरू राखिएको छन् ।

साधारण उद्देश्य :

यस पाठ्यक्रमले विद्यार्थीहरूमा निम्नलिखित क्षमताको अभिवृद्धि गर्नेछ :

(क) स्तरानुरूप विभिन्न विषय क्षेत्रमा प्रयोग हुने विविध प्रकृतिका कथ्य र लेख्य सामाग्रीको पठन, बोध र अभिव्यक्ति क्षमता बढाउनेछ ;

(ख) निर्धारित साहित्यिक रचनाहरूको पठन र आस्वादन गरी विषयवस्तु, परिवेश र उद्देश्यबारे कथ्य वा लेख्य अभिव्यक्ति क्षमता बढाउनेछ ;

(ग) नेपाली लेखनका क्रममा हुने भाषिक त्रुटिहरूप्रति सचेत भई तिनको निराकरण गर्ने सीप प्रदान गर्नेछ ;

(घ) व्यावहारिक लेखनसम्बन्धी अभिव्यक्ति क्षमताको विकास गर्नेछ ; र

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

विशिष्ट उद्देश्य :

यो पाठ्यक्रम पूरा गरेपछि विद्यार्थीहरू निम्नलिखित कुराहरूमा सक्षम हुनेछन् :

- (क) नेपाली भाषाको उच्चारण प्रक्रियासँग परिचित भई शुद्धसँग उच्चारण गर्न ;
- (ख) ज्ञान विज्ञानका विभिन्न क्षेत्रमा प्रयुक्त गद्यांशहरू विभिन्न प्रयोजनका लागि पढी उत्तर दिन ;
- (ग) निर्धारित पाठ तथा रचनाहरूलाई विषयवस्तु, भाव, पात्र, परिवेश र भाषाशैलीका आधारमा अध्ययन गर्न ;
- (घ) नेपाली लेखनमा शुद्ध वर्णविन्यासको प्रयोग गर्न ;
- (ङ) नेपाली शब्दहरूको वर्ग पहिचान गरी सो अनुरूप प्रयोग गर्न ;
- (च) विभिन्न वर्गका शब्दहरूको रूपायन गर्न र सो अनुरूप प्रयोग गर्न ;
- (छ) विभिन्न प्रक्रियाबाट शब्दहरूको निर्माण गर्न ;
- (ज) वाक्यका आधारभूत तत्वको पहिचान गरी वाक्य निर्माण गर्न ;
- (झ) व्यावहारिक प्रयोजनका लागि आवश्यक पर्ने पत्र, विज्ञापन, सूचना, पाठक प्रतिक्रिया, ब्याक्तिगत विवरण ( बायोडाटा), तयार गर्न ; र
- (ञ) स्तर अनुरूपका निबन्ध टिप्पणी र प्रतिवेदन लेख्न ।

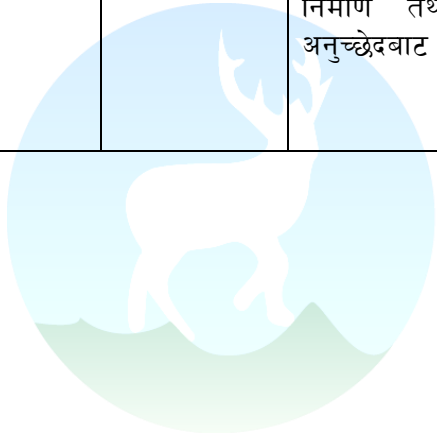
क्रम संख्या	पाठ	व्याकरण	बोध	अभिव्यक्ति	पाठ्य भार
१.	कविता नेपाली हामी रहौंला कहाँ नपालै नरहे माधव घिमिरे	अ) नेपाली वर्ण ( कथ्य र लेख्य) को पहिचान आ) (क) स्वर (ख) व्यञ्जन उच्चार्य व्यञ्जन वर्णको वर्गीकरण (स्थान, प्रयत्न, घोषत्व र प्राणत्व)	सामाजिक विषय (भाषा, जाति र संस्कृति) सम्बन्धी अनुच्छेदको बोध	-कविताको भावार्थ लेखन -सामाजिक/ सांस्कृतिक विषयमा अनुच्छेद लेखन	७



२.	कथा छिमेकी गुरुप्रसाद मैनाली	अ) नेपाली अक्षरको पहिचान आ) नेपाली अक्षरका प्रकार (स्व, स्वव्य, व्यस्व व्यस्वव्य व्यव्यस्व व्यव्यस्वव्य व्यव्यव्यस्व) इ) शब्दलाई अक्षरमा विभाजन	वतावरण र स्वास्थ्यसम्बन्धी अनुच्छेदको बोध ( प्रदूषण र मानवस्वास्थ्य विषयक) अनुच्छेदको पठन विषयवस्तु तथा भाषा बोध)	-कथासार लेखन	७
३.	निबन्ध आइमाई साथी श्यामप्रसाद शर्मा	अ) तत्सम र आगन्तुक शब्दको वर्णविन्यासका प्रमुख समस्याक्षेत्र र त्रुटिहरूको पहिचान तथा निराकरण आ) शब्दवर्ग: नाम, सर्वनाम, विशेषण र क्रियाको पहिचान इ) भाषिक त्रुटि निराकरणमा शब्दकोशको प्रयोग र अभ्यास	निबन्धको अनुच्छेदबाट बोध र बुँदाटिपोट	-लैङ्गिक समतासम्बन्धी अनुच्छेद लेखन	८
४	कथा मधुमालतीको कथा रमेश विकल	अ) लेख्य चिन्ह र तिनको प्रयोग : पूर्णविराम, अर्धविराम, अल्पविराम, कोष्ठ, विकल्पबोधक, प्रश्नविराम, उद्गार, उद्धरण, विस्मयसूचक, निर्देशक र योजक चिह्नको पहिचान र प्रयोग आ) शब्दवर्ग: नामयोगी, क्रियायोगी, संयोजक विस्मयादिबोधक र निपातको पहिचान	भूगोलसम्बन्धी अनुच्छेदको बोध र बुँदाटिपोट	-पात्रको परिचय लेखन -अनुच्छेदमा चिह्न प्रयोग	८
५.	निबन्ध भलादमी लक्ष्मीप्रसाद	नेपाली शब्दको पहिचान, प्रकार र कार्य अ) शब्दको पहिचान	निबन्धको मूल विचार र आशयको बोध	-निबन्धको मूल भाव/ विचारको प्रस्तुति - निबन्ध लेखन (	७

	देवकोटा	<p>आ) शब्दको प्रकार</p> <p>(क) स्रोतको आधार- तत्सम, तद्भव (अनुकरणात्मक समेत) र आगन्तुक</p> <p>(ख) संरचनाको आधार- मूल र व्युत्पन्न</p> <p>(ग) रूपायनको आधार- विकारी र अविकारी</p>		सामाजिक, सांस्कृतिक विषयमा आधारित)	
६.	कविता हर्कबहादुर दिनेश अधिकारी	<p>क) उपसर्गद्वारा शब्द निर्माण :</p> <p>अ) अ, अन, कु, वि, वे, बद, गैर, ना</p> <p>आ) अ, अन्, अधि, अन्, अभि, अति, अव, अप, उप, आ, उत्, दु, दुर्, दुस्, नि, निः, निर, निस्, परा, परि, प्र, प्रति, वि, सम, सु</p> <p>ख) द्वित्व प्रक्रियाद्वारा शब्द निर्माण पूर्ण, आंशिक र आपरिवर्तित द्वित्व शब्द निर्माण</p>	शिक्षासम्बन्धी अनुच्छेदको बोध	निर्धारित अनुच्छेदको सङ्क्षेपीकरण	१०

<p>७.</p>	<p>उपन्यासको अंश एक चिहान हृदयचन्द्र सिंह प्रधान</p>	<p>क) प्रत्ययद्वारा शब्द निर्माण : अ) अक्कड, अत, अन्त, आइ, आइं/याइं, आउ, आली, आलु, आवट, आहा/ याहा, इया, आ) यार, इलो, ई, उवा, ए, एली, ओ, ओट, औली/यौली, ती, पन/ पना, ली, ले, इ) अक, अन, अनीय, इक, इत, ई, इन/ ईण, ईय, क, तर, तम, तव्य, ता, ति, त्व, मय, मान, वान, य ख) समास : अव्ययीभाव तत्पुरुष, कर्मधारय, द्विगु, (विग्रह र समास दुवै)</p> <p>उपन्यासको अंशबाट प्रत्यय लागेको व्युत्पन्न शब्दको खोजी गरी थप शब्द निर्माण तथा निर्धारित अंश र अनुच्छेदबाट समस्त शब्दको खोजी</p>	<p>निर्धारित अंशबाट बुँदाटिपोट र सङ्क्षेपीकरण</p>	<p>पात्र परिचय लेखन</p>	<p>१०</p>
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<p>८.</p>	<p>निबन्ध म फुल लिएर आउनेछु सुधा त्रिपाठी</p>	<p>क) समास प्रक्रियाद्वारा शब्द निर्माण - द्वन्द्व र बहुव्रीहि समास (विग्रह समेत)</p> <p>(ख) सन्धि र सन्धिभएका शब्दको पहिचान</p> <p>ग) वाक्यको पहिचान र प्रयोग</p> <p>-उद्देश्य र उद्देश्य विस्तार</p> <p>-विधेय र विधेय विस्तार</p> <p>-क्रियाका काल (भूत अभूत )</p> <p>-पक्ष : सामान्य, अपूर्ण, पूर्ण, अज्ञात, अभ्यस्त</p> <p>-क्रियाका भाव : सामान्य, आज्ञा, इच्छा, संभावना र संकेत</p>	<p>निर्धारित अंशको पठन र विषयबोध ( निर्धारित अंशको अनुच्छेदबाट बुंदाटिपोट गरी सङ्क्षेपीकरण)</p>	<p>-सरल वाक्य ( उद्देश्य, उद्देश्य विस्तार, विधेय, विधेय विस्तार भएका)मा कुनै विषयवस्तु, घटना आदिको वर्णन - विभिन्न काल र पक्षको प्रयोग गरी अनुच्छेद लेखन - विभिन्न भावका क्रियाको प्रयोग गरी अनुच्छेद लेखन ।</p>	<p>१०</p>
<p>९.</p>	<p>कविता मानुषी पारिजात</p>	<p>पदक्रम क) सामान्य पदक्रम ख) विशिष्ट पदक्रम ( कविताका पङ्क्तिबाट सामान्य र विशिष्ट पदक्रमको अध्ययन)</p>	<p>वाणिज्य क्षेत्रसँग सम्बन्धित अनुच्छेदको बोध</p>	<p>- निर्धारित कविताको अध्ययनमा आधारित भई कुनै कृतिको पाठक प्रतिक्रिया लेखन</p>	<p>६</p>

१०.	कथा रातभरि हुरी चल्यो इन्द्रबहादुर राई	(क) कारक र विभक्ति अ) सरल र तिर्यक कारण आ) कारक कर्ता, कर्म, करणसम्प्रदान, अपादन, अधिकरण ख) कारकीय अर्थ, विभक्तिको प्रयोग र पहिचान ग) को, का, की; रो, रा, री, तथा नो, ना, नी को प्रयोग	कानून तथा प्रशासनसँग सम्बन्धित अनुच्छेदको बोध	-सरल र तिर्यक कारकको प्रयोग गरी कुनै विषय घटना आदिको वर्णन -विभिन्न कारकको प्रयोग गरी अनुच्छेद रचना  -व्यक्तिगत विवरण (बायोडाटा) लेखन	६
११.	कविता मेरो देश भूपी शेरचन	क) तद्भव र तत्सम शब्दको वर्णविन्यास ख) निर्धारित अनुच्छेदबाट तत्सम र तद्भव शब्दहरूको पहिचान	समाजशास्त्रसम्बन्धी अनुच्छेदको बोध	-पदपूर्ति सम्बन्धी विज्ञापन लेखन - व्यावसायिक विज्ञापन लेखन	७
१२.	निबन्ध आलु भैरव अर्याल	क) पद सङ्गति अ) लिङ्ग (पुलिङ्ग, स्त्रीलिङ्ग) आ) वचन (एकवचन, बहुवचन ) इ) पुरुष (प्रथम, द्वितीय, तृतीय) ई) आदर (आदर अनादर) ख) शब्दभण्डार प्राविधिक, पारिभाषिक शब्दको अध्ययन	(क) निबन्धको निर्धारित अनुच्छेदको बोध र प्रश्नोत्तर (ख) विज्ञान प्रविधिसम्बन्धी अनुच्छेदको बोध	लिङ्ग, वचन, पुरुष, आदर मिलाई सूचना लेखन	८
१३.	कथा शत्रु विश्वेश्वरप्रसाद कोइराला	क) सरल, संयुक्त र मिश्र, वाक्यको पहिचान र प्रयोग ख) निर्धारित कथाबाट सरल, मिश्र र संयुक्त वाक्यको पहिचान	सञ्चारसंग सम्बन्धित अनुच्छेदको बोध	-टिप्पणी लेखन / सम्पादकलाई चिठीलेखन	७
१४.	उपन्यास	वाक्यान्तरण क) संरचनागत (सरल, मिश्र, संयुक्त ) ख) वाच्यगत (कर्तृ, कर्म, भाव)	कृषि र वनसम्बन्धी अनुच्छेदको बोध	निबन्ध (स्वास्थ्य, विज्ञान र प्रविधि नागरिक अधिकार र दायित्व, आर्थिक	६

		ग) कथन (प्रत्यक्ष, अप्रत्यक्ष ) घ) ध्रुवीयता (करण, अकरण ) ड.) वाक्यसंश्लेषण		विकास आदि)	
१५.	कथा हारजित भवानी भिक्षु	वाक्य संश्लेषण (सरल वाक्यहरूलाई मिश्र वा संयुक्त वाक्यमा संश्लेषण)	कानून, न्याय तथा मानव अधिकारसंग सम्बन्धी अनुच्छेदको बोध	प्रतिवेदन लेखन (गोष्ठी, भ्रमण, घटना आदिको)	१०
१६.	निबन्ध खाद्य सङ्कट र जैविक विविधता डा. तीर्थवहादुर श्रेष्ठ	शब्दभण्डार (प्रविधिक तथा पारिभाषिक शब्द)	ग्रामीण विकाससंग सम्बन्धी अनुच्छेदको बोध	विज्ञान र प्रविधिसंग सम्बन्धित अनुच्छेद लेखन (जैविक विविधता, वातावरण पुनर्नवीकरणीय उर्जा, विद्युतीकरण, आर्थिक विकास)	१०
१७.	नाटक नालापानीमा बालकृष्ण सम	-क्रियाका भाव -उक्ति परिवर्तन -वर्ण र अक्षर	भाषा र साहित्यसंग सम्बन्धित अनुच्छेदको बोध	व्यावहारिक लेखन (समवेदना, श्रद्धाञ्जली, बधाइ, शुभकामना)	१०
१८.	कविता कान्छी, भट्टी र देश कृष्ण सेन 'इच्छुक'	क्रियाका काल र पक्ष	इन्जिनियरिङ्गसम्बन्धी अनुच्छेदको बोध	-पत्ररचना (निवेदन व्यावसायिक निमन्त्रणा) -विज्ञापन	६
१९.	नाटक बहुला काजीको सपना विजय मल्ल	वाक्यका प्रकार र वाक्यान्तरण	समाजशास्त्रसम्बन्धी अनुच्छेदको बोध	टिप्पणीलेखन -कानून र नागरिक अधिकार -संचार माध्यम र जिम्मेवारी -जनता, जाति र भाषा	१०

# 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 Databases
- 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)

