

UP-TO-DATE SYLLABUS

SCIENCE-XI

PHYSICS

Teaching hours: 150T + 50P

Full marks: 100 (75T + 25 P)

Nature of course: Theory + Practical

Pass Marks: 27T + 8P

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 [6 hrs]
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. [8 hrs]
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 track. [5 hrs]
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. [9 hrs]
8. **Equilibrium**– Moment of forces; Torque; Torque due to a couple; Center of mass; Center of gravity; Conditions of equilibrium. [2 hrs]
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 of a uniform rod; Torque and angular acceleration for a rigid body; Work and power in rotational motion; Angular momentum; Conservation of angular momentum. [8 hrs]
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. [6 hrs]
11. **Periodic Motion**– Oscillatory motion; Circle of reference; Equation of Simple Harmonic Motion (SHM); Energy in SHM; Application of SHM; Simple pendulum; Damped oscillation; Forced oscillation and resonance. [6 hrs]
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 of mixture and of liquids 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; Boltzman 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. [3 hrs]
- 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 [4 hrs]
- 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 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 (introduction only) [6 hrs]

Unit 3: Geometric 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 fiber. [3 hrs]
- 3. Refraction through prisms**- Minimum deviation; Relation between Angle of prism, minimum deviation and refractive index; Deviation in small angle prism. [3 hrs]
- 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. [7 hrs]
 3. **Potential-** Potential and potential difference, Potential due to a point charge; Equipotential lines and surfaces; Potential gradient; Potential energy, Electron volt. [3 hrs]
 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]
- A student will perform 20 experiments and 4 activities from the given list: General instruction: Students are expected to learn general ideas of errors, order of accuracy and graphical analysis.

List of Experiments

A. Mechanics

1. Use of Vernier calipers:
 - a. Determination of the length, the internal and external diameter of a given tube and calculation of its volume and density.
 - b. Determination of the volume and density of a given rectangular block and verification of the results using a graduated cylinder.
 - c. Determination of the internal diameter, depth and volume of a beaker or calorimeter.
2. Use of Spherometer:
 - a. Determination of the thickness of a given rectangular thin glass plate and calculation of its area using a graduated cylinder.
 - b. Determination of the radii of curvatures of a watch glass.
 - c. Determination of the focal length of a spherical mirror
3. Use of Screw gauge:
 - a. Determination of the diameter of a tube (or of a rod) and a small spherical bob and calculation of their densities.
 - b. Determination of the length, volume and density of a tangle of wire.
4. Determination of the coefficient of friction for the two surfaces by (i) the horizontal plane method and (ii) an inclined plane method.
5. Verification of the principle of moments and the determination of a mass of a given body
6. Use of Simple pendulum:
 - a. Determination of the length of a seconds pendulum and the value of 'g' in the laboratory.
 - b. Verification of law of length and determination of the value of 'g' in the laboratory by log- log plot of lime period versus length of the pendulum
7. Verification of Archimedes' Principle and determination of the specific gravity of a solid heavier than and insoluble in water
8. Determination of the specific gravity of
 - a. A liquid
 - b. A solid lighter than and insoluble in water
 - c. A solid heavier than and soluble in water
9. Use of Boyle's law apparatus:
 - a. Verification of Boyle's Law
 - b. Determination of the atmospheric pressure in the laboratory without reading a barometer and verification of the result by reading a barometer.
10. Use of Young's modulus apparatus
 - a. Verification of Hooke's Law

Mechanics	70	3/4	5/7	3/4	5+5+4	2×5=10	5+3+3	35
Heat and Thermodynamics	40	2/3	3/4	2/2	4+4	2×3=6	3+3	20
Geometrical Optics	20	1/2	1/2	1/1	4	2	4	10
Electrostatics	20	1/2	1/2	1/1	4	2	4	10
Total	150	7/11	10/15	7/8	30	20	25	75

Note: LAQ: Long answer questions

SAQ: Short answer questions

- Q. No. 1, 5, 8 and 10, the first questions of group A, B, C and D respectively should contain 7, 4, 2 and 2 conceptual questions each carrying 2 marks, out of which students should give answers as indicated in the table.
- In the table numerator denotes the number of questions to be attempted and denominator denotes the number of questions asked. For example, 3/4 means 3 questions are to be answered out of 4 questions.
- Short answer questions should cover the entire course as far as possible. These questions should be of conceptual type.
- Each of the questions numbering 2, 3, 6, 7, 9, 10 and 11 contains a long answer theory question and a numerical problem carrying marks as specified in the table.
- There will be only one specific 'or' choice in one of the questions of LAQ type in each group.
- There will be only one specific 'or' choice for numerical problems in mechanics.

Practical

Every student will perform at least 20 experiments and 4 activities during the academic year.

Evaluation Scheme for Practical Examination:

One experiment	12 Marks
One activity	3 Marks
Practical record of experiments and activities	5 marks
Viva on experiment and activity	5 Marks
Total	25 Marks

CHEMISTRY

Full marks: 100 (75T + 25 P)

Pass Marks: 27T+10P
Teaching Hours: 150T + 50P

i. INTRODUCTION

Chemistry is concerned with the physical and chemical characteristics of substances, the nature of matter and the study of chemical reactions. Chemistry, thus, is a powerful process of uncovering and extending our understanding of various chemical phenomena. The power resides in the combination of concepts and experiments involving careful observation and quantitative measurements under controlled conditions. The resulting concepts suggest further experiments and investigations as a result; there will be a modification of the existing concept leading to a creativity of thought. This creativity involves the recognition of a problem; formulation of ideas to solve the problem and ultimately refinement of the original ideas. The present curriculum aims to foster this uniqueness among students by enabling them to study both theoretical and practical aspects of chemistry.

This course is theory-cum-practical. It is intended to consolidate learning in chemistry achieved in the secondary school. Furthermore, it intends to provide a concrete knowledge and appropriate skills for those students, continuing further studies in chemistry and the students not studying the subject beyond this stage. The course seeks to maintain a balance between useful facts, concepts and theories which will facilitate understanding of the properties of substances,

reactions and processes. Emphasis is enforced to stimulate, create and sustain students' interest in chemistry.

Chemistry being an experimental science, laboratory is an essential component of its syllabus. The course intends to make students aware of the importance of scientific method for accurate experimental work and develop the abilities to interpret, organize and evaluate data in order to make decisions and solve problems.

ii. general objectives

The general objectives of this course are to:

1. apply appropriate chemical principles, concepts, theories, definitions, laws, models and patterns to interpret, draw conclusion, make generalization, and predictions from chemical facts, observations and experimental data;
2. select appropriate facts to illustrate a given principle, concept, theory, model and pattern;
3. present chemical ideas in a clear and logical form; and
4. select and organize data and perform calculations in which guidance on the method is not supplied.

iii. specific objectives

After studying the course, the student shall be able to:

1. state and apply fundamental facts and principles of chemistry dealing with the
 - i. Methods of preparation: general, laboratory and industrial process of the matters,
 - ii. Physical and chemical properties,
 - iii. Important applications.
2. perform chemical calculations;
3. identify the mineral resources of Nepal;
4. understand chemical patterns and principles;
5. apply knowledge and understanding of chemistry in familiar and unfamiliar situations;
6. make accurate observations and measurements, being aware of possible sources of error;
7. record the results of experiments accurately and clearly; draw conclusion and make generalization from experiment ; and
8. appreciate the scientific, social , economic, environmental and technological contributions and applications of chemistry.

General & Physical Chemistry (Section A)

Unit 1: Language of Chemistry (Review Lecturers) - 3 teaching hours

1. Chemical equations, their significances and limitations
2. Balancing chemical equations by:
 - i. Hit and trail 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:

Definition of atomic mass and molecular mass

1. Mole concept
2. Mole in term of mass, volume number and ions
3. 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
3. Chemical calculation based on following chemical equation
 - Limiting reactants
 - Mass-mass relationship
 - Volume - volume relationship
 - Mass volume relationship (Solving related 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
 - i. Deduction of atomicity of elementary gas
 - ii. Deduction of relationship between molecular mass and vapour density
 - iii. Deduction of molar volume of gases
 - iv. Deduction of molecular formula from its volumetric composition
(Solving related numerical problems)

2.5. Equivalent Masses:

1. Concept of equivalent mass
2. Equivalent weight of elements, and compounds (Salt, acid, base, oxidising 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
 - i. Hydrogen displacement method
 - ii. Oxide formation method
(Solving related numerical problems)

Unit 3: State of Matter

- 14 teaching hours

3.1. Gaseous State:

1. Boyle's law
2. Charles's law and Kelvin scale of temperature
3. Application of Charles's law and Boyle's law
4. Combined gas law, ideal gas equation and universal gas constant
5. Dalton's law of partial pressure
6. Mathematical derivation of Dalton's law and their applications
7. Graham's law of diffusion and its applications
8. Kinetic theory of gas and its postulates
9. Ideal and real gases
10. Deviation of gas from ideal behaviour (Solving related numerical problems)

3.2 Liquid State:

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

3.3. Solid State:

1. Crystalline and amorphous solids
2. Water of crystallization
3. Efflorescences
4. Deliquescences
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)

- Concept of atomic number, mass number, fractional atomic mass, isotopes, isobars
- Rutherford's α - ray scattering experiment and nuclear model of atom; limitation
- Bohr's model of atom and explanation of hydrogen spectra
- Limitation of Bohr's model of atom
- Elementary idea of quantum mechanical model
 - Dual nature of electron (de-Broglie equation)
 - Heisenberg's uncertainty principle
 - Probability concept
- Shape of atomic orbital (s and p orbitals only)
- Quantum numbers
- Pauli's exclusion principle
- Hund's rule of maximum multiplicity
- Aufbau principle and Bohr Bury rule
- Electronic configuration of the atoms and ions ($Z = 1$ to 30)

Unit 5: Nuclear Chemistry

- 3 Teaching hours

- Concept radioactivity
- Radioactive rays (alpha ray, beta ray & gamma ray)
- Meaning of natural and artificial radioactivity
- Nuclear reactions, Nuclear energy (fission and fusion)
- Nuclear isotopes and uses

Unit 6: Electronic Theory of Valency and Bonding

- 8 teaching hours

- Basic assumption of electronic theory of valency
- Octet rule
- Ionic bonds, ionic compounds and characteristics of ionic compounds. Lewis symbol to represent the formation of ionic compounds
- Covalent bonds, covalent compounds and characteristics of covalent compounds - Lewis structure of some typical covalent compounds
- Co-ordinate covalent bonds. Lewis structures of some typical co-ordinate covalent compounds
- Exception of the octet rule
- Partial ionic characters of covalent compounds. Non-polar and polar covalent molecules
- Dipole moments and its application
- Some special types of bonds: hydrogen bond and its types, metallic bond, vander Waal's bond, Resonance and resonance hybrid structures of O_3 , SO_3 , SO_2 , CO_3^{2-} , SO_4^{2-} , PO_4^{2-} , NO_3^-
- Classification of crystalline solids
 - Ionic solid
 - Covalent solid
 - Molecular solid
 - Metallic solid

Unit 7: Periodic Classification of Elements

- 6 teaching hours

- Introduction
- Mendeleev's periodic law and periodic table
- Anamolies of Mendeleev's periodic table
- Modern periodic law, and modern periodic table
- Advantages of modern Periodic table
- Division of elements into s,p, d and f blocks
- Periodicity of physical properties: valency , atomic radii, ionic radii ionisation energy, electron affinity and electronegativity (general trends only)

Unit 8: Oxidation and Reduction

- 6 teaching hours

- Classical concept of oxidation and reduction
- Electronic interpretation of oxidation and reduction
- Oxidation number and rules for the assignment of oxidation number
- Differentiate between oxidation number and valency
- Oxidising and reducing agent
- Redox reaction

7. Balancing redox reactions by
 - i. oxidation number method
 - ii. 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 (Section B)**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. Oxyacids 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 carnallite process and manufacture of iodine from
 - i. sea weeds (principle only)
 - ii. caliche (Principle only)
4. Uses of halogens
5. Comparative study on; preparation, properties and uses of haloacids (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 phosphorus
3. Preparation, properties and uses of phosphine
4. Oxides and oxyacids of phosphorous (structure and uses)
5. Preparation, properties and uses of orthophosphoric acid

11.4. Sulphur:

Position in periodic table and allotropes

1. Hydrogen Sulphide: (Laboratory methods and Kipp's apparatus), properties and uses of
2. Sulphurdioxide : Laboratory preparation, preparation and uses
3. Sulphuric acid: Manufacture by Contact process, properties and uses
4. Sodiumthiosulphate (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: Position in periodic table, occurrence and uses

11.7. Environmental Pollution:

- Air pollution, photochemical smog
- Acid rain, water pollution
- Green house 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 Downs 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
 - i. quick lime, ii. plaster of Paris iii. bleaching powder, iv. magnesia v. Epsom salt.

Organic Chemistry (Section C)**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 halogens 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

14.4 Preliminary Idea of Reaction Mechanism - 2 teaching hours

1. Concept of homolytic 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 from coal, quality of gasoline, octane member 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 ethene
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 ethene and uses

15.4. Alkynes: - 3 teaching hours

Ethyne

1. Preparation from
 - carbon and hydrogen
 - Kolbes electrolysis
 - 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 ammoniacal $AgNO_3$ and ammoniacal Cu_2Cl_2), Oxidation with alkaline $KMnO_4$, Polymerization and uses of ethyne

PRACTICAL

Full Marks: 25

Pass Marks: 10

Students are required to secure the pass marks in the practical paper separately. The following is the list of experiments. The students are required to perform in the practical classes in Grade XI.

A. Experiments based on laboratory techniques:

1. To separate the insoluble component in pure and dry state from the given mixture of soluble and insoluble solids. (NaCl and sand)
2. To separate volatile component from the given mixture of volatile and non volatile (demonstration of sublimation process)
3. To separate a mixture of two soluble solids by fractional crystallization ($\text{KNO}_3 + \text{NaCl}$)
4. To prepare a saturated solution of impure salt and obtain the pure crystal of the same salt by crystallization
5. To separate the component of a mixture of two insoluble solids (The being soluble in dil acids)
6. To obtain pure water from given sample of water (Distillation).

B. Experiment to study the different reactions (Neutralization, Precipitation, Redox reaction, electrolysis):

7. To perform precipitation reaction of BaCl_2 and H_2SO_4 and obtain solid BaSO_4 ;
8. To neutralize sodium hydroxide with hydrochloric acid solution and recover the crystal of sodium chloride
9. To test the ferrous ions in the given aqueous solution and oxidise it to ferric ion (Ferrous \rightarrow Ferric system)
Redox Reaction
10. To study the process of electrolysis and electroplating.

C. Experiments on quantitative analysis:

11. To determine the equivalent weight or weight of metal by hydrogen displacement method;
12. To determine the solubility of the given soluble solid at laboratory temperature;
13. To determine the relative surface tension of unknown liquid by drop count method;and
14. To study the rate of flow of liquid through Ostwald's viscometer and determine the relative viscosity of unknown liquid.

D. Experiments on preparation of gas and study of properties:

15. To prepare and collect hydrogen gas and study the following properties:
 - a. Solubility with water, colour, odour;
 - b. Litmus test;
 - c. Burning match stick test; and
 - d. Reducing properties of nascent hydrogen.
16. To prepare and collect ammonia gas and investigate the following properties:
 - a. Solubility with water / colour / odour;
 - b. Litmus test;
 - c. Action with copper sulphate solution; and
 - d. Action with mercurous nitrate paper.
17. To prepare carbondioxide gas and investigate the following properties:
 - a. Solubility, colour, odour;
 - b. Litmus paper test;
 - c. Lime water test; and
 - d. Action with burning magnesium ribbon.
18. To study the properties of hydrogen sulphide (Physical, analytical and reducing);
19. To study the following properties of sulphuric acid:
 - a. Solubility with water;
 - b. Litmus paper test;
 - c. Precipitating reaction and
 - d. Dehydrating reaction.

E. Experiments on qualitative analysis:

20. To detect the basic radical of the given salt by dry way and the acid radical by dry and wet ways. Basic radicals: Zn^{++} , Al^{+++} , NH_4^+ , Ca^{++} , Na^+ Acid radicals: CO_3^{--} , SO_4^{--} , NO_3^- , Br^- , I^- , Cl^-

Note: Experiment from no 1 to 19 requires one practical period of each experiment and the experiment no 20 requires four practical periods. (Two theory periods will be equivalent to one practical period)

Evaluation Scheme

The chemistry theory paper (XI) will consist of three types of questions:

- a. Very short-answer questions (weightage of 2 marks of each);
- b. Short-answer questions (weightage of 5 marks of each); and
- c. Long- answer questions (weightage of 10 marks of each).

According to manner of questions groups are divided into group 'A', group 'B' and group 'C'.

1. Group 'A' will consist of twenty two (22) very short questions, out of which, examinees are required to answer only fifteen (15) questions.
2. Group 'B' will consist of seven (7) short questions, out of which examinees are required to answer five (5) questions.
3. Group 'C' will consist of four (4) questions, out of which examinees are required to answer 2 questions.

MATHEMATICS

Full Marks: 100

Pass Marks: 35

Course Contents

I. Introduction:

This course deals with the fundamentals of advanced mathematical concepts. It also tries to consolidate the concepts and skills learnt in Mathematics course in school level. It is desirable at the end of each unit sufficient related problems be solved.

II. Specific Objectives:

On completion of this course students will be able to:

1. use principles of elementary logic to find the validity of statement;
2. state field and order axioms of Real number system;
3. define functions and illustrate them graphically;
4. sketch the curves;
5. use trigonometrical relations to find the general values, understand inverse circular functions and their properties and to find property & solution of triangle;
6. state properties of A.S., G.S. and H.S. Understand infinite series and use method of mathematical induction to establish the result;
7. define transpose, adjoint and inverse of matrix, state properties of determinants;
8. use matrix and determinant to solve system of linear equations;
9. explain the idea of a complex number, verify their properties, prove De–Moivre's theorem and use it;
10. define polynomial equations, establish fundamental theorem of algebra and quadratic equation, and find relation between roots and coefficients of a quadratic polynomials;
11. define straight lines, pair of lines in terms of co–ordinates and establish their properties;
12. define circle in terms of coordinates and establish their properties;
13. define limit of a function, establish properties of limits;
14. define continuity of a function using the concept of limit;
15. define derivative of a function and give its geometrical interpretation as rate of change;
16. use derivative to determine the nature of the function and determine the maxima and minima of a function and apply differentiation to find tangent & normal, increasing & decreasing function;
17. define anti-derivative as an inverse process of derivative and use various methods of integration; and
18. define integration as the area of the sum, and apply definite integral to find the area between the curves.

III. Course Contents:

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, statements, 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 range of a function, Functions defined as mappings, Inverse function, Composite function, functions of special type (Identity, Constant, Absolute value, Greatest integer), Algebraic (Linear, quadratic and cubic), Trigonometric, Exponential 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 Error! , 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 a 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 sequences and series (Arithmetic, Geometric, Harmonic), Properties of Arithmetic, Geometric, and Harmonic sequences, A.M., G.M. And H.M. Relation among A.M., G.M. 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, Minors and Cofactors, Adjoint, Inverse matrix. Determinant of a square matrix, properties of determinants (Without proof) upto 3×3 .	
Unit 7: System of Linear Equations	8 hrs
Consistency of system of linear equations, solution of a system of linear equations by Cramer's rule, Matrix method (row – equivalent and Inverse) upto 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: Co-ordinate Geometry 12 hrs

Straight line: Review 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 a circle in various forms (Centre at origin, centre at any point, general equation of a circle, circle with a given diameter), Condition of Tangency of a line at a point to the circle, Tangent and normal to a circle.

Unit 12: Limits and Continuity 10 hrs

Limits of a function, Indeterminate forms, Algebraic properties of limits (without proof), Theorem on limits of algebraic, Trigonometric, Exponential and logarithmic functions **Error!** Continuity of a function, Types of discontinuity, Graph of discontinuous function.

Unit 13: The Derivatives 8 hrs

Derivative of a function, Derivatives of algebraic, trigonometric, exponential and logarithmic functions by definition (simple forms), Rules of differentiation, Derivatives of parametric and implicit functions, Higher order derivatives.

Unit 14: Applications of Derivatives 12 hrs.

Geometric interpretation of derivative, Monotonocity of a function, Interval of monotonocity, Extrema 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, The definite integral as an area under the given curve, Area between two curves.

IV. Evaluation Scheme:

No. of questions	Marks	Total	Remarks
15	2	30	covering all units
10	4	40	with four OR-questions from the same
5	6	30	with two OR-questions from the same

The questions of 6 marks will be asked from the units with 12 or more credit hours.

V. Reference books:

- Adhikari, D.B. and et.al. *Element of Mathematics Part I*. Himalaya Book stall.
- Bajracharya, D.R.; Shrestha, R.M. and et.al. *Higher Secondary Level Basic Mathematics (For Grade XI)*. Kathmandu: Sukunda Pustak Bhawan.
- Bajracharya, P.M. and Basnet, G. (2008). *Fundamentals of Mathematics for Grade XI*. Kathmandu: Buddha Academic Publishers & Distributors P. Ltd.
- Koirala, S. and et.al. *Fundamentals of Mathematics*. Kathmandu: Nepal Sahitya Prakashan Kendra.
- Pant, S.R. and et.al. *A Text-Book of Higher Secondary Mathematics (For Grade XI)*. Kathmandu: Buddha Academic Publishers and Distributors P. Ltd.
- Uprety, K.N. and Ghimire, K.P., *Foundation of Mathematics, (For Grade XI)*. Pigeon Educational Publisher.

BIOLOGY

Course Contents**Section A (Botany)****Teaching hour 75****Unit 1: Introduction to Biology****TH 5**

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

Unit 2: Cell Biology**TH 15**

- **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, meiosis.

Unit 3: Biodiversity**TH 40**

- Definition and scope of biodiversity, flora 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 Zygomycetes (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. • **Angiosperm:** Morphology: root, stem, leaf, flower, fruit and seed. Taxonomy and economic importance of the following families: Cruciferae (Brassicaceae), Solanaceae, • Leguminosae – Papilionaceae only, Compositae (Asteraceae) and Gramineae (Poaceae). • **Lichen:** Introduction and economic importance. • **Virus:** Structure and economic importance.

Unit 4: Biota and their Environment**TH 15**

- 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). • **Adaptation:** Hydrophyte, mesophyte and xerophyte. • Conservation: • **Forest conservation:** Brief introduction of forests of Nepal, importance of afforestation and hazards of deforestation.

Evaluation Scheme

	Teaching Hrs	Marks	Types of question asked in the examination		
1. Introduction to Biology	5	3	×	1	×
2. Cell Biology	15	8	2 or 1 opt	2	Or 1*
3. Biodiversity	39	18.5	3 or 1 opt	3 or 1 opt	1 or 1 opt (7.5 marks)
4. Biota and their environmer	16	8	2 or 1 opt	2 or 1 opt	or 1*
Total	75	37.5 marks	7 ques × 1 mark	5 ques × 3 marks	2 ques × 7.5 marks and 8 marks
			Total 7 marks	Total 15 marks	Total 15.5 marks

* One full question of 8 marks will be asked either from the unit Evolution of life or Biota and environment.

Section B (Zoology)**Teaching hour****Unit 1: Introduction to Biology****TH 5**

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

Unit 2: Evolution of Life**TH 20**

- Meaning of evolution. • Life and its origin. • A brief history of evolutionary ideas. • Oparin and Haldane's theory, Miller and Urey experiment. • Organic evolution, evidences

of evolution: structural, anatomical, paleontological, embryological, biochemical and genetical. • Lamarckism, Darwinism and concept of Neo-Darwinism. • Human evolution.

Unit 3: Biodiversity

TH 35

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, circulatory, excretory, reproductive and nervous systems. Economic importance. • **Frog (Rana tigrina)**: Habit and habitat, structure; digestive, circulatory, respiratory, urino-genital and nervous system (structure and function of brain).

Unit 4: Biota and their Environment

TH 15

• **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 volant). • **Conservation**: (1) **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. (2) Management of land and water • Human responsibility for the protection of earth.

Evaluation Scheme

	Teaching Hrs	Marks	Types of question asked in the examination		
1. Introduction to Biology	5	2	2	×	×
2. Evolution of Life	20	10	2 or 1 opt	0 or 1 opt	1 (8 marks)*
3. Biodiversity	35	17.5	3 or 1 opt	3 or 1 opt	1 or 1 opt (7.5 marks)
4. Biota and their environment	15	8	2 or 1 opt	2	×
Total	75	37.5 marks	7 ques × 1 mark	5 ques × 3 marks	2 ques × 7.5 marks and 8 marks
			Total 7 marks	Total 15 marks	Total 15.5 marks

* One full question of 8 marks will asked either from the unit cell biology or Biota and environment.

Botany Practical – Grade XI

- Use and maintenance of compound microscope.
- Study of museum specimen and slides:
 - Types of bacterial cells;
 - Spirogyra filaments;
 - Mucor: Culture to demonstrate mycelium and sporangium; culture of yeast cells.
 - Study of vegetative and reproductive structure of Marchantia, Funaria, Dryopteris, Pinus.
- Study of different stages of mitotic and meiotic cell division through permanent slides and chart.
- Preparation of temporary slide to study cell structure:

Onion scale leaf, Leaf of Geranium or Zebrina or Tradescantia or any other locally available leaf.
- Description of following plants in semi-technical terms with their floral diagrams and formulae and identification and economic importance of at least one plant from each of the following families:

- a. Cruciferae (Brassicaceae) b. Solanaceae c. Leguminosae – Papilionoidae only
- d. Compositae (Asteraceae) e. Gramineae (Poaceae)
6. Study of freshwater ecosystem using an aquarium or pond showing a food chain.
7. Study of morphological adaptations of the hydrophytes, mesophytes and xerophytes.
8. Field study: Collection, identification of plants and animals from local area; Preservation of collected organisms in suitable preservatives and maintain a record. The students are also advised to observe different types of environmental pollution during their field study (Jointly with zoology Dept).

Zoology Practical – Grade XI

1. Study of permanent slide and museum specimen:
Paramecium, Plasmodium, Sycon, Hydra, Fasciola (Liver fluke), Taenia (Tape worm), Ascaris (Round worm), Pheretima (Earthworm), Hirudinaria (Leech), Palaemon (Prawn), Cancer (Crab), Periplaneta (Cockroach), Pieris (Butterfly), Bombyx (Moth), Aranea (Spider), Palamnaeus (Scorpion), Scolopendra (Centipede), Julus (Millipede), Helix (Garden Snail), Asterias (Starfish), Labeo (Rohu fish), Rana (Frog), Bufo (Toad), Hemidactylus (Wall-lizard), Chelone (Turtle), Columba (Pigeon), Rhinolophus (Bat) and Funambulus (Squirrel).
2. Preparation of temporary slide and their study:
 - i. Striated muscle fibre (thigh) of frog. ii. Setae and ovary of earthworm.
 - iii. Squamous epithelial cell of human cheek.
3. Study of histological structure through permanent slides of skin, oesophagus, stomach, intestine, rectum, liver, pancreas, lung, kidney, testis and ovary of frog.
4. Study of adaptational features of a primary aquatic animal (Labeo), secondary aquatic animal (Turtle), arboreal (Calotes, Tree frog), primary volant (Pigeon or other birds) and secondary volant (Flying fish, Bat)
5. Dissection of animal provided so as to expose their:
 - a. **Earthworm:** General anatomy, alimentary canal, nervous system and reproductive organs.
 - b. **Frog:** General anatomy, alimentary canal, arterial and venous systems, reproductive organs and brain.

COMPULSORY ENGLISH

Full Marks: 100

Teaching Hrs: 150

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 structure 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 Circumstances ◆ Leisure Activities and Skills ◆ Active ◆ 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

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

Essays

1. Barbara Holland, "Speaking of Children"
2. Joan Didion, "In Bed"
3. Isaac 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"
7. Patricia Hampt, "Look at a Teacup"

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 Hempel, "Look at a Teacup"
5. Eudora Welty, "A Worn Path"

Play

1. R.N. Tagore, "Malini"

COMPUTER SCIENCE

Full Marks: 100

Teaching Hrs: 150

I. Introduction:

Information Technology has become a part of contemporary society and as a potential tool in the socio-economic development of country. As Information technology manpower is the backbone for the rapid development of ICT sector in the country, government of Nepal has accordingly identified IT as a priority sector. Keeping in view the importance of computer technology in general and indispensability of its knowledge and skill to the society in general and to the students of higher secondary level in particular, the course seeks to introduce computer science to acquaint the learner with the basic skills of computer literacy.

II. General Objective:

The general objectives of this course are to:

1. help establish a strong foundation for the development of internationally competent human resources in the field of Information Communication and Technology;
2. help decrease the digital divide; and fulfill the middle level ICT Human Resources to the ICT industries.

III. Specific Objective:

1. After completing this course, the student will be able to:
2. explain the fundamental principle of computer system mechanism and Information and Communication Technology;
3. identify computer recourse for any specific purpose PC based application in the real life situations;
4. solve the office automation related system problems, general skill about network, internet, email and web site design;

5. provide computing knowledge and skill to individuals or organization;
6. engage in higher study of computer science and information technological course in the country or abroad;
7. provide the services as instructor of computer sciences course in schools or institutions;
8. state programming concept and tools;
9. explain the state-of-art information technology and works to change agents for spreading ICT culture in their society; and
10. encourage the student for visit the hardware and software industries, e-communities centers.

IV. Course Contents:

Course Contents

UNIT-1 Introduction and Evolution of Computer

- 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 Computer

- 2.1 On the basis of working principle - Analog, Digital and Hybrid Computers
- 2.2 On the basis of size - Super, Mainframe, Mini and Microcomputers
- 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

- 3.1 Decimal, Binary, Octal, Hexadecimal Number System & conversion
- 3.2 9's and 10's complements decimal subtraction
- 3.3 Calculation in Binary - addition, subtraction, One's and Two's Complement Methods of binary subtraction

UNIT-4 Logic Function and Boolean Algebra

- 4.1 Logic Function and Boolean Algebra
- 4.2 Introduction of Truth Table, Boolean Expression
- 4.3 Logic Gates -AND, OR, NOT, NAND, NOR, XOR and XNOR - its 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

- 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 Concept of System Buses: Data Bus, Address Bus, Control Bus
- 5.6 Memory - Primary and Secondary, Cache(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, Touch Pad 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 Ports, 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 Utilities Software
 - 5.14.3 Computer Virus and Antivirus

UNIT-6 Operating System

6.1 Fundamental Concept

- 6.1.1 Introduction to Operating System
- 6.1.2 Role of Operating System
- 6.1.3 Functions of an Operating System
- 6.1.4 Types of Operating System: Based on Processing Method (Batch, Multitasking, Multiprocessing, Timesharing, Real Time), Based on User Interface (GUI, CUI), Based on Mode of User (Single-user & Multi-user)

6.2 Disk Operating System (DOS)

- 6.2.1 Introduction to CUI and its feature
- 6.2.2 Common DOS Commands (External and Internal Commands)
- 6.2.3 Concept of File and Directory
- 6.2.4 Wildcards and Pathname
- 6.2.5 System Files: Config.sys, IO. sys, MSDOS. sys, autoexec.bat

6.3 Windows Operating System

- 6.3.1 Introduction to GUI and its features
- 6.3.2 Working with a Window Environment
- 6.3.3 Working with a Windows Application Program
- 6.3.4 Working with Files and Folders
- 6.3.5 Customizing the Taskbar and Desktop
- 6.3.6 Customizing Windows
- 6.3.7 Use of Accessories

6.4 Concept of Open Sources Operating System

- 6.4.1 Introduction to Open Sources Operating System
- 6.4.2 Introduction to Linux, UNIX

UNIT-7 Programming Concepts & Logics

- 7.1 Programming Languages (Low level, High level, 4 GL)
- 7.2 Compiler, Interpreter and Assembler
- 7.3 List of high level Programming Language
- 7.4 Difference between Program and Software
- 7.5 Concept of Programming Statement
- 7.6 Syntax and Semantics errors
- 7.7 Program Control Structures: Sequence, Selection and Iteration.
- 7.8 Program Design tools- Algorithm, Flowchart and Pseudo code
- 7.9 Introduction to Data Type
- 7.10 Codes: Absolute Binary, BCD, ASCII, EBCDIC, Unicode

UNIT-8 Application Package

8.1 Word Processor

- 8.1.1 Concept of Word Processor
- 8.1.2 Types of Word Processing
- 8.1.3 Basic 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 Merge
- 8.1.11 Document Collaboration
- 8.1.12 Working with Outlines and Long Documents
- 8.1.13 Working with WordArt and Charts
- 8.1.14 Project Work on Word 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 Worksheet
- 8.2.5 Creating and Working with Charts
- 8.2.4 Managing Workbooks
- 8.2.5 General Functions and Formulas
- 8.2.8 Data Filter and sorting
- 8.2.9 Working with Other objects
- 8.2.10 Data Analysis and PivotTables
- 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
- 8.3.3 Basic fundamental of Presentation
- 8.3.4 Editing a Presentation
- 8.3.5 Design and Formatting Presentation
- 8.3.6 Transition of Presentation
- 8.3.7 Animation and Custom Animation
- 8.3.8 Working with Tables, Graphics and WordArt
- 8.3.9 Working with Graphs and Organization Charts
- 8.3.10 Working with Multimedia
- 8.3.11 Project Work on Presentation

UNIT- 9 Internet and E-mail

9.1 Internet

- 9.1.1 Introduction of Internet
- 9.1.2 Uses of Internet:
- 9.1.3 Concept of Protocols
- 9.1.4 Web Browser, Web Page, Website, Web Server, URL, DNS
- 9.1.5 Search Engine, Messenger Services
- 9.1.6 Setting Browser Properties
- 9.1.7 Setup Network Connection

9.2 E-mail

- 9.2.1 Concept of E-mail
- 9.2.2 Uses of E-mail
- 9.2.3 Different types of E-mail Account
- 9.2.4 Web Based E-mail and POP E-mail

Unit- 10 Web Page Designing

- 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 an Ordered and Unordered List 10.6 Insert Images and Objects 10.7 Create Hyper Link
- 10.8 Create Table 10.9 Design Frames and Form 10.10 Concept of CSS and Script Language
- 10.11 Webpage Design and Editing Tools 10.12 Project Work on Web Page

UNIT-11 Final Project Work

- 11.1 Project Work on Webpage or Spread Sheet
- 11.2 Documentation of the Project