BIOLOGY

Grade: XII

Full Marks: 100 (75t + 25p)

Teaching Hours: 150

1. Introduction

Biology for Grade XII builds on the foundation of Biology and seeks to widen student's knowledge and practical understanding of the life process. It inculcates theoretical understanding, practical work out and analytical thinking. This course is designed to make the students better prepared for further studies in biological sciences.

2. General Objectives

The general objectives of this course are:

a) To provide the concept of biology and encourage the learners to use the knowledge in day to day life
b) To make the learners aware of the present development in the biological science with reference to genetics , physiological and human biology ,and
c) To prepare the students to take up advanced studies in biology at university level and encourages learners to be familiar with elementary knowledge of biotechnology and to work in the field of health, agriculture and industrial sectors

3. Specific Objectives

On completion of the course, the students will be able to

i. Describe the plant and animal tissue and anatomy structure of higher plants as well as their functional processes;
ii. Explain the developmental processes of typical plant and animal types;
iii. Explain the structure of human body-organs and systems;
iv. Discuss the role of hormones controlling various organs;
v. Describe common and socially significant human diseases;
vi. Explain elementary genetics and its usw in some technical fields; and
vii. Describe the application of biology in health, agriculture and various industrial sectors.

BIOLOGY

Course Content

Section A (Botany)

Teaching hour: 75

Full marks: 37.5

Unit-1: Anatomy and Physiological of Organisms

- **Plant anatomy:** Types of tissues, meristematic and permanent tissues;
  Internal structure of dicot and monocot root, stem and leaf; Secondary growth of dicot stem.
- **Plant physiological:**
  i. **Water relation:** Osmosis, diffusion, ascent of sap 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: Axons, Gibberellin, Cytokine
  v. **Plant movement:** Concept of growth and turgor movement.

Unit-2 : Genetics

Elements of heredity and variation; Genetic material (DNA and RNA), Genetic code, Gene 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 colour of Drosophila and colour blindness in man)

Unit-3: Developmental Biology

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

- Introduction to biotechnology , tissue culture, concept of breeding technique,
- Disease resistance plants, green manures
- Genetic engineering and its application

Unit wise weightage for Botany Grade XII

				Types of questions asked in the examination		
Title	**Teaching hour**	**Marks**		**Very short question (1 mark)**	**Short questions (3 marks)**	**Long questions (7.5 or 8 marks)**
1.Anatomy and Physiology of organisms	27	13.5		3	1 or 1 opt	1 or 1 opt (7.5 or marks)
2. Genetics	32	15		1 or 1 opt	2 or 1 opt	1 (18 marks)
3.Developmental Biology	10	5		2 or 1 opt	1	X
4.Application of Biology	8	4		1 or 1 opt	1	X
	75	37.5		7 quest. x 1 mark	5 quest. X 3 marks	2 quest. 7.5 marks & 8 marks
				Total 7 marks	**Total 15 marks**	**Total 15.5 marks**

Format of question model for biology Grade XII

Section A (Botany)

1) Answer in very short; any seven — 1 mark * 7 quest = 7 marks
   Total question to be asked – 10
2) Describe in brief; any five
   Total questions to be asked -7 — 3 marks * 5 quest = 15 marks
3) Long answer questions (two questions) — 8 marks + 1.5 marks = 15.5 marks
   one question is given as option as "or"

Total = 37.5 mark

Note:

1. There will be separate answer sheets for section A (botany) and section B (Zoology)
2. Total exam time period of theory will be 3 hrs. For both the sections A and B.
3. Concerned examiners will evaluate both the papers separately
4. The pass marks is 27. The students must pass in Botany and Zoology jointly.

Time schedule for questions

Very short questions – 1 mark - maximum 1 min

Short questions- 3 marks -maximum 7-8 min

Long question- 8 or 7.5 marks – maximum 23-24 min

Course Content

Section A (Zoology)

Teaching hour: 75
Full marks: 37.5

Unit -1: Animal Tissues

Epithelial; connective, muscular and nervous tissues

Unit-2 : Developmental Biology

i. **Development of frog:** Fertilization, cleverage, morulation, blastulation, gastrulation, formation of germinal layers, coelom and tissue formulation.
ii. Gametogeneisis in animal.

Unit-3 : Human Biology And health

- 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 formation, osmorehulation and domeostatic 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, function and disorders of pituitary, thyroid, parathyroid, pancreas and adrenal glands.
- Sense organs: Structure and functions and disorders of pituitary, thyroid, parathyroid, pancreas and adrenal glands.
- Sense organs: Structure and function of eye and ear
- Human population: Growth , problem and control strategies
- Human Diseases:
    a) Socially significant: Drug abuse, alcoholism and smoking
    b) Communicable : Typhoid, Tuberculosis, Ascariasis and AIDs
    c) Non-communicable: Cancer
    d) Concept of kalazar and hepatitis

Unit-4 : Application of Biology

- Antibiotics vaccines
- Tissue and organs transplantation
- Test-tube baby
- Introduction to poultry farming and fish farming

Zoology Practical Grade XII

1. **Experiments of biochemistry**
    a) Experiment to demonstrate the action of saliva on starch
    b) Experiment to detect the presence of starch in a given solution.
    c) Experiment to detect the presence of sugar in urine
    d) Experiment to detect the presence of protein in a given solution (hen's albumen)
    e) Study the effect of temperature, ethyl alcohol, and pH on enzymatic action of saliva.
    f) Measurement of human blood-pressure with sphygmomanometer.
2. *Study the permanent slides of different types of animal tissues:*
   Squamous, columnar, cuboidal, areolar, adipose, hyaline and bone
3. *Study the permanent slides of following histological organs of mammal:*
   Skin, stomach, intestine, liver, pancreas, kidney, lung, testis and ovary
4. Study the bones of rabbit (Articulate and disarticulate) or models of human bones.
5. Study of embryological permanent slides of frog : Cleavage, Blastula and gastrula
6. Dissection of a mammal so as to expose its:
    i. General anatomy
    ii. Alimentary canal;
    iii. Arterial an venous systems;
    iv. Brain;
    v. Reproductive organs.

Botany Practical Grade XII

1. **Experiments on plant physiology**
    a) Experiment to demonstrate the process of osmosis
    b) Experiment to demonstrate the process of ascent of sap
    c) Experiment to demonstrate the unequal transpiration from two surfaces of dorsiventral
    d) Experiment to demonstrate that the chlorophyll is essential for photosynthesis
    e) Experiment to demonstrate the rate or transpiration by Ganong's photometer
    f) Experiment to demonstrate that the carbon dioxide is essential for photosynthesis
    g) Experiment to demonstrate the process of evolution of oxygen during photosynthesis
    h) Experiment to demonstrate the aerobic and anaerobic respiration
    i) Study on effect of growth hormones on germination and shoot elongation
    j) Demonstration of plant tissue culture
    k) Demonstration of yeast culture
    l) Preparation of DNA control
2. **Demonstration of Mendalian Genetics using maize cob:**
    I. To demonstrate segregation of characters in a monohybrid cross
    II. To demonstrate independent assortment of characters in a dihydric cross

3. Study the permanent slides of different types of simple , permanent and complex plant tissues
4. Demonstration of vegetative propogation
5. Study the permanent slides of
    i. TS on anther
    ii. L.S of ovule of dicot plant
    iii. Structure of embryo
6. Preparation of temporary slide of following plant materials
    i. T.S of dicot root, stem and leaf
    ii. T.S of monocot root stem and leaf

Chemistry
Grade: XI

Full Marks: 100(75 T+25P)
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 man
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 reacted numerical problems))

2.4. Avogadro's Hypothesis and Its Applications:

1 Development of Avogardro'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 Masse:

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. Charle's law and Kelvin scale of temperature
3. application of Charle's law and Boyle's law
4. Combined gas law, ideal gas equation and universal gas constant
5. Dalton's law of partial pressure
6. Mathematical derivation of Dalton's law and their applications
7. Graham's law of diffusion and its applications
8. Kinetic model of gas and its postulates
9. 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
    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 Statem:

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

Unit 4: Atomic Structure **- 10 teaching hours**

1. Discovery of fundamental particles of atom (electron, proton and neutron)
2. Concept of atomic number, mass number, fractional atomic mass, isotopes, isobars
3. Rutherford's α ray scattering experiment and nuclear model of atom; limitation
4. Bohr's model of atom and explanation of hydrogen spectra
5. Limitation of Bohr's model of atom
6. Elementary idea of quantum mechanical model

i. Dual nature of electron (de-Broglie equation)
ii. Heisenberg's uncertainty principle
iii. Probability concept

7 Shape of atomic orbital (s and p orbitals only)
8 Quantum numbers
9 Pauli's exclustion principle
10 Hund's rule of maximum multiplicity
11 Aufbau principle and Bohr Bury rule
12 Electronic configuration of the atoms and ions(Z = 1 to 30)

Unit 5: Nuclear Chemistry - 3 Teaching hours

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

Unit 6: Electronic Theory of Valency and Bonding - 8 teaching hours

1 Basic assumption of electronic theory of valency
2 Octet rule
3 Ionic bonds, ionic compounds and characteristics of ionic compounds. Lewis symbol to represent the formation of ionic compounds
4 Covalent bonds, covalent compounds and characteristics of covalent compounds – Lewis structure of some typical covalent compounds
5 Co-ordinate covalent bonds. Lewis structures of some typical co-ordinate covalent compounds
6 Exception of the octet rule
7 Partial ionic characters of covalent compounds. Non-polar and polar covalent molecules
8 Dipole moments and its application
9 Some special types of bonds: hydrogen bond and its types, metallic bond, 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^-
10 Classification of crystalline solids
i. Ionic solid
ii. Covalent solid
iii. Molecular solid
iv. Metallic solid

Unit 7: Periodic Classification of Elements - 6 teaching hours

1. Introduction
2. Mendeleev's periodic law and periodic table
3. Anamolies of Mendeleev's periodic table
4. Modern periodic law, and modern periodic table

5. Advantages of modern Periodic table
6. Division of elements into s,p, d and f blocks
7. Periodicity of physical properties: valency , atomic radii, ionic radii ionisation energy, electron affinity and electronegativity (general trends only)

Unit 8: Oxidation and Reduction - 6 teaching hours

1 Classical concept of oxidation and reduction
2 Electronic interpretation of oxidation and reduction
3 Oxidation number and rules for the assignment of oxidation number
4 Differentiate between oxidation number and valency
5 Oxidising and reducing agent
6 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 (Kc) and its characteristics
   - Homogenous and heterogeneous equilibrium
   - Relation between Kp and Kc (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 form
   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 orthophospheric 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 burax, 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 metalurgical 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 Lassaegne'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 herterolytic fission
2 Electrophile , nucleophiles and free- radicals
3 Inductive effect, +I and –I effect

Unit 15: Hydrocarbons

15.1 Sources: - 4 teaching hours

Origin of coal and petroleum , hydrocarbon from petroleum cracking and reforming , aliphatic and aromatic hydrocarbon form coal, quality of gasoline, octane 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 Grigrand's reagent
   - Wurtz reaction
   - From aldelydes and ketones
2 Physical properties
3 Chemical properties: Substitutions reaction, oxidation, pyrolysis or cracking aromatization

15.3. Alkenes : - 4 teaching hours

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

15.4. Alkynes :

- 3 teaching hours

Ethyne

1 Preparation form i. carbon and hydrogen ii. Kolbes electrolysis iii. 1,2 dibromoethane

2 Lab preparation of ethyne
3 Physical properties
4 Chemical properties: Addition (H_2,X_2, HX, H_2O, O_3), Acidic nature (action with ammonical $AgNO_3$ and ammonical Cu_2Cl_2) , Oxidation with alkaline $KMnO_4$, Polymerization uses of ethyne

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 form the given mixture of volatile and non volatile (demonstration of sublimation process)
3. To separate a mixture of two soluble solids by fractional crystallization (KNO_3 + 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 BaCl2 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.

The weightage of content distribution for the three types of questions form different sections of the curriculum will be as follows:

	Units	Teaching hours	V.S.Q.	S.Q.	L.Q.
	1	3	×		
	2	17	2		
	3	14	2		
	4	10	2		
	5	3	1		
	6	8	2		
	7	6	1		
	8	6	1		
	9	5	1		
	10	12	2		
	11	23	2		
	12	6	1		
	13	10	1		
	14	16	2		
	15	11	2		
Total	**15**	**150**	**22**	**7**	**4**

Prescribe textbook- To be written.

Reference books

Chemistry
Grade: XII

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Teaching Hours: 150T+50P

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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: Chemical Bonding and Shape of Molecules - 3 teaching hours

1 Hybridization and concept of sigma and pi bond

2 Valence shell Electron Pair Repulsion (VSEPR) theory

3 Prediction of molecular geometry (Shape of molecules) on the basis of VSEPR and hybridization. (BeF_2, BF_3, NH_3, H_2O, CH_4, H_2O, C_2H_2 C_2H_4 H_2S)

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 molarity

6 Selection of indicators in acid-base titration and P^H 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 interm of K_a, K_b and pK_a and pK_b values

5 Acid-base concept

i. Arrhenius concept of acids and bases.

ii. Bronsted lowrry concept of acids and bases

iii. Lewis concept of acids and bases.

6 Ionization of water, pH and pH scale.

7 Hydrolysis of salts. (qualitative concept)

8 Solubility product principle and its application

9 Common ion effects and its application

10 Application of solubility product principle in qualitative analysis

11 Buffer Solution

(Solving numerical problems related with solubility, solubility product, pH and pOH)

Unit 4: Electrochemistry - 10 teaching hours

1 Introduction

2 Electrolysis; strong and weak electrolyte

3 Arrehenius theory of ionization

4 Faraday's laws of electrolysis

5 Criteria of product formation during electrolysis
6 Electrolytic conduction, equivalent and molar conductivities
7 Variation of conductivity with concentration
8 Electrode potential, standard electrode potential,standard hydrogen electrode and its applications
9 Eletrochemical series and its use to predict the feasibility of redox reactions
10 Electrochemical cell (Galvanic cell)
11 EMF of electrochemical cell in the standard state

(Solving related numerical problems)

Unit 5: Energetics of Chemical Reactions - 8 teaching hours

1 Introduction , unit of energy
2 Some thermodynamical terms: system, surrounding , boundary , universe different types of system, state function, state variables and internal energy
3 Exchange of energy between the system and surrounding
4 Different types of thermodynamic process
5 The first law of thermodynamics
6 Sign convention of heat and work
7 Enthalpy, enthalpy change in chemical reactions
8 Hess's law of constant heat summation
9 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

1 Spontaneous process
2 Second law of thermodynamics
3 Entropy and its physical concept
4 Entropy change in phase transformation
5 Entropy and spontaneity
6 Entropy changes and their calculation
7 Gibb's free energy and prediction for the feasibility of reaction
8 Standard free energy change and equilibrium constant

9 Influence of temperature on spontaneous process
(Calculation involving in standard free energy change and equilibrium constant)

Unit 7: Chemical Kinetics - 10 Teaching hours

1 Concept of reaction rate
2 Average rate and instantaneous rate of a reaction
3 Factors that influences the rate of reaction
4 Rate law equation, rate constant and its units
5 I^{st} order, II^{nd} order, III^{rd} 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 trichloromethane from ethanol and proponone
- Physical properties of trichloromethane
- Chemical properties : oxidation reduction, action on Silver Powder, con. nitric acid, propanone, aqueous alkali, Carbylamine reaction , Remer Tiemann reaction , Iodiform 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 substitutre reactons
  - 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 form 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_5 $SOCl_2$
- 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 (Catalyic dehydrogenation)
- Laboratory test of ethanol
- Absolute alcohol, methylated spirit, rectified spirit; alcoholic beverage.

- Preparation and uses of ethan- 1, 2. diol (glycol)
- 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, brominaiton 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 form ethanol

4 Physical properties of ether

5 Chemical properties of etherxyethane

- action with HI , PCl_5, con. HCl, Conc. H_2SO_4 air and Cl_2
- Uses of ethoxy ethane

11.2 Aromatic Ether:

- Preparation of methoxy benzene (anisole)
- Halogenation, nitration and sulphonation reactions

Unit 12: Aldehydes and Ketones - 11 teaching hours

12.1 Aliphatic Aldehydes and Ketones

1 Introduction, structure of carbonyl group, nomenclature and isomerism in carbonyl compound

2 Preparation of aldehydes and ketones from

i. Dehydrogenation and oxidation of alcohol
ii. Ozonolysis of alkenes
iii. Acid chloride
iv. Gem dihaloalkane
v. Calalytic distillation of fatty acid
vi. Distillaiton of salt of fatty acid
vii. Calalyic hydration of alkynes

3 Physical properties

4 Chemical properties

i. Addition reaction: addition of H_2, HCN, $NaHSO_3$ and Grignand's reagents

ii. Action with ammonia derivatives; NH_2OH, NH_2-NH_2, phenyl hydrazine, semicarbazides and 2,4- DNP

iii. Reduction properties of aldelydes

- Oxidation with Tollen's reagent, Fehling's solution

iv. Aldol or condensation reaction; clemennson's reduction Wolf- Kischner reduction, Action with PCl_5, action with $LiAlH_4$

v. Special reaction of methenal; cannazzaro's reaction, action with ammonia, action with phenol. formalin and its uses

12.2 Aromatic Aldelydes and Ketones :

- Preparation of benzaldelyde from toluene
- Properties of benzaldelyde
- Important reaction benzaldelyde different form aliphatic aldelydes:
  - Perkin condensation
  - Benzoin condensation
  - Electrophilic substitution reaction
  - Cannizzaro's reaction
- Preparation of acetophenone by Friedal Craft's acylation

Unit 13: Carboxylic Acids - 10 teaching hours

13.1 Aliphatic Carboxylic Acids:

- Introduction, nomenclature, examples
- Preparation of monocarboxylic acids from

  i. aldehydes ii. nitriles iii. Grignard's reagents iv. dicarboxylic acid

  v. sodium alkoxide. vi. trihaloalkanes
- Physical properties of monocarboxylic acids
- Chemical properties: Action with alkalies metal oxides, metal carbonates, metal

bicarbonates, PCl_3, $LiAlH_4$ and dehydration of carboxylic acid, esterification, halogenation

- Effect of constituents on the acidic strength of carboxylic acid
- Laboratory preparation of methanoic acid
- abnormal behaviour 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 Acids:

- Preparation of benzoic acid
- Physical and chemical properties
- Uses of benzoic acid

Unit 14: Nitrocompounds: - 4 teaching hours

14.1 Aliphalic Nitrocompounds (Nitroalkane):

2 Introduction and nomenclature
3 Preparation from haloalkane and alkane
4 Physical properties
5 Reduction of nitroalkane
6 Uses

14.2 Aromatic Nitrocompounds:

1 Laboratory preparation of nitrobenzene
2 Physical properties
3 Chemical properties
    - Reduction in different media
    - Electrophilic substitution reactions
    - 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 Hoffmann's method

3 Preparation of primary amines form haloalkane , nitriles, nitroalkanes and amides

4 Physical properties

5 Chemical Properties: basicity of amines, comparative study of basic nature of 1^0, 2^0 and 3^0 amines. Reaction of Primary amines with chloroform, conc. HCl, R-X, RCOX and nitrous acid ($NaNO_2$ / HCl)

6 Test of 1^0, 2^0 and 3^0 amines. (nitrous acid test)

15.2 Aromatic Amine (Aniline):

1 Laboratory preparation of aniline

2 Physical properties

3 Chemical properties: bassicity of aniline, comparision of basic nature of aniline with aliphatic amines; alkylation , acylation , diazotization, carbylamine and coupling reaction

4 Electrophilic substitution : Nitration sulphonation and bromination

5 Uses of anitne

Unit 16: Molecules of Life - 8 teaching hours

1 Carbohydrates: definition, classification of carbohydrates, various examples of carbohydrate of different class. structure and glucose and fructose, function of carbohydrates , sugar and non-sugar

2 Protein :definition, amino acid , essential and non-essential aminoacids, peptide linkage, hydrolysis of aminoacids, denaturation of protein, zwitter ions, functions of aminoacids

3 Nucleic acid: definition, basic components of nucleic acid; doule helix, difference between RNA and DNA; biological function of nucleic acid

4 Lipid: definition, fatty acids, fat as ester of fatty acid and difference between fats and oils, function of lipid

5 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 Preparation of some polymers; PVC polyethene polystyreno 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 fungcides (examples and their uses)

Inorganic Chemistry

Section C

Unit 18: Heavy Metals -18 teaching hours

1 General Characteristics of Transition Metals

18.1. Copper:

1 Position in periodic table
2 Occurrence and extraction of copper form copper pyrites
3 Properties and uses
4 Chemistry of (i) blue vitriol (ii) black oxide of copper (iii) red oxide of copper

18.2 Zinc:

1 Position 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 mercur
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 and its uses
2 Preparation and uses of
   iv. Silver chloride
   v. Silver nitrate

Practical

Full Marks: 25
Pass Marks: 10

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

A. Experiments based on recovery and preparation of salt.

1. To recover blue vitriol crystal from the given mixture of copper sulphate and Sodium chloride;
2. To recover $CaCO_3$ from the mixture of $CaCO_3$ and $MgCO_3$ (dolomite); and
3. To obtain hydrated calcium sulphate form the given marble chips.

B. Experiments on volumetric analysis (Titration)

4. To prepare primary standard solution of Na_2CO_3 and standardize the given acid solution HCl by the standard solution;
5. To determine the strength of approximate $\frac{N}{10}$ NaOH solution with the help of standard decimal solution of HCl supplied
6. To determine the strength of bench sulphuric acid (H_2SO_4) with the help of standard NaOH or Na_2CO_3 solution and express the concentration in (i) normality (ii) molarity (iii) gm/litre (iv) percentage (Double titration)
7. To standardize the given approximate $\frac{N}{10} KMnO_4$ solution with the help of primary standard oxalic solution. (Redox titration) ;
8. To determine the enthalpy of neutralization of a strong acid and strong base;
9. To complete salt analysis by dry and wet ways. (at least 3 salts);
10. To detect foreign elements present in a given organic compounds. (N, S and X);
11. To identify the functional group present in the organic compounds. (OH, -COOH, - CHO, > CO, - NH_2); and
12. To test the presence of

a. Saturated or unsaturated fats,
b. Carbohydrate,
c. Proteins,
d. Phenol.

Note: The experiment no.9 requires 4 practical periods. The experiment no. 10 requires 3 practical periods, the experiment no. 11 requires 3 periods and remaining experiments require 1 period of each. (2 theory periods will be equivalent to 1 practical period.)

Evaluation Scheme

The chemistry theory paper (XII) 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);
(c) Long- answer questions (weightage of 10 mark of each.)

According to nature 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 examinee are required to answer 2 questions.

The weightage of content distribution for the three types of questions form different sections of the curriculum will be as follows:

	Units	**Teaching hours**	**V.S.Q.**	**S.Q.**	**L.Q.**
	1	3	1		
	2	8	1		

	3	12	1		
	4	10	1		
	5	8	1		
	6	6	1		
	7	10	1		
	8	3	1		
	9	8	1		
	10	10	1		
	11	4	1		
	12	11	1		
	13	10	1		
	14	4	1		
	15	7	1		
	16	8	2		
	17	10	2		
Inorganic Chemistry	18	18	3	1	0.5
Total	**18**	**150**	**22**	**7**	**4**

Prescribe textbook- To be written.

Reference books

COMPUTER SCIENCE
GRADE: XI

Full Marks: 100 (75T+25P)

Teaching Hours: 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
3. fulfill the middle level ICT Human Resources to the ICT industries.

III. Specific Objective:

After completing this course, the student will be able to:

1. explain the fundamental principle of computer system mechanism and Information and Communication Technology;
2. identify computer recourse for any specific purpose PC based application in the real life situations;
3. solve the office automation related system problems, general skill about network, internet, email and web site design;
4. provide computing knowledge and skill to individuals or organization;
5. engage in higher study of computer science and information technological course in the country or aboard;
6. provide the services as instructor of computer sciences course in schools or institutions;
7. state programming concept and tools;
8. explain the state-of-art information technology and works to change agents for spreading ICT culture in their society; and
9. encourage the student for visit the hardware and software industries, e-communities centers.

IV. 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 it's 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

8.2.6 Managing Workbooks
8.2.7 General Functions and Formulas
8.2.8 Data Filter and sorting
8.2.9 Working with Other objects
8.2.10 Data Analysis and 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 Introdution 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

V. Instructional Materials:

- To be guided by Teaching Manual

VI. Instructional Techniques:

- To be guided by Teaching Manual

VII. Evaluation Schemes:

a) Theory Evaluation:

- Short Questions
- Long Questions
- Short Notes

Theory Questions are guided by marks distribution and model questions.

b) Practical Evaluation:

S. No.	Unit	Topics	No of Exercise	Mini Projects Evaluation	Remarks
1	5	PC Component Identification	2	-	Practical Marks Evaluated By: External Examiner: 10 Internal Examiner: 15 Based on Mini Project, Lab Exercise and Final Project
2	6.3	Operating System(Windows)	4	-	
3	8.1	Word Processor	6	5	
4	8.2	Spreadsheet	5	5	
5	8.3	Presentation	4	5	
6	9	Internet, Email	4	2	
7	10	Web Page Designing (HTML)	6	5	
8	11	Final Project			

Lab exercises are guided by marks distribution and Teaching Manual.

VIII. Marks and Teaching Hours distribution

Units	Mark Distribution		Number of Hours	
	Theory	Practical	Theory	Practical
1	2		3	
2	3		5	
3	5		5	
4	5		10	
5	10		15	2
6	10	3	10	20
7	10		10	
8	15	15	10	22
9	10	5	10	16
10	5	2	5	7
11				
Total	**75**	**25**	**83**	**67**

IX. Reference books:

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- Subba, B.R***., Computer Science Grade-XII,*** **Kathmandu**: Taleju Prakashan.
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- Pudasaini, D.Shakar; Adhikari, N., ***A Text Book on Computer Science Grade XI,*** Kathmandu: Buddha Academic Enterprises Pvt. Ltd.
- Basandra, S. K. (2008), ***Computers Today Updated Edition,*** Galgotia Publication.
- Leon, Alexis and Leon, Mathews, ***Fundamental of Information Technology,*** New Delhi: Vikash Publishing Houses.
- Sinha, P. K. (2003), ***Computer Fundamentals (Cd) 4th Edition,*** BPP Publication.
- Rajaraman, V. (*2007), **Fundamental of Computer,** Prentics Hall, Fourth Edition.*
- URL: *http://www.w3.org/html/*
- URL: *http://en.wikipedia.org/*

HSEB
Computer Science-Grade XI
Model Questions

Full Marks: 75
Pass Marks: 27
Time: 3 Hrs.

Candidates are required to give their answers in their own words as far as pra figures in the margin indicate full marks.

Group – A
(Long Answer Questions)

Attempt all questions *[3x10=30]*

1. Draw a well-labeled diagram of typical architecture of a computer system and explain the main function of Control Unit and ALU. [4+3+3]

2. (a) What is an operating system? Explain any three functions of an operating system. [1+6]
   (b) The 'WiMP' environment is much more user-friendly why? [3]

   OR

   (a) What is cell addressing and explain different types of cell addressing used in Spreadsheet. [5]
   (b) Explain about the following HTML tag with example: <A>, <input> [5]

3. (a) Define flow-chart and pseudo-code. Explain their significance in programming. [5]
   (b) Write a pseudo-code to accept any three numbers and output the largest among them. [5]

Group – B
(Short Answer Questions)

Attempt any Nine Questions *[9x5=45]*

4. Classify the computers according to their generation based on the technology used. [5]
5. Differentiate between analogue and digital computer, explain with examples. [5]
6. What do you mean by number system? Why do digital computers use binary numbers for their operation? [2+3]
7. Convert these number [5]
   a) $(126)_{10} = (?)_2$
   b) $(11011)_2 = (?)_{10}$
   c) $(57)_8 = (?)_2$

   Perform following operations
   d) 1011 – 1001
   e) 1110 + 1110
8. State the Demorgan's theorem and verify it. [5]
9. What are logic gates? Construct the truth table of NOR operation. [5]
10. Write short notes on (any two): [5]
    (i) IDE (ii) SCSI (iii) Wave Camera
11. What are uses of internet? Write any five search engine name. [5]
12. Differentiate between System Software and Application Software with examples. [5]
13. What are DTP features in MS-Word? Write three features of Presentation Packages. [2+3]
14. Write an algorithm and flow chart to print the word "Hello" ten times using "while loop" [5]

COMPUTER SCIENCE
GRADE: XII

Full Marks: 100 (75T+25P)

Teaching Hours: 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 its 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
3. fulfill the middle level ICT Human Resources.

III. Specific Objective:

After completing this course, the student will be able to:

1. state the fundamental principle of computer system mechanism and information technology;
2. identify computer recourse for any specific purpose PC based application in the real life situations;
3. solve the office automation related system problems, general networking problems, and web site design;
4. provide computing knowledge and skill to individuals or organization;
5. engage in higher study of computer science and information technological course in the country or aboard;
6. provide the services as instructor of computer sciences course in schools or institutions;
7. discuss programming tool technique and concept about database and C programming;
8. discuss the state-of-art information technology and works to change agents for spreading ICT culture in their society; and
9. encourage the students to visit the hardware and software industries, e-communities centers.

IV. 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

2.2.1 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, Halfduplex,)
- 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), Unbound 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 Constants 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 & Associativety
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.)

V. Instructional Materials:

- To be guided by Teaching Manual

VI. Instructional Techniques:

- To be guided by Teaching Manual

VII. Evaluation Schemes

c) Theory Evaluation:

- Short Questions
- Long Questions
- Short Notes

Theory Questions are guided by marks distribution and model questions.

d) Practical Evaluation:

S. No.	Unit	Topics	No of Exercise	Mini Projects Evaluation	Remarks
1	2.2	Database Management System	10	10	Practical Marks Evaluated By: External Examiner: 10 Internal Examiner: 15 Based on Mini Project,
2	3.10	Networking	2	-	

3	4	C programming Language	30	15
4	10	Final Project		

Lab Exercise and Final Project

Lab exercises are guided by marks distribution and Teaching Manual.

VIII. Marks and hours distribution

Units	Mark Distribution		Number of Hours	
	Theory	**Practical**	**Theory**	**Practical**
1	10		15	
2	15	10	15	15
3	10		15	3
4	25	15	30	30
5	3		6	
6	3		6	
7	3		4	
8	2		3	
9	4		8	
10				
Total	**75**	**25**	**102**	**48**

IX. Reference books:

- Gurung, J.B.; Baskota, A; Baral, D.S.; Baral, D.; Niroula, R.; Dhakal, T.P***., A Text Book on Computer Science Part-B,*** Kathmandu: Bhundipuran Prakashan.
- Subba, B.R., ***Computer Science Grade-XII,*** Kathmandu: Taleju Prakashan.
- Baral, D.S.; Baral, D.; Ghimire; S.K. (2008), ***The Secretes of C Programming Language,*** Kathmandu: Bhundipuran Prakashan.
- Subba, B.R., ***Computer Programming,*** Kathmandu: Taleju Prakashan.
- Khanal, R. C. (2007), ***Computer Concept for Grade XII,*** Kathmandu: Ekata Publication.
- Pudasaini, D. Shakar; Adhikari, N., ***A Text Book on Computer Science Grade XII,*** Kathmandu: Buddha Academic Enterprises Pvt. Ltd.
- Balaguruswamy, E. (2000), ***Programming in ANSI C, Second Edition,*** Tata McGraw Hill Publishing Company.
- Gottfried, B.S. (2001), ***Schaum's Outline Series for Programming with C, Second Edition,*** Tata McGraw Hill Publishing Company.
- Yashavant, P. Kanetkar (2008), ***Let Us C E/D,*** BPB Publications.
- URL: http://en.wikipedia.org/

HSEB
Computer Science-Grade XII
Model Questions

Full Marks: 75
Pass Marks: 27
Time: 3 Hrs.

Candidates are required to give their answers in their own words as far as pra figures in the margin indicate full marks.

Group – A
(Long Answer Questions)

Attempt any Four Questions *[4x10=40]*

1. What is Entity-Relationship Data Model? Give an ER-diagram for a database showing fatherhood, motherhood and spouse relationship among men and women. [4+6]

2. The rate of interest offered by a bank on fixed deposit:
   i) Period < 6 month 5%
   ii) Period 6 to 12 month 6%
   iii) Above 1 year 10%
   Write a flowchart and program using C language to calculate monthly interest of customer. [3+7]

3. Write a program that reads several different names and addresses into the computer, rearrange the names into alphabetical order. Make use of structure variables. [10]

4. Write a program that will read successive records from the new data file and display each record on the screen in an appropriately formatted form. [10]

5. Write a program with function and input menu from keyboard & activate these functions:
   i) print a circle()
   ii) reverse string() [10]

Group – B
(Short Answer Questions)

Attempt any Seven Questions *[7x5=35]*

6. What is feasibility study? Why feasibility study is important in system analysis phase?. Explain. [2+3]
7. What are the different types of LAN topology? Write merits and demerits of Star Topology. [2+3]
8. Write short notes on (any two): [2.5+2.5]
   (a) Coaxial Cable (b) Fiber-Optic Cable (c) Switch
9. Differentiate between array and structure with suitable examples. [2.5+2.5]
10. What do you mean by parameter "Passing by value" and "Passing by reference" in C? Explain with suitable example. [2.5+2.5]
11. Explain the terms Polymorphism and Inheritance. [2.5+2.5]
12. Describe the limitations of using *getchar()* and *putchar()* functions for reading strings. [2.5+2.5]
13. What do you understand by AI? How it may effect the society? [2.5+2.5]
14. Write short notes on (any two): [3+2]
    (a) Cyber Law (b) Normalization (c) Context Diagram [2.5+2.5]

COMPULSORY ENGLISH

GRADE: XII

Full marks 100

Teaching hours 150

I. Introduction

This course in a continuation of Grade XI English. It builds on to the language skills and communicative competence introduced in the previous year.

II. General Objective

The general objectives of this course are:

1. To provide students techniques in the use of English for academic and communicative purposes,
2. To train them in the functional, notional and grammatical areas of English language use,
3. To make them see the relationship between structures and meaning, and
4. To teach them structures in a context.

III. Specific Objective

The specific objectives of this course (Compulsory English II) are:

1. To teach students language use and functions,
2. To enable them to establish a link between structure and meaning,
3. To provide them with more examples of language in context, and
4. To engage them in more fruitful reading.

IV. Course Contents

The contents of this paper can be divided into two components:

1. Core English
2. Extensive Reading and Writing

This text for language skills has the following units:

- Experience
- Appearance
- Relating past events
- Attitudes and reactions
- 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

6. Moti Nissani, "Two Longterm Problems"
7. Marsha Traugot, "The Children Who Wait"
8. Martin Luther King, "I Have a Dream"
9. Ilene Kantrov, "Women's Business"

10. Liila, M and Barry, C. Bishop, "Hurried Trip to Avoid a Bad Star"
11. Germaine Greer, "A Child is Born"

Stories

12. Poe, 'The Tell-Tale Heart"
13. Dylan Thomas, "A Story"
14. James Joyce, 'The Boarding House"
15. G. Garcia Marquez, "The Last Boyage of the Ghost Ship"
16. Chekhov, "About Love"
17. Brothers Grimm, "Hansel and Gretel" and its variations

Play

18. W.B. Yeats, "Purgatory"

V. Evaluation Scheme

This paper carries 100 marks, which will be divided as follows:

Core English	60%
Extensive Reading and Writing	40%

Skill-wise the weightage will be as follows:

Reading	40%
Writing	40%
Grammar and language use	20%

Short and long answer questions, questions on vocabulary, grammar and language use, composition, letter writing, essay writing, note making, summary writing, filling in the gaps, rewriting sentences, etc. will be used to assess students' achievement in their studies. Questions will be set to test students' knowledge of the content of the textbooks as well as their ability to use the linguistic tools and skills outside the prescribed textbooks.

VI. Prescribed Texts

1. Doff, Adrian, Christopher Jones, Keith Mitchell (1984), Meanings into Words (Upper – Intermediate) Student's Book. Cambridge: Cambridge University Press.
2. Meanings into Words (Workbook). Cambridge. Cambridge University Press.
3. Lohani, Adhikari, & Subedi (1998), The Heritage of Word,. Kathmandu: M.K. Publisher.

VII. Reference books

1. One of the followings dictionaries:
    a. Cambridge International Dictionary of English, Cambridge: C.U.P. 1995.
    b. Collins COBUILD English Dictionary (New Edition). London : Harper Collins, 1995
    c. Longman Dictionary of Contemporary English (Third Edition) Harlow: Longman Group, 1995.
    d. Oxford Advanced Learner's Dictionary (Fifth Edition) Oxford: O.U.P. 1996.
2. Swan, Michael (1984), Basic English Usage. Oxford: O.U.P.
3. Doff, Adrian, Christopher Jones, . Keith Mitchell (1984), Meanings into Words (Upper-Intermediate)) Teacher's Book. Cambridge: Cambridge University Press.
4. (1984) Meanings into Words (Upper-Intermediate) Cassette (Student's Book) Cambridge: Cambridge University Press.
5. (1984) Meanings into Words, (Upper-Intermediate) Cassette (Drills)

Mathematics
Grade: XI

Full Marks: 100
Teaching hours: 150

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 antiderivative 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 $\left(\frac{1}{x}, \frac{x^2-a^2}{x-a}, \frac{1}{x+a,}, x^2, x^3\right)$, 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), Propertics 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 $\left(\underset{x \to a}{Lim} \frac{x^n - a^n}{x - a}, \underset{x \to 0}{Lim} \sin x \frac{\sin x}{x}, \underset{x \to 0}{Lim} \frac{e^x - 1}{x}, \underset{x \to 0}{Lim} \frac{\log(1+x)}{x} \right)$

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:

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

Mathematics
Grade - XI
Group 'A' [5 × 3 × 2]

Attempt ALL questions.

1. a) Write truth table for $p \wedge q \Leftrightarrow p \wedge q$, hence draw a conclusion from the truth table.

   b) If $a = \{1, \ 2, \ 3\}$ find the relation on A satisfying the condition $x + y < 4$. Is this relation a function? Give reason.

   c) Test periodicity and symmetricity of the function $y = \cos x$.

2 a) Find the value of x for which $\sin x = \frac{1}{2}$ and $\cos x = \sqrt{\frac{3}{2}} (0 \le x \le 2\pi)$.

   b) Using mathematical induction, prove that $1 + 3 + 5 ..... + n = n^2$.

   c) Find the inverse $\begin{pmatrix} 3 & 2 \\ -1 & 6 \end{pmatrix}$.

3 a) Solve the following system of linear equations by inverse matrix method, if possible:

   $5x - 3y = 9$

   $10x - 6y = 16$

   b) Find the value of the real numbers x and y if $(x + z) + yi = (3 + i)(1 + 2i)$.

   c) Determine the nature of the roots of the equation $2x^2 + 3x - 2 = 0$.

4 a) Show that the points $(1, \ 2)$ and $(2, \ -3)$ lie on the opposite side of the line $5x - 2y - 3 = 0$.

   b) Find the equation of the circle concentric with $x^2 + y^2 - 8x - 12y + 14 = 0$. and passing through $(5, \ 4)$.

   c) Find the limit of $f(x) = \frac{x^2 - 4}{x - 2}$ as $x \to 2$. Is $f(x)$ continuous? If not, find the point of discontinuity.

5 a) Find the derivative of $\sec^2 (\tan \sqrt{x})$.

   b) For any curve $y = f(x)$, what do $f'(x) > 0$ and $f'(x) < 0$ represent?

   c) Evaluate: $\int \frac{x}{(1 - x^2)^{3/2}} \, dx$.

Group 'B' [5 × 2 × 4]

6 a) If A, B and C are any three non-empty sets, prove that

$$A \cup (B \cap C) = (A \cup B) \cap (A \cup B).$$

OR

Define the absolute value of a real number. If a is any positive real number and $X \subseteq R$, prove that $|x| < a \Leftrightarrow -a < x < a$.

   b) Sketch the graph of $y = x^2 - 6x + 9$ indicating its different characteristics.

7 a) If $\cos^{-1} x + \cos^{-1} y + \cos^{-1} z = \pi$, Allow that $x^2 + y^2 + z^2 + 2xyz = 1$.

OR

State and prove sine law.

b) Prove that $\begin{bmatrix} a & b & c \\ a & b^2 & c^2 \\ b+c & c+a & a+b \end{bmatrix} = (b-c)(c-a)(a-b)(a+b+c).$

8 a) Applying Cramer's rule or row equivalent method, solve the system of linear equations :

$3x + y + 2z = -1$

$2x + 3y + z = 5$

$x + 2y - z = 8$

b) If the equation $x^2 + px + q = 0$ and $x^2 + qx + p = 0$ have a common root, prove that either $p = q$ or $p + q + 1 = 0$.

9 a) Prove that the line $y = mx + c$ is tangent to the circle $x^2 + y^2 = a^2$ if $c = \pm a\sqrt{1+m^2}$. Also show that $3x + 4y = 20$ is tangent to the circle $x^2 + y^2 = 16$.

b) Evaluate: $\lim_{x \to \theta} \frac{x\cot\theta - \theta\cot x}{x - \theta}$.

OR

A function $f(x)$ is defined as follows:

$$f(x) = \begin{cases} 2x-3 & \text{for } x < 2 \\ 2 & \text{for } x = 2 \\ 3x-5 & \text{for } x > 2 \end{cases}.$$

Is $f(x)$ continuous at $x = 2$. If not, how can $f(x)$ be made continuous at $x = 2$.

10. a) Find the derivative of $\sqrt{3-2x}$ from first principles.

b) Find area between the curves $y^2 = 4ax$ and $x^2 = 4ay$.

Group 'C' [5 × 6 = 30]

11. Define domain and range of a function. Find the domain and the range of the $f(z) = \sqrt{21 - 4x - x^2}$.

12. If AM, GM and HM be the arithmetic, geometric and harmonic means between two unequal positive numbers prove that:

i) $GM^2 = AM \times HM$ ii) $AM > GM > HM$

13. Derive the formula for the length of the perpendicular from a point (x, y) to a line $x\cos\alpha + y\sin\alpha = p$. Also, find the distance between the parallel lines $5x - 12y + 8 = 0$ and $10x + 24y - 3 = 0$.

Or

Find the condition that the general equation of second degree may represent a line-pair. If $3x^2 + 5xy - 3y^2 + 2x + 3y = 0$ represents a line pair, show that the lines are perpendicular.

14. Define conjugate of a complex number. Find the square root of $\frac{2 - 36\iota}{2 + 3\iota}$.

15. Find the local maxima and minima, and also the point of inflection (if exists) of the function $f(x) = 4x^3 6x^2 - 9x + 1$ on the interval $(-1, 2)$. Also, examine whether the function is increasing or decreasing at $z = 0$.

Or

Two concentric circles are expanding in such a way that the radius of the inner circle is increasing at the rate of $8cm \setminus \sec$ and that of the outer circle at the rate of $5cm \setminus \sec$. At a certain instant the radii of the inner and outer circles are respectively $24cm$ and $30cm$. At what rate does the area between the two circles changes?

Mathematics
Grade: XII

Full Marks: 100
Teaching hours: 150

I. Introduction:

This course is a continuation to the course of Grade XI. It further consolidates the concept learnt in Grade XI. For the completeness of the course it includes other areas in mathematics such as Mechanics, Group theory, Statistics and probability, Numerical methods.

Group (A) contains eleven units, and is compulsory while Group (B) and Group (C) each containing four units are optional. Students will be required to offer either Group (B) or Group (C).

II. Specific Objectives:

On completion of this course students will able to:

1. state basic principles of counting and find number of permutations and combinations of set of objects with various conditions;
2. prove binomial theorem for positive index, state exponential and logarithmic series, and apply them in solving problems;
3. understand group as algebraic structure and establish simple results on finite and infinite groups;
4. derive equations of parabola, ellipse and hyperbola, and find tangent & normal to the parabola;
5. locate points in space and derive the equation of plane;
6. define product of vectors and give their geometrical meaning and use it to find various results of geometry and trigonometry;
7. establish the relation between continuity and differentiability of a function, compute, derivatives of exponential, logarithmic and hyperbolic and inverse circular functions, apply Hospital's rule;
8. determine standard integrals, use partial fractions of integrate rational function;
9. define differential equations and different forms of solutions and use them in application;
10. state measures of dispersion and find coefficient of correlation and equation of regression;
11. define probability, establish basic laws of probability;
12. define parallelogram of forces, composition and resolution of forces, triangle of forces, and prove Lami's theorem;
13. find resultant of like and unlike parallel forces, moment of a force and moment of couple of forces;
14. state and use Newton's laws of motion. Find Impulse, work, Energy & Power, and acquaint with a projectile;
15. formulate linear programming problem, solve LPP graphically and by simplex method;

16. determine a root of equations by numerical methods; and
17. evaluate integrals by trapezoid and Simpson's rules.

III. Course Contents:

Group 'A'

Unit 1: Permutation and Combination. 10 hrs

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 the same object.
Combination of things all different, Properties of combination.

Unit 2: Binomial Theorem 10 hrs

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 hrs.

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

Unit 4: Conic Sections 12 hrs

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

Unit 5: Co-ordinates in Space 12 hrs

Co-ordinate axes, Co-ordinate planes, The octants,, Distance between two points, External and internal point 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 hrs

Cartesian representation of vectors, Collinear and non-collinear vectors, Coplanar and non-Coplanar 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 vector product, Properties of Vector Product, Application of product of vectors in plane trigonometry.

Unit 7: Derivative and its Application **14 hrs**

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 $f(x)^{g(x)}$.

L'Hospital's rule (for 0/0, ∞/∞), Differentials, Tangent and Normal, Geometric interpretation and application of Rolle's theorem and Mean value theorem.

Unit 8: Antiderivatives **7 hrs**

Antiderivatives, Standard integrals, Integrals reducible to standard forms, Integrals of rational functions.

Unit 9: Differential Equations and their Applications **7 hrs**

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

Unit 10: Dispersion, Correlation and Regression **12 hrs**

Dispersion, Measures of dispersion (Range, Semi interpqrtile 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 hrs**

Random experiment, sample space, Event, Equally likely cases, Mutually exclusive events, Exhaustive cases, Favourable 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: Statics **9 hrs.**

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 hrs**

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

Unit 14: Dynamics **9hrs**

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 hrs**

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

Group 'C'

Unit 16: Linear Programming **11 hrs**

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 hrs**

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

Unit 18: Computational Method (Continued) **8 hrs**

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

Unit 19: Numerical Integration **8 hrs**

Trapezoidal and Simpson's rules, estimation of errors.

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:

1. Adhikari, D.B. and et.al. ***Element of Mathematics Part II.*** Himaly Book stall.
2. Bajracharya, D.R.; Shrestha, R.M. and et.al. ***Higher Secondary Level Basic Mathematics (For Grade XII).*** Kathmandu: Sukunda Pustak Bhawan.
3. Bajracharya, P.M. and Basnet, G. (2008). ***Fundamentals of Mathematics (For Grade XII).*** Kathmandu: Buddha Academic Publishers and Distributors P. Ltd.
4. Balagurusamy, E., ***Numerical Methods***. India: Tata Mc Graw Hill.
5. Pant, S.R. and et.al. ***A Text-Book of Higher Secondary Mathematics (For Grade XII).*** Kathmandu: Buddha Academic Publishers and Distributors P. Ltd.
6. Ranganath, G.K. and Narayan, B.S. ***A Text-Book of Computer Oriented Numerical Methods and Linear Programming.***
7. Upadhyaya, M.P., ***An Introduction to Linear Programming***. kathmandu: Sukunda Pustak Bhawan.
8. Uprety, K.N. and Ghimire, K.P., ***Foundation of Mathematics, (For Grade XII).*** Pigeon Educational Publisher.
9. Sitaula, K., Sharma, B., Bhatta, C.R., ***Essential Mathematics***

अनिवार्य नेपाली

कक्षा : ११

पूर्णाङ्क : १००

पाठ्यभार: १५० घण्टा

पाठ्यक्रम परिचय :

यो पाठ्यक्रम उच्च माध्यमिक तहमा अध्ययन गर्ने विद्यार्थीहरूको नेपाली भाषासम्बन्धी आधारभूत क्षमताको विकासका निम्ति राखिएको हो । यस पाठ्यक्रममा मूलत: विद्यार्थीको पढाइ र लेखाइ क्षमताको विकाशका लागि आवश्यक पर्ने पाठ्यवस्तुहरू समावेश गरिएका छन् । यसका लागि रचनाको पठन र आस्वादन, व्याकरण, बोध र अभिव्यक्तिलाई अन्तर्सम्बन्धित गराई प्रस्तुत गरिएको छ । पाठ अन्तर्गत साहित्यक कृति रहेका छन् भने भाषाको प्रयोगलाई शुद्ध तथा परिष्कृत तुल्याउन व्याकरण राखिएको छ । बोध र अभिव्यक्तिमा पठनबोध सम्बन्धी विषय र अभिव्यक्ति सीपको विकासका लागि आवश्यक पर्ने पाठ्यवस्तुहरू राखिएका छन् ।

साधारण उद्देश्य :

यस पाठ्यक्रमले विद्यार्थीहरूमा निम्नलिखित क्षमताको अभिवृद्धि गर्नेछ ।

(क) स्तरअनुरुप 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 अभिव्यक्तिको क्षमता बढाउनेछ ;

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

(घ) व्यवहारिक लेखनसम्बन्धी अभिव्यक्ति क्षमताको विकास गर्नेछ ; र

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

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, व्यक्तिगत विवरण (बायोडाटा), तयार गर्न ; र

(ञ) स्तर अनुरूपका निबन्ध टिप्पणी र प्रतिवेदन लेख्न ।

क्र.सं.	पाठ	व्याकरण	बोध	अभिव्यक्ति	पाठ्य भार
१	**कविता** नेपाली हामी रहौंला कहाँ नेपालै नरहे – माधव घिमिरे	अ) नेपाली वर्ण (कथ्य र लेख्य) को पहिचान आ) (क) स्वर (ख) व्यञ्जन उच्चार्थ 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 अक्षरको प्रकार (स्व, स्वव्य, व्यस्य , व्यस्वव्य व्यव्यस्व, व्यव्यस्वव्य, व्यव्यव्यस्व) इ) शब्दलाई अक्षरमा विभाजन	वातावरण र स्वास्थ्य सम्बन्धी 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 नीराकरण आ) शब्दवर्ग: नाम, सर्वनाम, विशेषण र क्रियाको पहिचान इ) भाषिक त्रुटि नीराकरणमा शब्दकोशको प्रयोग र अभ्यास	निबन्धको अनुच्छेदबाट बोध र बुँदाटिपोट	-लैङ्गिक समतासम्बन्धी अनुच्छेद लेखन	८
४	**कथा** मधुमालती को कथा –रमेश विकल	अ) लेख्य चिह्न 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 देवकोटा	नेपाली शब्दको पहिचान, प्रकार र कार्य अ) शब्दको पहिचान आ) शब्दको प्रकार (क) स्रोतको आधार -तत्सम, तद्‌भव (अनुकरणात्मक समेत) र आगन्तुक (ख) संरचनाको आधार-मूल र व्युत्पन्न (ग) रूपायनको आधार-विकारी र अविकारी	निबन्धको मूल विचार र आशयको बोध	- निबन्धको मूल भाव/विचारको प्रस्तुति -निबन्ध लेखन, (सामाजिक, सांस्कृतिक विषयमा आधारित)	७

क्र.सं.	पाठ	व्याकरण	बोध	अभिव्यक्ति	पाठ्य भार
६	**कविता** हर्कबहादुर दिनेश अधिकारी	क) उपसर्गद्वारा शब्द निर्माण : अ) अ, अन, कु, बि, बे, बद, गैर, ना आ) अ, अन्, अधि, अनु, अभि, अति, अव, अप, उप, आ, उत्, दु, दुर, दुस्, निः, निर्, निस्, परा, परि, प्र, प्रति, वि, सम्, सु ख) द्वित्व प्रक्रियाद्वारा शब्द निर्माण पूर्ण, आंशिक र आपरिवर्तित द्वित्व शब्द निर्माण	शिक्षासम्बन्धी अनुच्छेदको बोध	निर्धारित अनुच्छेदको सङ्क्षेपीकरण	१०
७	**उपन्यासको अंश** एक चिहान हृदयचन्द्र सिंह, प्रधान	क) प्रत्ययद्वारा शब्द निर्माणः अ) अक्कड, अत, अन्त, आइ, आइँ/याइँ, 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, ईन/ईण, ईय, क, तर, तम, तव्य, ता, ति, त्व, मय, मान, वान, य ख) समासः अव्ययीभाव, तत्पुरुष, कर्मधारण, द्विगु (विग्रह र समास दुवै) (उपन्यासको अंशबाट प्रत्यय लागेका व्युत्पन्न शब्दको खोजी गरी थप शब्द निर्माण तथा निर्धारित अंश र अनुच्छेदबाट समस्त शब्दको खोजी	निर्धारित अंशबाट बुँदाटिपोट र सङ्क्षेपीकरण	पत्र परिचय लेखन	१०
८	**निबन्ध** म फूल लिएर आउनेछु सुधा त्रिपाठी	क) समास प्रक्रियाद्वारा शब्द निर्माण- द्वन्द्व र बहुव्रीहि समास (विग्रह समेत) ख) सन्धि र सन्धि भएका शब्दको पहिचान ग) वाक्यको पहिचान र प्रयोग -उद्देश्य र उद्देश्य विस्तार -विधेय र विधेय विस्तार -क्रियाका काल (भूत अभूत) -पक्षः सामान्य, अपूर्ण, पूर्ण, अज्ञात, अभ्यस्त -क्रियाका भाव : सामान्य, आज्ञा, इच्छा, संभावना र संकेत	निर्धारित अंशको पठन र विषयबोध (निर्धारित अंशको अनुच्छेदबाट बुँदाटिपोट गरी सङ्क्षेपीकरण)	-सरल वाक्य (उद्देश्य, उद्देश्य विस्तार, विधेय, विधेय विस्तार भएका)मा कुनै विषयवस्तु घटना आदिको वर्णन -विभिन्न काल र पक्षको प्रयोग गरी अनुच्छेद लेखन	१०

क्र.सं.	पाठ	व्याकरण	बोध	अभिव्यक्ति	पाठ्य भार
९	**कविता** मानुषी पारिजात	पदक्रम क) सामान्य पदक्रम ख) विशिष्ट पदक्रम (कविताका पंक्तिबाट सामान्य र विशिष्ट पदक्रमको अध्ययन)	वाणिज्य क्षेत्रसँग सम्बन्धित अनुच्छेदको बोध	-निर्धारित कविताको अध्ययनमा आधारित भई कुनै कृतिको पाठक प्रतिक्रिया लेखन	६
१०	**कथा** रातभरि हुरी चल्यो इन्द्रबहादुर राई	(क) कारक र विभक्ति अ) सरल र तिर्यक कारक आ)कारक कर्ता, कर्म, करणसम्प्रदान, अपादान, अधिकरण (ख) कारकीय अर्थ, विभक्तिको प्रयोग र पहिचान (ग) को, का, की; रो, रा, री तथा नो, ना, नी को प्रयोग	कानुन तथा प्रशासनसँग सम्बन्धित अनुच्छेदको बोध	-सरल र तिर्यक कारकको प्रयोग गरी कुनै विषय घट्ना 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	समाजशास्त्र सम्बन्धी अनुच्छेदको बोध	-पदपूर्ति सम्बन्धी विज्ञापन लेखन -व्यावसायिक विज्ञापन लेखन	७

क्र.सं.	पाठ	व्याकरण	बोध	अभिव्यक्ति	पाठ्य भार
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 विज्ञान प्रविधि सम्बन्धी 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	संचारसँग सम्बन्धित अनुच्छेदको बोध	-टिप्पणी लेखन/संम्पादकलाई चिट्ठीलेखन	७
१४	**उपन्यास**	वाक्यान्तरण (क) संरचनागत (सरल, मिश्र, संयुक्त) (ख) वाच्यगत (कर्तृ, कर्म, भाव) (ग) कथन (प्रत्यक्ष, अप्रत्यक्ष) (घ) ध्रुवीयता (करण, अकरण) (ङ) वाक्यसंश्लेषण	कृषि र वन सम्बन्धी अनुच्छेदको बोध	-निबन्ध (स्वास्थ्य, विज्ञान र प्रविधि नागरिक अधिकार र दायित्व, आर्थिक विकास आदि)	६
१५	**कथा** हारजित भवानी भिक्षु	वाक्य संश्लेषण (सरल वाक्यहरूलाई मिश्र वा संयुक्त वाक्यमा संश्लेषण)	कानुन, न्याय तथा मानव अधिकारसँग सम्बन्धित अनुच्छेदको बोध	प्रतिवेदन लेखन (गोष्ठी, भ्रमण, घट्ना आदिको)	१०
१६	**निबन्ध** खाद्य सङ्कट र जैविक विविधता डा.तीर्थबहादुर श्रेष्ठ	शब्दभण्डार (प्राविधिक तथा पारिभाषिक शब्द)	ग्रामीण विकाससँग सम्बन्धित अनुच्छेदको बोध	विज्ञान र प्रविधिसँग सम्बन्धित अनुच्छेद लेखन (जैविक विविधता, वातावरण, पुनर्नवीकरणीय उर्जा, विद्युतीकरण, आर्थिक विकास)	१०

क्र.सं.	पाठ	व्याकरण	बोध	अभिव्यक्ति	पाठ्य भार
१७	**नाटक** नालापानीमा बालकृष्ण सम	-क्रियाका भाव -उक्ति परिवर्तन -वर्ण र अक्षर	भाषा र साहित्यसँग सम्बन्धित अनुच्छेदको बोध	व्यावहारिक लेखन (समवेदना, श्रद्धाञ्जली, बधाइ, शुभकामना)	१०
१८	**कविता** कान्छी, भट्टी र देश कृष्ण सेन 'इच्छुक'	क्रियाका काल र पक्ष	इन्जिनियरङ सम्बन्धी अनुच्छेदको बोध	-पत्ररचना (निवेदन व्यावसायिक निमन्त्रण) -विज्ञापन	६
१९	**नाटक** बहुलाकाजीको सपना विजय मल्ल	वाक्यका प्रकार र वाक्यान्तरण	समाजशास्त्र सम्बन्धी अनुच्छेदको बोध	टिप्पणी लेखन -कानुन र नागरिक अधिकार -संचार माध्यम र जिम्मेवारी -जनता, जाति र भाषा	१०

सन्दर्भ सामाग्रीहरू :

१. घिमिरे, माधवप्रसाद, नेपाली हामी रहौंला कहाँ नेपालै नरहे, किन्नर किन्नरी, काठमाण्डौ : साझा प्रकाशन ।

२. पारिजात, मानुषी, बैँसालु वर्तमान ।

३. शेरचन, भूपी, मेरो देश, घुम्ने मेचमाथि अन्धो मान्छे ।

४. अधिकारी, दिनेश, हर्कबहादुर, धरतीको गीत, काठमाण्डौं : साझा प्रकाशन ।

५. 'इच्छुक', कृष्ण सेन, कान्छी भट्टी र देश, इच्छुक रचनावली भाग – २ ।

६. मैनाली, गुरुप्रसाद, छिमेकी, नासो, काठमाण्डौ : साझा प्रकाशन ।

७. भिक्षु, भवानी – हारजित ।

८. कोइराला, विश्वेश्वरप्रसाद – शत्रु, दोषी चस्मा, काठमाण्डौं : साझा प्रकाशन ।

९. विकल, रमेश, मधुमालतीको कथा ।

१०. राई, इन्द्रबहादुर (२०२७), रातभरि हुरी चल्या, विपना कतिपय, श्याम ब्रदर्स दार्जिलिङ् ।

११. देवकोटा, लक्ष्मीप्रसाद, भलादमी, लक्ष्मी निबन्ध संग्रह, काठमाण्डौ : साझा प्रकाशन ।

१२. अर्याल, भैरब, आलु ।

१३. शर्मा, श्यामप्रसाद, आइमाई साथी ।

१४. श्रेष्ठ, डा.तीर्थबहादुर (२०६५-२-३२), खाद्य सङ्कट र जैविक विविधता, हिमाल ।

१५. त्रिपाठी, सुधा (२०५३), म फल लिएर आउनेछु जीवनसूत्र र स्वप्नाभास, काठमाण्डौ : जिगीषा प्रकाशन ।

१६. सम, बालकृष्ण (२०२०), नालापानीमा, चार एकाङ्की, काठमाण्डौ : रोयल नेपाल एकेडेमी ।

१७. मल्ल, विजय (२०२८), बहुला काजीको सपना, काठमाण्डौ : साझा प्रकाशन ।

१८. प्रधान, हृदयचन्द्र सिंह, एक चिहान ।

१९. अधिकारी, हेमाङ्गराज र भट्टराई, बद्रीविशाल (२०६१), प्रयोगात्मक नेपाली शब्दकोश, काठमाण्डौ : विद्यार्थी पुस्तक भण्डार ।

PHYSICS

Teaching Hours: 150T + 50P *Full Marks:* 100(75T + 25P)

Nature of course: Theory + Practical *Pass Marks*: *27T + 8P*

1. Introduction

The curriculum in Physics is designed to provide students with an understanding of the scientific laws and principles of the physical world. As expected this curriculum will provide an opportunity to the students to see physics as a contribution to life in modern society.

The course demands emphasis on conceptual understanding of the physics phenomena. This will involve the proper utilization of suitable mathematical and environmental aspects need to be emphasized whenever possible. The students are expected to actively participate in the learning process trough experimentation supplemented by demonstration, discussions and problem solving.

2. Objectives

2.1 General objectives

The general objectives of this course are:

a) To provide students with sufficient understanding and knowledge of the fundamental principles of physics and their applications;
b) To develop the skills of experimenting , observing, interpreting data evaluating evidence and formulating generalizations and other implications of the physics and appreciate the advancement of physics and its applications as essential for the growth of national economy.

2.2 Specific objective

Upon completion of this course, the students will be able to:

1. Describe physics as a coherent and developing framework of knowledge based on fundamental theories of the structure and process of the physical world;
2. Explain phenomena in terms of theories and models;
3. Apply quantitatively and qualitatively the knowledge and understanding of physical principles and theories;

4. Translate information from one from to another;
5. Present information in the language of physics or other appropriate form; and
6. Design simple experiment to develop relations among physical quantities and draw conclusions.

3. 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 – Stationery 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. (6hrs)
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 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 (20hrs)

1. D.C. circuit – Electric currents; Drift velocity and its relation with current; Ohm's law; Electrical Resistance; Resistivity; Conductivity; Super conductors; Perfect Conductors; Perfect Conductors; Current – Voltage relations; Ohmic and Non-Ohmic resistance; Resistances in series and parallel, Potential Divier Conversion of galvanometer into voltmeter and ammeter, Ohmmeter; Electromotive force: Emf of a source, internal resistence; work and power in electrical circuits- Joule's law and its verification. (9 hrs)
2. Electrical circuits – Kirchhoffs laws; Wheatstone bridge circuit; P.O Box, Meter Bridge; Potentiometer; Comparison of emf's , measurement of internal resistence of a cell. (7 hrs)
3. Thermoelectirc 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-Magnet 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; 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; Fluw density in magnetic material; Relative permeability; Suspectibilty; Hysteresis, Dia, Para and Ferromagnetic materials. (5 hrs)
3. Electromagnetic induction- Faraday's laws; Induced electric fields; Lenz's law, Motional electromotive force; AC generators; eddy fields; Self inductance and mutal 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; Pasor diagram, Series circuits containing combination of resistor, capacitor and inductor; Series Resonance, Qulaity factor; Power in AC circuits: Power factor; Choke coil. (8 hrs)

Unit-3 Modern Physics

1. Electrons and Photons-Electrons: Milikan'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. (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 semi-conductors; P-N junction; Semiconductor diode: Characteristics in forward and reverse bias; Full wave rectification; Filter circuit; Zenar 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.

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.
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.
6. Nuclear energy and other sources of energy – Sources of energy; Conservation and degradation of energy; Transformation of energy.
   Nuclear energy: Energy released from fission and fusion; Thermal and Hydroelectric power; Wind energy consumption pattern and demands; Energy use in Nepal.
   Fuels and pollution: Global Warming; Acid Rain.
7. Particle physics and cosmology particles and antiparticles, Quarks and Leptons, baryons, mesons.
8. *Universe:* Hubble law; Big Bang; Critical density; Dark matter,

Practical

A student will perform at least 24 experiments from the given list:

Introduction

General instruction: Students are expected to learn general ideas of errors, order of accuracy and graphical analysis. Students are also expected to learn the physical principles and theory of experiments on magnetism not covered in the theory curriculum.

List of Experiments

A. Wave and Optics

1. Determination of the wavelength of sodium light by measuring the diameter of Newton's rings.
2. Determination of the wavelength of a given monochromatic source of light by passing a plane diffraction grating.
3. Determination of the refractive index of a given transparent medium and calculation of the speed of the light In the medium.
4. Uses of laser beams:
    I. Determination of the wavelength of He-Ne laser light
    II. Determination of the diameter of a given hair
5. Use of Sonometer:
    I. Determination of the frequency of a given tuning fork
    II. Comparison of frequencies of two tuning forks.
6. Determination of the frequency of A.C. Mains
7. Use of resonance tube:
    I. Determination of velocity of sound in air at NTP
    II. Comparison of frequencies of two tuning forks.
8. Determination of the end correction of the resonance tube apparatus.

B. Electricity

9. Verification of Ohm's Law
10. Use of P.O. Box:
    I. Determination of the resistivity of the material of a given wire
    II. Verification of the laws of series and parallel resistances
11. Use of meter bridge:
    I. Comparison of resistances of two given wires
    II. Determination of the resistivity of the material of a given wire
    III. Verification of the laws of series and parallel resistances
12. Determination of high resisitance by substitution method.
13. Determination of the capacitance of the capacitor by charging and discharging a capacitor.
14. Use of potentiometer:
    I. Comparision of emf's of two cells
    II. Comparison Of resistances of two given wires
    III. Determination of the internal resistance of a cell
15. Conversion of given galvanometer into an ammeter and a voltmeter of desired range.
16. Calibration of a given ammeter and voltmeter.
17. Determination of the half-life of a circuit containing a pure capacitor in series with a resistance in a D.C. ciruit.
18. Uses of a series LCR circuit:
    I. Determination of the resonant frequency of a series LCR circuit
    II. Determination of the quality factor of a series LCR circuit

C. Magnetism

19. Determination of the pole strength and magnetic moment of a bar magnet by locating the neutral points keeping:
    I. North pole pointing towards the geographical south
    II. North pole pointing towards the geographical north
20. Use of deflection magnetmeter:
    I. Determination of the pole strength and magnetic moment of a bar magnet
    II. Comparison of the magnetic moments of two bar magnets
21. Use of oscilliation magnetometer:
    I. Determination of the pole strength and magnetic moment of a bar magnet
    II. Comparison of the magnetic moments of two bar magnets
22. Use of dip circle:
    Determination of the angle of dip in the laboratory

C. Modern Physics

23. Study the characteristics of a junction diode.
24. Study the characteristics of a transistor.
25. Study the characteristics of a Zener diode.
26. Determination of Planck's constant using a photocell

List of Activities

1. To assemble a household circuit comprising three bulbs, three switches, a fuse and a power source. Measure current and voltage across each component and then interpret the data.
2. To use multimeter to (a) identity base of transistor and terminal of IC (b) Check whether a given electronic component (e.g diode, transistor, and IC) is in working order.
3. To study the relation between frequency and length of a given wire under constant tension using sonometer.
4. To study AND, OR, and NOT gates.
5. To identify the difference between e.m.f and p.d. of acell.
   Note: The above are only the specimens of activities. In order to arouse creativity, the students must be encouraged to take up new activities (other than mentioned above) in consultation with the teacher concerned.

Laboratory Manual

I. Certificate Level Physics Practical Guide, U.P Shrestha, Ratna Pustak Bhandar, Kathmandu
II. Elementary Practical Physics, Dr. Narayan Hari Joshi , Taleju Prakashan

4. Teaching Strategies:

- Lecturing
- Group Interaction
- Problem solving
- Demonstration
- Evaluation

5.Instructional materials

OHP, LCD demonstration kits, writing boards etc.

6.Evaluation Scheme

Unit	Teaching hours	LAQ	SAQ	NP	Mark Distribution			Total
					LAQ	SAQ	NP	
Electricity And magnetism	55	3\4	2\3	2\3	4x3	2x4	4x2	28
Modern Physics	55	3\4	2\3	2\3	4x3	2x4	4x2	28
Waves And sound	21	1\2	1\1	1\1	4x1	2x1	4	10
Physical Optics	19	1\2	1\1	1\1	4x1	2x1	3	9
Total	**150**	**8\12**	**10\14**	**6\8**	**32**	**20**	**23**	**75**

Note:

LAQ: long answer Question

SAQ: Short answer Question

NP: Numerical problems

a. In the table numerator denotes the number of questions to be attempted and denominator denotes the number of question asked. For example,3\4 means 3 questions are to be answered out of 4 questions.
b. There will be three groups A,B and C. Group A contains short-answer questions(SAQ),group B long answer Questions(LAQ) and Group C Numerical Problems(NP)
c. Each of SAQs carries 2 marks, each of LAQs carries 4 marks and each of numerical problems carries 4 marks except in Physics Optics for which it carries only 3 marks.
d. Short answer questions should cover the entire course as far as possible. These questions should be of conceptual type.

Practical

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

7.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

Reference books:

1. University Physics, Sears F. W., M.W. Zemansky, H.D. Young and R. A. Freedman, 11th edition, Pearson Education Singapore, 2004.
2. Advanced Level Physics, Nelkon and Parker, Heimesmann Education book Ltd., 2000
3. Advanced Level Physics Tom Duncan, John Murray Ltd, 2000.

PHYSICS

Grade: XI

Teaching hours : 150T + 50P **Full marks :** 100 (75T + 25P)
Nature of Course : Theory + Practical **Pass marks :** 27T + 8P

I. Introduction

The curriculum in Physics is designed to provide students with an understanding of the scientific laws and principles of the physical world. As expected this curriculum will provide an opportunity to the students to see physics as a contribution to life in modern society.

The course demands emphasis on conceptual understanding of the physical phenomena. This will involve the proper utilization of suitable mathematical models and equations. The applications of the physics together with the social and environmental aspects need to be emphasized whenever possible. The students are expected to actively participate in the learning process through experimentation supplemented by demonstration, discussions and problem solving.

The practical component of this course is designed to supplement learning through the application of the learned theory. The students will handle simple apparatus to do simple measurements, verifies physical laws and apply their knowledge of physics to real life example.

II. Objectives

General objectives

The general objectives of this course are:

a) To provide students with sufficient understanding and knowledge of the fundamental principles of physics and their applications;
b) To develop the skills of experimenting, observing, interpreting data evaluating evidence and formulating generalizations and models; and
c) To explain the social, economic, environmental and other implications of physics and appreciate the advancement of physics and its applications as essential for the growth of national economy.

Specific Objective

Upon completion of this course, the students will be able to :

1. Describe physics as coherent and developing framework of knowledge based on fundamental theories of the structure and process of the physical world;
2. Explain phenomena in terms of theories and models;
3. Apply quantitavely and qualitatively the knowledge and understanding of physical principles and theories;
4. Translate information from one from to another;
5. Present information in the language of physics or other appropriate form; and
6. Design simple experiment to develop relations among physical quantities and draw conclusions.

III. Course contents

70 teaching hours

Unit – 1 Mechanics

1. Physical Quantities – Need for measurements; system of units; S.I. unit; Precision and significant figures; Dimensions; Main uses of dimensional equations.
2. Vectors – Graphical presentation of vectors; Addition and subtraction of vectors: Parallelogram, triangle and polygon laws of vectors; Resolution of vectors; Unit vectors;
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.

4. Laws of Motion – Newton's laws of motion; Inertia, force, linear momentum, Impulse, Conversion of linear momentum; Free-body diagrams; Solid frictions: Laws of solid friction and their verifications; Application of Newton's laws: Particles on equilibrium,
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
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 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
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 a 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; Motion of a body suspended from coiled spring, angular SHM; simple pendulum; Damped oscillation; Forced oscillation and
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; 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 viscous liquid; Equation of continuity; Bernoulli's equation and its applications.

Unit-2 Heat and thermodynamics

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 translation kinetic energy of a gas molecule; Boltzman constant, Root mean square speed; Heat capacities: heat capacities of gases.
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 Sealre's method; Convection: convective coefficient Radiation: Ideal radiator ; Black body radiation; Stefan-Boltzmann law
6. First law of thermodynamics- Thermodynamic systems; Work done during volume change, Heat and work; Internal energy and first law of thermodynamics; Thermodynamic processes: Adiabatic, Isochoric, Isothermal, Isobaric processes; Heat capacities of ideal gas at constant pressure and volume and relation between them; Isothermal and adiabatic processes for an idea 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

Unit – 3 Geometric Optics

1. Photometry, Reflection at curved mirrors – Convex and concave mirrors; Image in Spherical mirrors, Mirrors formula; Real and virtual images. (2hrs)
2. Refraction at plane surfaces – Laws of refraction: Refractive index; Relation between refractive indices; Lateral shift; Total internal reflection and its applications; critical
3. Refraction through prisms – Minimum deviation; Relation between angle of prism, minimum deviation and refractive index; Deviation in small angle
4. Lenses – Spherical lenses; thin lens formula; Lens maker's formula; Power of a lens; Combination of thin lenses in contact.
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. (3hrs)
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) .

Unit – 4 Electrostatics

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. (3hrs)
2. Electric filed – Electric fields; Calculation electric field due to point charges; Field lines. Gauss Law; Electric Flux; Gauss Law and its application: Filed of a charged sphere, line charge, plane sheet of charge. (7hrs)
3. Potential: Potential and potential difference, Potential due to a point charge; Equipotential lines and surfaces; Potential gradient; Potential energy, Electron volt. (3hrs)
4. Capacitance and dielectrics – capacitance and capacitor; Charging and discharging of capacitor through a resistor; Parallel plate capacitor; Combination of capacitors; Energy of charged capacitor; Effect of a dielectric; Molecular theory of induced charges; Polarization and displacement.

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 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 and calculation of its area using a graduated cylinder.
b. Determination of the radii of curvatures aof a watch glass.
c. Determination of the focal lenghth of a spherical mirror.

3. Use of a Screw gauge:
   a. Determination of the diameter of atube (or of arod) 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' I 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 insoluble in water
   c) A solid heavier than soluble water
9. Use of Young's modulus apparatus
   a. Verification of Hooke'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
    b. Determination of Young's modulus of elasticity of the material of a given wire
11. Determination of the surface tension of water by capillary tube method
12. Determination of the coefficient of viscosity of liquid by Stoke's method

B. Heat

1. Calibration of agiven thermometer and determination of the correct temperature of tap water.
2. Use of Pullinger's apparatus Determination of the linear and cubical expansivity of a rod
3. Use of Regnault's apparatus:
   a. Determination of the specific heat capacity of a solid by the method of mixture.
   b. Determination of the specific heat capacity of a liquid by the method of mixture.
4. Determination of the specific heat capacity of a liquid by the method of cooking.
5. Determination of latent heat of fusion of ice.
6. Determination of latent heat of vaporization of water.
7. Determination of the melting point of a solid by
   (i) Cooling curve method
   (ii) Capillary tube method
8. Determination of the thermal conductivity of a good conductor by Searle's method.

Mathematics
Grade : XI

Full Marks: 100
Teaching hours: 150

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 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 and 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 and normal, increasing and decreasing function;
17. define antiderivative 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 are 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.

Function:

Definition, Domain and range of a function, Functions defined as mappings, Inverse function, Composite function, functions of special type (Identity, Constant, Absolute value, Gereatest 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 $\left(\frac{1}{x}, \frac{x^2-a^2}{x-a}, \frac{1}{x+a}, x^2, x^3\right)$, 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 sequence 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 mx 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 $\left(\lim_{x\to a}\frac{x^n-a^n}{x-a},\ \lim_{x\to 0}\frac{\sin x}{x},\ \lim_{x\to 0}\frac{e^x-1}{x},\ \lim_{x\to 0}\frac{\log(1+x)}{x}\right)$

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:

1. Bajracharya, Prakash Muni, Fundamentals of Mathematics-XI, Buddha Publication, Ktm
2. Adhikari, D. B., Elements of Mathematics-XI, Ekata Books and Distributors, Ktm
3. G.C. Phan Bahadur et. al., Mathematics-XI, Asmita Books Publication, Ktm
4. Awasthi, Ramesh Prasad, Mathematics XI, Unice Educational Publication, Ktm
5. Mahato, Hem Chandra et. al., Mathematics-XI, G-7 Publication Pvt. Ltd., Ktm
6. Mishra, Sailendra Kumar et. al., Conceptual Mathematics0-XI, Divya Deuralis Publication, ktm
7. Bajracharya, D. R. and et. al., Basic Mathematics-XI, Sukunda Pustak Bhawan, Ktm
8. Sharma Basant Raj et. al., Essentials of Mathematics-XI, I.M. Publication Pvt. Ltd., Ktm

COMPULSORY ENGLISH

GRADE XI

Hours: 150 Full marks: 100

Teaching

I. Introduction

This is an integrated general English course which treats English as a medium for communication and as a means to knowledge. This course is divided into two interrelated papers leading students from intermediate level of English proficiency to upper intermediate.

II. General Objectives

The general objectives of this course are:

a) To teach students skills in the use of English for academic and communicative purposes,
b) To train them in the functional, national and grammatical areas of English language use,
c) To make them see the relationship between structures and meaning,
d) To teach them English structures in a communicative context, and
e) To provide students a self-complete, self- terminating, as well as a bridge between secondary and University English (+3).

III. Specific Objectives

The specific objectives of this courses are:

1. To give a short remedial or link course as a kind of bridge or a refresher course between English at the secondary and higher levels,
2. To teach English for functional, academic and communicative purposes, and
3. To provide students interesting reading materials for information, knowledge and pleasure.

IV. Course Contents

The contents of this paper are:

a) A remedial or refresher course: It will be given at the beginning of the session. The contents include basic English structures and the use of dictionary.

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

The contents of this unit are:

- Places
- Jobs and routine
- Past event
- Requests and offers
- Comparison
- Likes and dislikes
- Leisure activities and skills
- Origin and duration
- Similarities and differences
- Prediction
- Degree
- Criticizing
- Decisions and intentions
- Direction
- Talking about now
- Recent actions and activities
- Thepast and the present
- Events and circumstances
- Advice
- Location
- Obligation
- Objects
- Setting a scene
- Explanation

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

Poems

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

Essays:

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

Stories:

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

Play

17,R.N. Tagore, "Malini"

V. Prescribed texts

1. Doff, Adrian, C. Jones, and K. Mitchell. *Meanings into Words* (Intermediate). Student's Book. Cambridge: Cambridge University. Press 1983.
2. *Link English.* Revised edition. Kathmandu: Sajha Prakashan, 1996.
3. *Meanings into Words* (Intermediate), Workbook. Cambridge: C.U.P. 1983
4. *The Magic of Words* (A collection of poetry, prose and drama). Kathmandu, 1996.

VI. Reference books

1. One of the following dictionaries:

a) *Cambridge International Dictionary Of English,* Cambridge: C.U.P.. 1995.
b) *Collins COBUILD English Dictionary.* New Edition. London: Harper Collins, 1995
c) *Longman Dictionary of Contemporary English.* 3rd edition. Harlow: Longman Group. 1995.
d) *Oxford Advanced learner's Dictionary. 5th edition. Oxford: O.U.P. 1996*

2. Doff, Adrian, C. Jones, and K. Mitchell. *Meanings into words* (Intermediate). Teacher's Book. Cambridge: Cambridge University Press. 1983.
3. *Meanings into words.* (Intermediate). Test Book, C.U.P.
4. ……*Meaning into Words,* (Intermediate). Cassette (Student's Book), C.U.P.
5. *Meanings into words,* (Intermediate). Cassette (Drills), C.U.P. Swan, Michael. *Basic English Usage*. Oxford: Oxford University Press. 1984

COMPUTER SCIENCE

GRADE: XI

Teaching Hours : 150 **Full Marks : 100 (75T + 25P)**

I. Introduction

Information technology has become a part of contemporary society and as a potential tool in the socio-economic development of country. As IT 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 source seeks to introduce computer science to acquaint the learner with the basic skills of computer literacy.

II. General Objective:

The general objective of this course is to:

1. Help establish a strong foundation for the development of internationally competent human resource in the field of information communication and technology
2. Help decrease the digital divide ; and
3. Fulfill the middle level ICT human resource to the ICT industries.

III. Specific Objective

1. Explain the fundamental principle of computer system mechanism and information and communication technology
2. Identify computer resource for any specific purpose PC based application in the real life situations
3. Solve the office automation related system problems , general skill about network , internet , email and web site design
4. Engage in higher study of computer science and IT courses in the country or abroad;
5. Provide the services as instructors of computer sciences courses in schools or institutions;
6. State programming concept and tolls;
7. Explain the state – of –art information technology and works to change agents for spreading ICT culture in their society; and
8. Encourage the student for visit the hardware and software industries, etc.

IV. 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 computers
1.4 Generations of computers
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
2.3 On the basis of brand

UNIT-3 Number System and Their conversion

3.1 Decimal, Binary, Octal, Hexadecimal Number system and conversion
3.2 9's and 10's complements decimal subtraction
3.3 Calculation in Binary

UNIT-4 Logic Function and Boolean algebra

1.1 Logic Function and Boolean Algebra
1.2 Introduction of truth table , Boolean Expression
1.3 Logic Gates
1.4 Duality Principle
1.5 Laws of Boolean Algebra
1.6 De Morgan's Theorem : Statement and logic expression
1.7 Venn diagram and its repetition 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
5.4 Concept of system buses: Data Bus, Control Bus
5.5 Memory- Primary and Secondary
5.6 Storage devices
5.7 Input devices
5.8 Output devices
5.9 Computer peripherals
5.10 Interfaces- Parallel port, Serial port, USB Ports, IEEE 1394 and slots
5.11 Identification of PC Accessories and Peripherals
5.12 Specification of PC
5.13 Software and Classification
- 5.13.1 System software
- 5.13.2 Application software including Utilities Software
- 5.13.3 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 Function of an Operating system
- 6.1.4 Types of operating system

6.2 Disk Operating System (DOS)
- 6.2.1 Introduction to CUI and its feature
- 6.2.2 Common DOS Commands
- 6.2.3 Concept of file and directory
- 6.2.4 Wildcards and Pathname
- 6.2.5 System files

6.3 Windows Operation 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 source operating system

UNIT-7 Programming Concepts and Logics

7.1 Programming languages
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 students
7.6 Syntax and Semantics errors
7.7 Program Control Structures
7.8 Program Design Tools
7.9 Introduction to data type
7.10 Codes: Absolute binary, BCD, ASCII, UNICODE etc.

UNIT-8 Application Package

8.1 Word Processor

8.1.1 Concept of word processing
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 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 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
8.2.6 Managing Workbooks
8.2.7 General Functions and Formulas
8.2.8 Data Filter and sorting
8.2.9 Working with other objects
8.2.10 Data analysis and Pivot tablets

8.3 Presentation

8.3.1 Concept of presentation
8.3.2 Types and use of presentation program,
8.3.3 Basic function 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 tablets , graphics and word art
8.3.9 Working with charts and multimedia

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, web site, web server, URL, DNS

9.1.5 Search engine, messenger services

9.1.6 Setting Browser properties

9.2 Email

9.2.1 Concept of email

9.2.2 Uses of e-mail

9.2.3 Different types of E-mails 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

10.5 Create an Ordered and Unordered list

10.6 Insert images and objects

10.6 Create Hyper links

10.7 Create table

10.8 Designs frames and form

10.9 Webpage Design and script language

10.11 Project work on Web Page

Marks and Teaching Hours Distribution

Units	**Mark Distribution**		**Number of Hours**	
	Theory	**Practical**	**Theory**	**Practical**
1	2		3	
2	3		5	
3	5		5	
4	5		10	
5	10		15	2
6	10	3	10	20
7	10		10	
8	15	15	10	22
9	10	5	10	16
10	5	2	5	7
11				
Total	**75**	**25**	**83**	**67**

Evaluation Schemes:

a) Practical Evaluation

S. No.	Unit	Topics	No of exercise	Mini Projects Evaluation	Remarks
1	5	PC Component Identification	2	-	Practical Marks Evaluated by: External examiner:10 Internal examiner: 15 Based on project and lab exercise
2	6.3	Operating system	4	-	
3	8.1	Word Processor	6	5	
4	8.2	Spreadsheet	5	5	
5	8.3	Presentation	4	5	
6	9	Internet , Email	4	2	
7	10	Web page designing	6	5	
8	11	Final Project			

Theory Evaluation

- **Short question**
- **Long Question**
- **Short Question**

Theory Questions are guided by marks distribution and model question

Chemistry

Grade: XI

Teaching Hours : 150T + 50P **Full Marks : 100(75 t + 24P)**

Pass Marks : 27T + 10P

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 and 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 in 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
   a. Methods of preparation: general, laboratory and industrial process of the matters,
   b. Physical and chemical properties,
   c. 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;
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 significance and limitations
2. Balancing chemical equations by:

a. Hit and trial method b. 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 man

1. Mole Concept
2. Mole in terms 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

   (Solving reacted numerical problems)

2.4 Avogadro's Hypothesis and Its Applications:

1. Development of Avogadro's hypothesis
2. Definition of Avogadro's hypothesis
3. Application of Avogadro's hypothesis
   a. Deduction of atomicity of elementary gas
   b. Deduction of relationship between molecular mass and vapor density
   c. Deduction of molar volume of gases
   d. Deduction of molecular formula from its volumetric composition

   (Solving related numerical problems)

2.5 Equivalent Masse:

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

   (Solving related numerical problems)

Unit 3: State of Matter -14 teaching hours

3.1 Gaseous State

1. Boyle's law
2. Charle's law and Kelvin scale of temperature
3. Application of Charle's law and Boyle's law
4. Combined gas law, ideal gas equation and universal gas constant
5. Dalton's law of partial pressure
6. Mathematical derivation of Dalton's law and their applications
7. Graham's law of diffusion and its applications
8. Kinetic model of gas and its postulates
9. Ideal and real gases
10. Deviation of gas from ideal behavior

(Solving related numerical problems)

3.2 Liquid State:

1. Physical properties of liquid:

a. Evaporation and condensation
b. Vapor pressure of liquid and boiling
c. Surface tension
d. Viscosity

2. Solution and solubility:
   a. Equilibrium in saturated solution
   b. 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. Efflorescence
4. Deliquesces
5. Hygroscopic
6. Seven types of crystal system
7. Simple cubic, face centered and body centered

Unit 4: Atomic Structure -10 teaching hours

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

Unit 5: Nuclear Chemistry -3 teaching hours

1. Concept radioactivity
2. Radioactive rays (alpha ray, beta ray and gamma ray)
3. Meaning of natural and artificial radioactivity)
4. Nuclear reactions, Nuclear energy (fission and fusion)
5. Nuclear isotopes and uses

Unit 6: Electronic Theory of Valency and Bonding -8 teaching hours

1. Basic assumption of electronic theory of valency
2. Octet rule
3. Ionic bonds, ionic compounds and characteristics of ionic compounds. Lewis symbol to represent the formation of ionic compounds
4. Covalent bonds, covalent compounds and characteristics of covalent compounds –Lewis structure of some typical covalent compounds
5. Co-ordinate covalent bonds. Lewis structures of some typical co-ordinate co-valent compounds
6. Exception of the octet rule
7. Partial ionic characters of covalent compounds. Non-polar and polar covalent molecules
8. Dipole moments and its application
9. Some special types of bonds: hydrogen bond and its types, metallic bond, 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^-
10. Classification of crystalline solids
    a. Ionic solid
    b. Covalent solid
    c. Molecular solid
    d. Metallic solid

Unit 7: Periodic Classification of Elements -6 teaching hours

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

Unit 8: Oxidation and Reduction -6 teaching hours

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

Unit 9: Equilibrium

1. Introduction
2. Equilibrium
3. Chemical equilibrium
   a. Reversible and irreversible reactions
   b. Dynamic nature of chemical equilibrium and its characteristics
   c. Law of mass action
   d. Equilibrium constant (Kc) and its characteristics
   e. Homogenous and heterogeneous
   f. Relation between Kp and Kc (derivation)
   g. Le-chatelier's principle and its application

   (No numerical is required)

Inorganic Chemistry

Section B

Unit 10: Non-Metals I

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 (nake and Lewis structure)
4. Ammonia
   - Manufacture by Haber's synthesis method
   - Physical properties, chemical properties and uses
5. Oxyacid of nitrogen (type)
6. Technical production and nitric acid by Ostwald method
   - Properties of nitric acid and uses
   - Test of nitrate ion

Unit 11: Non-Metals II

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 form
   a. Sea weeds (principle only) b. caliche (Principle only)
4. Uses of halogens
5. Comparative study on; preparation, properties and uses of haloacids (HCI, HBr and HI)

11.2 Carbon:

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

11.3 Phosphorous:

1. Occurrence, position in periodic table
2. Allotropes of phosphorous and uses of phosphorous
3. Preparation, properties and uses of phosphine
4. Oxides and oxyacids of phosphorous (structure and uses)
5. Preparation, properties and uses of orthophospheric 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 burax, boric acid, Silicate and Silica

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

11.7 Environmental Pollution:

- Air pollution, photochemical song
- Acid rain, water pollution
- Greenhouse effect

Unit 12: Metal and Metallurgical Principles

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

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:
    a. Quick lime
    b. Plaster of Paris
    c. Bleaching Powder
    d. Magnesia
    e. Epsom salt.

Organic Chemistry

Section C

Unit 14: Introduction to Organic Chemistry

14.1 Fundamental Principles:

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 Lassaegne's test)

14.2 Nomenclature of Organic Compounds:

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:

1. Definition of structure isomerism
2. Types of structure isomerism: chain isomerism, position, isomerism, functional isomerism and mesmerism

14.4 Preliminary Idea of Reaction Mechanism

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

Unit 15: Hydrocarbons

15.1 Sources:

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

15.2 Alkanes (Saturated Hydrocarbons):

1. General Methods of preparation:
    - Decarboxylation
    - Catalytic hydrogenation
    - Reduction of halo alkane
    - Kolbe's electrolysis method
    - Using Grigrand's reagent
    - Wurtz reaction
    - From aldelydes and ketones

2. Physical properties
3. Chemical properties: Substitutions reaction, oxidation, pyrolysis or cracking aromatization

15.3 Alkenes:

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

15.4 Alkynes:

Ethyne

1. Preparation form i. carbon and hydrogen ii. Kolbes electrolysis iii. 1, 2 dibromoethane
2. Lab preparation of ethyne
3. Physical properties
4. Chemical properties: Addition (H_2, X_2, HX, H_2O, O_3), Acidic nature (action with ammonical $AgNO_3$ and ammonical Cu_2Cl_2), Oxidation with alkaline $KMnO_4$, Polymerization uses of ethyne

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 form the given mixture of volatile and non-volatile (demonstration of sublimation process)
3. To separate a mixture of two soluble solids by fractional crystallization (KNO_3+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) :

1. To perform precipitation reaction of $BaCl_2$ and H_2SO_4 and obtain solid $BaSO_4$;
2. To neutralize sodium hydroxide with hydrochloric acid solution and recover the crystal of sodium chloride.
3. To test the ferrous ions in the given aqueous solution and oxidise it to ferric ion (Ferrous → Ferric system)
4. Redox Reaction
5. To study the process of electrolysis and electroplating

C. Experiments on quantitative analysis:

1. To determine the equivalent weight or weight of metal by hydrogen displacement method;
2. To determine the solubility of the given soluble solid at laboratory temperature;
3. To determine the relative surface tension of unknown liquid by drop count method; and
4. 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 properties:

1. To prepare and collect hydrogen gas and study the following properties;
   a. Solubility with water, color, odor;
   b. Litmus test;
   c. Burning match stick test; and
   d. Reducing properties of nascent hydrogen.
2. To prepare and collect ammonia gas and investigate the following properties:
   a. Solubility with water/ color/ odor;
   b. Litmus test;
   c. Action with copper sulphate solution; and
   d. Action with mercurous nitrate paper.

3. To prepare carbondioxide gas and investigate the following properties:
    a. Solubility, color, odor;
    b. Litmus paper test
    c. Lime water test; and
    d. Action with burning magnesium ribbon.
4. To study the properties of hydrogen sulphide (Physical, analytical and reducing) ;
5. 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:

7. 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: Experiments from 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 22 very short questions, out of which, examinees are required to answer only 15 questions.
2. Group 'B' will consist of 7 short questions, out of which, examinees are required to answer 5 questions.
3. Group 'C' will consist of 4 questions, out of which, examinees are required to answer 2 questions.

The weightage of content distribution for the three of questions from different sections of the curriculum will be as follows:

	Units	Teaching Hours	V.S.Q.	S.Q.	L.Q.
	1	3	X		
	2	17	2		
	3	14	2		
	4	10	2		
	5	3	1		
	6	8	2		
	7	6	1		
	8	6	1		
	9	5	1		
	10	12	2		
	11	23	2		
	12	6	1		
	13	10	1		
	14	16	2		
	15	11	2		
	15	**150**	**22**	**7**	**4**

Reference Books:

Acharya, Suk Dev, et.al. Fundamentals of Chemistry-XI, Bhundipuran Prakashan, KTM.

Biology

Grade XI

Teaching Hours: 150 **Full Marks: 75 + 25 = 100**

1. Introduction

Biology, being the science of nature, deals the fascinating changes, which continuously takes place in the living world. Every person is expected to understand the nature of which he is a part. One needs to be familiar with the changes taking place in nature. The study of biology equips an individual to understand the living world in the light of new researches. Besides realizing the general objectives of any discipline of science like development of scientific temper and analytical skill, the curriculum in biology has also to be geared to meet the requirement of careers in the field of medicine and related disciplines (wildlife, forestry, agriculture, natural resources, environment, etc). This course is designed for general science (Biological and Physical) students of Grade XI.

2. General Objectives

The general objectives of this course are,

a. To provide the concept of biology and encourage the learners to use the acquired knowledge in day to day life;
b. To make the learners aware of the present development in the biological science as well as to develop the knowledge and skill in the wise use of the available natural resources and sustaining them; and
c. To prepare the students to take up advance studies in biology at university level.

3. Specific Objectives

On completion of the course the students will be able to:

a. Describe the life components, origin of life and its evolution up to present day;
b. Explain the cell components, their types and cell division;
c. Explain diversity of plant and animal;
d. Discuss functional processes of the typical animal types;
e. Describe functional concept, ecological imbalances and their consequences; and
f. Explain importance of natural resources, their conservation and management with reference to national context

Course Content

Section A (Botany)

Teaching Hour: 75 **Full Marks: 37.5**

Unit 1: Introduction to Biology **5 Teaching hour**

- Biochemically important organic and inorganic molecules (general concepts):

Carbohydrate, protein, lipid, nucleic acid, minerals and water.

Unit 2: Cell Biology **15 Teaching Hour**

- 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 **40 Teaching Hour**

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 (Mucor), Ascomycetes (Yeast). Economic importance of fungi.
- **Plantae:**

Algae: Introduction to green, red and brown algae, structure and reproduction of Spirogyra.
Bryophyta: Marchantia and Funaria (morphology and life cycle).
Pteridophyta: Dryopteris (morphology and life cycle).
Gymnosperm: Brief morphological structure of Cycas and Pinus structure and it's distribution.
Angiosperm: Morphology: root, stem, leaf, flower, fruit and seed relevant to the following families. Taxanomy and economic importance of the following families; Cruciferae (Brassicaceae), Solanaceae,
Leguminosae: Papilionoidae only, Compositae (Asteraceae) and Gramineae (Poaceae).
Virus: Structure and economic importance.

Unit 4: Biota and their environment **15 Teaching hour**

- Ecology: Definition, abiotic, biotic factors and their interactions.
- Concept of ecosystem, Pond and grassland ecosystem: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).

- **Conservation:**

Forest conservation: Brief introduction of forests of Nepal, importance of afforestation and hazards of deforestation.
Management of land and water.

Evaluation Scheme

Unit wise weightage for Botany Part 1

				Types of questions asked in the Examination		
Unit	**Teaching Hour**	**Marks**		**Very Short question (1 mark)**	**Short questions (3 marks)**	**Long Questions (7.5 or 8 marks)**
1. Introduction to Biology	5	3		X	1	X
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 environment	16	8		2 or 1 opt	2 or 1 opt	Or 1*
Total	75	37.5		7 ques x 1 mark	5 ques x 3 marks	2 ques x 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 cell biology or Biota and environment*

Course Content

Section B (Zoology)

Teaching Hour: 75 **Full Marks: 37.5**

Unit 1: Introduction to Biology **5 Teaching Hour**

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

Unit 2: Origin and evolution of life **20 Teaching Hour**

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

Unit 3: Biodiversity **35 Teaching Hour**

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 (a concept of P.Falciparum).
- **Animalia:** General characters and classification of the following phyla (upto class) with examples – Porifera, Colenterata (Cnidaria), Platyhelminthes, Aschelminthes (Nemathelminthes), Annelida, Arthropoda, Mollusca, Echinodermata and Chordata.

Earthworm (Pheretima Posthuma): Habit and habitat, structure; digestive, excretory, reproductive and nervous systems.

Frog (Rana Tigrina): Habit and habitat, structure; digestive, circulatory, respiratory, reproductive

Unit 4: Biota and their Environment **15 Teaching Hour**

- **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 behavior of fish and bird.
- **Adaptation:** Animal: Aquatic, amphibious and terrestrial (arboreal and volan)
- **Conservation:**
  Wildlife Conservation: Meaning of wildlife, importance of wildlife, meaning of rare, threatened, vulnerable and endangered species; few endangered species in Nepal. Conservation practices (National Parks, wildlife reserves and hunting reserves), Ways of conservation and causes of extinction.
- Human responsibility for the protection of earth.

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Evaluation Scheme

Unit wise weightage for Zoology Grade XI

			Types of questions asked in the Examination		
Unit	**Teaching Hour**	**Marks**	**Very Short Question (1 mark)**	**Short Questions (3 marks)**	**Long Questions (7.5 or 8 marks)**
1. Introduction to Biology	5	2	×	×	×
2. Evolution of Life	20	10	2 or 1 opt	0 or 1 opt	1 (8 marks)
3. Biodiversity	35	17.5	1 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	X *
l			7 ques × 1 mark	5 ques × 3 marks	2 ques × 7.5 marks and 8 marks
Total	**75**	**37.5**	**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*

Format for question model for Biology – Part 1
Section B (Zoology)

1. Answer in very short; any seven — 1 mark × 7 ques. = 7 marks
   - Total questions to be asked – 10
2. Describe in brief; any five — 3 marks × 5 ques. = 15 marks
   - Total questions to be asked – 7
3. Long questions (two questions) — 8 marks + 7.5 marks = 15.5 marks
4. One question is given as option as "or" — Total = 37.5 Marks

Time schedule for questions

Very short question – 1 mark - maximum 1 min
Short question – 3 marks - maximum 7 – 8 min.
Long question – 7 or 7.5 marks - maximum 23 – 24 min.

Note:

1. There will be separate answer sheets for section A (Botany) and Section B (Zoology).
2. Total exam time period of theory will be of 3 hours for both the sections A and B.
3. Concerned examiners will evaluate both the papers separately.
4. The pass marks is 27. The students must pass in Botany and Zoology jointly.

Botany Practical

Grade XI

1. Use and maintenance of compound microscope.
2. Study of museum specimen and slides:
   a. Types of bacterial cells;
   b. Spirogyra filaments;
   c. Mucor: Culture to demonstrate mycelium and sporangium; culture of yeast cells.
   d. Study of vegetative and reproductive structure of Marchantia, Funaria, Dryopteris, Pinus.
3. Study of different stages of mitotic and meiotic cell division through permanent slides and chart.
4. Preparation of temporart slide to study cell structure:
   Onion scale leaf, Leaf of Geranium or Zebrina or Tradescantia or any other locally available leaf.
5. 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 morphological adaptions of the hydrophytes 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), Preplanteta (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 (Pegion) Rhinophus (Bat) and Funambulus (Squirrel).
2. Preparation of temporary slide and their study:
   a. Striated muscle fibre (thigh) of frog.
   b. Setae and ovary of earthworm.
   c. Squamous epithelial cell of human cheek.
3. Study of histological structure through permanent slides of skin, oesophagus, stomach, intestine, rectum, live, 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 (Pegion 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, arterial and venous systems, reproductive organs.
   b. Frog: General anatomy, alimentary canal, arterial and venous systems, reproductive organs and brain.

Format of model question for practical exam

Section A – Botany (Grade XI)

Time : 3 hours **Full marks** : 12.5 marks

Pass Marks : 5 marks

1.	Taxonomy – Identification of family and plant	–	3 marks
2.	Preparation of temporary slide	–	1.5 marks
3.	Spotting (6 spotting)	–	3 marks
4.	Viva voce	–	2 marks
5.	Class Record	–	2.5 marks
		Total	12.5 marks

Section B – Zoology (Grade XI)

Time: 3 hours **Full marks** : 12.5 marks

Pass Marks : 5 marks

1.	Dissection of animals	–	3 marks
2.	Preparation of temporary slide	–	1.5 marks
3.	Spotting (6 spotting)	–	3 marks
4.	Viva voce	–	2 marks
5.	Class Record	Total	12.5 marks

Note:

1. There will be separate practical exam for Botany and Zoology.
2. Practical exam time will be of 3 hours for each practical exam.
3. Students mush pas both the practical exams separately.

References Books

Mahato, Ras Bihari, Advance Level Biology – XI, Ekata Books and Distributors, Ktm.