Syllabus

UG0101 – Three/Four Year Bachelor of Science (Bio Group)
I-Semester - Botany
BOT-51T-101 -Cell Biology and Diversity of Plant Kingdom-I

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
I	BOT-51T-101	Cell Biology and Diversity of Plant Kingdom-I				5	4
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	Major	4	2	6	Yes	60 lectures with diagrammatic and informative assessments during lecture hours	
Prerequisites		Biology Courses of Senior Secondary level					
Objectives of the Course:		➢ To understand the structural organization and functions of organelles in the cell. ➢ To differentiate between prokaryotic and eukaryotic cells and plant and animal cells. ➢ To gain understanding on Nucleic acids and chromosome organization. ➢ To understand cell cycle and analyze different stages of mitosis and meiosis. ➢ To understand microscopic to macroscopic view of the Algae and Fungi. ➢ To be able to differentiate algal and fungal members. ➢ To understand difference between Hepaticopsida, Anthocerotopsida and Bryopsida. ➢ To be able to identify and know about Lichens.					

Course Outcomes:

At the completion of the course, the student would be able to:

Cognitive level	Course outcomes
1. Understanding	• To know the structural and functions properties of prokaryotic and eukaryotic cells. • To learn, understand and develop skill and hands on training in basics of cell biology. • To make students know of all the kind of plant groups and understand relationships between them. • To aware students about diversity of lower plant presents on various habitats. • To understand microscopic to macroscopic view of th plants. • To interpret amphibious to symbiotic relationship of the plants.
2. Memorizing	• Composition of cell. • Human chromosomes and organization of chromosomes. • Names of all plant groups and relationships between them. • Diagrammatic representation of the algae, bryophytes and lichens. • Typical type of Life cycles found in algae, Fungi and bryophytes.
3. Applying	• Variations in functions of cell organelles. • Concept of cell cycle, abnormalities, cell membrane, cell-cell interactions. • Economic importance of algae, fungi and lichens. • Microscopic identification of algae, bryophytes, fungi and lichens.

Detailed Syllabus

BOT-51T-101 -Cell Biology and Diversity of Plant Kingdom-I

Unit – I

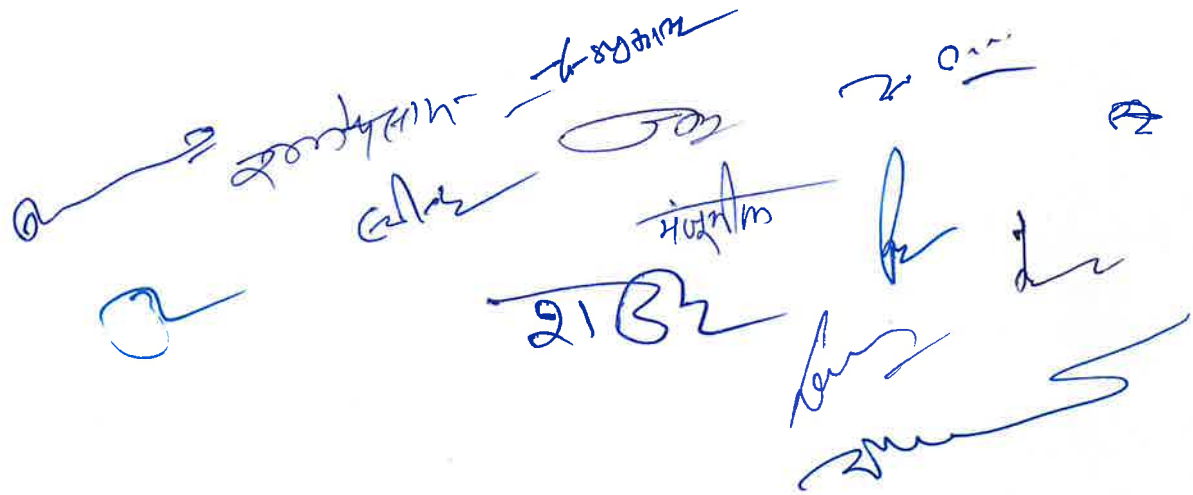
Cell and Cytoskeleton	Cell as a unit of structure and function; Characteristics of prokaryotic and eukaryotic cells; Plant and animal cells; Chemistry, structure and function of Plant cell wall. Overview of plasma membrane: fluid mosaic model; Chemical composition of membranes; Membrane transport – Passive, active and facilitated transport, endocytosis and exocytosis. Nucleus: Structure-nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus. Cytoskeleton: Role and structure of microtubules, microfilaments and intermediary filaments.	**(8 lectures)**
Cell Organelles	Chloroplast, mitochondria and peroxisomes: Structural organization; Function; Semi-autonomous nature of mitochondria and chloroplast. Lysosomes and Vacuoles. Endomembrane system: Endoplasmic Reticulum – Types and Structure. Golgi Apparatus – organization, protein glycosylation, protein sorting and export from Golgi Apparatus.	**(7 lectures)**

Unit –II

Nucleic acids	DNA as genetic material (Griffith's transformation experiment and Hershey and Chase blender experiment); Structure and function of DNA (Watson and Crick Model); Structure and function of different types of RNA (rRNA, mRNA, tRNA, snRNA).	**(6 lectures)**
Chromosomes	Chromosome number, structure and function, types of chromosomes (metacentric, sub-metacentric, acrocentric, telocentric); Chromosome organization according to Nucleosome model; Special types of chromosomes: Lamp brush and Polytene chromosomes.	**(5 lectures)**
Cell Division	Phases of eukaryotic cell cycle; Different stages of mitosis; Different stages of Meiosis I and Meiosis II, synaptonemal complex, chiasmata formation and crossing over.	**(4 lectures)**

Unit –III

Plant Kingdom	Introduction to Plant kingdom- Basic idea of hierarchy in all groups of plants	**(2 lectures)**
Algae	General characteristics; Diverse Habitats; Range of thallus organization; methods of reproduction (Vegetative, Asexual, Sexual); Economic importance. Criteria and classification system of Fritsch (1935) (distinguishing features upto classes). Morphology and life history of: Cyanophyceae: *Nostoc*; Chlorophyceae: *Volvox*; Xanthophyceae: *Vaucheria*; Phaeophyceae: *Ectocarpus*; Rhodophyceae: *Polysiphonia.*	**(10 lectures)**
Lichen	General characteristics; Habitat; Structure; Reproduction; Ecological and Economic importance.	**(3 lectures)**



Unit-IV

Fungi General characteristics; Thallus organization; Different hyphal forms; Heterokaryosis and Para sexuality; Nutrition and Reproduction in fungi; Economic importance.Classification (*Alexopoulos & Mims, 1996*); Morphology and life history of: Zygomycota: *Rhizopus*, Ascomycota: *Peziza*, Basidiomycota: *Puccinia.* **(7 Lectures)**

Bryophytes General characteristics; affinities with algae and pteridophytes; Distribution; Range of thallus structure; Reproduction (Vegetative and Sexual); Alternation of generations and evolution of sporophytes.Classification (Proskauer, 1957); Structures of gametophyte & sporophyte and life history (Development details not included) of: Hepaticopsida: *Marchantia*, Anthocerotopsida: *Anthoceros* and Bryopsida: *Funaria.* **(8 lectures)**

Suggested Books and References –

1. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2014). **Molecular Biology of the Cell** (6thEd.). New York: Garland Science
2. Cooper, G. M., and Hausman, R. E. (2013). **The Cell: A Molecular Approach** (6th Ed.). Washington: ASM; Sunderland.
3. Karp, G. **Cell and Molecular Biology. Concepts and experiments**. John Harris, D., Wiley & sons, New York
4. Veer Bala Rastogi. **Genetics.** Medtech
5. Veer Bala Rastogi. **A Textbook of Cell Biology and Genetics.** Kedarnath Ramnath
6. Alexopoulos, C.J. and Mims, C.W.: **Introductory Mycology**, John Wiley and Sons, New York, 2000
7. Singh, Pande and Jain. **A Textbook of Botany,** Rastogi publications
8. Dube, H.C.: Fungi, Rastogi Publication, Meerut, 1989.
9. Vashishtha, **B.R. Botany for Degree Students -Fungi**, S. Chand & Co., New Delhi, 2001.
10. Gilbart, M. Smith: **Cryptogamic Botany**, Vol. I & II (2nd Ed.) Tata McGraw Hill. Publishing Co., Ltd., New Delhi, 1985.
11. Puri. P.: **Bryophytes**, Atmaram& Sons. Delhi, Lucknow, 1985.
12. Aneja, K.R.: **Experiments in Microbiology, Plant Pathology and Biotechnology**. New Age International (P) Ltd., Publishers, New Delhi 2003.
13. Pandey B. P.(2022) **Algae, Bryophytes and Lichens**. S Chand Publication

Suggested E-resources:

1. **RRC E-resources**
2. **https://youtu.be/K2teJ6-DBLw**
3. https://archive.nptel.ac.in/courses/102/108/102108086/
4. https://archive.org/details/cellmolecularapp6edcoop

B.Sc. Semester- I (Bio Group)
BOT-51P-102 Botany Practical-I
Syllabus

Cell and Cell Organelles

- Study of electron microphotographs of prokaryotic and eukaryotic cell.
- Study of electron microphotographs of virus, bacteria and eukaryotic cells for comparative study of cellular organization.
- Study of cell structure in Onion, *Hydrilla* and *Spirogyra*.
- Study of plastid for pigment distribution in *Lycopersicon*, *Cassia* and *Capsicum*.

Cell Division and Chromosomes

- Study of permanent slides/photographs of different stages of mitosis meiosis, sex chromosomes, polytene chromosome and salivary gland chromosomes.
- Study of different stages of mitosis and meiosis in root-tip cells and flower buds respectively of onion.
- Calculate the mitotic index of onion root tip cells.
- Study of induced aberrations in onion root tips employing chemicals and plant extracts.

Algae and Lichen

- **Algae-** Study of morphology and anatomy of *Nostoc*, *Volvox*, *Chara*, *Vaucheria*, *Ectocarpus* and *Polysiphonia* (vegetative and reproductive structures) by preparing temporary slides and studying permanent slides.
- **Lichens:** Study of growth forms of lichens (crustose, foliose and fruticose)

Fungi and Bryophyta

- **Fungi-** Microscopic observation of vegetative and reproductive structures of *Rhizopus*, *Peziza* and *Puccinia* through preparation of temporary slides and permanent slides.
- **Bryophytes-** Study of morphology, anatomy, vegetative and reproductive organs of *Marchantia*, *Anthoceros* and *Funaria* by preparing temporary slides and studying permanent slides.
- Study of renowned Indian scientists in the fields of phycology (M.O.P Iyengar), mycology (K. C. Mehta), bryology (S.R.Kashyap) and lichens (D.D.Awasthi).
- Make a list of national and international institutes of repute in the fields of cytology, phycology, mycology, bryology and lichens.

Raj Rishi Govt. (Autonomous) College Alwar (Rajasthan)

B.Sc. Semester- I (Bio Group) Botany Practical-I

Scheme of Practical Examination and Distribution of Marks

BOT-51P-102 **Duration- 4 hrs**

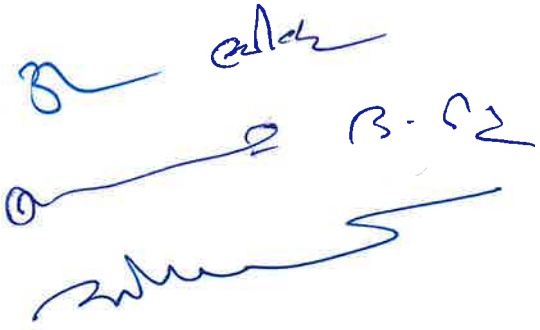
Max. Marks: 10*+40 **Min. Marks: 4*+16**

S.No.	**Exercise**	**Regular**	**Ex students**
1.	Exercise based on cell structure and types.	**4**	**6**
2.	Make a suitable acetocarmine preparation of the given material. Draw a well-labelled diagram of any one stage of nuclear division.	**4**	**6**
3.	Make a suitable stained preparation of the given material **A**. Draw a labelled diagram and identify giving reasons. **(Algae)**	**4**	**6**
4.	Make a suitable stained preparation of the given material **B**. Draw a labelled diagram and identify giving reasons. **(Fungi)**	**4**	**6**
5.	Make a suitable stained preparation of the given material **C**(vegetative/Reproductive part). Draw a labelled diagram and identify giving reasons. **(Bryophyte)**	**4**	**6**
6.	Comment upon the spots- identify giving reasons. (1 to 5)	**10**	**15**
7.	Viva-voce	**5**	**5**
8.	Record	**5**	**-**
	Total	**10*+40=50**	**50**
Regular students' internal marks are based on Viva voce /Group discussion/Project/ Field Study/Herbarium/Chart/Model/Specimen.			
Regular Candidates must keep a record of all work done in the practical classes and submit the same for inspection at the time of practical examination.			

Course Learning Outcomes:

At the completion of the course, the student would be able to:

1. Learn, understand and develop skill and hands on training in basics of cell biology.
2. Acquire basic knowledge of hereditary material and chromosomes.
3. Know all the kind of plant groups and understand relationships between them.
4. Understand diversity of lower plant presents on various habitats.
5. Identify microscopic to macroscopic view of the plants.
6. Apply the economic importance of lower plants in their endeavours.
7. Promote shared learning through practical classes, presentations and assignments.



Syllabus

UG0101 – Three/Four Year Bachelor of Science (Bio Group)

II-Semester - Botany

BOT-52T- 103 - Molecular Biology, Genetics and Diversity of Plant Kingdom-II

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
II	BOT-52T- 103	Molecular Biology, Genetics and Diversity of Plant Kingdom-II				5	4
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	Major	4	2	6	Yes	60 lectures with diagrammatic and informative assessments during lecture hours	
Prerequisites		Biology Courses of Senior Secondary level					
Objectives of the Course:		➢ To understand the Mendel's laws and its deviations. ➢ To impart knowledge on DNA replication, Mendel's laws of inheritance, mutations. ➢ To understand functions of genes, linkage and crossing over. ➢ To understand morphology and anatomy of the Pteridophytes and Gymnosperms. ➢ To understand reproduction in the Pteridophytes and Gymnosperms. ➢ To have a basic idea of Fossil plants.					

Course Outcomes:

At the completion of the course, the student would be able to:

Cognitive level	Course outcomes
Understanding	• To learn, understand and develop skill and hands on training in basics of genetics. • To understand functions of genes, linkage and crossing over. • To interpret genetics of a large group of populations. • To understand characteristic features and life cycle patterns of pteridophytes and gymnosperms. • To understand adaptation of pteridophytes to land habit.
Memorizing	• Differentiation between linkage, crossing over, allelic interactions. • Mendel's laws of genetics. • Classification of pteridophytes and gymnosperms. • Evolutionary concepts in pteridophytes and gymnosperms. • Habit, habitat, morphology and anatomy of various members.
Applying	• Allelic and non-allelic interactions • Possibilities of mutations and mutagens and ploidy in plants. • Ecology and economic importance of pteridophytes and gymnosperms.

Detailed Syllabus

BOT-52T- 103 - Molecular Biology, Genetics and Diversity of Plant Kingdom-II

Unit – I

DNA replication	Enzymes and mechanisms of prokaryotic DNA replication: Initiation, Elongation and Termination; Leading and lagging strands, Okazaki fragments.	**7 lectures**
Expression of Gene in Prokaryotes	Transcription, Initiation, elongation and termination. **Genetic code:** Meaning, types of codons, properties. **Translation**: Initiation, Elongation and Termination in Prokaryotes	**8 lectures**

Unit –II

Genetic inheritance	Mendel's laws of inheritance and their exceptions; allelic (incomplete dominance, co-dominance, lethality) and non-allelic interactions (complementary genes, epistasis and duplicate genes); Multiple allelism (ABO blood groups in men); Quantitative inheritance (Grain color in wheat). **Cytoplasmic inheritance:** Plastid inheritance (different types of leaves in *Mirabilis jalapa*); Mitochondrial inheritance (Cytopla mic male sterility in plants).	**8 lectures**
Structural and numerical aberrations	Deletion, Duplication, Translocation, Inversion, Aneuploidy and Polyploidy. **Mutations**: Types of Mutations, Spontaneous and induced Mutations, Physical and Chemical mutagens.	**7 lectures**

Unit –III

Pteridophytes	General characteristics; Affinities with bryophytes & gymnosperm; Heterospory and seed habit; Evolution of stele in Pteridophytes; Economic importance. Classification (Riemers, 1954); Study of life history of fossil Pteridophyte – *Rhynia*. Life history of Psiloptopsida: *Psilotum;* Lycopsida: *Selaginella*; Sphenopsida: *Equisetum*; Pteropsida: *Marsilea.*	**15 lectures**

Unit-IV

Gymnosperms	General characteristics; Affinities with Pteridophytes and Angiosperms, Distribution; Economic importance. Classification (Sporne, 1965); Life history of Cycadopsia: *Cycas*; Coniferopsida: *Pinus*; Gnetopsida: *Ephedra.*	**12 lectures**
Paleobotany	Introduction, Basic concept and significance, Geological time scale; Types of Fossils.	**3 lectures**

Suggested Books and References –

1. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2014). **Molecular Biology of the Cell** (6thEd.). New York: Garland Science
2. Cooper, G. M., and Hausman, R. E. (2013). **The Cell: A Molecular Approach** (6th Ed.). Washington: ASM; Sunderland.
3. Karp, G. **Cell and Molecular Biology. Concepts and experiments**. John Harris, D., Wiley & sons, New York
4. Lodish, HF. Berk, A. Kaiser, CA, Krieger, M. Bretscher, A. Ploegh, H. Aman, A. Martin, K. (2016). **Molecular Cell Biology** (8th Ed.). New York: W.H. Freeman
5. Gupta P.K. **Cell and Molecular Biology** 2018. 5th edition Rastogi Publication India.
6. Veer Bala Rastogi. **Genetics.** Medtech
7. Veer Bala Rastogi. **A Textbook of Cell Biology and Genetics.** Kedarnath Ramnath
8. Singh, Pande and Jain. **A Textbook of Botany,** Rastogi publications
9. B.R. Vashishta and P.C. Vashishta. **Botany for Degree Students: Pteridophyta - Vascular Cryptogams),** S.Chand (G/L) & Company Ltd
10. B.R. Vashishta and P.C. Vashishta. **Gymnsperms (Botany for Degree Students),** S.Chand (G/L) & Company Ltd

Suggested E-resources:

1 **RRC E-resources**

1. **https://youtu.be/K2teJ6-DBLw**
2. https://archive.org/details/cellmolecularapp6edcoop
3. https://assets.cambridge.org/97805217/07725/excerpt/9780521707725_excerpt.pdf
4. https://books.google.co.in/books?id=Xz1RCgAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

B.Sc. Semester- II (Bio Group)
BOT-52P-104-Botany Practical-II
Syllabus

Practicals related to DNA

- Isolation of Genomic DNA from Onion/Banana/Pineapple/etc.
- Demonstration of Gel-electrophoresis

Practicals related to Genetics

- To solve genetic problems based upon Mendel's laws of inheritance: Monohybrid cross, Dihybrid cross, Back cross and test cross.
- Induction of polyploidy using colchicines
- Emasculation, Bagging and Tagging

Pteridophytes-

- Study of vegetative and reproductive stages of *Selaginella*, *Equisetum* and *Marsilea* by preparing temporary slides and studying permanent slides.
- Study of fossil plant: *Rhynia*

Gymnosperms

- Study of Vegetative and reproductive stages of *Cycas*, *Pinus* and *Ephedra* by preparing temporary slides and studying permanent slides.

Raj Rishi Govt. (Autonomous) College Alwar (Rajasthan)

B.Sc. Semester- II (Bio Group) Botany Practical-II

Scheme of Practical Examination and Distribution of marks

BOT-52P-104 **Duration- 4 hrs**

Max. Marks: 10*+40 **Min. Marks: 4*+16**

S.No.	Exercise	Regular	Ex students
1.	Exercise-based on Nucleic acids	**5**	**7**
2.	Exercise-based on Genetics	**5**	**7**
3.	Make a suitable stained preparation of the given material **A**(vegetative/Reproductive part). Draw a labelled diagram and identify giving reasons. (**Pteridophyte)**	**5**	**8**
4.	Make a suitable stained preparation of the given material **B** (vegetative/Reproductive part). Draw a labelled diagram and identify giving reasons. (**Gymnosperm**)	**5**	**8**
5.	Comment upon the spots- identify giving reasons. (1 to 5)	**10**	**15**
6.	Viva-voce	**5**	**5**
7.	Record	**5**	**-**
	Total	**10*+40= 50**	**50**
	Regular students' internal marks are based on Viva voce /Group discussion/Project/ Field Study/Herbarium/Chart/Model/Specimen.		
	Regular Candidates must keep a record of all work done in the practical classes and submit the same for inspection at the time of practical examination.		

Course Learning Outcomes:

At the completion of the course, the student would be able to:

1. Learn, understand and develop skill and hands on training in basics of genetics.
2. Acquire basic knowledge of Mendel's laws of genetics.
3. Develop possibilities of mutations and mutagens and ploidy in plants.
4. Understandcharacteristic feature and life cycle pattern of pteridophytes and gymnosperms.
5. Apply the economic importance and evolutionary concepts of pteridophytes and gymnosperms.
6. Comprehend information about fossil plants.

7. Promote shared learning through practical classes, presentations and assignments.

5. Credit points in a Course/Subject will be assigned only if, the student obtains at least a C grade in midterm and EoSE examination of a Course/Subject.

Syllabus: UG0101/02 - B.Sc. (Pass Course)

CHEMISTRY

Semester – I (2023-2024)

Course Code	Course Title	Duration	Maximum Marks	Minimum Marks
CHM-51T-101	Structure-bonding, Mathematical concept and States of matter	CA - 1 Hr. EoSE - 3 Hrs.	CA - 20 EoSE - 80	CA - 08 EoSE - 32
CHM-51P-102	Chemistry Lab-I	CA - 2 Hrs. EoSE - 4 Hrs.	CA - 10 EoSE - 40	CA - 04 EoSE - 16
Prerequisites/Eligibility	12^{th} standard pass in science from CBSE, RBSE or a recognized board of education.			
Course Objectives: The aim of this course is to provide students with a theoretical understanding of the basic constituents of matter; atoms, ions and molecules in terms of their electronic structure and chemical bonding of these are to be explained by applying basic quantum chemistry. The objective of this course is to explain the basic concepts of mathematics and to explain the structural differences and transformations between states of matter. In addition, the laboratory course is designed to provide students with practical experience in basic qualitative analytical techniques, the use of laboratory techniques, and the determination of physical properties of matter.				
Course Outcomes: By the end of this course, students will have a clear understanding of various concepts related to atomic and molecular structure, chemical bonding, mathematical concepts, and states of matter. Students will also have practical experience in calibration of glassware, qualitative analysis of radicals, identification of functional groups in organic compounds, determination of various physical properties of substances, crystallization and preparation of standard solutions of different concentrations.				

Syllabus

CHM-51T-101: (4 Hrs./week) **Structure-bonding, Mathematical concept and States of matter.**

Duration	Maximum Marks	Minimum Marks
1 Hour	CA – 20 Marks	CA – 08 Marks
3 Hours	EoSE – 80 Marks	EoSE – 32 Marks

Unit-I

Ionic Solids: General characteristics of ionic bonding, Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, Lattice enthalpy and Born-Lande equation for calculation of Lattice Enthalpy (no derivation), Born-Haber cycle and its applications, Solvation enthalpy and solubility of ionic solids, polarizing power and polarizability, Fajan's rule. lattice defects, semiconductors.

Metallic bond: Free electron, valence bond and band theories.

Weak Interactions: Hydrogen bonding, Van der Waals forces. **15 Lecture**

Unit-II

Covalent Bond: Valence bond theory and its limitations, Directional character, Hybridization. Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, ClF_3, ICl_2^-, H_2O.

Molecular Orbital Theory: LCAO method, bonding, nonbonding and antibonding MOs and their characteristics for combinations of atomic orbitals, MO treatment of homonuclear and heteronuclear (CO and NO) diatomic molecules. Comparison of VB and MO approaches.

Multicenter bonding in electron deficient molecules, bond strength and bond energy, ionic character in covalent compounds, calculation of percentage ionic character from dipole moment and electronegativity difference. **15 Lecture**

Unit-III

Mathematical Concepts: Logarithmic relations, curve sketching, linear graphs and calculations of slopes, differentiation of functions like k_x, e^x, x^n, sinx and log x; maxima and minima, partial differentiation and reciprocity relations, integration of some useful/relevant functions; permutations and combinations, factorials, probability. Matrices and Determinant.

Liquid State: Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solids, liquids and gases. Liquid crystals: Difference between liquid crystal, solid and liquid.

Solid State: Definition of space lattice, unit cell.

Laws of crystallography- (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of symmetry. Symmetry elements in crystals.

Basic concept of X-ray diffraction by crystals. Derivation of Bragg's equation. Determination of crystal structure of NaCl and CsCl (Laue's method and powder method.). Defects in solids.

15 Lecture

Unit- IV

Gaseous State: Postulates of kinetic theory of gases, deviation from ideal behavior, van der Waals equation of state.

Critical Phenomenon: PV isotherms of real gases, continuity of states, the isotherms of van der Waals equation, relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of state.

Molecular Velocities: Root mean square, average and most probable velocities. Qualitative

discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquification of gases (based on Joule-Thomson effect.)

Colloidal State: Definition of colloids, classification of colloids.

Solids in liquids (sols): properties - kinetic, optical and electrical, stability of colloids. Protective action, Hardy-Schulze law, gold number.

Liquids in solids (gels): classification, preparation and properties, inhibition, general applications of colloids.

Liquids in liquids (emulsions): types of emulsions, preparation. Emulsifier.

15 Lecture

Suggested Books and References:

1. Lee, J.D. Concise Inorganic Chemistry Wiley, India.
2. Housecroft, Catherine E. & Sharpe, Alan G. Inorganic Chemistry, Pearson Education Ltd.
3. Tuli, G. D. Advanced Inorganic Chemistry, S. Chand, New Delhi.
4. Satya Prakash Advanced Inorganic Chemistry, S. Chand, New Delhi.
5. Adams, D. M. Inorganic Solids – Introduction to Concepts in Solid-state Structural Chemistry, John Wiley, London.
6. Puri, Sharma & Kalia, Principles of Inorganic Chemistry, S. Chand, New Delhi.
7. Puri, B. R., Sharma, L. R. & Pathania, M. S. Principles of Physical Chemistry, Vishal Publishing Co.
8. Gurdeep Raj, Advanced Physical Chemistry, Goel Publishing House.
9. Atkins, W. Physical Chemistry, Oxford University Press.
10. Silby, R. J. & Alberty, R. A. Physical Chemistry, John Wiley & Sons.
11. Barrow, G.M. Physical Chemistry, Tata McGraw-Hill.
12. Kapoor, K. L. A Textbook of Physical Chemistry, (Volume I) Macmillan India Ltd.

Syllabus

CHM-51P-102: Chemistry Lab I **(4 Hrs./week)**

Duration	Maximum Marks	Minimum Marks
2 Hours	CA – 10 Marks	CA – 04 Marks
4 Hours	EoSE – 40 Marks	EoSE – 16 Marks

Inorganic Chemistry **10 marks**

Separation and identification of six radicals (3 cations and 3 anions) in the given inorganic mixture including special combinations.

Organic Chemistry

Laboratory Techniques **3 marks**

(a) Determination of melting point (naphthalene, benzoic acid, urea, etc.); boiling point (methanol, ethanol, cyclohexane, etc.): mixed melting point (urea-cinnamic acid, etc.).

(b) Crystallization of phthalic acid and benzoic acid from hot water, acetanilide from boiling water, naphthalene from ethanol etc.; Sublimation of naphthalene, camphor, etc.

Qualitative Analysis **7 marks**

Identification of functional groups (unsaturation, phenolic, alcoholic, carboxylic, carbonyl, ester, carbohydrate, amine, amide, nitro and hydrocarbon) in simple organic compounds (solids or liquids) through element detection (N, S and halogens).

Physical Chemistry

Viscosity and Surface Tension: **10 marks**

a) To determine the viscosity/surface tension of a pure liquid (alcohol etc.) at room temperature. (Using the Ostwald viscometer/stalagmometer).

b) To determine the percentage composition of a given binary mixture (acetone and ethyl methyl ketone) by surface tension method.

c) To determine the percentage composition of a given mixture (non- interacting systems) by viscosity method.

d) To determine the viscosity of amyl alcohol in water at different concentration and calculate the excess viscosity of these solutions.

Viva voce **5 marks**

Practical Record **5 marks**

Syllabus: UG0101/02 -B.Sc. (Pass Course)

CHEMISTRY

Semester – II (2023-2024)

Course Code	Course Title	Duration	Maximum Marks	Minimum Marks
CHM-52T-103	Reaction mechanism, Stereochemistry, Aromatic hydrocarbons and Chemical kinetics.	CA - 1 Hr. EoSE - 3 Hrs.	CA - 20 EoSE - 80	CA - 08 EoSE - 32
CHM-52P-104	Chemistry Lab-II	CA - 2 Hrs. EoSE - 4 Hrs.	CA - 10 EoSE - 40	CA - 04 EoSE - 16
Course Objectives: The objective of this course is to provide students with a theoretical understanding of the types of organic reactions and their mechanisms, generation and stability				

of various intermediates, determination of rection mechanism, stereochemistry of organic compounds with an understanding of the enantiomers, diastereomers, D/L and R/S nomenclature. The aim of this course is to explain the structure and reactivity of aromatic hydrocarbons, and to explain the order and molecularity of the reactions, the rate law and order of reactions determination. In addition, the laboratory course is designed to provide students with practical experience in basic quantitative analytical techniques including volumetric analysis, qualitative analytical techniques, and the determination of kinetic parameters of reactions.
Course Outcomes: By the end of this course, students will have a clear understanding of drawing logical and detailed reaction mechanisms for various fundamental reactions of aliphatic and aromatic hydrocarbons, methods of determining the reaction mechanisms, classifying the molecules as chiral or achiral, determining the D/L and R/S nomenclature of stereoisomers and identifying the formation of racemic mixture or optically active compounds during the reactions. Students will also have an understanding about order and molecularity of reactions, rate law and methods determining of order and kinetic parameters of reactions. Students will also have practical experience in quantitative analytical techniques including volumetric analysis, identification of organic compounds by determination of functional groups, determination of order and rate constant of various reactions.

Syllabus

CHM-52T-103: (4 Hrs./week) **Reaction mechanism, Stereochemistry, Aromatic hydrocarbons and Chemical kinetics.**

Duration	Maximum Marks	Minimum Marks
1 Hour	CA – 20 Marks	CA – 08 Marks
3 Hours	EoSE – 80 Marks	EoSE – 32 Marks

Unit-I

Introductory Concept and Mechanism of Organic Reactions: IUPAC nomenclature of organic compounds, Dipole moment, Inductive and field effects, electromeric effect, conjugation, resonance and resonance energy, hyperconjugation. Homolytic and heterolytic bond cleavage. Type of reagents, electrophiles and nucleophiles. Reactive intermediates - carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (generation, reactions and stability). Types of organic reactions. Markovnikov's rule, Anti-Markovnikov's rule, Saytzeff's rule and Hofmann elimination. Energy considerations. Methods of determination of reaction mechanism (product analysis, intermediates, isotope labelling, kinetic and stereochemical studies), isotope effects.

15 Lecture

Unit-II

Stereochemistry of Organic Compounds: Concept of isomerism, Types of isomerism, Difference between configuration and conformation, Flying wedge and Fischer projection formulae.

Optical Isomerism: Elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity. Properties of enantiomers, chiral and achiral molecules with two stereogenic centres. Diastereomers, threo and erythro isomers, meso compounds. Resolution of enantiomers. Inversion, retention and racemization (with examples).

Relative and absolute configuration, sequence rules, D / L and R / S systems of nomenclature.

Geometrical Isomerism: Determination of configuration of geometric isomers - cis / trans and E / Z systems of nomenclature. Geometrical isomerism in oximes and alicyclic compounds.

Conformational Isomerism: Newman projection and Sawhorse formulae, Conformational analysis of ethane, *n*-butane and cyclohexane. **15 Lecture**

Unit-III

Arenes and Aromaticity: Nomenclature of benzene derivatives. The aryl group, aromatic nucleus and side chain. Structure of benzene: molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO diagram.

Aromaticity: Huckel rule, aromatic ions-three to eight membered.

Aromatic electrophilic substitution: General pattern of the mechanism, role of sigma and pi complexes. Mechanism of nitration, halogenation, sulphonation, mercuration, chloromethylation and Friedel crafts reactions. Energy profile diagrams. Activating and deactivating substituents. Directive influence orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Birch reduction. **15 Lecture**

Unit- IV

Chemical Kinetics: Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction: concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions - zero order, first order, second order and pseudo-order; half-life and mean-life. Determination of the order of reaction - differential method, method of integration, method of half-life period and isolation method.

Radioactive decay as a first order phenomenon.

Experimental methods of chemical kinetics: conductometric, potentiometric, optical methods, (polarimetry) and spectrophotometric method. Theories of chemical kinetics. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy.

Simple collision theory based on hard sphere model transition state theory (equilibrium hypothesis). Expression for the rate constant bases on equilibrium constant and thermodynamic

aspects. **15 Lecture**

Suggested Books and References:

1. Gupta, S. S. Organic Chemistry, Oxford University Press.
2. Ahluwalia, V. K. Organic Reaction Mechanisms, Narosa Publishing House, New Delhi.
3. Agarwal, O. P. Organic Chemistry – Reactions and Reagents: Covering Complete Theoretical Organic Chemistry, Goel Publishing House, Meerut.
4. Morrison R. T. & Boyed R. N. Organic Chemistry, Prentice Hall.
5. Finar, I. L. Organic Chemistry (Vol. I & II) ELBS.
6. Bahl A. & Bahl B. S. Advanced Organic Chemistry, S. Chand.
7. Jain, M.K. & Sharma, S.C. Modera Organic Chemistry, Vishal Publishing Co.
8. March, J. & Smith, M. B. March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure, Wiley.
9. Ahluwalia, V. K. Stereochemistry of Organic Compounds, Springer.
10. Puri, B. R., Sharma, L. R. & Pathania, M. S. Principles of Physical Chemistry, Vishal Publishing Co.
11. Gurdeep Raj, Advanced Physical Chemistry, Goel Publishing House.
12. Kapoor, K. L. A Textbook of Physical Chemistry, (Volume 5) Macmillan India Ltd.

Syllabus

CHM-52P-104: Chemistry Lab II **4 Hrs./week**

Duration	Maximum Marks	Minimum Marks
2 Hours	CA – 10 Marks	CA – 04 Marks
4 Hours	EoSE – 40 Marks	EoSE – 16 Marks

Inorganic Chemistry

Volumetric Analysis **10 marks**

(a) Determination of acetic acid in commercial vinegar using NaOH
(b) Determination of alkali content in antacid tablet using HCl
(c) Estimation of calcium content in chalk as calcium oxalate by permanganometery.
(d) Estimation of hardness of water by EDTA
(e) Estimation of ferrous and ferric by dichromate/permanganate method.
(f) Estimation of copper using thiosulphate by iodometric method.

Organic Chemistry

Qualitative Analysis **10 marks**

Identification of organic compound through the functional group analysis, determination of melting point, boiling point and specific test.

Physical Chemistry

Chemical Kinetics: **10 marks**

a) To determine the specific reaction rate of the hydrolysis of methyl acetate/ ethyl acetate catalyzed by hydrogen ions at room temperature.
b) To study the effect of acid strength on the hydrolysis of an ester.
c) To compare the strengths of HCl and H_2SO_4 by studying the kinetics of hydrolysis of ethyl acetate.
d) To study kinetically the reaction rate of decomposition of iodide by H_2O_2.

Viva voce **5 marks**

Practical Record **5 marks**

Syllabus

UG0101 - ZOO- 51T-101- Diversity & Biology of Non-Chordates

UG0101 -ZOO-51P-102- Practicals based on Diversity & Biology of Non-Chordates

I Semester -Zoology

Objectives of theCourse:

- The main purpose of introducing this course is to teach the students the Morpho-taxonomy, and evolutionary relationships among and between non-chordates and chordates along with creating awareness and concern towards the importance of animal diversity for human survival and its socioeconomic significance.
- In addition to this, the course is aimed at nurturing skills of conducting scientific inquiry and experimentation in the field of animal diversity to acquire knowledge of fundamental concepts and theories of animal diversity

Detailed Syllabus Semester I

ZOO- 51T-101: Diversity & Biology of Non -Chordates

UNIT-I

Principles of taxonomy: International code of nomenclature; Concept of five kingdom system; basis of classification: symmetry, coelom, segmentation, embryogeny and levels of organization, Invertebrate versus vertebrate (comparison) **3 Hrs**

Protozoa: General characteristics and classification up to classes; Habit, Habitat, Morphology, locomotion, nutrition, reproduction and economic importance of protozoa: *Paramecium* **6 Hrs**

Porifera: General characteristics and Classification up to classes; Canal system inPorifera; Habit, Habitat, Morphology, reproduction, regeneration and economic importance of sponges and life cycle: *Sycon* **6Hrs**

UNIT-II

Coelenterata (Cnidaria): General characteristics and Classification up to classes; Polymorphism; Coral, Coral reefs and their economic importance, Habit, Habitat, Morphology, reproduction and life cycle: *Obelia.* **7 Hrs**

Platyhelminthes and Nemathelminthes: General characteristics and Classification up to classes; parasitic adaptations, phylogenetic significance of flatworms; Habit, Habitat, morphology, organ systems: digestive, circulatory, excretory, nervous, reproductive and life cycle: *Taenia* and *Ascaris* **8 Hrs**

UNIT-III

Annelida: General characteristics and Classification up to classes; Habit, Habitat, Morphology, organ systems: locomotion, digestive, circulatory, excretory, nervous, reproduction and life cycle: *Neanthes (Nereis).* **6Hrs**

Arthropoda: General characteristics and Classification up to classes; Larval forms in crustacea, Metamorphosis and Social organization in insects; Habit, Habitat, Morphology, organ systems: digestive, circulatory, excretory, nervous, reproductive and life cycle: Prawn **7 Hrs**

Onycophora: Annelidian, Molluscan and Arthropodian characters of *Peripatus* **2 Hrs**

UNIT-IV

Mollusca: General characteristics and Classification up to classes; Torsion and detorsion in Gastropoda; Pearl formation. Habit, Habitat, Morphology, organ systems: locomotion, digestive, circulatory, excretory, reproductive and life cycle: *Pila.*

7 Hrs

Echinodermata:

General characteristics and Classification up to classes; Water-vascular system in Asteroidea; Habit,Habitat, Morphology, organ system: digestive,circulatory, excretory, reproductive and life cycle:*Asterias.* **4 Hrs**

Hemichordata: Affinities with Chordata and Echinodermata, Systemic position and Phylogeny of *Balanoglossus* **4 Hrs**

Suggested Books and References:

1. Invertebrate Zoology. VII Edition, Barnes, R.D. (2006) Cengage Learning, India.
2. The Invertebrates: A New Synthesis. III Edition, Barnes, R.S.K., Calow, P., Olive,P.J.W., Golding, D.W. and Spicer, J.I. (2002) Blackwell Science
3. Invertebrate Zoology. Jordan E.L., Verma P. S. (2022): S. Chand and CompanyLimited
4. Invertebrate Structure and Functions. II Edition Barrington, E.J.W. (2012), EWPPublishers
5. Invertebrate Zoology: A Functional Evolutionary Approach. VII Edition, Ruppert,E.E., Fox, R.S., Barnes, R. D. (2003) Cengage Learning, India
6. Biology of the Invertebrates. VII Edition, Pechenik, J. A. (2015) Mraw-HillEducation
7. जववविविधता Mali, P. C., Singh, M., Kumari, V. and Digarwal, G. L. (2023) (Animal Diversity-B.Sc I Semester). Neelkanth Publishers (P) Ltd.

Suggested E-roesources:

1. Kachhwaha, N and Kaushik, P (2019): Freely online available gamingwebsiteinnovativezoology.com to study vertebrate and invertebrate classification.

Course Learning Outcome:

Upon completion of the course, students will have knowledge of:

- Morpho-taxonomy and structural organization of non-chordata and chordatagroups.
- Diversity of non-chordata and chordata groups.
- Evolutionary relationships and phylogeny of non-chordates and chordates throughfunctional and structural similarities.
- Economic importance of non-chordates and chordates and their significance in theecosystem.

Practical Syllabus Semester I

UG0101 -ZOO-51P-102- Practicals based on Diversity & Biology of Non Chordates

1. Organization and working of Optical Microscope: Dissecting and compoundmicroscopes.
2. General methods of microscopic slide preparations: Narcotization; fixing and preservation; washing; staining; destaining; dehydration; clearing and mounting.
3. General idea of composition, preparation and use of:

   i. Fixatives: Formalin, Bouin's fluid.

   ii. Stains: Aceto-carmine, Aceto-orcein, Haematoxylin, Eosin.

   iii. Common reagents: Normal saline, Acid water, Acid alcohol and Mayer'salbumin.

4. Study of Microscopic Slides and Museum Specimens:

i. Protozoa: *Euglena, Amoeba, Plasmodium, Paramecium* (W.M.), binary fission,conjugation)

ii. Porifera: *Leucosolenia, Euplectella, Spongilla, sycon*

iii. Coelenterata: Millipora, *Physalia, Aurelia, Velella,* Sea anemone, *Gorgonia,*Stone corals.

iv. Platyhelminthes: *Taenia* (WM), Cysticercus larva, *Fasciola* (WM), Miracidium,Sporocyst, Redia, Cercaria and Metacercaria Larvae of *Fasciola.*

v. Aschelminthes: *Ascaris*

vi. Annelida: Neanthes*(Nereis), Aphrodite, Pontobdella, Arenicola, Glossiphonia,Hirudinaria.*

vii. Onychophora: *Peripatus*

viii. Arthropoda: *Limulus,* Scorpion, Centipede, Millipede, *Lepas,* Crab, *Mantis, Pediculus,* Termite, *Cyclops, Daphnia,* crustacean larvae (Nauplius, Zoea, Mysis, Megalopa),

ix. Mollusca: *Chiton, Aplysia, Dentalium, Cypraea, Mytilus, Loligo, Octopus, Nautilus.* Glochidium larva

x. Echinodermata: *Asterias, Antendon.*

5. Anatomy:

i. Pila: External features and nervous system.

ii. Prawn: External features, appendages, alimentary canal, and nervous system.

6. Study of the following through Permanent Slide Preparation: *Euglena*, *Paramecium*, Sponge spicules, Gemmule, *Obelia* colony, Statocyst and hastate plate of prawn, osphradium and gill lamella of *Pila*
7. Education tour and report preparation on the study of local invertebrate fauna

Scheme of Practical Examination and Distribution of Marks

S.No.	Practical Exercise	Regular Students	Ex. /N.C. Students
1.	Major exercise	6	12
2.	Minor exercise	4	6
3.	Permanent slide preparation	4	6
3.	Identification and comments on Spots (1 to 8)	16	16
4.	Viva Voce	5	10
5.	Class Record	5	
		10*+40=50	50

Note:

***Internal marks for regular students only.**

1. Anatomy: Study of systems of the prescribed types with the help of dissection. Detailed charts/Dissection softwares/virtual tools/models can also be utilized tostudy anatomy.
2. With reference to microscopic slides, in case of non-availability, the exercise should be substituted with diagrams / photographs.
3. Candidates must keep a record of all work done in the practical class and submitthe same for inspection at the time of the practical examination.
4. Mounting material for permanent preparations would be as per the syllabus or as available through collection and culture methods.
5. It should be ensured that animals used in the practical exercises are not covered under the wild life act 1972 and amendments made subsequently.

Syllabus

UG0101 -ZOO-52T-103- Diversity of Chordates & Developmental Biology ofVertebrates

UG0101 -ZOO-52P-104- Practicals based on Diversity of Chordates &Developmental Biology of Vertebrates

II-Semester Zoology

Objectives of theCourse:

- The course offers a complete understanding about diversity and classification of Chordate animals.
- It educates the students regarding general and specific characteristics of chordates. Thorough understanding of their affinities and evolutionary aspects of chordates will be developed in students.
- The course will also provide a glimpse of scope and historical background of developmental biology to the students.
- It will impart knowledge regarding basic concepts of differentiation, morphogenesis and pattern formation and insight into stem cells and cloning.
- Understanding of essential events of developmental biology will be imparted through proper explanation of gametogenesis, stages of embryonic development and foetus formation.

Detailed Syllabus Semester II

ZOO-52T-103: Diversity of Chordates & Developmental Biology of Vertebrates

Unit-I

General characteristics and classification of Chordata:-

Urochordata: General characteristics and classification up to sub-classes, Study of *Herdmania* and Its affinities **4 Hrs**

Cephalochordata: General characteristics and classification up to sub-classes, Study of *Branchiostoma* (Amphioxus) and its affinities **4 Hrs**

Cyclostomata (Agnatha): General characteristics and classification up sub-class; Study of *Petromyzon* and its affinities **3 Hrs**

Pisces: General characteristics and classification up to sub-classes; Types of fins and scales, swim bladder, Weberian ossicles, Parental care and migration in fishes. **4 Hrs**

Unit-II

General characteristics and classification of Amphibia & Reptilia up to order and Aves & Mammals up to sub-classes **4 Hrs**

Amphibia; Origin and evolution of Amphibia; Neoteny; Parental care in Amphibians. **3 Hrs**

Reptilia: Identification of poisonous and non-poisonous snakes. **2 Hrs**

Aves: Flight adaptationsand Migration in birds. **4 Hrs**

Mammals; Dentition in Mammals; Adaptive radiation in mammals. **3 Hrs**

Unit-III

Scope and History of Developmental Biology; Early Embryonic Development:Gametogenesis: Spermatogenesis and Oogenesis; germ **4 Hrs**

Fertilization; Cleavage: planes and patterns of cleavage; blastulation and morulation;parthenogenesis **3 Hrs**

Gastrulation: Types of morphogenetic movements; Embryonic induction; Fate of germ layers, Fate maps **4 Hrs**

Early embryonic development of frog (up to neurulation) and chick (up to 96 hrs). **4 Hrs**

Unit-IV

Metamorphosis and its hormonal regulation in frogs; Regeneration of limb in frog

4 Hrs

Types and functions of extra embryonic membranes in chick development

2 Hrs

Types, formation and functions of placenta in mammals, Implantation, Pregnancy and Parturition

5 Hrs

Teratology and Developmental disorders. **3 Hrs**

Suggested Books and References:

1. Biology. Campbell & Reece (2005)., Pearson Education, (Singapore) Pvt. Ltd.
2. Chordate Zoology. Jordan E.L., Verma P. S. (2022) S. Chand and Company Limited.
3. Biology, 6th edition. Raven, P. H. and Johnson, G. B. (2004) Tata McGraw Hill Publications. New Delhi.
4. Analysis of Vertebrate Structure. Hilderbrand, M and Gaslow G.E.. John Wiley and Sons
5. Principles of Developmental Biology (4th edition). Wolpert, L & Tickle, C (2011). Oxford University Press, ISBN: 9780198792918
6. Patten's Foundations of Embryology. Carlson, Bruce M (1996). McGraw Hill, Inc. ISBN: 9780070634275
7. The Life of Vertebrates. III Edition. Young, J. Z. (2004) Oxford university press.
8. Comparative Anatomy and Development Biology of Vertebrates (2024) Dr Jyotsna Jain, Dr Dev D. Patel, Dr Pallavi Kaushik and Dr Dau Lal Bohra.Text book for B.Sc. II Semester, Neelkanth Publishers (P) Ltd, Jaipur, India 2024 ISBN: 978-93-5736-733-2.
9. Developmental Biology. X Edition. Gilbert, SF (2014) Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA. ISBN : 9780878939787
10. An Introduction to Embryology. Balinsky, B.I. (2008). International Thomson Computer Press.

Suggested E-resources:

1. Meena G, 2020. Developmental Biology, Glossary, Ideal International PublicationPvt.Ltd. https://drive.google.com/file/d/1ebK1B6QHc6fJG6CXaGicmXTZlY6VkOxi/view ?usp=drivesdk

Course Learning Outcome:

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

- Know about the levels of organization among different groups of vertebrates.
- Understand how chordates evolved during the course of evolution through succession.
- Know the evolution of different concepts in developmental biology.
- Understand the process of gamete formation from stem cell population to mature ova and sperm.
- Comprehend the sequence of steps leading to the formation of gametes and development of embryo.
- Know the mechanisms underpinning cellular diversity and specificity in animals.
- Have the knowledge about the methods and tools related to developmental biology which help to understand different processes of embryogenesis.

Practical Syllabus Semester II

UG0101 -ZOO-52P-104- Practicals based on Diversity of Chordates &Developmental Biology of Vertebrates

1. Anatomy: Study of swim bladder and Cranial nerves in any edible fish
2. Study of microscopic slides and museum specimens:

i. **Protochordates:** *Herdmania*, *Ciona*, *Botryllus*, *Amphioxus*, *Doliolum*, *Oikopleura*, *Pyrosoma*, Tadepole larva of Ascidia

ii. **Agnatha:** *Petromyzon*, *Myxine,* Ammocoete larva.

iii. **Pisces:** *Zygaena* (*Sphyrna*), *Torpedo*, *Pristis*, *Chimaera*; *Acipenser*, *Amia* or *Lepidosteus*, *Labeo*, *Clarias*, *Anguilla*, *Hippocampus*, *Exocoetus*, *Echenies*, any flat-fish, *Syngnathus*, *Protopterus*, *Lepidosiren*, *Neoceratodus*, *Notopterus*.

iv. **Amphibia:** *Icthyophis*, *Necturus*, *Proteus*, *Ambystoma*, *Salamander*, Axolotl, *Siren*, *Alytes*, *Hyla*, *Pipa*, *Rachophorus*, *Rana*

v. **Reptilia:** *Testudo*, *Chelone* and fresh water tortoise, *Sphenodon*, *Hemidactylus*,*Phrynosoma*, *Draco*, *Calotes*, *Chameleon*; *Eryx*, *Hydrophis*, *Krait*, *Naja*, *Viper*,*Bungarus*, *Crocodilus*, Alligator.

vi. **Aves:** *Pavo cristatus* (peacock), *Choriotis* (Great Indian Bustard), *Columba*

vii. **Mammalia:** *Ornithorhynchus*, *Echidna*, *Tachyglossus*, *Didelphys*, Kangaroo, Bat, *Loris*, *Manis*, Mongoose, Otter

3. Study of the following through Permanent Slide preparations: oral hood ofamphioxus, scales of fishes, hair of mammals
4. Frog - Study of developmental stages - through permanent slides (whole mounts and sections) — cleavage stages, blastula, gastrula, neurula, tail bud stage, tadpoleexternal and internal gill stages.
5. Study of Chick Embryo: 18 hrs, 21 hrs, 24 hrs, 33 hrs, 48 hrs, 72 hrs and 96 hrs of incubation.
6. Window making in chick eggs to study the various incubation stages ofdeveloping chick embryo
7. Study of extra-embryonic membranes in chick development.
8. Educational tour: Visit to Zoo/National Park/Sanctuary and submission of report.

Scheme of Practical Examination and Distribution of Marks

S.No.	Practical Exercise	Regular Students	Ex. /N.C. Students
1.	Major exercise	6	12
2.	Permanent slide preparation	4	6
3.	Developmental Biology	4	6
3.	Identification and comments on Spots (1 to 8) **Note**: Spot 1 to 4 from Chordata and 5 to 8 from Developmental Biology.	16	16
4.	Viva Voce	5	10
5.	Class Record	5	
		10*+40=50	50

Note:

***Internal marks for regular students only.**

1. Anatomy: Study of systems of the prescribed types with the help of dissection. Detailed charts/Dissection softwares/virtual tools/models can also be utilized to study anatomy.
2. With reference to microscopic slides, in case of non-availability, the exercise should be substituted with diagrams / photographs.
3. Candidates must keep a record of all work done in the practical class and submit the same for inspection at the time of the practical examination.
4. Mounting material for permanent preparations would be as per the syllabus or as available through collection and culture methods.
5. It should be ensured that animals used in the practical exercises are not covered under the wild life act 1972 and amendments made subsequently.

राजर्षि महाविद्यालय, अलवर

B.Sc. (Bio & Math Group, chemistry & Mathematics) Semester I & III

Hindi - I

पूर्णांक - 40

समय - 1.30

नोट:– इस प्रश्नपत्र में प्राप्त अंको को श्रेणी निर्धारण हेतु नहीं जोडा जायेगा।

प्रश्नपत्र में दो भाग होंगे–1. साहित्य खण्ड 2. व्याकरण खण्ड

साहित्य खण्ड में दो भाग होंगे– गद्य भाग एवं पद्य भाग

साहित्य खण्ड (गद्य भाग)

गद्य भाग = 16 अंक

1. प्रेमचन्द – नमक का दारोगा (कहानी) व्याख्या 8 अंक
2. महादेवी – प्रणाम (संस्मरण)
3. बनारसी दास चतुर्वेदी – बाईस वर्ष बाद (रेखाचित्र) प्रश्न 8 अंक
4. गुणाकर मुले – शनि सबसे सुन्दर ग्रह (विज्ञान)
5. पद्य भाग

पद्य भाग – 16 अंक

1. कबीर – 20 साखिया, कबीर ग्रथावली – सं. डॉ श्यामसुन्दरदास

(i)	गुरुदेव कौ अंग	–3,11,12,22,–(साखी नं.)
(ii)	बिरह कौ अंग	–5,11,31,32,–(साखी नं.)
(iii)	करणी बिन कथनी	–5 ,–(साखी नं.)
(iv)	भ्रम बिधौसण कौ अंग	–10 ,–(साखी नं.)
(v)	भेष कौ अंग	–5,12 ,–(साखी नं.)
(vi)	कुसंगति कौ अंग	– 1,7 ,–(साखी नं.)
(vii)	कसतूरिया मृग कौ अंग	–1 ,–(साखी नं.)
(viii)	चितावनी कौ अंग	–1 ,–(साखी नं.)
(ix)	साध कौ अंग	–1 ,–(साखी नं.)
(x)	उपदेश कौ अंग	–9, –(साखी नं.)

8 अंक

27-9-23
Dr. Richa Meena

C.B. Meena
27-9-23

(Bhagirath Prasad Meena)
27/09/23

(प्रो० उमेश कुमार राय)

(xi) काल कौ अंग —1, 4 —(साखी नं.)

2. सूरदास—वात्सलय वर्णन, सूरसागर—दशम स्कन्ध पद संख्या—43,75,99,108,249,344

3. तुलसीदास —कवितावली सं. रामचन्द्र शुल्क—नागरी प्रचारिणी सभा

(1) पुरतें निकसी रघुबीर बधू
(2) जल को गए लक्खन
(3) वनिता बनी स्यामल गौर
(4) रानी मैं जानी अजानी
(5) सीस जटा उर बाहुविसाल
(6) सुनि सुंदर बैन सुधारस साने

4. रहीम— 10 दोहे रहीम ग्रंथावली—पं. विद्यानिवास मिश्र 8 अंक

(1) प्रीतम छवि नैनन बसी
(2) बसि कुसग चाहत कुसल 1 व्याख्या
(3) रहिमन अंसुना नयन ढरि
(4) रहिमन ओछे नरन सो 1 प्रश्न
(5) रहिमन निजमन की व्यथा
(6) काज परै कछु और हैं
(7) रहिमन धागा प्रेम का
(8) पावस देखि रहीम मन
(9) रूठे सुजन मनाइये, जो रूठे सौ बार
(10) रहिमन पानी राखिए, बिन पानी सबसून

(ब) व्याकरण खण्ड = 8 अंक

1. निबंध लेखन (विकल्प देय एवं शब्द सीमा 300 शब्द)
2. कार्यालयी पत्र / अर्द्धशासकीय पत्र / परिपत्र / ज्ञापन / विज्ञप्ति / निविदा 8 अंक
3. संक्षेपण
4. पल्लवन
5. उपसर्ग, संधि, प्रत्यय, समास
6. वाक्य शुद्धि / शब्द शुद्धि
7. मुहावेर / लोकोक्तियाँ

27-9-23
Dr. Richa Meena

C.B. Meena
27/9/23

(Bhagirath Bairwa Meena)
27/09/23

(प्रो० उमेश कुमार)

NEW SYLLABUS

राजर्षि महाविद्यालय, अलवर

B.Sc. (Bio & Math Group, chemistry & Mathematics) Semester II & IV

Hindi - II

समय – 1.30 पूर्णांक 40 अंक

नोट:– इस प्रश्नपत्र में प्राप्त अंको को श्रेणी निर्धारण हेतु नहीं जोडा जायेगा।

प्रश्नपत्र में दो भाग होंगे–1. साहित्य खण्ड 2. व्याकरण खण्ड

साहित्य खण्ड में दो भाग होंगे– गद्य भाग एवं पद्य भाग

(अ) साहित्य खण्ड (गद्य भाग) = 16 अंक

1. हरिशंकर परसाई– भोलाराम का जीव (व्यंग्य) 8 अंक व्याख्या
2. भारत भूषण अग्रवाल– महाभारत की एक सांझ (एकांकी) 8 अंक प्रश्न
3. रामचन्द्र शुक्ल– उत्साह (ललित निबंध)

पद्य भाग = 16 अंक

1. मैथिली शरण गुप्त– मातृभूमिए वही मनुष्य है कि जो मनुष्य के लिए मरे
2. सुमित्रानंदन पंत– भारतमाता, पावस ऋतु में पर्वत प्रदेश 8 अंक व्याख्या
3. दिनकर –रश्मिरथी (तृतीय सर्ग से)
   (सच है, विपत्ति जब आजी है .....क्या कर सकती है चिनगारी) 8 अंक प्रश्न
4. नागार्जुन–अकाल और उसके बाद, बादल को घिरते देखा है।

गद्य व पद्य दोनों को एक ही पाठ्य पुस्तक में संकलित किया जाएगा।

(ब) व्याकरण खण्ड = 8 अंक

1. पारिभाषिक, शब्दावली
2. संज्ञा, सर्वनाम, विशेषण, क्रिया, क्रिया विशेषण (व्यावाहारिक पक्ष)
3. शब्द युग्मों का अर्थ भेद — 8 अंक
4. वाक्यांश के लिए एक शब्द
5. पर्यायवाची / विलोम शब्द

Dr. Richa Meena 27-9-23

C.B. Meena 27/9/23

Bhagwati Prasad Meena 27/09/23

अंक विभाजन:--

कुल चार संख्या — 2 गद्य भाग से

2 पद्य भाग से

कुल चार आलोचनात्मक प्रश्न

2 गद्य भाग से

2 पद्य भाग से

प्रथम सेमेस्टर – I	सेमेस्टर – II
1 गद्य भाग - 1 व्याख्या - 8 अंक; 1 प्रश्न - 8 अंक	1 गद्य भाग - एक व्याख्या - 8 अंक; प्रश्न - 8 अंक
2 पद्य भाग - 1 व्याख्या - 8 अंक; 1 प्रश्न - 8 अंक	2 पद्य भाग - एक व्याख्या - 8 अंक; प्रश्न - 8 अंक
3 - भाग व्याकरण - 8 अंक	3 व्याकरण - 8 अंक

C.D. Meena
27/9/23

Bhagirath
(Bhagirath Prasad Meena)
27/09/23

(प्रो० [illegible])

27-9-23
Dr. Richa Meena

SEC- Computer Fundamentals

Semester	Code of the Course	Title of the Course/Paper		NHEQF Level	Credits
I	SEC	**Computer Fundamentals**		S	2
Level of **Course**	Type of the Course	**Credit Distribution**		Offered to **NC Student**	**Delivery Type of the Course**
		Theory	**Practical**		
Introductory	**Skill Enhancement**	2	-	**Yes**	30 Hours Theory
Prerequisites	XII Pass				
Objectives of the Course:	Objectives of the Course- 1. To provide students with a comprehensive understanding of information Technology and its evolution, including the different generations of computers and types of computer systems. 2. To familiarize students with the architecture of a computer system, encompassing the CPU, ALU, memory, input/output devices, and hardware- software interactions. 3. To introduce students to various operating systems, such as UNIX, Linux. Windows, and their types, enabling them to comprehend the significance of operating systems in computing. 4. To acquaint students with different programming languages, including low- level and high-level languages, procedural programming, object-oriented programming, functional programming, scripting **languages.** and their respective applications. 5. To enable students to utilize the Internet effectively, including web browsing, understanding domain names and URLs, utilizing email services, participating in online communication, and exploring e-commerce and m-commerce platforms. 6. To educate students about social, legal, and ethical aspects of information technology, raising awareness about cyber threats, cybercrime prevention, and the importance of data security. 7. To provide insights into various cyber threats and attacks, such as computer viruses, malware, identity theft, phishing, and SQL injection, and to equip students with preventive measures against such threats.				

Examination Scheme-

Type	Paper code and Nomenclature	Duration of examination	Maximum Marks (Midterm+ EoSE)	Minimum Marks (Midterm + EoSE)
Theory	**SEC-001 -Computer Fundamentals**	**I Hrs.-MT** **I Hrs.-EoSE**	**10 Marks-MT** **40 Marks-EoSE**	**4 Marks-MT** **16 Marks-EoSE**

Detailed Syllabus SEC-001

Computer Fundamentals

Unit-I

Introduction to Information Technology: Evolution and generation of computers, Type of computers, Micro. Mini, mainframe and Super computer. Architecture of a computer system: CPU, ALU. Memory (RAM. ROM families, Cache Memory. Input/Output Devices. Pointing Devices, Hardware and Software

Operating System and Programming Languages: Concept of Operating System, Need, Types of Operating Systems, Batch, Single User, Multi-Processing, Distributed and Timeshared operating systems, Introduction to UNIX, Linux, Windows, Window NT, Virtual Machine, Programming Languages, Low Level and High Level, Generation of Languages, 3 GL and 4 GL languages. Procedural Programming Languages, Object Oriented Programming languages, Functional Programming Languages, Scripting Languages, Logic Programming Languages, Command Line Interface and Graphical User Interface

(8 Lectures)

Unit -II

The Internet: History and Functions of the Internet, Working with Internet, Web Browsers, World Wide Web, Uniform Resource Locator and Domain Names, Uses of Internet, Search for Information, Email, Chatting, Instant Messenger Services, News Group, Teleconferencing. Video Conferencing, E-Commerce and M-Commerce, E-services -Online Banking, Online Payment Modes, Mobile Wallets, Social Networking Sites, E-Learning/ Online Educations, Cloud-Based Storage, Digital Signature Manage an E-Mail Account, E-Mail Address, Configure E-Mail Account, Login to an Email, Receive Email, Sending Email, Sending Files as Attachments, Address Book, Downloading files.

(8 Lectures)

Unit -Ill

Social, Legal, Ethical Matters and Network Security: Types of Cyber Threats, how to identify Sate Websites/ Portals, Secure Seals (Verisign/Trust pay etc.), Secure Browsing Habits and Mailing Etiquettes, Social, Legal and ethical aspect of IT, Effects on the way we work Socialize, Operational Areas, Cyber Crime, Prevention of Cyber Crime, Cyber Law. Indian IT Act, Intellectual Property Right, Software Piracy, Copy right and Patent, Software Licensing, Proprietary Software, Free and Open-Source Software. GPL License. **(7 Lectures)**

Unit-IV

Cyber Security Threats: Security Threats and Attacks (Passive. Active). Types and Effects. Computer Virus, Malware. Adware. Ransomware, Spyware. Emote!. Identity Theli. Denial of Service, Man in Middle. Phishing. MySQL/SQL Injection, Password Attacks

Network Security: Risk Assessment and Security Measures. Assets and Type (Data. Applications System and Network). Security issues and Security Measure (Firewall. Encryption/Decryption)'. Prevention.

(7 Lectures)

Syllabus

SEC – Application of Computer Science

Semester	Code of the Course	Title of the Course/Paper		NHEQF Level	Credits
II	SEC-	Application of Computer Science		S	4
Level of Course	Type of the Course	Credit Distribution		Offered to NC Student	Delivery Type of the Course
		Theory	Practical		
Introductory	Skill Enhancement	2	2	Yes	30 Hours Theory

Examination Scheme

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (Midterm+ EoSEl	Minimum Marks (Midterm+ EoSE)
Practical	SEC- Application of Computer Science	I Hrs.-MT I Hrs.-EoSE	10 Marks-MT 40 Marks-EoSE	4Marks-MT 16 Marks-EoSE

The Practical examination Scheme for **Introduction to Office Productivity Software** should be as follows-

- Three Practical Exercise of 10 Marks each from each Unit -30 Marks
- Viva-Voce – 10
- Marks Record - 10 Marks

Duration of Practical Examination will be of I Hours.

Detailed Syllabus
Applications of Computer Science

Unit-I

Word Processing Tools:
Text Basics: Typing the text, Alignment of text, Editing Text: Cut, Copy, Paste, Select All, Clear, Find & Replace, **Text Formatting and saving file:** New, Open, Close, Save, Save As, Formatting Text: Font Size, Font Style, Font Colour, Use the Bold, Italic, and Underline, Change the Text Case, Line spacing. Paragraph spacing. Shading text and paragraph. Working with Tabs and Indents, **Objects:** Shapes, Clipart and Picture, Word Art, Smart Art. Columns and Orderings - To Add Columns to a Document, Change the Order of Objects, Page Number. Date & Time. Inserting Text boxes, Inserting Word art. inserting symbols, Inserting Chart, **Header & Footers:** Inserting custom Header and Footer, insening objects in the header and footer, add section break to a document **Bullets and numbered lists:** Multilevel numbering and Bulleting. Creating List, Customizing List style, Page bordering, Page background. **Tables:** Working with Tables, Table Formatting, Table Styles, Alignment option, Merge and split option, **Styles and Content:** Using Build- in Styles. Modifying Styles, Creating Styles, Creating a list style, Table of contents and references, Adding internal references, Adding a

Footnote, Adding Endnote **Merging Documents:** Typing new address list, Importing address list from Excel file, Write and insert field. Merging with outlook contact, Preview Result, Merging to envelopes, Merging to label, Setting rules for merges, Finish & Merge options **Sharing and Maintaining Document:** Changing Word Options, Changing the Proofing Tools, Managing Templates, Restricting Document Access. Using Protected View, Working with Templates. Managing Templates. Understanding building blocks **Proofing the document:** Check Spelling As You Type, Mark Grammar Errors As You Type, Setting AutoCorrect Options **Printing:** Page Setup, setting margins. Print Preview, Print.

(20 Hours Practical)

Unit-II

Electronic Spreadsheet,

Introduction to spreadsheet: Introduction. Understanding rows and columns, Naming Cells, Working with excel workbook and sheets. **Formatting excel work book::** New, Open. Close, Save, Save As, Formatting Text: Font Size, Font Style. Font Color. Use the Bold, Italic, and Underline, Wrap text, Merge and Centre. Currency, Accounting and other fonts, Modifying Columns. Rows & Cells. **Perform Calculations with Functions:** Creating Simple Formulas, Setting up your own formula, Date and Time Functions, Financial Functions, Logical Functions, Lookup and Reference, Functions Mathematical Functions, Statistical Functions, Text Functions, **Sort and Filter Data:** Sort and filtering data, Using number filter. Text filter. Custom filtering. Removing filters from columns, Conditional fonnatting. **Create Charts:** Create an effective chart with Chart Tool. Design. Format and Layout options. Adding chart title. Changing layouts. Chart styles. Editing chart data range. Editing data series. Changing chan. **PivotTables and Pivot Charts:** Understand PivotTables. l'reate a PivotTable. Framework Using the PivotTable and PivotChart. Pivot Chart from pivot Table. Inserting slicer. Creating calculated fields **Protecting and Sharing the work book:** Protecting a workbook with a password, Allow user to edit ranges, Track changes. Working with Com) J} ents, Insert Excel Objects and Charts in Word Document and Power point Presentation. Use Macros to Automate Tasks: Creating and Recording Macros. Assigning Macros to the work sheets. S<lving Macro enabled workbook **Proofing and Printing:** Page setup. Setting print area. Print titles. Inserting custom Header and footer, inserting objects in the header and footer, page Setup. Setting margins. Print preview, Print enables background error checking, setting auto correct option. **(20 Hours Practical)**

Unit -III

POWERPOINT:

Setting Up PowerPoint Environment: New, Open, Close, Save, Save As, Typing the text Alignment of text, Formatting Text: Font Size, Font Style Font Color, Use the Bold, Italic, and Underline, Cut, Copy, Paste, Select All, Clear text, Find & Replace, Working with Tabs and Indents, **Creating slides and Applying themes:** Inserting new slide, Changing layout of slides, Duplicating slides, Copying and pasting slide, Applying themes to the slide layout, Changing theme color ,Slide background, Formatting slide background ,Using slide views, **Working with bullets and numbering:** Multilevel numbering and Bulleting, Creating List, Page bordering, Page background, Aligning text, Text directions, Columns option **Working with Objects:** Shapes, Clipart and Picture, Word Art, Smart Art Change the Order of Objects, Inserting slide header and footer, Inserting Text boxes, Inserting shapes, using quick styles, Inserting Word art Inserting symbols, Inserting Chart, **Hyperlinks and Action Buttons:** Inserting Hyperlinks and Action Buttons, Edit Hyperlinks and Action Button, Word Art and Shapes Working With Movies and Sounds: Inserting Movie From a Computer File, Inserting Audio file , Audio Video playback and format options, Video options, Adjust options, Reshaping and bordering Video, **Using SmartArt and Tables:** Working with Tables, Table Formatting, Table Styles, Alignment option, Merge and split option, Converting text to smart art, **Animation and Slide Transition:** Default Animation, Custom Animation, Modify a Default or Custom Animation, Reorder Animation Using Transitions ,Apply a Slide Transition, Modifying, Transition, Advancing to the Next Slide, **Using slide Master:** Using slide master, Inserting layout

op tion, Creating custom layout, Inserting place holders, Fo1matting place holders, **Slide show** option: Start slide show, Start show from the current slide, Rehearse timing, creating custom slide show, Proofing and Printing: Check Spelling As You Type, Setting Auto Correct Options, Save as video, Save as JPEG files, Save as PowerPoint Show file, Print Preview, Print

(20 Hours Practical)

Suggested Books and References -

1. Microsoft Office for Beginners by M,L Humphrey
2. Microsoft Word 2016 Step by Step by Joan Lambert and Curtis Frye
3. Excel 2016 Bible by John Walkenbach
4. PowerPoint 2016 For Dummies by Doug Lowe
5. Microsoft Office 2016 In Practice by Randy NordeH

Course Learning Outcomes:

By the end of the course, students should be able

1. **Word Processing:**
   - Format documents using advanced text styling and alignment,
   - **Manipulate text with cut, copy, paste, and find & replace functions.**
   - Enhance document layout with headers, footers, and page numbering,
   - Create visually appealing content using tables, objects, and styles,
   - Efficiently merge documents and manage templates for streamlined work,
2. **Electronic Spreadsheet:**
   - Apply fom1atting and calculations using a variety of functions,
   - Organize and analyze data through sorting, filtering, and charts_
   - Automate tasks with macros and protect workbooks with passwords,
   - Create dynamic pivot tables for data visualization and analysis,
3. **PowerPoint:**
   - Design captivating presentations with themes. formatting, and multimedia
   - Incorporate interactive elements like hyperlink and active button
   - Apply animations and transitions, for engaging, slide shows,
   - Customized Master slides tor consistent and polished presentations.

GERIATRIC WELLNESS AND CARE

Programme Objective:

The course shall give the student an understanding of role of geriatric care assistance and shall equip the student to be an effective care giver. The student shall be understand the importance of the general, medical and psychological problems faced by the elderly and be able to learn about basic first aid for elderly. An understanding of the current health scenario in the country and globally will be imparted.

Course content

UNIT-I

Introduction to healthcare of Geriatric population: Health care delivery system in India at primary, secondary and tertiary care, Community participation m health care delivery system. Basic medical and nutrition related terminologies. Role of a Geriatric Care Assistant, Do's and Don'ts Requirements to become a Certified Geriatric Care Assistant.

UNIT-II

Introduction to Geriatric Care Assistants: Basics of emergency care and life support skills-Vital signs, first aid and triage, Identifying signs and taking measures for elderly emergency conditions.

UNIT-III

Personal Hygiene and Health of elderly: Understanding and procedures of hygiene and prevention of infection including effective hand washing, bathing, drying, grooming etc. Vaccination protocol against common Infectious diseases: immunization to reduce the health risks for care giver and patients.

UNIT-IV

Basic applied knowledge for geriatric care: Understanding working system for geriatric care like old age home. Basic first-aid for elderly population.

Suggested Books/References/Web-links:

(l) NurseAssistantTrainingTextAmericaRedcross2013
(2) Draft Short Term, Training Curriculum Handbook of General Duty Assistant MOHFW. Govt. of India.
(3) Draft of S.TIC Hand book of Hons. Health Aide MOHFN,GOI.
(4) Manual on Geriatric care, MOHFW, Dept. of Ayush, GOI.

Programme Outcome

1. Understanding the health care in India.
2. Understanding the role of a Geriatric care Assistant.
3. Skilled and Trained caretakers for geriatric population.

ENVIRONMENTAL STUDIES

Programme Objective:

To make students aware about the importance of physical environment and its various components. The students realize their role in the protection and maintenance of a healthy environment for sustainable development. To understand the significance and issues related to natural resources, ecosystems, biodiversity to encourage them to explore ways of managing/ conserving natural resources. To develop understanding of causes and sources of environmental pollution and their impact on quality of life. To encourage to adopt sustainability as a practice in life, society, and industry.

Course content

UNIT-I

Definition Scope and importance relationship between environmental studies and other branches of science and social science. Need for environmental awareness, environmental education in present day context.
Forest resources: Use and over exploitation, deforestation, case studies. Limber extraction, mining, dams and the fleet on forest and tribal people.
Water recourses: Use and over-libation of fund groundwater, floods, drought conflicts or water, duress benefits in problems.
Energy resource: Growing energy need, renewable and non-renewable energy sources, use of alternate energy sources.

UNIT-II

Biodiversity and its conservation, Introduction. Biogeographical classification of India. Threats to biodiversity, habitat loss, pouching of wildlife, man-wild life conflicts, Endangered, Threatened and endemic species of India.
Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity, Red Data Book

UNIT-III

Environmental Pollution and Control Measures, Definition, Causes, effects and control measures of Air Pollution, Water Pollution, Soil Pollution, Noise Pollution, Thermal Pollution, Nuclear Hazards

UNIT-IV

Water conservation, rain water harvesting, watershed management Resettlement and rehabilitation of people; its problems and concerns.
Climate change, global warming, acid rain ozone layer depletion accidents and holocaust. Disaster management: floods earthquake, cyclone and landslides. Environment and Human health.

Suggested Books/References/Web-links:

1. Chauhan. Surendra Singh 2004 Environmental Protection and Management: From Stockholm to Rio and After, Kalinga Publications, New Delhi.

4/10/24
Dr. Ram Nath Khanwal

2. Diwan A.P. and Arora D.K. 1995. Human Ecology Anmol Publication Pvt. Ltd., New Delhi.
3. Dubey, R.M. 1992. Human Ecology and Environmental Education, Chaugh Publications, Allahabad.
4. Goudie, Andrew. The Human Impact.
5. Husain Maxin 1994 Human Geography, Rawat Publication, Jaipur.
6. Malik, S. L. and Bhattacharya D. K. 1986. Aspects of Human Ecology, Northern Book Center, New Delhi.
7. Smith, Dlanne, 1984.Urban Ecology.George Allen, London.
8. Swarnkar, R.C 1985. Indian Tribes Printwell out.
9. Tivy, Joy and O'Hugegreg, 1985. Human Impact on the Ecosystem Edinburgh George Allen Boyd.

Programme Outcome

1. Gain in-depth knowledge on natural processes and resources that sustain life and govern economy.
2. Develop critical thinking to shape strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, protection of natural resources and sustainable development.
3. Understand and predict the consequences of human actions on the environment and quality of human life. Acquisition of values and attitudes towards understanding complex environmental economic-social challenges, and actively participate in solving current environmental problems and preventing the future ones.