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.

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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)**

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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: **(8 lectures)** *Marchantia*, Anthocerotopsida: *Anthoceros* and Bryopsida: *Funaria*.

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

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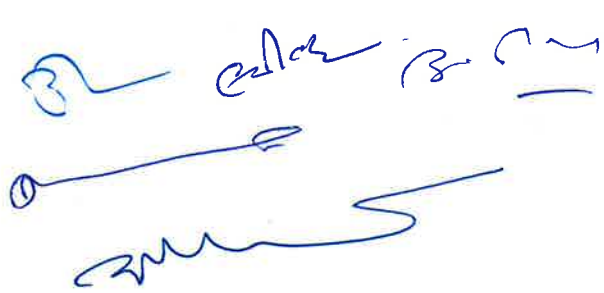7. Promote shared learning through practical classes, presentations and assignments.

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. 5thedition 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.

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

physical properties of substances, crystallization and preparation of standard solutions of different concentrations and determination of order and rate constant of various reactions.

Syllabus

CHM-51T-101: **Chemical Bonding and Chemistry of Representative and**
4 Hrs./week **Transition elements.**

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

Unit-I

Ionic Bond:

General characteristics, types of ions, size effects, radius ratio and coordination number, Madelung-constant, Born-Haber cycle, applications of lattice energy, polarizing power, polarizability, Fajan's rules, hydration energy, solubility of ionic-compounds, defects in structures, Frankel and Schottky defects, non-stoichiometric compounds.

Solids:

Metallic bond: Qualitative idea of free electron, valence bond and band theories, semiconductors and insulators, conduction in ionic solids, electrical and magnetic properties of solids, introduction to superconductors and super-conductivity. **15 Lecture**

Unit-II

Covalent bond: General characteristics, Valence bond theory and its limitations. Directional characteristics of covalent bond, Resonance and resonance energy, Hybridization involving s, p and d-orbitals.

Valence Shell Electron Pair Repulsion (VSEPR) Theory to NH_3, H_2O, H_3O^+, SF_4, ClF_3, ICl_2^-, shapes of simple inorganic molecules and ions. Dipole moment, percentage ionic-character from dipole moment and electronegativity difference.

Molecular Orbital Theory: Detailed description of linear combination of atomic orbital (LCAO), Homonuclear (H_2, He_2, B_2, C_2, N_2, O_2, F_2) and heteronuclear diatomic molecules (CO, NO) and their ions, comparison of valence bond and molecular orbital theories, multicenter bonding in electron deficient molecules, bond strength and bond energy.

Weak Interactions:

Hydrogen bond, theories of hydrogen bonding. Weak intermolecular forces of attraction, Vander Waals forces. **15 Lecture**

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Unit-III

s-Block Elements:
Comparative study, diagonal relationship, salient features of hydrides, solvation and complexation tendencies including their functions in biosystems, an introduction to alkyls and aryls.

p-Block Elements:
Comparative study of the p-block elements and group trends, electronic configuration, physical and chemical properties, diagonal relationship, atomic and ionic radii, ionization potentials, electron affinity, electronegativity and oxidation states, oxidation state diagrams on the basis of redox potentials, inert pair effect, catenation.

Compounds of p-Block Elements:
Hydrides of boron, diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, fluorocarbons, silicates (structural principle), silicones, oxygen fluorides, peracids of sulphur, tetrasulphur tetranitride, basic properties of halogens, interhalogen compounds and polyhalides.

Chemistry of Noble Gases:
Position in the periodic table, discovery, isolation, important compounds of noble gases with special references to xenon compounds: Synthesis, bonding and their stereochemistry. **15 Lecture**

Unit-IV

d-Block elements:

Chemistry of the elements of first transition series: Electronic configuration and comparative study with respect to atomic and ionic radii, oxidation states and ionization potentials. Redox potentials, oxidation state diagrams on the basis of redox potentials, binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry, metallic nature, magnetic properties, catalytic activity, colour and spectral properties of transition metal ions.

Chemistry of the elements of second and third transition series: Electronic configuration, general characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry. **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. Cotton, F.A., Wilkinson, G. & Gaus, P.L. Basic Inorganic Chemistry, Wiley.

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8. Douglas, B.E., McDaniel, D.H. & Alexander, J.J. Concepts and Models in Inorganic Chemistry, John Wiley & Sons.
9. Sharpe G., Inorganic Chemistry, Pearson Education Ltd.
10. Pfennig Brian W. Principles of Inorganic Chemistry, John Wiley & Sons.

Syllabus

CHM-51T-102:   Stats of Matter, Chemical Kinetics and Thermodynamics.
4 Hrs./week

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

Unit I

States of matter:

Ideal gases: Kinetic Theory of Gases, Concept of molar mass and molar volume. Determination of molar mass of a gas and volatile substances. The barometric distribution laws. Maxwell distribution law of molecular velocities. The Maxwell energy distribution. The Maxwell Boltzmann distribution law and its experimental verification, Derivation of average, root mean square velocities and most probable velocities. Collision properties: Collision cross section, collision number, collision frequency, collision diameter and mean free path of molecules.

Real gases: Deviations of real gases from ideal behaviour, compressibility factor, causes of deviation. Van der Waal's equations and its implications. Isotherms of van der Waals gas. Critical phenomenon and critical constants. Reduced equation of state and law of corresponding states.

15 Lecture

Unit II

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:

Thermal expansion and compressibility, Heat of vaporization. Determination of vapour pressure and heat of vaporization. Disorder in liquid state and structure of liquid water. Intermolecular forces. Cohesion of liquids. Eyring theory of liquids, seven segment cell.

Solid state: Crystalline and amorphous states. Isotropy and anisotropy. Elements of symmetry. Law of rational indices. Weiss and miller indices and equation of plane in intercept form. Law of constancy of interfacial angles. Unit cell and lattice, Laue's method and powder method of X-ray examination of crystals,

15 Lecture

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Unit III

Chemical Kinetics:

Rate, Initial rate, specific rate, rate constant and units. Method of determination of initial rate. Order, molecularity and stoichiometry of reaction. Methods of determination of order of reaction. Derivation of integrated rate equations- zero order, first order, second order and third order. Graphical applications of these equations for the determinations of rate constant. Effect of temperature on rate constant, Arrhenius equation, energy of activation and its determination. Complex reactions and their nature. Derivation of rate equation for the opposing or reversible reactions (A + B ←C), parallel reactions and consecutive reactions (A → B → C), characteristics of consecutive reactions.
                                                                                    15 Lecture

Unit IV

Thermodynamics:

Definitions of thermodynamic terms: system, surroundings, thermodynamic process. Concept of work and heat, Internal energy, Enthalpy. State and path functions and their exact and inexact differential, Work of expansion and compression under isothermal and adiabatic conditions. Zeroth law of thermodynamics, first law of thermodynamics. Changes in enthalpy at constant temperature and pressure. Concept of heat capacity (C_p and C_v) and their thermodynamic relationship. Application of first law of thermodynamics. The heat of reaction and heat of formation. Hesse's Law. Heat of reaction at constant Pressure and volume. Variation of heat of reaction with temperature. Bond enthalpies and bond energies.
                                                                                    15 Lecture

Suggested Books and References:

1. Puri, B. R., Sharma, L. R. & Pathania, M. S. Principles of Physical Chemistry, Vishal Publishing Co.
2. Gurdeep Raj, Advanced Physical Chemistry, Goel Publishing House.
3. Atkins, W. Physical Chemistry, Oxford University Press.
4. Silby, R. J. & Alberty, R. A. Physical Chemistry, John Wiley & Sons.
5. Barrow, G.M. Physical Chemistry, Tata McGraw-Hill.
6. Kapoor, K. L. A Textbook of Physical Chemistry, (Volume 1) Macmillan India Ltd.
7. Kapoor, K. L. A Textbook of Physical Chemistry, (Volume 1) Macmillan India Ltd.

Syllabus

CHM-51P-103: Practical I   **8 Hrs./week**

Duration	Maximum Marks	Minimum Marks
4 Hours	CA – 20 Marks	CA – 08 Marks
8 Hours	EoSE – 80 Marks	EoSE – 32 Marks

Inorganic Chemistry

A. Qualitative analysis: **15 marks**

Analysis of the given inorganic mixture containing six radicals (three acidic and three basic) including interfering acid radicals - fluoride, borate, oxalate, phosphate and excluding insoluble.

B. Quantitative analysis: Volumetric analysis   **15 marks**

1. Estimation of Ca^{2+} & Mg^{2+} using EDTA solution.
2. Estimation of Cu (II) ions iodometrically, using sodium thiosulphate solution.
3. Determination of total hardness of water.
4. Determination of number of molecules of water of crystallization in oxalic acid crystals.
5. Estimation of sodium carbonate and bicarbonate in mixed solution.
6. Estimation of sodium carbonate and sodium hydroxide in a mixed solution.
7. Estimation of Ferrous and Ferric sulphates in a mixed solution.

Physical Chemistry: (any two exercise, $2 \times 15 = 30$ marks)

1. To study the solubility curve of salts such as potassium nitrate, etc.
2. To Study the solubility curve of phenol in water and hence study the effect of separate addition of substances such as naphthalene, potassium chloride and acetic acid.
3. Determination of pH of different buffer solutions and evaluate the p^{Ka} of an acid by Handerson equation.
4. Determine the relative viscosity of a liquid by using viscometer.

5. Determine the relative surface tension of a liquid by using stalagmometer.
6. Determine the heat of neutralization of an acid and base.
7. Determine the molecular complexity of benzoic acid in benzene by Distribution Law.
8. Determine the heat of reaction and verify Hess's law.

Viva voce   **10 marks**

Practical Record   **10 marks**

Suggested Books and References:

1. Vogel, A. I. Vogel's Qualitative Inorganic Analysis, Prentice Hall.
2. Vogel, A. I. Vogel's Quantitative Inorganic Analysis Including Elementary Instrumental Analysis, ELBS.
3. Gurdeep Raj, Advance Practical Inorganic Chemistry, Goel Publishing House.
4. Yadav, J. B. Advanced Practical Physical Chemistry, Goel Publishing House.
5. Khosla, B. D. Practical Physical Chemistry, S. Chand & Company.

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Syllabus: UG0104 B.Sc.

CHEMISTRY
Semester – II (2023-2024)

Course Code	Course Title	Duration	Maximum Marks	Minimum Marks
CHM-52T-104	Reaction mechanism, Stereochemistry and Hydrocarbons	CA - 1 Hr. EoSE - 3 Hrs.	CA - 20 EoSE - 80	CA - 08 EoSE - 32
CHM-52T-105	Principles and Methods of Analytical Techniques.	CA - 1 Hr. EoSE - 3 Hrs.	CA - 20 EoSE - 80	CA - 08 EoSE - 32
CHM-52P-106	Practical- II	CA – 4 Hrs. EoSE – 8 Hrs.	CA - 20 EoSE - 80	CA - 08 EoSE - 32

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 aliphatic and aromatic hydrocarbons, alkyl and aryl halides, and to explain principles and methods of different analytical techniques viz. quantitative analysis including volumetric and gravimetric analysis, solvent extraction, distillation. In addition, the laboratory course is designed to provide students with practical experience in basic quantitative analytical techniques including volumetric and gravimetric analysis, qualitative analytical techniques, and the laboratory techniques.

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

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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 principles and methods of analytical techniques. Students will also have practical experience in quantitative analytical techniques including volumetric and gravimetric analysis, identification of organic compounds by determination of functional groups, thin layer and paper chromatography.

Syllabus

CHM-52T-104: Reaction mechanism, Stereochemistry, Hydrocarbons,
4 Hrs./week Aliphatic and aromatic halides.

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

Unit-I

Structure and Bonding: Hybridization, inductive effect, hyperconjugation, resonance, Vander Waals interactions, inclusion compounds, clathrates, charge transfer complexes, hydrogen bonding.

Mechanism of Organic Reactions: Free radical and ionic reactions, homolytic and heterolytic bond breaking, electrophiles and nucleophiles, types of organic reactions, energy considerations, transition state, reactive intermediates-carbocations, carbanions, free radicals, carbenes, arynes and nitrenes. Methods of determination of reaction mechanism.

Alkanes: Nomenclature of branched and unbranched alkanes. Classification of carbon atoms in alkanes. Isomerism in alkanes, methods of formation (with special reference of Wurtz reaction. Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids) physical properties and chemical reaction of alkanes. Mechanism of free-radical halogenation of alkanes, orientation, reactivity and selectivity.
15 Lecture

Unit-II

Stereochemistry of Organic Compounds: Concept of isomerism. Types of isomerism.

Optical Isomerism: Elements of symmetry, molecular chirality, enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resoltuion of enantiomers, inversion, retention and racemization, Asymmetric synthesis.

Relative and absolute configuration, sequence rule, D & L and R & S systems of nomenclature.
Geometric isomerism: Determination of configuration of geometrical isomers, E & Z system of

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nomenclature, geometric isomerism in oximes and alicyclic compounds.

Conformational isomerism: Conformational analysis of ethane and n-butane. Newman projection and Sawhorse formulae. Fischer and flying wedge formulae. Difference between configuration and conformation. **15 Lecture**

Unit-III

Cycloalkanes: Nomenclature, methods of formation, chemical reactions. Baeyer's strain theory and its limitations. Ring strain in small rings (cyclo-propane and cyclo-butane). Theory of strain less rings. The case of cyclopropane ring: banana bonds.

Alkenes: Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration. The Saytzeff's rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes, mechanisms involved in hydrogenation, electrophilic and free radical additions. Markovnikov's rule, hydroboration-oxidation, oxymercuration- demercuration, epoxidation, ozonolysis, hydration, hydroxylation and oxidation with $KMnO_4$, polymerization of alkenes. Substitution at the allylic and vinylic positions of alkenes. Industrial applications of ethylene and propene.

Cycloalkenes: Methods of formation, conformations and chemical reactions.

Dienes: Nomenclature and classification, isolated, conjugated and cumulated dienes, Structure of allenes and butadiene, methods of formation, polymerization, Chemical reaction-1,2 and 1,4 additions. Diels-Alder reaction.

Alkynes: Nomenclature, structure and bonding, Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation, metal-ammonia reduction, oxidation and polymerization. **15 Lecture**

Unit-IV

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 picture.

Aromaticity: The Huckel rule and its applications. Energy level, molecular orbital diagram (ethene, 1-3-butadiene, benzene) Aromatic electrophilic substitution: General pattern of the mechanism, role of sigma and π-complexes, mechanism of nitration, halogenation, sulphonation, and Friedel-Crafts reaction. Effect of substituent groups (inductive, mesomeric and hyperconjugative effect), activating and deactivating groups, directive influence of groups, determination of orientation up to disubstituted derivatives, ortho/para ratio, Birch Reduction.

Method of formation and chemical reactions of benzene, alkyl benzenes and biphenyl.

Alkyl and Aryl Halides: Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms of nucleophilic substitution, reactions of alkyl halides S_N2 and S_N1 reactions with energy profile diagrams.

Methods of formation of aryl halides, nuclear and side chain reactions. The addition-elimination and elimination-addition mechanisms of nucleophilic aromatic substitution reactions.

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Relative reactivities of alkyl halides V/s allyl vinyl and aryl halides. Preparation and properties of vinly, allyl and benzyl halides. Synthesis and uses of DDT and BHC.   **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. Pillai, C. N. Organic Chemistry, Oxford University Press.
8. Jain, M.K. & Sharma, S.C. Modera Organic Chemistry, Vishal Publishing Co.
9. March, J. & Smith, M. B. March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure, Wiley.
10. Ahluwalia, V. K. Stereochemistry of Organic Compounds, Springer.

Syllabus

CHM-52T-105:   Principles and Methods of Analytical Techniques.
4 Hrs./week

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

Unit-I

Principle of Gravimetric analysis, precipitation methods, super saturation and precipitate formation, the purity of the precipitate, coprecipitation, post precipitation, conditions of precipitation, precipitation from homogeneous solution, washing of the precipitate. Ignition of the precipitate, masking and demasking agents.   **15 Lecture**

Unit-II

Solvent extraction: Principles and process of solvent extraction, the distribution law and the partition coefficient, liquid-liquid extraction, factors favouring solvent extraction, choice of solvent for solvent extraction, stripping, solid liquid extraction, organic reagents used in solvent extraction. Organic reagents in quantitative inorganic analysis. Application of the following organic reagents-

DMG, Cupferron, 8-hydroxyquinoline, cupron, salicylaldehyde, oxime, l-nitroso-2- naphthol, 4-bromoandelic acid, nitron, tannic acid, arsonic acids, pyridine, anthranilic acid, pyrogallol and ethylenediamine. **15 Lecture**

Unit-III

Completion of gravimetric results, compilation of results, reliability of results-accuracy and precision, cleaning and calibration of glassware, standard deviation, T, Q and F tests, correction, significant figures, errors in analysis.

Volumetric analysis: Principle and applications of redox titrations, iodometry and iodimetry. Theory of complexation titrations. Methods of end point detection, EDTA as Titrant, types of EDTA titration of mixtures, metal indicators. **15 Lecture**

Unit-IV

Distillation methods of organic solvents, steam, fractional, vacuum and molecular distillations, monometers and monostates. Analysis of oils and fats, saponification value, iodine value, RM value, acid value.

Quantitative estimation of following functional groups-alcoholic phenolic, carboxylic acids and unsaturated groups (olefinic & acetylenic).

Polarimetry: Basic principle, instrumentation, experimental techniques, determination of (a) specific rotation of a substance (b) concentration of the substance & applications. An elementary idea of Refractometry, Interferometry-circular dichroism & optical rotatory dispersion. **15 Lecture**

Suggested Books and References:

1. Chatwal, Gurdeep R., Anand, S. Instrumental Methods of Chemical analysis (Analytical Chemistry), Himalaya Publishing House.
2. Chatwal, Gurdeep R., Analytical Chemistry, Himalaya Publishing House.
3. Douglas, A. Skoog & Donald M. West et al, Fundamentals of Analytical Chemistry, Cengage Learning India Pvt. Ltd. 2022.

Syllabus

CHM-52P-106: Practical- II   **8 Hrs./week**

Duration	Maximum Marks	Minimum Marks
4 Hours	CA– 20 Marks	CA– 08 Marks
8 Hours	EoSE – 80 Marks	EoSE – 32 Marks

Organic Chemistry: **(any two exercise, $2 \times 15 = 30$ marks)**

1. Identification of organic compounds through functional groups analysis, determination of melting point, boiling point and specific test and preparation of a suitable derivative.
2. Purification of solid substance by recrystallization.
3. Separation of two miscible liquids by fractional distillation.
4. Preparation of acetanilide from aniline.
5. Preparation of an azo-dye.
6. Determination of m.p. and mixed m.p.

Gravimetric Analysis   **15 marks**
   (a) Estimation of Cu as CuSCN
   (b) Estimation of Ni as Ni (dimethylglyoxime)

Laboratory Techniques   **15 marks**
   A. **Thin Layer Chromatography:** Determination of R_f values and identification of organic compounds.
   (a) Separation of green leaf pigments (spinach leaves may be used).

(b) Preparation and separation of 2,4-dinitrophenylhydrazones of acetone, 2-butanone, hexan-2-one and hexan-3-one using toluene and light petroleum (40-60) solvent system.
(c) Separation of a mixture of dyes using cyclohexane and ethyl acetate (8.5: 1.5)

B. Paper Chromatography: Ascending and Circular: Determination of R_f values and identification of organic compounds.

(a) Separation of mixture of phenylalanine and glycine. Alanine and aspartic acid, leucine and glutamic acid. Spray reagent – ninhydrin.
(b) Separation of a mixture of DL – alanine, glycine and L-Leucine using n-butanol: acetic acid: water (4:1:5), Spray reagent-ninhydrin.
(c) Separation of monosaccharides a mixture of D- galactose and D-Fructose Using n-butanol: acetone: water (4:5:1) Spray reagent -aniline hydrogen phthalate.

Viva voce   10 marks

Practical Record   10 marks

Suggested Books and References:

1. Ahluwalia, V. K. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, Universities Press, Hyderabad.
2. Ahluwalia, V. K. Laboratory Techniques in Organic Chemistry, I K International, New Delhi.
3. Arora Amit Advanced Practical Organic Chemistry, Discovery Publishing House, New Delhi.
4. Furniss, Brian S., Hannaford, Antony J. et al, Vogel's Textbook of Practical Organic Chemistry, Pearson.

Syllabus
[UG0102-Three/Four Year Bachelor of Science (Maths Group)] - [UG0102-MAT-51T-101] - [Discrete Mathematics & Optimization Techniques-I]
I-Semester - [Mathematics]

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Passing Marks (CA + EoSE)
Theory	UG0102-MAT-51T-101 Discrete Mathematics & Optimization Techniques-I	1 Hrs-CA 3 Hrs-EoSE	30 Marks-CA 120 Marks-EoSE	12 Marks-CA 48 Marks-EoSE

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
I	UG0102-MAT-51T-101	Discrete Mathematics & Optimization Techniques-I			5	6

Level of Course	Type of the Course	Credit Distribution			Course Delivery Method
		Theory	Practical	Total	
Introductory	UG	6	0	6	Lecture, Ninety lectures

List of Programme Codes in which Offered as Minor Discipline	
Prerequisites	Mathematics courses of XIIStd. Of Central Board of Secondary Education or equivalent.
Objectives of the Course:	The objective of the course is to expose discrete structures and involved topology, an optimization of real world problems.

Detailed Syllabus
[UG0102-MAT-51T-101] - [Discrete Mathematics & Optimization Techniques-I]

Unit - I

Relations on a set, Equivalence class, partial order relations, Chains and Anti-chains. Lattices, Distributive and Complemented Lattices. Boolean algebra, conjunctive normal form, disjunctive normal form. Principle of inclusion and exclusion. Propositional calculus, Basic logical operations, Truth tables, Tautologies and contradictions.   **(22 Lectures)**

Unit -II

Discrete numeric functions, Generating functions, Recurrence relations, linear recurrence relation with constant coefficients and their solutions: Total solutions, Solution by the method of generating functions. Basic concepts of graph theory, Types of graphs, Walks, Paths & Circuits, Shortest path problem.

(23 Lectures)

Unit -III

Planar graphs, Operations on graphs (union, join, products). Matrix representation of graphs, Adjacency matrices, Incidence matrices. Hamiltonian and Eulerian graphs. Tree, Spanning tree, Minimum spanning tree, Distance between vertices, Center of tree, Binary tree, Rooted tree.

(22 Lectures)

Unit-IV

Linear programming problems. Feasible solution, Basic feasible solution. Some basic properties and theorems on convex sets. Simplex algorithm, Transportation problems. Assignment problems.

(23 Lectures)

Suggested Books and References –

1. V.K.Balakrishnan, Introductory Discrete Mathematics, Prentice-Hall, 1996.
2. N. Deo, Graph Theory with Applications to Computer Science, Prentice-Hall of India.
3. C.L. Liu, Elements of Discrete Mathematics, (Second Edition), McGraw Hill, International Edition, 1986.
4. Kenneth H. Roson, Discrete Mathematics and Its Applications, Tata Mc-GrawHiils, New Delhi, 2003.
5. G. Hadley, Linear Programming, Narosa Publishing House, New Delhi, 2002.
6. Hamdy A. Taha, Operations Research, An Introduction (9th edition), Prentice-Hall, 2010.

Suggested E-resources:

1. Online Lecture Notes and Course Materials

Course Learning Outcomes:

The course would enable the student
1. To understand the ideas in discrete structures viz. Partially ordered sets, Lattices , Graphs etc. and allied conceptual intricacies with applications.
2. To understand mathematical formulation of optimization problems and allied theoretical concepts for solution methodologies for linear programming problems, Transportation problems and assignment problems.

Syllabus
[UG0102-Three/Four Year Bachelor of Science (Maths Group)] - [UG0102-MAT-52T-102] - [Calculus]
II-Semester - [Mathematics]

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Passing Marks (CA + EoSE)
Theory	UG0102-MAT-52T-102 Calculus	1 Hrs-CA 3 Hrs-EoSE	30 Marks-CA 120 Marks-EoSE	12 Marks-CA 48 Marks-EoSE

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
II	UG0102-MAT-52T-102	Calculus			5	6

Level of Course	Type of the Course	Credit Distribution			Course Delivery Method
		Theory	Practical	Total	
Introductory	UG	6	0	6	Lecture, Ninety lectures

List of Programme Codes in which Offered as Minor Discipline	
Prerequisites	Mathematics course of XII std. of Central Board of Secondary Education or equivalent.
Objectives of the Course:	The objective of the course is to provide students with a comprehensive understanding of the fundamental concepts of calculus as a tool for dynamic systems, diverse topics which find applications in many branches of science.

Detailed Syllabus

[UG0102-MAT-52T-102] -

[Calculus]

Unit - I
Taylor's theorem. Maclaurin's theorem. Power series expansion of a function. Power series expansion of sin(x), cos(x), e^x, $\log_e(1+x)$, $(1+x)^n$. Derivative of the length of an arc. Pedal equations. Curvature: Various formulae, Centre of curvature and Chord of curvature.

(22 Lectures)

Unit -II
Partial differentiation. Euler's theorem for homogeneous functions. Chain rule of partial differentiation. Total differentiation, Differentiation of implicit functions. Envelopes: One parameter family of curves when two parameters are connected by a relation. Maxima and Minima of functions of two variables. Lagrange's method of undetermined multipliers.

(23 Lectures)

Unit -III
Asymptotes: Definition, Parallel to coordinate axes, General rational algebraic curves, inspection method, Intersection of a curve and its asymptotes. Multiple points. Curve tracing of Cartesian, Polar and parametric curves. Beta and Gamma functions.

(22 Lectures)

Unit-IV
Double integrals in Cartesian and Polar Coordinates, Change of order of integration. Triple integrals. Dirichlet's integral. Rectification, Area, Volume and Surface of solids of revolution.

(23 Lectures)

Suggested Books and References –

1. Shanti Narayan and P.K. Mittal, Integral Calculus, S. Chand & Co., N. D., 2013.
2. H.S.Dhami, Differential Calculus, Age Int. Ltd., New Delhi, 2012.
3. M. J. Strauss, G. L. Bradley and K. J. Smith, Calculus (3rd Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2007.
4. H. Anton, I. Bivens and S. Davis, Calculus (7th Edition), John Wiley and sons (Asia), Pt Ltd., Singapore, 2002.
5. G.B. Thomas, R. L. Finney, M. D. Weir, Calculus and Analytic Geometry, Pearson Education Ltd, 2003.

Suggested E-resources:

1. Online Lecture Notes and Course Materials:

Course Learning Outcomes:

By the end of the course, students should be able to:
1. Understand the concept of curvature, padel equations, partial differentiation, envelope, asymptotes.
2. Understand the concept of maxima-minima, curve tracing, double triple integration and their applications.

Name of College	Raj. Rishi Govt. Autonomous College Alwar (Rajasthan)
Name of Faculty	UG. -B. Sc. (Maths Group)
Name of Discipline	Physics

SEMESTER-WISE PAPER TITLES WITH DETAILS

Syllabus

Semester-I

Mechanics & Oscillation

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (Midterm + EoSE)	Minimum Marks (Midterm + EoSE)
Theory	UG0102, PHY-51T-101 Mechanics & Oscillation	1 Hrs...-MT 3 Hrs.- EoSE	20 Marks-MT 80 Marks-EoSE	8 Marks-MT 32 Marks-EoSE
Practical	UG0102, PHY-51P-102 Physics Lab-I	2 Hrs.-MT 4 Hrs.- EoSE	10 Marks-MT 40 Marks-EoSE	4 Marks-MT 16 Marks-EoSE

Level of Course	Type of Course	Delivery of the Course
Introductory	Major/Minor	Lecture, Sixty Lectures (4 Hrs.. in a week) including diagnostic and formative assessment during lecture hours.
Prerequisites	Physics and Mathematics courses of Central Board of Secondary Education or equivalent.	
Objectives of the Course	Objectives of the Course in Mechanics: The objective of the course is to provide students with a comprehensive understanding of classical mechanics, including the laws of motion, frames of reference, forces, motion of particles and rigid bodies, oscillations, and central forces. The course aims to develop their knowledge and skills in analyzing and solving problems related to these topics, using appropriate mathematical formalism and physical concepts.	

Unit-I

Physical Law and frame of Reference:

Inertial and non-inertial frames, Coordinate transformation: transformation of displacement, velocity, acceleration between different frames of reference involving translation motion, Galilean transformation and invariance of Newton's laws.

   (a) The Special theory of relativity: Postulates of STR (Special theory of relativity), the Lorentz transformation, transformation of velocity, acceleration, Length contraction, time dilation and its experimental evidence.

   (b) Coriolis Force: Transformation of displacement, velocity and acceleration between rotating frame, Pseudo forces, Coriolis force, motion relative to earth, Foucault's pendulum.

   (c) Conservative Forces: Introduction about conservative and non-conservative forces, rectilinear motion under conservative forces, discussion of potential energy curve and motion of a particle. **(15 Lectures)**

Unit-II

Centre of Mass: Introduction about Centre of Mass, Centre of Mass Frame: Collision of two particles in one and two dimensions (elastic and inelastic), Slowing down of neutrons in a moderator, Motion of a system with varying mass, Angular momentum concept, conservation and charge particle scattering by a nucleus.

Rigid body: Equation of a motion of a rigid body, Inertial coefficient, Case of J not parallel to ω, the kinetic energy of rotation and the idea of principal axes, the processional motion of the spinning top. **(15 Lectures)**

Unit -III

Motion under Central Forces: Introduction about Central Forces, Motion under central forces, Gravitational interaction, inertia and gravitational mass, General solution under gravitational interaction, Kepler's laws, Discussion of trajectories: Cases of elliptical and circular orbits, Rutherford scattering.

Damped Harmonic Oscillations: Oscillations in a potential well, Damped force and motion under damping, Damped Harmonic Oscillator, Power dissipation, Anharmonic oscillator and simple pendulum as an example. **(15 Lectures)**

Unit-IV

Driven Harmonic Oscillations: Driven harmonic oscillator with damping, Frequency response, Phase relation, Quality factor, Series and parallel of LCR circuit, electromechanical system: (Ballistic galvanometer). **Coupled Oscillations:** Equation of motion of two coupled Harmonic Oscillators, Normal modes, motion in mixed modes and transient behavior, Dynamics of many number of oscillators. **(15 Lectures)**

Suggested Books and References –

1. Mechanics, Berkeley Physics, Vol.1, Kittel, Knight, et.al. 2007, Tata McGraw-Hill
2. An introduction to Mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill
3. Feynman Lectures, Vol. I, R.P. Feynman, R.B. Leighton, M. Sands, 2008, Pearson Education.
4. Course of Theoretical Physics, Vol-I Mechanics, L.D. Landau, E.M. Lifshitz, Butterworth-Heinemann
5. Mechanics, D.S. Mathur, S. Chand and Company Limited,
6. Theoretical Mechanics, M.R. Spiegel, 2006, Tata McGraw Hill.
7. Introduction to Classical Mechanics: With Problems and Solutions, David Morin
8. Classical Mechanics, Herbert Goldstein, Charles P. Poole, and John L. Safko
9. Classical Mechanics, John R. Taylor
10. Mechanics, Keith R. Symon
11. The Physics of Waves & Oscillations, Bajaj
12. Waves, A. P. French

Suggested E-resources:

Online Lecture Notes and Course Materials:

1. MIT Open Course Ware: Classical Mechanics - This resource provides lecture notes, problem sets, and solutions for a complete course on classical mechanics: https://ocw.mit.edu/courses/physics/8-01sc-classical-mechanics-fall-2016/
2. Hyper Physics - This online resource provides concise explanations and interactive simulations for various topics in mechanics: http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html

Syllabus

Physics Lab-I

Semester	Code of the Course	Title of the Course / Paper	NHEQF Level	Credits
I	UG0102, PHY-51P-102	Physics Lab-I	5	2

Level of Course	Type of Course	Delivery of the Course		
Introductory	Major/Minor	Lecture, Sixty Lectures (4 Hrs.. in a week) including diagnostic and formative assessment during lecture hours.		
Prerequisites	Physics and Mathematics courses of Central Board of Secondary Education or equivalent.			
Objectives of the Course	The objective of the physics Lab-I, with the mentioned experiments, is to provide students with hands-on experience in conducting experiments related to oscillations, damping, coupled oscillators, and properties of materials. The lab aims to reinforce theoretical concepts learned in the classroom, develop practical skills, and enhance the understanding of physics principles through experimentation.			

The colleges are free to set new experiments of equivalent standards. This should be intimated and approved by the Convener, Board of Studies before the start of the academic session. It is binding on the college to have an experimental set-up of at least ten experiments listed below. In case the number of experiments performed by the student is less than eight, his marks shall be scaled down in the final examination on a pro-rata basis. Laboratory examination paper will be set by the external examiner out of eight or more experiments available at the center

Exam Scheme-

Students will have to perform one practical in the exam. The duration of practical exam will be 4 hours.

Marks distribution

Student category	Experiments	Viva-voice	Record	Maximum marks
Regular Student	20	10	10	40

04/10/24

Marking distribution in practical

Student category	Theory/formula	Figure/circuit	Observation	Calculation	Results/Error	Precautions
Regular	3	2	6	5	3	1

Physics Lab - I

List of Experiments:

1. Study the variation of the time period with amplitude in large-angle oscillations using a compound pendulum.
2. To study the damping using a coupled pendulum.
3. To study the excitation of normal modes and measure frequency splitting into two coupled oscillators.
4. To study the frequency of energy transfer as a function of coupling with mass using coupled oscillators.
5. To study the viscous fluid damping of a compound pendulum and determiner the damping coefficient and quality factor of the oscillator.
6. To study the electromagnetic damping of a compound pendulum and to find the variation of damping coefficients with the assistance of a conducting lamina.
7. Study of normal modes of a coupled pendulum system. Study of oscillations in mixed modes and find the period of energy exchange between the two oscillators.
8. To determine Young's modulus by bending of the beam method.
9. To determine Y, σ and η by Searle's method
10. To determine the modulus of rigidity of a wire using Maxwell's needle.
11. To determine the moment of Inertia of a fly-wheel.
12. To find the motion of a spring and calculate (a) Spring constant (b) Acceleration due to gravity (g) (c) Modulus of Rigidity.

Suggested Books and References -

Suggested E-resources:

Course Learning Outcomes:

Through these experiments, students will develop practical skills in experimental techniques, data collection, analysis, and interpretation. They will also enhance their understanding of fundamental concepts and principles in oscillations, damping, coupled oscillators, and material properties. The lab experiences will foster critical thinking, problem- solving abilities, and the application of theoretical knowledge to real-world scenarios.

Syllabus

Semester-II

Electromagnetism

Semester	Code of the Course	Title of the Course / Paper	NHEQF Level	Credits
II	UG0102PHY-52T-103	Electromagnetism	5	4
Level of Course	Type of Course	Delivery of the Course		
Introductory	Major/Minor	Lecture, Sixty Lectures (4 Hrs. in a week) including diagnostic and formative assessment during lecture hours.		
Prerequisites	Physics and Mathematics courses of Central Board of Secondary Education or equivalent.			
Objectives of the Course	Objectives of the Course in Electromagnetism: Objectives of the Course: The objective of the course is to provide students with a comprehensive understanding of the fundamental concepts and principles of electromagnetism. It aims to develop their knowledge and skills in analyzing scalar and vector fields, electric and magnetic fields, and their interactions, as described by Maxwell's equations. The course will also cover important topics such as electric potential, polarization, magnetostatics and electromagnetic waves.			

Unit I

Scalar and Vector Fields: Concept of Field, Scalar and Vector Fields, Gradient of scalar field, Physical significance of Gradient, Divergence and Curl of a vector field, Cartesian co-ordinates system, Problems based on Gradient, Divergence and curl operators.

Concept of Solid angle, Gauss divergence and Stoke's theorem. Gauss law from inverse square law. Differential form of Gauss law.

Electric Field and Potential Energy: Invariance of Charge, Potential energy of system of (i) Discrete N-charges (ii) Continuous charge distribution, Energy required to built a uniformly

charged sphere, classical radius of electron, Electric field due to a short electric dipole, Interaction of electric dipole with external uniform and non-uniform electric field, potential due to a uniformly charged spherical shell.

Poisson's and Laplace equations in Cartesian co-ordinates and their applications to solve the problems of electrostatics, Electric field measured in moving frames, Electric field of a point charge moving with constant velocity. **(15 Lectures)**

Unit II

Electric field in matter: Multipole expansion, definition of moments of charge distribution, Dielectrics, Induced dipole moments, polar and non-polar molecules, Free and bound charges, Polarization, Atomic polarizability, electric displacement vector, electric susceptibility, dielectric constant, relation between them.

Electric potential and electric field due to a uniformly polarized sphere (i) outside the sphere (ii) at the surface of the sphere (iii) inside the sphere, Electric field due to a dielectric sphere placed in a uniform electric field (a) outside the sphere (b) inside the sphere, Electric field-due to a charge placed in dielectric medium and Gauss law, Clausius-Mossotti relation in dielectrics. **(15 Lectures)**

Unit III

Magnetostatics and Magnetic field in matter: Lorentz force, properties of magnetic field, Ampere's law, field due to a current carrying solid conducting cylinder (a) outside (b) at the surface and (ii) inside the cylinder, Ampere's law in differential form, Introduction of Magnetic Vector potential, Poisson's equation for vector potential, Deduction of Biot-Savart law using Magnetic Vector potentials, Atomic magnet, Gyromagnetic ratio, Bohr-magneton, Larmor frequency, induced magnetic moment and dia-magnetism, spin magnetic moment, Para and ferro magnetism, Intensity of Magnetization, Magnetic permeability and Susceptibility, free and bound current densities, Magnetic field due to a uniformly magnetized material and Non- uniformly magnetized material. **(15 Lectures)**

Unit IV

Maxwell's Equations and Electromagnetic waves: Displacement current, Maxwell's Equations, Electromagnetic waves, Electromagnetic waves in an Isotropic medium, Properties of electromagnetic waves, Energy density of Electromagnetic waves, Pointing vector, Radiation pressure of free space, Electromagnetic waves in Dispersive medium, Spectrum of Electromagnetic waves.   **(15 Lectures)**

Suggested Books and References -

1. Berkeley Physics Course, Vol II
2. Feynman in Physics Vol. II
3. An Introduction to Electrodynamics by Griffiths
4. Fundamental University Physics Vol. II: Fields and Waves; M. Alonso and E.J. Finn: Addison-Wesley Publishing Company

Suggested E-resources-

1. MIT Open Course Ware: Electricity and Magnetism - This resource offers lecture notes, assignments, and exams for a complete course on electricity and magnetism: https://ocw.mit.edu/courses/physics/8-02sc-physics-ii-electricity-and-magnetism-spring- 2011/
2. Hyper Physics - This online resource provides concise explanations and interactive simulations for various topics in electrostatics and electric fields: http://hyperphysics.phy- astr.gsu.edu/hbase/hframe.html

Course Learning Outcomes:

By the end of the course, students should be able to:

1. Understand the concept of scalar and vector fields and their physical significance.
2. Demonstrate knowledge of gradient, divergence, and curl operators and their applications in electromagnetism.

3. Apply Gauss divergence and Stoke's theorems to analyze electric and magnetic fields.
4. Explain the behaviour of electric fields and potential energy in different charge distributions.
5. Analyze the interaction of electric dipoles with external electric fields and calculate the resulting potentials.
6. Solve problems related to Poisson's and Laplace's equations in electrostatics.
7. Describe the behaviour of electric fields in different types of matter, including dielectrics and polarized spheres.
8. Understand the concept of electric displacement, susceptibility, and dielectric constant.
9. Analyze the behaviour of magnetic fields in various materials and the effects of currents on magnetic fields.
10. Apply Ampere's law and the magnetic vector potential to calculate magnetic fields in different scenarios.
11. Explain the properties of electromagnetic waves and their behavior in isotropic and dispersive media.
12. Calculate the energy density and radiation pressure of electromagnetic waves

Syllabus

Physics Lab-II

Semester	Code of the Course	Title of the Course / Paper	NHEQF Level	Credits
II	UG0102PHY-52P-104	Physics Lab-II	5	2

Level of Course	Type of Course	Delivery of the Course		
Introductory	Major/Minor	Lecture, Sixty Lectures (4 Hrs. in a week) including Diagnostic and formative assessment during lecture hours.		
Prerequisites	Physics and Mathematics courses of Central Board of Secondary Education or Equivalent.			
Objectives of the Course	1. To provide hands-on experience in conducting experiments related to electricity and magnetism. 2. To develop practical skills in using various electrical components and instruments. 3. To reinforce theoretical concepts learned in the corresponding lecture course through practical applications. 4. To enhance problem-solving and analytical skills by analyzing experimental data and interpreting results. 5. To promote scientific inquiry, critical thinking, and the ability to design and execute experiments. 6. To foster teamwork and collaboration in conducting experiments and analyzing results. 7. To develop skills in accurately measuring and recording experimental data.			

The colleges are free to set new experiments of equivalent standards. This should be intimated and approved by the Convener, Board of Studies before the start of the academic session. It is binding on the college to have an experimental set-up of at least ten experiments listed below. In case the number of experiments performed by the student is less than eight, his marks shall be scaled down in the final

examination on a pro-rata basis. Laboratory examination paper will be set by the external examiner out of eight or more experiments available at the center.

Exam Scheme-

Students will have to perform one practical in the exam. The duration of practical exam will be 4 hours.

Marks distribution

Student category	Experiments	Viva-voice	Record	Maximum marks
Regular Student	20	10	10	40

Marking distribution in practical

Student category	Theory/formula	Figure/circuit	Observation	Calculation	Results/Error	Precautions
Regular	3	2	6	5	3	1

List of Experiments -

1. To study the Faradays Law of electromagnetic induction.
2. To study the variation of power transfer by two different loads by a D.C. source and to verify the maximum power transfer theorem.
3. To study the variation of charge and current in an RC circuit with a different time constant (using a DC source).
4. To study the behaviour of an RC circuit with varying resistance and capacitance using AC mains as a power source and also to determine the impedance and phase relations.
5. To study the rise and decay of current in an LR circuit with a source of constant emf.
6. To study the voltage and current behaviour of an LR circuit with an AC power source. Also determine power factor, impedance and phase relations.
7. To study the magnetic field along the axis of a current-carrying circular coil. Plot the necessary graph and hence find the radius of the circular coil.
8. To study the frequency response of a series LCR series circuit and to estimate the

resonant frequency and find out Q-factor and band width.

9. To study the frequency response and to find resonant frequencies of L-C-R parallel circuits. And find out Q-factor and band width.
10. To determine the specific resistance of a material and determine the difference between two small resistance using Carey Fosters Bridge.
11. To convert a galvanometer into an ammeter of a given range.
12. To convert a galvanometer into a voltmeter of a given range.

Suggested E-resources:

Course Learning Outcomes:
By the end of the course, students should be able to:

1. Demonstrate proficiency in using various electrical components and instruments required for conducting experiments.
2. Apply theoretical concepts of electricity and magnetism to design and execute experiments.
3. Analyze experimental data using appropriate mathematical and statistical techniques.
4. Interpret experimental results and draw conclusions based on data analysis.
5. Develop skills in accurately measuring physical quantities and recording experimental observations.
6. Communicate experimental procedures, results, and conclusions effectively in written reports.

<u>Syllabus</u>

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. जवविविधता 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 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.

<u>Syllabus</u>

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.

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.

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.

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)   गुरूदेव 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.)   8 अंक
    (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 को अंग   —1 ,—(साखी नं.)
    (ix)   साध कौ अंग   —1 ,—(साखी नं.)
    (x)   उपदेश कौ अंग   --9, —(साखी नं.)

Sukhleen
27-9-23
Dr. Richa Meena

C.B. meena
27-9-23

Bhagwati Prasad
(meena)
27/09/23

(प्रो० उमेश कुमार)14

(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 कुसंग चाहत कुसल   व्याख्या
    (3) रहिमन अंसुना नयन ढरि   (4) रहिमन औछे 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
3. संक्षेपण   8 अंक
4. पल्लवन
5. उपसर्ग, संधि, प्रत्यय, समास
6. वाक्य शुद्धि / शब्द शुद्धि
7. मुहावरे / लोकोक्तियाँ

27-9-23
Dr. Richa Meena

(Brajnath Baleel Meena)
27/09/23

C.B.meen.
27/9/23

(प्रो० उमेश कुमार)

समय – 1:30   पूर्णांक 40 अंक

नोट:– इस प्रश्नपत्र में प्राप्त अंको को श्रेणी निर्धारण हेतु नहीं जोड़ा 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)
3. रामचन्द्र शुक्ल– उत्साह (ललित निबंध)   8 अंक प्रश्न

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
4. वाक्यांश के लिए एक शब्द   – 8 अंक
5. पर्यायवाची / विलोम शब्द

C.B. meena
27/9/23

(Bhagvati Parsad
Meena)
27/09/23

(प्रो० उमेश कुमार)

27-9-23
Dr. Richa Meena

अंक विभाजनः--

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-2 - 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

Bhoopradh
(Bhoopnath Prasad Meena)
27/09/23

(प्रो० उमेशकुमार राय)

Richufeer
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 -III

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+ EoSE)	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.

<div align="center">

(20 Hours Practical)

Unit-II

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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<1ving 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)**

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Unit -III

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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: Sta1t slide show, Start show from the current slide, Rehearse timing, creating custom slide show, Pr00fing 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
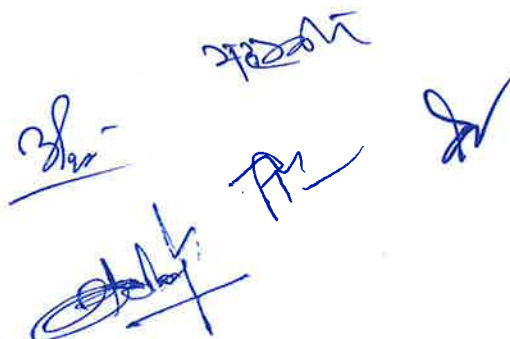
1. **Word Processing:**
   * Format documents using advanced text styling and alignment,
   * **Manipulate text with cut, copy, paste, and find & replace functions.**
   * Enhance document layout with headers, footers, and page numbering,
   * Create visually appealing content using tables, objects, 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:
(1) 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.

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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.

(Dr. C. P. Mahendra).

(Dr. Ram Nath Khorwal)