

Annexure II

REVISED SYLLABUS OF ZOO-I.C-1 Approved by BOS

PAPER TITLE:	Animal Diversity: Non Chordates
PAPER CODE:	ZOO-I.C-1
NAME OF FACULTY:	Ms. SOCORRINHA D’COSTA
MARKS:	100 [75 –Theory ; 25- Practicals]
CREDITS:	04 [03 –Theory; 01- Practical]
CONTACT HOURS:	THEORY : 45 HOURS (03 LEC/WEEK) PRACTICALS: 30 HOURS (01 PRACTICAL /WEEK)
COURSE OBJECTIVES:	<ul style="list-style-type: none">• To be familiar with the different non-chordate phyla.• To know the general and distinguishing characters of each of them.• To study how the different systems evolved in their complexity.• To compare and contrasts the life processes in different phyla.
LEARNING OUTCOME:	At the end of the course, the students will be familiar with the non-chordate world that surrounds us. They will be able to appreciate the process of evolution and see how it progressed from simple, unicellular cells to complex, multicellular organisms. Students will be able to identify the invertebrates and classify them upto the class level. Students will understand the basis of life processes in the non-chordates.

MODULE	TOPICS	CONTACT HOURS
Unit 1: Evolution of Animal Diversity and Diversity of lower non chordates	1.1 Non chordate evolution and diversity 1.2 Taxonomy and phylogeny of animals 1.3 Invertebrate cladogram 1.4 Protista Classification and general characters upto class for the following phyla: 1.5 Porifera 1.6 Cnidaria 1.7 Platyhelminthes 1.8 Aschelminthes 1.9 Annelida	15
Unit 2: Diversity of higher Non Chordates And Biological systems of non chordates 1	Classification and general characters upto class for the following phyla: 3.1: Onychophora 3.2: Arthropoda 3.3: Mollusca 3.4: Echinodermata 3.5: Hemichordata Comparison of life processes such as nutrition, sensory and neural control and coordination, sense organs	15
Unit 3: Biological systems of Non Chordates 2	Comparison of life processes such as blood vascular system, exoskeleton, endoskeleton, locomotion and muscular system, respiration, excretion, reproduction and development of phylum porifera to hemichordata	15

REFERENCE BOOKS:

1. Barnes R.D. (2000). Invertebrate Zoology. Hall Saunders International Edition, London.
2. Barrington E.J.W. 1979. Invertebrate structure and Function. John Wiley and Sons Inc.
3. Jordan, E. L. and Verma, P.S. (2000). Invertebrate Zoology. S. Chand & Co. Pvt. Ltd. New Delhi.
4. Marshall A.J. and W.D. Williams. 1974. Textbook of Zoology. Macmillan.
5. Pechenik J.A. (2002). Biology of the invertebrates. Tata McGraw hill Publishing company limited, New Delhi .

PRACTICAL COMPONENT OF ZOO-I.C-1: ANIMAL DIVERSITY: NON CHORDATES (DURATION -02 HRS /WEEK)		
Sr.	Practical	No. of Practicals
1.	Identification of organisms from phylum protozoa to phylum Hemichordata	06
2.	Observation of permanent slides	03
3.	Mountings: Cockroach mouth parts, prawn appendages	02
4.	Field trip to terrestrial environment to study the invertebrates in their natural habitat	01

REFERENCE BOOKS FOR PRACTICALS:

1) Ziser. W.S (2014) Biology 1413 Introductory Zoology Lab Manual.Morton Publishing Co. Austin Community College.

2) Lal S.S. (2004) A textbook of practical zoology vertebrate. Rastogi publications, Meerut India.

FACULTY:		
UNIT	TOPICS	CONTACT HOURS
CREDITS:	04 [03 –Theory; 01- Practical]	
CONTACT HOURS:	THEORY : 45 HOURS (03 LEC/WEEK) PRACTICALS: 30 HOURS (01 PRACTICAL /WEEK)	
COURSE OBJECTIVES:	<p>This course will give firm and rigorous foundation in the principles of modern molecular and cellular biology. It discusses the fundamental processes that enable cells to grow, move and communicate and will cover topics such as cell architecture, cell chemistry, cell division, functions and cell cycle. Students will also learn current molecular biological techniques that are used to study cell biology. Laboratories will focus both on exercises that help illustrate cellular phenomena, as well as on the introduction of techniques and procedures commonly utilized in modern cell and molecular biology research.</p>	
LEARNING OUTCOME:	<p>Upon successful completion of the course, students will be able to:</p> <ul style="list-style-type: none"> • Develop deeper understanding of what life is and how it functions at cellular level. • Describe cellular membrane structure and function, fine structure and function of cell organelles. • Perform a variety of molecular and cellular biology techniques. 	

UNIT1: TECHNIQUES OF CELL STUDY AND CELL CHEMISTRY (15 Hrs)		
	1: MICROSCOPY <ul style="list-style-type: none"> • Light Microscopy • Electron Microscopy (SEM, TEM, IEM,STEM). 	04
	2: CELL STUDY METHODS <ul style="list-style-type: none"> • Cell Fractionation, Chromatography and electrophoresis • X-ray diffraction and NMR spectroscopy • Radioisotope tracer technique, Autoradiography, intracellular electrodes 	04
	3: MOLECULES IN CELL. <ul style="list-style-type: none"> • Micromolecules in cells: Sugars, Fatty acids, aminoacids, Nucleotides. • Macromolecules in cells: Nucleic acids, proteins, Polysaccharides, glycogen, fats. 	05
	4: CHEMICAL BONDS IN BIOMOLECULES <ul style="list-style-type: none"> • covalent bonds, ionic bonds, noncovalent interactions 	02
UNIT 2: CELL ARCHITECTURE (15 Hrs)		
	5: MEMBRANE STRUCTURE AND MEMBRANE PROTEINS <ul style="list-style-type: none"> • lipid bilayer – composition and structural organization (amphipathic phospholipids, Fluidity of cell membrane) • Membrane Proteins –structure and function (transmembrane proteins, peripheral membrane proteins) • Phospholipids, sphingolipids, Cholesterol in cell membrane. 	06
	6: MOLECULAR STRUCTURE AND FUNCTION <ul style="list-style-type: none"> • Plasma Membrane • Cell matrix: Physical nature and Properties. • Nucleus: Ultra Structure and function • Mitochondria: Ultra Structure and functions • Endoplasmic Reticulum: ultra structure, modifications, functions 	06
	7: MOLECULAR STRUCTURE AND FUNCTION <ul style="list-style-type: none"> • Golgi Complex: detailed structure and function • Ribosomes- Structure and function • Microsomes: Lysosome-morphology and function, Microbodies • Cytoskeleton – Microtubules, Microfilaments, intermediate filaments 	03
UNIT 3: CELLULAR TRANSPORT OF PROTEINS AND VESICLES(15 Hrs)		
	8: TRANSPORT ACROSS CELL MEMBRANES <ul style="list-style-type: none"> • Principle of transmembrane transport (transporters and channels, active and passive transport, osmosis) • Transporters and their function- passive transporters, Pumps (Na⁺, K⁺, Ca⁺⁺), functions of transporters. • Ion Channels - ion channels activities, regulation of opening and closing of channels. • Protein transport into organelles (nucleus, mitochondria, ER). 	10
	9: VESICULAR TRANSPORT. <ul style="list-style-type: none"> • Vesicular transport – transport of soluble proteins, vesicle budding, vesicle docking, endocytic pathways • General principles of cell signaling, G-Protein coupled receptors, enzyme coupled receptors 	05

REFERENCE BOOKS:

Essential books:

- 1) *Alberts B, Hopkins, Lewis J, Raff M, Robertis K, Walter P (2014): Essential Cell Biology, Fourth Edition, Garland Science Taylor & Francis Group, UK.*
- 2) *Lodish H, Berk A, Kaiser CA, Krieger M, Scott MP, Anthony, Bretscher A, Amon A. Scott MP (2013): Molecular Cell Biology, Seventh Edition, W. H. Freeman and Company New York.*

Supplementary Reading:

- 3) *Gupta PK (2003): Cell and Molecular Biology, Second Edition, Rakesh Kumar Rastogi for Rastogi Publications, Meerut, New Delhi, India.*
- 4) *Bolsover SR, Shephard EA, Hugh AW, Hyams JS (2011): Cell Biology, Third Edition, Wiley Blackwell, A John Wiley & Sons, Inc., Publications.*
- 5) *Verma PS and Agarwal VK (2007): Cell Biology Genetics Molecular Biology Evolution & Ecology. S Chand and Company PVT LTD, New Delhi.*
- 6) *Bhamrah HS, Juneja K(2007): Molecular Cell Biology, First Edition, Anmol Publications Pvt. Ltd. New Delhi.*
- 7) *Gerald Karp: Cell Biology, International Student Edition*

PRACTICAL COMPONENT OF ZOO-I.C-2: CELL AND MOLECULAR BIOLOGY (DURATION -02 HRS /WEEK)

Sr. No	Practical	No. of Practicals
1.	Introduction to Lab techniques – Pipetting, preparation of buffers and solutions, Lab equipments (use and maintenance), acquaintance with general laboratory practices	02
2.	Cytochemistry: Localisation of Proteins, Carbohydrates & fats using different stains.	03
3.	Comparison of membrane permeability – Cellophane and Chick intestine.	01
4.	Osmotic studies – Using Human Red blood cells.	01
5.	Permament slides: <ul style="list-style-type: none">- Mitotic stages- Meiotic stages (mounting from grasshopper testes)- Histology - Study of different cell types (animal cells)	03
6.	Technique of Agarose gel electrophoresis(Observation of technique)	01
7.	Protein study – SDS-PAGE(Observation of technique)	01

REFERENCE BOOKS FOR PRACTICALS:

- 1) *Alberts B, Hopkins, Lewis J, Raff M, Robertis K, Walter P (2014): Essential Cell Biology, Fourth Edition, Garland Science Taylor & Francis Group, UK.*
- 2) *Bolsover SR, Shephard EA, Hugh AW, Hyams JS (2011): Cell Biology, Third Edition, Wiley Blackwell, A John Wiley & Sons, Inc., Publications.*

- 3) *Verma PS and Agarwal VK (2007): Cell Biology Genetics Molecular Biology Evolution & Ecology. S Chand and Company PVT LTD, New Delhi.*
- 4) *Alberts B, Johnson A, Lewis J, Raff M, Robertis K, Walter P (2008): Molecular Biology of the Cell, Fifth Edition, Published by Garland Science, Taylor & Francis Group, UK.*
- 5) *Lodish H, Berk A, Kaiser CA, Krienger M, Scott MP, Anthony, Bretscher A, Amon A. Scott MP (2013): Molecular Cell Biology, Seventh Edition, W. H. Freeman and Company New York.*
