

- Introduction to Bioinformatics, Arthur M. Lesk, OUP Oxford, 4th edition, 2014.
- Bioinformatics and Functional Genomics, Jonathan Pevsner, Wiley-Blackwell, 3rd Edition, 2015.

GENERIC ELECTIVES (GE-IV.4.4): The Living world: Systems Approach

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course	Department offering the course
		Lecture	Tutorial	Practical/ Practice			
*GE IV.4.4 The Living world: Systems Approach	4	2	0	2	Class XII pass	NIL	Chemistry/ Biology Faculty of CIC

***This paper can be opted by students in either 3rd or 4th semester.**

Learning Objectives

This module is designed to:

- Introduce students to the living system in terms of their hierarchical organization and their distinction from the nonliving.
- The specific objective of the module is to introduce biology even to students with no biology background and enable them to understand living systems.
- To enthuse students with tools and techniques for studying biology.
- Introduce students to the origin and evolution of living systems
- Introduce students to the essence of model organisms for studying biology

Learning outcomes

After studying this course, the students will be able to:

- Understand the diversity and complexity of living systems
- To comprehend different fields within Bio-Sciences
- To understand experimental processes undertaken in Biology
- Will develop a philosophical understanding of the origin and evolution of living systems, the nature of genetic materials etc.

SYLLABUS

Unit I: Introduction and organization of living systems

[6 hours]

Introduction to living state: (living versus non-living), Hierarchy of organization of living systems and classification (cellular, multicellular and organismic and population levels), Cell as the unit of life.

Unit II: Origin and diversification of the living systems [6 hours]

Nature of the genetic material (DNA versus RNA), Introduction to molecular evolution, Origin of life, Evidence of evolution, Theories of evolution, Creating living systems (synthetic cell).

Unit III: Designing living systems [6 hours]

Nature of biological processes - Approaches to study Biology: Observational and Experimental, Physiology and Behaviour

Unit IV: Tools and materials for studying living systems [12 hours]

Observational, synthetic and reductionist approaches for studying living organisms, Microscopy, Centrifugation and separation techniques as basic tools for studying components of living systems, Model organisms.

Practicals - [60 hours]

Basic equipment and techniques

- a. Observation or permanent slides of pollens, microbes, hydra, Daphnia and bacteria under a microscope
- b. Separation techniques:
 - Fraction of cell organelles through centrifugation
 - Separation of chlorophyll pigments by paper chromatography

Exploring different levels of organization (using model organisms)

- a. Tissue organization and diversity in cell shapes: studying through plant and animal tissues sections
- b. Inflorescence as a model of organization
- c. Understanding parts of the flower

Studying cells:

- a. Bacterial growth curve analysis
- b. Genomic DNA isolation
- c. Preparation of metaphase chromosome
- d. Preparation of karyotypes using photographs of metaphase spreads
- e. Demonstration of osmosis and plasmolysis

Essential/recommended readings

- Biology, Raven et al., Tata McGraw-Hill, 2016.
- Biology: Global Approach. Reece et al., Pearson Educations, Global edition, 2020.