GENERIC ELECTIVE COURSE -18

Biology of Animal Cells

Zoo-GE -18

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
		Lectures	Tutorial	Practical/ Practice			
Biology of Animal Cells **Zoo-GE-18**	**4**	**2**	**0**	**2**	As per the Program Eligibility	Nil	Zoology

Learning Objectives

The learning objectives of this course are to:

- Explore the diversity of the cells ranging from unicellular to multicellular organisms
- Explore the different models of the plasma membrane and various modes of transport across them
- Understand the fundamental structure of cell and its various functions.
- Examine the structural details of the cell organelles in relation to their role in the organism.
- Investigate the process of cell division and its relevance in the continuation of the species
- Analyse the various practical techniques to study the cell and its function.

Learning Outcomes

By studying this course, students will be able to:

- Explain the fundamental and functional principles of different types of cells
- Describe the structure and various models of plasma membrane and its role in transport of materials across cells
- Analyze the organizational details of key cell organelles involved in diverse cellular processes.

- Appreciate the characteristics of cellular growth, division, survival and death to regulate these important processes.
- Comprehend the process of cell division and its role in cellular cycle.
- Gain insights into the defects in functioning and regulation of cell organelles leading to diseases.
- Apply practical skills to understand the different cell division methods..

SYLLABUS

THEORY (30 Hrs)

UNIT 1: Types of Cells, Plasma Membrane and Endo-membrane System 13 hrs

Virus, Viroids, Mycoplasma, Prokaryotic and Eukaryotic cells. Different structures and models of plasma membrane, Transport across membranes: active and passive transport, facilitated transport; Cell-cell junctions: Tight junctions, adherens junctions, gap junctions. Endo-membrane system: Structure and Functions: Endoplasmic Reticulum, Vesicular transport from ER to Golgi apparatus; Protein sorting and transport from Golgi apparatus; Golgi apparatus, Vesicular transport: Coated Vesicles; Lysosomes; Peroxisomes.

UNIT 2: Mitochondria 4 hrs

Endo-symbiotic hypothesis; Respiratory chain, Chemi-osmotic hypothesis.

UNIT 3: Cytoskeleton 4 hrs

Microtubules, Microfilaments and Intermediate filaments.

UNIT 4: Nucleus and Cell division 9 hrs

Structure of Nucleus: Nuclear envelope, Nuclear pore complex, Transport of molecules across nuclear membrane, Chromatin: euchromatin, heterochromatin and packaging, nucleosome, nucleolus. Cell division: Mitosis, meiosis and regulation of cell cycle.

PRACTICALS 60 hrs

(Laboratory periods: 15 classes of 4 hours each)

1. Principles of Microscopy: Compound microscope: Phase contrast microscope; Electron microscope; Differential Interference Contrast (DIC) Microscope.
2. Principle and types of cell fixation and staining; Cell fractionation.
3. Study of prokaryotic cells by Gram staining and eukaryotic cells (cheek cells) by staining with hematoxylin/methylene blue.
4. 4.Study the effect of hypotonic, isotonic, and hypertonic solutions on cell permeability.
5. Preparation of a temporary slide of squashed and stained onion root tip to study various stages of mitosis.
6. Study of various stages of meiosis through permanent slides.

7. Preparation of stained mount to show the presence of Barr body in human female WBCs /cheek cells.

Essential/recommended readings:

1. Cooper, G.M., Hausman, R.E. (2019). The Cell: A Molecular Approach. VIII Edition, ASM Press and Sinauer Associates.
2. Becker, Kleinsmith, and Hardin (2018). The World of the Cell, IX Edition, Benjamin Cummings Publishing, San Francisco.
3. Karp, G. (2015). Cell and Molecular Biology: Concepts and Experiments, VIII Edition, John Wiley & Sons Inc.

Suggested readings:

1. Renu Gupta, Seema Makhija and Ravi Toteja (2018). Cell Biology Practical Manual, Prestige Publishers, New Delhi
2. V. K Sharma (1991). Techniques in Microscopy and Cell Biology, Tata McGraw-Hill Publishing Company Limited, New Delhi.

NOTE: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.