

3rd SEMESTER
BIOTECHNOLOGY AS MAJOR
BTG322J: BIOTECHNOLOGY: MOLECULAR CELL BIOLOGY

Theory: 4, Practicals: 2

Objectives: Cell being the basic unit of life, this course is aimed to provide students an insight about basic cellular structure, functioning of cell organelles and cell cycle.

Expected Learning Outcomes: Students will be able to;

- Draw the organization of cell membrane and distinguish between different types of transport across it.
- Analyze the functioning of Endoplasmic reticulum, Golgi complex and associated vesicle transport.
- Describe the structure and functioning of nucleus and other organelles.
- Gain an understanding of the functions performed by the cytoskeleton and the significance of cell-cell interactions and distinguish between different phases of the cell cycle.

UNIT I 15 lectures

Introduction to cell (animal and plant cell). Cell Membrane – structure and function. Membrane organization (Fluid Mosaic Model). Transport across membrane – Active and Passive transport (Ca^{++} -ATPase, Na^+/K^+ ATPase, Na^+ linked, Na^+ -linked Antiporter, Ca^{++} from cardiac muscle, symporters, diffusion and facilitated diffusion).

UNIT II 15 lectures

Endoplasmic reticulum, Golgi complex and Lysosomes: Structure and function. Role in Protein sorting and transport. Mechanism of vesicular transport (COP I, COP II and Clathrin coated vesicles). Endocytosis, Pinocytosis and Phagocytosis.

Unit III 15 lectures

Mitochondria, chloroplast, ribosomes, vacuoles and peroxisomes: Structure and function. Structure and organization of nucleus, organization of nuclear pore. Structure and functions of microtubules, microfilaments and intermediate filaments.

UNIT IV 15 lectures

Extra cellular matrix and cell-matrix interactions. Cell-cell interactions: Adherence junctions, tight junctions, gap junctions, desmosomes, hemidesmosomes, focal adhesions and plasmodesmata. Cell cycle (mitosis and meiosis), regulation of cell cycle. Apoptosis - brief idea.

Practicals:

1. Studying of different cellular organelles with animations and micrographs.
2. Studying the different stages of mitosis by preparing slides of onion root tip.
3. Staining of cells.
4. Karyotyping.
5. Observations on the permeability of Plasma membrane- effect of Isotonic, Hypotonic and Hypertonic solutions on Mammalian R.B.Cs or any other cell.
6. Field trip/subject tour/report.

Books:

1. Molecular Biology of the Cell by Alberts, B Taylor and Francis, New York. USA.
2. Cell and Molecular Biology: Concepts and Experiments by G. Karp, John Wiley & Sons.
3. Cell and Molecular Biology by De Robertis and De Robertis Lippincott Williams and Wilkins, Philadelphia.
4. The Cell: A Molecular Approach by Cooper, G.M. and Hausman, ASM Press.
5. The World of the Cell by Becker, Kleinsmith, Hardin. J. and Berton, Pearson Benjamin Cummings Publishing,