

BACHELORS WITH BOTANY AS MAJOR (CT - II)

SEMESTER 5th

BOT522J2: BOTANY _ CELL BIOLOGY

OBJECTIVES:

CREDITS: THEORY: 4; INTERNSHIP / PRACTICAL

- 1. Cell biology study will help the students to gain knowledge on the activities in which the giant molecules and miniscule structures that inhabit the cellular world of life are engaged.*
- 2. This will provide insight into the organization of cell, its features and regulation at different levels.*
- 3. Through the study of Cell Organelles, they will be able to understand the various metabolic processes such as respiration, photosynthesis etc. which are important for life.*

LEARNING OUTCOMES:

This course will be able to demonstrate foundational knowledge in understanding of:

- 1. The relationship between the properties of macromolecules, their cellular activities and biological responses*
- 2. Understanding of Cell metabolism, chemical composition, physiochemical and functional organization of organelle*
- 3. Contemporary approaches in modern cell and molecular biology*

THEORY (4 CREDITS)

UNIT I: THE CELL

Cell as a unit of life, structure and function, Characteristics of prokaryotic and eukaryotic cells, Cell theory; Origin of eukaryotic cell (Endosymbiotic theory). Cell wall: structure and functions, biogenesis and growth. Plasma membrane: structure and overview of membrane function; fluid mosaic model; Chemical composition of membranes; Mycoplasma, viruses, viroids, Virusoids & prions.

UNIT II: CELL ORGANELLES

Chloroplast, mitochondria and peroxisomes, Structural organization; Function; Semiautonomous nature of mitochondria and chloroplast, Endomembrane system: Endoplasmic Reticulum – Structure, types, targeting and insertion of proteins in the ER, protein folding, processing; Smooth ER and lipid synthesis, export of proteins and lipids; Golgi Apparatus – organization, protein glycosylation, protein sorting and export from Golgi Apparatus; Lysosomes Different forms of lysosomes, role in cellular digestion, lysosomal storage diseases. Peroxisomes: assembly, functions, glyoxysomes

UNIT III: CYTOSKELETON

Composition, organization and functions of microfilaments, microtubules, intermediate filaments and associated proteins, centrioles and basal bodies. Nucleus: Structure-nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus. Chromatin organization, structure and chromatin and chromosomes, heterochromatin, euchromatin.

UNIT IV: CELL CYCLE AND CELL DIVISION

Cell cycle: Phases and Regulation of cell cycle- checkpoints, role of protein kinases. Cell Division: Mitosis, phases of mitosis, regulation and its significance. Meiosis; Phases of meiosis, regulation and its significance. Cancer – types & causes of cancer. Apoptotic death in relation to cell cycle.

INTERNSHIP OR PRACTICALS (2 CREDITS)

1. Study of cell and its organelles with the help of electron micrographs.
2. Study of plant cell structure with the help of epidermal peel mount of Onion.
3. Demonstration of the phenomenon of protoplasmic streaming in Hydrilla leaf.
4. Measurement of cell size by the technique of micrometry.
5. Study different stages of mitosis and meiosis through temporary mounts and permanent slides.
6. Study the effect of organic solvent and temperature on membrane permeability
7. Study the phenomenon of plasmolysis and deplasmolysis.

SUGGESTED READINGS

- 1) Campbell, MK (2012) Biochemistry, 7th ed., Published by Cengage Learning
- 2) Campbell, PN and Smith AD (2011) Biochemistry Illustrated, 4th ed., Published by Churchill
- 3) Livingstone
- 4) Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed., W. H. Freeman
- 5) Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W. H. Freeman and Company
- 6) Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5th Edition., W.H. Freeman and Company.
- 7) Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
- 8) Hardin, J., Becker, G., Skliensmith, L. J. (2012). Becker's World of the Cell, Pearson Education Inc. U.S.A. 8th edition.
- 9) Cooper, G.M. and Hausman, R.E. (2009) The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
- 10) Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009) The World of the Cell. 7th
