Core-IV **Cell Biology**

Programme Outcome:

- Introducing prokaryotic and eukaryotic cells and their features, ultrastructure of plasma membrane and mechanism of transport of molecules across plasma membrane.
- To know the structure, function and properties of endomembrane & cytoskeletal network system and cell organelles.
- To understand the importance of mitochondria in aerobes, the role of mitochondrial electron transport chain, oxidative phosphorylation & mechanism of ATP synthesis.
- To study the structure and packaging of chromosome in nucleus, behaviour of chromosome during cell division, cell cycle and its regulation.

Course Outcome:

- Understanding the difference between prokaryotic and eukaryotic cells and the mechanism of transportation across their membrane system.
- Understanding the role of cytoskeleton in maintaining structural frame work, cell motility and cell organelles.
- Deciphering the role of mitochondria in cellular respiration and energy production.
- Obtaining knowledge on structure and function of nucleus, cell division and regulation of cell cycle.

Learning Outcome

Understanding Cell junctions and mechanism of transportation across membrane.

- Obtaining knowledge on structural and functional aspect of cytoskeleton and endomembrane system.
- Obtaining knowledge on nucleus, nucleosome and cell division and cell cycle regulation.
- Knowledge about mitochondrial respiratory chain, chemi-osmotic hypothesis and functions of peroxisome.

Unit 1: Overview of cells and plasma membrane

Prokaryotic and Eukaryotic cells, Virus, Viroids, Mycoplasma, Prions, Various models of plasma membrane structure. Transport across membranes: Active and Passive transport,

Facilitated transport. Cell junctions: Tight junctions, Desmosomes, Gap junctions.

Unit 2: Cytoskeleton & Endomembrane System

Structure and Functions: Microtubules, Microfilaments and Intermediate filaments; Structure and Functions: Endoplasmic Reticulum, Golgi apparatus, Lysosomes.

Unit 3: Mitochondria and Peroxisomes

Mitochondria: Structure, Semi-autonomous nature, Endosymbiotic hypothesis; Mitochondrial Respiratory Chain, Chemi-osmotic hypothesis. Peroxisomes.

Unit 4: Nucleus, Cell Division and Cell signalling

Structure of Nucleus: Nuclear envelope, Nuclear pore complex, Nucleolus; Chromatin: Euchromatin and Heterochromatin and packaging (nucleosome); Mitosis, Meiosis, Cell cycle and its regulation; GPCR and Role of second messenger (cAMP).

Text Books:

- ✓ *Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. VI Edition.John Wiley and Sons. Inc.*
- ✓ *De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology.VIII Edition. Lippincott Williams and Wilkins, Philadelphia.*

Suggested Readings:

- ✓ *Bruce Albert, Bray Dennis, Levis Julian, Raff Martin, Roberts Keith and Watson James (2008). Molecular Biology of the Cell, V Edition, Garland publishing Inc., New York and London.*
- ✓ *Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). The World ofthe Cell. VII Edition. Pearson Benjamin Cummings Publishing, San Francisco.*
- ✓ *Suvarna S, Lyton C, Bancroft JD (2013) Theory and practice of histological techniques, Churchill Livingstone, Elsevier, UK*
- ✓ *Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. V Edition. ASM Press and Sunderland, Washington, D.C.; Sinauer Associates, MA.*

PRACTICAL

1. Understanding of simple and compound microscopes.
2. To study different cell types such as buccal epithelial cells, striated muscle cells using Methylene blue/any suitable stain (virtual/ slide/slaughtered tissue).
3. Preparation of temporary stained squash of onion root tip to study various

stages of mitosis.

4. Study of various stages of meiosis in grasshopper testis
5. Preparation of permanent slide to show the presence of Barr body in human female blood cells/cheek cells.
6. Preparation of permanent slide to demonstrate:
   i. DNA by Feulgen reaction
   ii. DNA and RNA by MGP
   iii. Mucopolysaccharides by PAS reaction
   iv. Proteins by Mercuric bromophenol blue/Fast Green
7. Demonstration of osmosis (RBC/ Egg etc.).

Suggested Reading:

1. Verma PS and Srivastava PC. (2011) Advanced Practical Zoology. S Chand Publication.
2. S.S Lal. (2019) Practical Zoology (Invertebrate) Rastogi Publications.