

16BT202 CELL BIOLOGY

Hours Per Week :

L	T	P	C
3	-	2	4



Source:

Prof. S.Krupanidhi, HoD, BT, VU

Course Description and Objectives:

This course provides an understanding of various cell organelles, their functions and inter-organelle interactions. The objective of the course is to impart knowledge on complexity involved in cell signaling and cell cycle. In addition, laboratory experiments are designed to familiarize students with the functioning of cell and its organelles.

Course Outcomes:

Upon completion of the course, the student will be able to

- CO1: Understand the basic structure of cell and their organelles.
- CO2: Analyze various stages of cell cycle to regulate cell cycle and cancer.
- CO3: Apply the knowledge in *in-vitro* fertilization.
- CO4: Evaluate cell to cell communication.
- CO5: Demonstrate various stages of embryo development.

SKILLS:

- ✓ Differentiate various blood cells for hematological profile.
- ✓ Identify various stages of cell division and differentiation.
- ✓ Handle fluorescence microscope.

ACTIVITIES:

- Demonstrate various stages of chick embryo development.
- Culture different cell lines.
- Assess cell viability.
- Identify individual cell organelles by staining.

UNIT - 1**L-9**

STRUCTURE OF CELLS: Structure of prokaryotic and eukaryotic cells; Overview of organelles- mitochondria, chloroplasts, endoplasmic reticulum, golgi complex, nucleus; Cytoskeletal proteins - contractile proteins - actin, myosin and nebulin.

UNIT - 2**L-9**

TRANSPORT ACROSS CELL MEMBRANES: Organization of plasma membrane; Passive and active transport; Na-K pump; Ca²⁺ ATPase pump; Lysosomal and vacuolar membrane; ATP dependent proton pumps - cotransport, symport, anti-port, ion-gated and ligand gated channels; Endocytosis and exocytosis.

UNIT - 3**L-9**

REGULATION OF CELL CYCLE AND CANCER: Cell division- mitosis and meiosis; Cell cycle and regulation; Cancer- types, development and causes; Mutagenesis - tumor suppressor genes and oncogenes.

UNIT - 4**L-9**

CELL SIGNALING: Intracellular signaling; types of signal receptors; signal transduction by hormones - steroid/peptide hormones; secondary messengers - cAMP, cGMP, protein kinases; G Proteins - receptor mediated tyrosine kinases.

UNIT - 5**L-9**

GAMETE BIOLOGY: Heterogamy in eukaryotes; Leydig cells- morphology and differentiation; Spermatogenesis; Semen formation; Sperm bank; Artificial insemination; *in vitro* fertilization; Stages of development - zygote, blastula, gastrula and neurula.

LABORATORY EXPERIMENTS**List of Experiments**

Total Hours-30

1. Media Preparation for *in vitro* animal cell culture and propagation.
2. Microscopic analysis of cells and cell organelles.
3. In vitro primary cell culture and maintenance.
4. Quantitative assessment of cell attachment to different surfaces.
5. Trypsinization of cells from cell culture plates.
6. Cell Counting by Haemocytometer.
7. Passaging of cells for further culturing of cells *in vitro*.
8. Differential cell count by staining to differentiate between cell types.
9. Smear preparation for microscopy and immunohistochemistry.

TEXT BOOKS :

1. P. S. Verma and V.K. Agarwal, "Cell Biology, Genetics and Molecular Biology", S. Chand and company, New Delhi, 2000.
2. E.D.P. De Robertis and E.M.F. De Robertis, "Cell and Molecular Biology", 8th edition, B.I. Waverly Pvt. Ltd., New Delhi, 2006.
3. G.M. Cooper, "The Cell-A Molecular Approach", 3rd edition, Sinauer Publications, 2004.

REFERENCE BOOKS :

1. G. Karp, "Cell and Molecular Biology", 5th edition, Wiley Publishers, 2008.
2. B. Alberts, et al., "Molecular Biology of the Cell", 4th edition, Garland Science Publishers, 2002.