

**BT -I : Cell and Developmental Biology****Marks: 100****Hours: 45****Unit I: Study of Cell & its architecture**

Diversity of cell size and shape, History & Evolution, Cell as the basic unit of life, cell theory, Structural organization of prokaryotes and eukaryotes. Biogenesis of Mitochondria, Chloroplast. Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, membrane pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes. Structure and function of Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast, structure & function of cytoskeleton and its role in motility

**Unit II: Cell-cell interactions** General principles of cell communication cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins. Neurotransmission and its regulation. Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two component systems, light signaling in plants, bacterial chemotaxis and quorum sensing. Regulation of hematopoiesis,

**Unit III: Cell division & Cancer genetics**

Mechanism of cell division mitosis, meiosis and genetic recombination; regulation of cell cycle; factors and genes regulating cell cycle. Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth

**Unit IV: Developmental Biology**

Gametogenesis, Fertilization, cleavage, blastulation, Gastrulation & formation of germ layers in animals, Concepts of competence, determination, commitment and differentiation (dedifferentiation, redifferentiation, transdifferentiation) developmental plasticity in plant and animal development. Embryo sac development and double fertilization in plants, seed formation and germination, Meristem structure and activity, Sex determination in plants & animals.

**Unit V: Gene patterning & stem cells**

Role of gene/s in patterning and development e.g. *Arabidopsis thaliana* (root, shoot, leaf & flower) & *Drosophila melanogaster* (maternal genes, bicoid, gap genes), Stem cells.

**Text and Reference:**

1. David Sadava; Cell and Molecular biology- Jones & Bartlett Publishers
2. Cell & molecular biology - Gerald karp :John Wills
3. Developmental biology- SF Gilbert Sinauer associates.
4. T.A. Brown – Genomes – Garland Science
5. Molecular Biology of the Cell- Alberts, B –Garland Science
6. Molecular cell Biology - Darnell, Lodish, Baltimore,-W.H. Freeman
7. Reproduction in Eukaryotic cells- DM Prescott, Academic Press.
8. Cell in Developmental and Inheritance- EB Wilson, MacMilan New York.
9. Fertilization-F T logo-Chapman and Hall
10. Molecular Biology of Steroid and Nuclear Hormone Receptors- LP Freedman,
11. Molecular Cloning: a Laboratory Manual- J. Sambrook, -CSHL Press,

**PRACTICALS:**

1. Microscopy : Bright field & phase contrast & fluorescence microscopy
2. Cell types of plants- Microtomy/ maceration of various tissue explants and identification
3. Study of Mitosis and Meiosis (root tips and anthers)
4. Study of karyotypes of genetic disorders and normal
5. Cell fractionation and separation at cell organelles chloroplast and Mitochondria
6. Pigment separation by TLC & Chromatography.
7. Analysis of chlorophyll amount by Spectrophotometer.
8. *Drosophila* culture: Cultivation, maintenance and *Drosophila* genetics study
9. Study of chick/ Frog/ Plant embryo for developmental study.