

## **MB1PG03- CELL BIOLOGY AND GENETICS**

**Number of Hours / Week: 4**

**Credits: 4**

### **UNIT I**

Membrane proteins, lipids. Fluid mosaic model, membrane fluidity, asymmetry, lipid raft, functions of membrane proteins & lipids. Functions of the memb: delineation and compartmentalization, localization & organization of function, regulation of transport: porins facilitated diffusion, porter molecules; Facilitated transport: symport, antiport, uniport, anion porter, glucose porter; Active transport: proton pumps; Na<sup>+</sup> K<sup>+</sup> pumps, Ca<sup>2+</sup> pumps; Ionic channels: general characteristics of ionic channels, types of ionic channels.

### **UNIT II**

ER: Rough and smooth ER, functions, Golgi complex: structure, types, modification of proteins, protein sorting and trafficking, secretory pathways, exo and endocytosis, coated pits and vesicles, Lysosomes and peroxisomes: enzymatic components and functions, Cytoskeleton: Microtubule, assembly and organization, microfilaments: actin structure and assembly, Intermediate filaments, types, filament based movement in muscle, sliding filament model. Mitochondrion: structural features and functions, Chloroplast structural features and functions, photosystems, LHC, RuBisco, Cell junctions- tight, gap junctions.

### **UNIT III**

Signal transduction: electrical impulses and their transmission: Structure and electrical properties of neurons, resting potential, action potential, propagation of action potential, voltage gated and ligand gated channels, synaptic transmission ,chemical signals and receptors, second messengers: cAMP, Ca ions, Ras pathway, glycogen breakdown by epinephrine.

Nucleus, structure of chromosomes, chromosome banding, mitosis and meiosis, chromosomal organization Cell cycle: G1, S,G2, M phases, model organisms, MPF, cyclins, checkpoints, Role of Rb & p53. Cell cycle inhibitors

Cellular differentiation: maternal, segmentation and homeotic genes,hox genes, gene interactions bicoid- nanos system. Differentiation in plants, floral development-apetalous, pistillate, agamous interactions. Cell death and cancer: Apoptosis and necrosis, apoptotic pathways , theories on apoptosis, types of tumor, induction of cancer, properties of cancer cells, oncogenes and c onco genes, tumor suppressors, Molecular pathways- PIP3 Akt, MAP kinase

### **UNIT IV**

Mono, di and trihybrid crosses, dominance, epistasis, pleiotropic interactions, multiple alleles- ABO blood groups, pseudoalleles, atavism, linkage, sex linkage, sex influenced genes, sex limited genes, linkage groups, two point and three point test crosses, determination of gene order, chromosome mapping, inherited disorders in metabolism-maple syrup urine disease,Lesch Nyhan syndrome, Cytoplasmic inheritance, cytoplasmic male sterility, Down's syndrome, polyploidy, aneuploidy , structural and functional genomics.

## UNIT V

Behavioral genetics, Hardy Weinberg principle, natural selection, genetic drift, Genetic variation, Allele frequencies and its changes, mutation , gene flow, random mating, inbreeding, outbreeding, assortive mating, hybrid vigour.

### Reference:

1. *Principles of Genetics*, Snustad, Simmons and Jenkins, John Wiley And Sons Inc
2. Genetics, Robert Weaver and Philip Hendricks, WH.C. Brown Publishers, Iowa  
*Fundamentals of Genetics*, B D Singh, Kalyani Publishers
3. *Introduction to Genetic Analysis*, Griffiths, Wessler, Lewontin, Gelbart, Suzuki and Miller, Freeman's and Co, New York
4. *Principles of Genetics*: A.G.Gardner, John Wiley and sons.
5. *Cell Biology*, Smith and Wood
6. *Cell and Molecular Biology* by Gerald Karp, Academic Press
7. *Cell and Molecular Biology* Cooper, Hausman, ASM Press.
8. *World of the Cell*, Becker, Reece, Poenie, The Benjamin/Cumming's Pub.
9. *Cell Biology*, Lodish et al, W H Freeman and Co., New York.
10. *Cell Biology* , Thomas D Pollard and W.C.Earnshaw, Saunder's Publishers