Semester	**3**
Course	**Major**
Paper Code	C2MB230322T
Paper Title	**Cell Biology**
No. of Credits	**4**
Theory / Practical / Composite	**Composite**
Minimum No. of preparatory hours per week a student has to devote	4 hours/week
Number of Modules	No modules
Syllabus	**Unit 1: Structure and organization of Cell**: • Plasma membrane: Structure and function of Eukaryotic (Plant and animal cells) and prokaryotic cells • Cell Wall: Prokaryotic cell wall, Eukaryotic cell wall (Plant and Fungi), Extra cellular matrix and cell matrix interactions, Cell-Cell Interactions - adhesion junctions, tight junctions, gap junctions, and plasmodesmata (only structural aspects), • Mitochondria, chloroplasts and peroxisomes; • Cytoskeleton: Structure and organization of actin filaments, association of actin filaments with plasma membrane, cell surface protrusions, intermediate filaments, microtubules • Nucleus: Nuclear envelope, nuclear pore complex and nuclear lamina, Chromatin – Molecular organization, Nucleolus, Changes in Chromatin Structure - DNA methylation and Histone Acetylation mechanisms. **Unit 2: Cell Cycle, Cell Death and Cell Renewal** • Eukaryotic cell cycle and its regulation, Mitosis and Meiosis, Development of cancer, causes and types. Programmed cell death, Stem cells, Embryonic stem cell, induced pleuripotent stem cells **Unit 3: Protein Sorting/targeting and Transport:** • Transport across membrane: Different types of membrane proteins, Transporter protein. • Hydropathy plot and index, Active and Passive transport (facilitated diffusion-gated ion channels), different types and examples, Group translocation. • Protein targeting to different organelle and protein secretion: Different types of intracellular protein sorting. • Protein secretory pathway-GERL system-Golgi apparatus, Ribosomes, Endoplasmic Reticulum, lysosome – Structure, organization, function and different types, targeting and insertion of proteins in the ER, protein folding, processing and quality control in ER, protein

	glycosylation in Golgi, protein sorting and export from Golgi Apparatus, early and late endosome. Exocytosis and Endocytosis-different types. Protein targeting to Mitochondria, Nucleus, Peroxisome. **Unit 4: Cell Signalling** • Significance and different components of signal transduction. Different types of extracellular receptors and intracellular receptor, first and second messengers like cAMP, DAG; G-protein coupled receptor signalling-Adenylate cyclase and Phospholipase C pathway, Receptor tyrosine kinase (MAP kinase pathway), ion channels **PRACTICAL** 1. Study a representative plant and animal cell by microscopy. 2. Study of the structure of cell organelles through electron micrographs 3. Cytochemical staining of DNA – Feulgen 4. Demonstration of the presence of mitochondria in striated muscle cells/ cheek epithelial cell using vital stain Janus Green B 5. Study of polyploidy in Onion root tip by colchicine treatment. 6. Identification and study of cancer cells by photomicrographs. 7. Study of different stages of Mitosis. 8. Study of different stages of Meiosis.
Learning Outcomes	• To learn about the cellular organization of eukaryotic and prokaryotic cells • To know about the eukaryotic cell cycle, its regulation and cancer. • To learn about protein sorting and transport of proteins • To study about cell signalling
Reading/Reference Lists	1. Hardin J, Bertoni G and Kleinsmith LJ. (2010). Becker's World of the Cell. 8th edition. Pearson. 2. Karp G. (2010) Cell and Molecular Biology: Concepts and Experiments. 6th edition. John Wiley & Sons. Inc. 3. De Robertis, EDP and De Robertis EMF. (2006). Cell and Molecular Biology. 8th edition. Lipincott Williams and Wilkins, Philadelphia 4. Cooper, G.M. and Hausman, R.E. (2009) The Cell: A Molecular Approach. 5th Edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA. 5. Lodish. Molecular Biology 6. Bruce Alberts :The Cell

Evaluation	Theory	Practical
	60 (45+15)	40
	CIA-10+3+2	CA (38+2)

Paper Structure for Theory Semester Exam	Full Marks: 45 Short questions: 5 (each 1 mark) from 7 (5x1=5) Long questions: 4 (each 10 marks) from 6 (4x10=40)