

Syllabus template

Semester: III				
Course : Microbiology				
Paper Title: CELL BIOLOGY				
Paper code: C2MB230322T			Credits: 4	
Hours/week : 4 hours/week				
Category: Core/MDC/SEC/VAC : Core				
Theory / Practical / Composite : Theory (composite)+Practical				
No of Modules : No modules				
<p>Course Overview: Structure and organization of Cell: including Plasma membrane its Structure and function of Eukaryotic (Plant and animal cells) and prokaryotic cells ,Cell Wall including Prokaryotic cell wall, Eukaryotic cell wall (Plant and Fungi), Extra cellular matrix and cell matrix interactions, Cell-Cell Interactions like adhesion junctions, tight junctions, gap junctions, and plasmodesmata (only structural aspects), the aspects of Mitochondria, chloroplasts and peroxisomes; Cytoskeleton-its Structure and organization of actin filaments, association of actin filaments with plasma membrane, cell surface protrusions, intermediate filaments, microtubules, the domain of Nucleus including Nuclear envelope, nuclear pore complex and nuclear lamina, Chromatin – Molecular organization, Nucleolus, Changes in Chromatin Structure - DNA methylation and Histone Acetylation mechanisms. Cell Cycle, Cell Death and Cell Renewal including eukaryotic cell cycle regulation. Protein (intracellular) sorting and trafficking-the outline, sorting and sending of transmembrane protein transport, gated transport and vesicular transport. The cell signalling including the different receptor types, GPCR signalling, RTK signalling and ion channel signalling. The second and third messenger involved.</p>				
Course Outcome:				
1. Understand and explain the structures and importance of Plasma membrane, Cell wall, mitochondria				
2. Evaluate the concepts of the structure of cytoskeleton and nucleus				
3. Remember the organization of Plasma membrane, Cell wall, mitochondria, cytoskeleton and nucleus				
4. Analyse the different regulation of cell cycle and cancer				
5. Apply the concepts of different types of intracellular protein trafficking				
6. Analyse the basic ideas of cell signaling including second messengers				
7. To study and demonstrate cytochemical staining, mitosis and meiosis				
Prerequisites: Basic knowledge about any prior course				
SYLLABUS				
UNIT/Module	CONTENT	HOURS or NUMBER OF CLASSES	CO Mapping	COGNITIVE LEVEL
1	Structure and organization of Cell: Plasma membrane: Structure and function of Eukaryotic (Plant and animal cells) and prokaryotic cells	12	CO1,CO2,CO3	K2,K5

	<p>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.</p>			
2	<p>Cell cycle, cell death and cell renewal:</p> <p>Eukaryotic cell cycle and its regulation, Mitosis and Meiosis, Development of cancer, causes and types. Programmed cell death, Stem cells, Embryonic stem cell, induced pluripotent stem cells</p>	14	CO4	K1,K4
3	<p>Protein Sorting/targeting and Transport:</p> <p>Transport across membrane: Different types of membrane proteins, Transporter protein., Hydrophathy plot and index, Active and Passive transport (facilitated diffusion-gated ion channels),</p>	14	CO5	K3

	<p>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</p> <p>glycosylation in Golgi, protein sorting and export from Golgi Apparatus, early and late endosome. Exocytosis and</p> <p>Endocytosis-different types. Protein targeting to Mitochondria, Nucleus, Peroxisome .</p>			
4	<p>Cell Signalling:</p> <p>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</p>	12	CO6	K4
5	<p>Practical:</p> <ol style="list-style-type: none"> 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. 	24	CO7	K4

	7. Study of different stages of Mitosis. 8. Study of different stages of Meiosis.			
Text Books				
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 &				
5. Lodish. Molecular Biology				
Suggested readings				
1.				
2.				
3.				
Web Resources				
1.				
2.				
3.				
4.				
Evaluation Theory CIA:30 Semester Exam:70;				
Paper Structure for Theory Semester Exam Module : Theory: 60 (45+15) ,CIA-10+3+2 Practical: 40 ,CA (38+2) Full Marks: 45 Short questions: 5 (each 1 mark) from 7 (5x1=5) Long questions: 4 (each 10 marks) from 6 (4x10=40)				

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
CO1	Understand and explain the structures and importance of Plasma membrane, Cell wall, mitochondria	K2
CO2	Evaluate the concepts of the structure of cytoskeleton and nucleus	K5
CO3	Remember the organization of Plasma membrane, Cell wall, mitochondria, cytoskeleton and nucleus	K1
CO4	Analyse the different regulation of cell cycle and cancer	K4
CO5	Apply the concepts of different types of intracellular protein trafficking	K3
CO6	Analyse the basic ideas of cell signalling including second messengers	K4
CO7	To study and demonstrate cytochemical staining, mitosis and miosis	K4