

Semester: 1	
Course: Major 2	
Paper Title: Cell Biology	
Paper code: C1BT230122T/P	Credits: 4 (3 Th + 1 Pr)
Hours/week: 3 + 3	
Category: Core/MDC/SEC/VAC: Core	
Theory / Practical / Composite: Composite	
No of Modules: 2 (Theory)	
Course Overview:	
<ol style="list-style-type: none"> 1. Getting a comprehensive overview of the basic principles of cell biology. 2. Acquiring information about the structure and function of the cell membrane and cellular organelles 3. Acquiring information about the assembly and dynamics of the cytoskeleton. 4. Getting an overview of cell-cell communication and role of the extracellular matrix. 5. An introduction to cell division, cancer and apoptosis in eukaryotic cells. 6. Introduction to basic biochemical techniques and to familiarize them with techniques and equipment used in the studies of biomolecules, cells and tissues (practical) 	
Course Outcome:	
Theory	
Module A	
<ol style="list-style-type: none"> 1. Define the various aspects of classification of organisms by cell structure, of the cell, cell membrane and subcellular organelles 2. Describe organization and components of the biological membranes and structure and function of subcellular organelles (for e.g., lysosomes, ribosomes, mitochondria and nucleus) 3. Apply the concept of Fluid Mosaic Model, cell membrane permeability, cell fractionation and illustrate roles of subcellular organelles 4. Associate the concepts of compartmentalization of eukaryotic cells, membrane as a dynamic entity and structure, function and dysfunction of subcellular organelles with cellular function 5. Compare and contrast various aspects of the cell, cell membrane and subcellular organelles 6. Create a comprehensive overview of the basic principles of cell biology 	
Module B	
<ol style="list-style-type: none"> 1. Outline the various aspects of cytoskeleton and cell motility, extracellular matrix, cell division, cancer and apoptosis 2. Discuss the structure and function of cytoskeletal elements and the extracellular matrix and explain the processes of cell division, cancer and apoptosis and their significance 3. Illustrate the roles of microtubules, microfilaments, intermediate filaments, extracellular matrix proteins and membrane receptors in cellular functions, and determine the processes of mitosis and meiosis, the concept of cancer as dysregulation of cell division and pathways of apoptosis 4. Use analysis to differentiate between the structural and functional roles of microtubules, microfilaments, intermediate filaments, extracellular matrix proteins, cell-cell junctions, and associate the agents promoting carcinogenesis, 	

differences in characteristics of cancer and normal cells and apoptotic pathways with the processes of cancer and apoptosis				
5. Critically evaluate various aspects of cytoskeleton and cell motility, extracellular matrix, cell division, cancer and apoptosis				
6. Develop a comprehensive overview of the basic principles of cell biology				
Practical				
1. To recognize prokaryotic and eukaryotic cells and eukaryotic tissues by studying structural features.				
2. To understand and interpret membrane properties by studying plasmolysis and effects of temperature and organic solvents on semi-permeable membranes.				
3. To understand buffer systems by preparing buffers and learning the principles and procedures involved.				
4. To demonstrate and understand dialysis and enzyme activity and the basic principles underlying these phenomena.				
5. To identify and analyse carbohydrates, proteins and lipids through qualitative biochemical tests.				
Prerequisites: Basic knowledge about biology				
SYLLABUS				
UNIT/Module	CONTENT	HOURS or NUMBER OF CLASSES	CO Mapping	COGNITIVE LEVEL
Module A	<p>UNIT I: Cell: Introduction and classification of organisms by cell structure, cytosol, compartmentalization of eukaryotic cells, cell fractionation. Cell Membrane and Permeability: Chemical components of biological membranes, organization and Fluid Mosaic Model, membrane as a dynamic entity.</p> <p>UNIT II: Subcellular organelles: Lysosomes, vacuoles and microbodies: Structure, functions and dysfunction. Ribosomes: Structures and function including role in protein synthesis. Mitochondria: Structure, function and dysfunction. Nucleus: Structure and function. Endoplasmic reticulum: Structure, and function</p>	1 class per week	CO1-CO6	K1-K6

	including role in protein segregation.			
Module B	<p>UNIT III: Cytoskeleton and cell motility: Structure and function of microtubules, microfilaments, intermediate filaments</p> <p>UNIT IV: Extracellular matrix: composition, molecules that mediate cell adhesion, cell-cell junctions, membrane receptors for extra cellular matrix proteins, regulation of receptor function and signal transduction.</p> <p>UNIT V: Cell Division, Cancer & Apoptosis: Mitosis and Meiosis. Cancer as dysregulation of cell division, characteristics of cancer cells, agents promoting carcinogenesis. Apoptosis: definition, pathways and significance.</p>	2 classes per week	CO1-CO6	K1-K6
Practical	<ol style="list-style-type: none"> 1. Study of effect of temperature and organic solvents on semi permeable membranes. 2. Demonstration of dialysis. 3. Study of plasmolysis and de-plasmolysis. 4. Study of prokaryotic and eukaryotic cells and eukaryotic tissues. 5. Demonstration of action of an enzyme. 6. Concepts of buffer preparation. 7. Qualitative tests for carbohydrates, lipids and proteins 	3 classes per week		
Text Books				
1. G.M. Cooper, R.E. Hausman. The Cell – A Molecular Approach				
2. Bruce Alberts et al. Molecular Biology of the Cell				
3. R.A. Weinberg. The Biology of Cancer				
4. K. C. Ghose, B. Manna. Practical Zoology (For Practical)				
Evaluation: Theory: CIA: 15 marks; Semester Exam: 45 marks				

Practical: 40 marks (30 marks Continuous Assessment; End Semester Viva: 8 Marks; Attendance: 2 marks)

Paper Structure for Theory Semester Exam:

Module A (18 marks)

Any two from three questions: Each of 2 marks

Any two from three questions: Each of 7 marks with subparts; [No sub-part will be less than 2 marks and more than 5 marks]

Module B (27 marks)

Any three from four questions: Each of 2 marks

Any three from four questions: Each of 7 marks with subparts; [No sub-part will be less than 2 marks and more than 5 marks]

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
	Theory Module A	
CO1	Define the various aspects of classification of organisms by cell structure, of the cell, cell membrane and subcellular organelles	K1
CO2	Describe organization and components of the biological membranes and structure and function of subcellular organelles (for e.g., lysosomes, ribosomes, mitochondria and nucleus)	K2
CO3	Apply the concept of Fluid Mosaic Model, cell membrane permeability, cell fractionation and illustrate roles of subcellular organelles	K3
CO4	Associate the concepts of compartmentalization of eukaryotic cells, membrane as a dynamic entity and structure, function and dysfunction of subcellular organelles with cellular function	K4
CO5	Compare and contrast various aspects of the cell, cell membrane and subcellular organelles	K5
CO6	Create a comprehensive overview of the basic principles of cell biology	K6
	Theory Module B	
CO1	Outline the various aspects of cytoskeleton and cell motility, extracellular matrix, cell division, cancer and apoptosis	K1
CO2	Discuss the structure and function of cytoskeletal elements and the extracellular matrix and explain the processes of cell division, cancer and apoptosis and their significance	K2
CO3	Illustrate the roles of microtubules, microfilaments, intermediate filaments, extracellular matrix proteins and membrane receptors in cellular functions, and determine the processes of mitosis and meiosis, the concept of cancer as dysregulation of cell division and pathways of apoptosis	K3
CO4	Use analysis to differentiate between the structural and functional roles of microtubules, microfilaments, intermediate filaments, extracellular matrix proteins, cell-cell junctions, and associate the agents promoting carcinogenesis, differences in	K4

	characteristics of cancer and normal cells and apoptotic pathways with the processes of cancer and apoptosis	
CO5	Critically evaluate various aspects of cytoskeleton and cell motility, extracellular matrix, cell division, cancer and apoptosis	K5
CO6	Develop a comprehensive overview of the basic principles of cell biology	K6