



Course Title: Fundamentals of Cell Biology

Course Code: GCMB204

Credit Units: 4

L	T	P/ S	Lab	TOTAL CREDIT UNITS
3			2	4

Course Objectives:

The course is designed to explain the fundamentals of the structure and function of cells as the basic unit of living things and as the building blocks of multi-cellular organisms. It emphasizes the basis of sub cellular processes and their inter relationships at the cellular level. It aims to define how cellular components perform their individual functions to make the cell a self sustaining, energy generating unit in itself. Practical are designed to impart practical skill for comprehending the theoretical aspects of cell structure and cellular processes like cell division at the microscopic level and acquainting students with instruments and techniques associated with the skill development.

Pre-requisites: Senior Secondary with science

Student Learning Outcomes:

At the end of the course, the student should be able to:

- Define and describe the structure and function of basic components of prokaryotic and eukaryotic cells, specially cell membranes and sub-cellular organelles.
- Describe the process of cell growth, its duplication and division and identify the mechanism by which cells undergo equational and reductional division.
- Interpret and identify the mechanism of communication of a living cell with its environment and surroundings and analyze the mechanism which leads to the generation of response.
- Students will be able to develop skills, through lab experiments, in some of the specific methodologies used in the study of cell biology.

Course Contents/Syllabus- Theory:

	Weightage (%)
Module I	10
Descriptors/Topics: Cell as a basic unit of life and its evolution The Cell Theory, Modern concept of cell, Pre- cellular evolution, Endosymbiont theory, Overview of prokaryotic and eukaryotic cell types.	
Module II	40
Descriptors/Topics: Intracellular organelles and their functions Plasma Membrane: various models of biological membrane, Membrane structure and composition: lipid bilayer, membrane carbohydrates, membrane proteins, channel proteins and carrier proteins and pumps, Transport across membranes- active, facilitated and passive transport; Nucleus: structure of nuclear envelope, nuclear pore complex, nucleoplasm emphasizing nuclear organization of chromatin; Mitochondria- structure and function: Oxidative Phosphorylation,, Chloroplast- structure and function: Photophosphorylation; GERL Complex: Golgi complex,	

Endoplasmic reticulum and Lysosomes and Ribosome and Peroxisome. Cytoskeleton: Structure and organization of microtubules, microfilaments and intermediate filaments.	
Module III	10
Descriptors/Topics: Cellular communication Cell junctions: Cell adhesions, Tight junction Gap junction, Adherens junctions, Desmosomes, Hemidesmosomes and extracellular matrix.	
Module IV	20
Descriptors/Topics: Cell growth and division cycle Cell cycle , Check-points, Cell Cycle Regulators – Cyclins and CDKs, Mechanism of cell division: Mitosis and Meiosis; Programmed Cell Death: intrinsic and extrinsic pathways.	
Module V	20
Signal Transduction: Overview of extracellular signaling, modes of signaling, ligands and receptor molecules. G-protein coupled receptor, Secondary messengers (cAMP), Tyrosine kinase linked receptors.	

Pedagogy for Course Delivery:

Lectures: 42
Home Assignment 1
Class Test: 2
Total: 45

Lab/ Practical details, if applicable:

Practical: 13
Class Test: 02
Total: 15

List of Experiments:

- Microscopy- Working Knowledge of Light and Electron microscopy.
- Study of cell biology techniques: Pretreatment, Fixation and Staining of cells.
- Study of mitosis and meiosis from permanent slides.
- Preparation of temporary mount to study different stages of Mitosis.
- Preparation of temporary mount to study different stages of Meiosis.
- Study of chloroplast and stomata.

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	End Term Examination
75	25	100

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment						End Term Examination
Components (Drop down)	Class Test 1	Class Test 2	Home Assignment	Presentation/ Seminar	Attendance	
Weightage (%)	10	10	5	0	5	70

Lab/ Practical/ Studio Assessment:

Components (Drop down)	Continuous Assessment/Internal Assessment				End Term Examination			Total
	Performance	Lab record	viva	Attendance	Lab record	Performance	Viva	
Weightage (%)	15	5	5	5	10	50	10	100

Text Books:

- Cell and Molecular Biology, 7th edi, Gerald Karp, (2013) John Wiley and Sons Inc.
- Becker's World of the cell – 8th edition, Harden, Kleinshmith and Bertoni. (2011) Pearson Education Cell. ISBN-13:9788184734508
- Cell and Molecular Cell biology, 8th edition, De Robertis and De Robertis, (2011) Lippincott Williams & Wilkins. ISBN-13:9788184734508

References:

- Molecular Biology of the Cell, 5th Ed, B. Alberts, D. Bray, A. Johnson, J. Lewis, M. Roff, (2008) Garland Publishing Company. ISBN-13: 978-0815316206