GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Science

Level: Under Graduate

Branch Name: Honors/ Honors With Research (Biotechnology)

Course / Subject Code: BS02001011

Course / Subject Name: Cell Biology

w. e. f. Academic Year:	2024-25
Semester:	2
Category of the Course:	Core Course

Prerequisite:	Strong background in basic biology and chemistry. Understanding of genetics, biochemistry, and familiarity with laboratory techniques are also crucial for comprehending advanced topics such as cell structure, function, signaling pathways, and molecular biology processes covered in the course.
Rationale:	This course is designed for the students to identify the molecules present in living cells. This wouldhelp in gaining the deep knowledge on application of techniques for research purposes also.

Course Outcome:

After completion of the course, student will able to:

No	Course Outcomes	RBT Level
1	Correlate the functions of different organelles of the cell	RM,UN
2	Examine contemporary issues in related fields	RM,UN
3	Perceive recent developments in the field	RM,UN
4	Able to apply scientific knowledge to address the nature problems.	RM,UN

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	70	30	30	200

Course Content:

Sr. No.	Course Content	No. of Hours	% of Weightage
1	**The Cell structural organization** Cell theory, structure of prokaryotic and eukaryotic cells; plant and	7	16

	animal cells. Cell membrane and component of cell: Organisation of cell membrane, lipid and protein constituents, membrane transporters, cytoskeleton, cell wall, nucleus, mitochondria, chloroplast, endoplasmic reticulum, Golgi apparatus, peroxisome, vacuole, lysosome, ribosome, centrosome, glyoxisome and the ultra-structure of cytoplasm		
2	**Structure of Nucleus** Nuclear membrane, nuclear pore, nucleolus, chromatin, structure of nucleic acids. Mitochondria – Ultra structure and function; Biogenesis of mitochondrial Genomes, Chloroplast – Ultra structure and function, Genome biogenesis. Ribosomes detailed structure and its function with involvement in protein synthesis. Vacuoles, Lysosomes structure and functions	**9**	**20**
3	**Cytoskeleton structure and functions** Overview of the Major Functions of Cytoskeleton. Microtubules: Structure, Composition and functions, Composition, Assembly and Disassembly, Structure, composition and functions of Centrioles and Basal bodies, Microtubules in Cilia and Flagella. Microfilaments and Intermediate filaments: Structure and Composition; Endoplasmic reticulum: Structure, function including role in protein segregation. Golgi complex: Structure, biogenesis and functions including role in protein secretion	**12**	**25**
4	**The Life Cycle of Cell** Cell division in prokaryotes and eukaryotes, mitosis and meiosis, and regulation of cell cycle by mitogens, cyclins, and Cdks. Apoptosis in multicellular organisms	**7**	**16**
5	**Cell signalling and Signal transduction pathways** Primary and secondary signaling molecules. Autocrine, paracrine, and endocrine signal. Signal amplification, Introduction to major signaling pathways. G-protein coupled signal transduction pathway involving cAMP, cGMP, IP3, DAG, and Ca2+ as second messengers.	**10**	**23**
	Total	**45**	

Reference Books:

1. Molecular Biology of the cell by Albert et al.4th Edition, Garland Science, Taylor & Francis Group. 2002.
2. Cell Biology by C.B. Powar. Himalaya Publishing House, Mumbai.2004.

3. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology by P.S. Verma and V.K. Agarwal.S.Chand & Company Ltd.Ram Nagar, New Delhi. 2007

List of Experiments: (Minimum 6 experiments need to be performed)

1. Nucleus staining visualization in Bright Field Microscope
2. Mitosis and Meiosis: Observation through Prepared Slides
3. Cell staining and counting: Haemocytometer
4. Nucleus staining and visualization in Fluorescent microscope
5. Cell fractionation using density gradient
6. Bacterial cell wall staining
7. Microscopic visualization of prokaryotic and eukaryotic cells (Plant & animal cells)
8. MTT assay
9. Effect of hyper, hypo and isotonic solvent on cell morphology
10. Mitosis in onion root tip

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