



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3130406

Semester – III

Cell Biology

Type of course: Professional Core Course

Prerequisite: Basic Knowledge of Biology

Rationale: It is one of the basic subjects of Biotechnology. It involves various aspects of internal structure of prokaryotic and eukaryotic cells, various processes carried out by them.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
5	0	2	6	70	30	30	20	150

Contents:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	An Overview of Cells Biology: Importance, scope, role in ancient and modern era, use and misuse of biology. The Origin and Evolution of Cells, Basics of Akaryotic, Prokaryotic and Eukaryotic cells.	8	8%
2	Prokaryotic cell structure and function Cellular components of prokaryotic organisms – Cell wall, Cell membrane, Outer Membrane, Gas vesicle, Endospore, Plasmid, Nucleoid, Mesosome, Ribosome, Flagella, Slime layer/Capsule - structure, function and integration, Microbial locomotion.	14	15%
3	Eukaryotic cell structure and function: Cellular components of eukaryotic organisms - Cell Wall, Cell membrane, Cytoplasm, Endoplasmic Reticulum, Ribosome, Lysosome, Golgi Apparatus, Microbodies, Mitochondria, Plastids, Nucleus, Chromosome, Cytoskeleton, Centrioles and Basal bodies , structure, function and integration	20	23%
4	Cellular Processes:	38	38%



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	<p>Cell Interactions: Adhesion Junctions, Tight Junctions Gap Junctions, Plasmodesmata</p> <p>Cell Signalling: Signaling Molecules and Their Receptors, Modes of Cell-Cell Signaling, Functions of Cell Surface Receptors, Pathways of Intracellular Signal Transduction, Signaling Networks.</p> <p>Cell cycle: Eukaryotic cell cycle, Phases of the cell cycle, Regulation of the cell cycle by cell growth and extracellular signals, Cell cycle checkpoints, Regulators of cell cycle progression, DNA damage checkpoints, Events of M phase</p> <p>Cell Death: The Events of Apoptosis, Caspases, Central regulator of Apoptosis, Signalling pathways to regulate apoptosis.</p> <p>Cell Renewal: Stem Cells and the Maintenance of Adult Tissues, Reprogramming and Growth factors</p>			
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Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	40	15	15	15	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. Cooper, G. M., & Hausman, R. E. (2009). The Cell: a Molecular Approach. Washington: ASM; Sunderland.
2. Cell and Molecular Biology by De Roberties, Publisher: Lippincott Williams and Wilkins, 1st Edition.



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3. Brock Biology of Microorganism by Micheal T. Madigan, John M Martinko, Kelly S. Bender, Daniel H Buckley, David A Stahl, Pearson Publications.
4. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology by P.S.Verma and V. K. Agarwal, Publisher: Chand (S.) & Co Ltd, India, 1st Edition.

Course Outcome:

Sr. No.	CO Statement	Marks % Weightage
CO-1	To develop a fundamental understanding between prokaryotic and eukaryotic cells.	25%
CO-2	To compare prokaryotic and eukaryotic cells based on structure and function of their cellular components.	25%
CO-3	To evaluate different biosignalling pathways and various cell processes	25%
CO-4	To develop understanding and applications of microbial taxonomy	25%

LIST OF PRACTICALS:

1. Introduction of laboratory equipment.
2. a) Cleaning and sterilization of glasswares.
b) Disposal of laboratory wastes and cultures
3. Preparation of culture media
4. Simple staining
5. Differential staining
6. Aseptic handling and Pure culture techniques.
7. Growth curve of *E.coli*
8. Viable Count
9. Effect of pH on growth of bacteria.
10. Effect of Temperature on growth of bacteria
11. Effect of Metal on growth of bacteria.
12. To observe mitosis in root of onion

Reference Books:

1. Laboratory exercises in microbiology by Harley & Prescott, 5th Edition, The McGraw-Hill Companies.



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2. Microbiological Applications by Benson, The McGraw-Hill Companies,
3. Experiments in Microbiology, Plant pathology and Biotechnology by K R Aneja, New Age International Publishers.

Major Equipment:

1. Microscope
2. Autoclave
3. Incubator
4. Laminar Air Flow
5. Refrigerator

List of Open Source Software/learning website:

- 1) NPTEL
- 2) MIT Open course lecture