

Subject Code: 2SC1010101	Subject Title: BIOTECHNOLOGY
Course Type: Core Course	

Course Objective:

Cell biology deals with intra and inter-cellular organization, structure and functions of different organelles. By learning this subject, the student will understand the basics of cellular organelles, functions and their significance in living systems.

Teaching scheme (hours) per week		Credit			Theory Marks		Practical Marks		Total
Theory	Practical	Theory	Practical	Total	Uni. Assessment	Cont. Assessment	Uni. Assessment	Cont. Assessment	
4	4	4	2	6	70	30	30	20	150

A. Biotechnology Theory:

Unit	Content	Lectures	Weight (%)
1	Introduction to Biotechnology: Branches of biotechnology/ Domains of biotechnology Applications and future prospectus of biotechnology in various fields(major breakthroughs of modern biotechnology, enhancement and upliftment of science and society, Carrier opportunities: (i) Academic (ii) Research (iii) Industry (iv) Entrepreneurship) Biotechnology in India: Government initiatives to promote Biotechnologists in enhancement of R&D Output of country: (i) Exams (ii) schemes- i.e. IBTP, JRF etc. (iii) Major research labs across country, Contribution of renown Indian scientists/ biotechnologists	13	22
2	Cell: Introduction and classification of organisms by cell structure & Cell Organization – Eukaryotic (Plant and animal cells, compartmentalization of eukaryotic cells) and prokaryotic Prokaryotic cell structure: Morphology of Bacterial cell: Size, shape and arrangement of bacterial cells External structure: Flagella, Pili, Fimbriae, Prosthacate Boundary layer: Capsule, cell wall, cell membrane. Internal cell structures: Mesosome, ribosome, inclusion bodies, nucleoid. Dormant forms: Spores and cyst Eukaryotic cell structure: External structures: Flagella, cilia The cell envelope (boundary layer): cell wall, cell membrane (Structure of Plasma membrane: Fluid Mosaic Model and Various Models, Functions of Cell Membrane: Transport of small molecules, Endocytosis and exocytosis) Cell communication (cell matrix interactions/Cell-Cell Interactions - adhesion junctions, tight junctions, gap junctions, and plasmodesmata) Internal structures: Cytoplasm, cytoskeleton (Structure and function of microtubules, Microfilaments, Intermediate filaments.)	18	30
3	Protein Sorting and Transport Ribosomes: Structures and function (including role in protein synthesis). Endoplasmic Reticulum – Structure and function (targeting and insertion of proteins in the ER, protein folding, processing and quality control in ER, smooth ER and lipid synthesis, export of proteins and lipids, role in protein segregation). Golgi Apparatus: Structure (Organization) and functions (protein	14	23

	glycosylation, protein sorting and export from Golgi Apparatus, protein secretion). Structure and function of Lysosomes, micro bodies (Glyoxysome and Peroxisome), Mitochondria, Chloroplasts		
4	Nucleus: Structure (Nuclear envelope, nuclear pore complex and nuclear lamina), function Chromosome: Size, shape, types and basic structure of chromosome, euchromatin and heterochromatin, karyotyping, Chromatin – Molecular organization Giant Chromosome: Polytene chromosome and lamp brush chromosome Nucleolus Cell cycle: Cell cycle and its regulation Mitosis and meiosis	15	25

Learning Outcome:

By offering this course student will learn basic structure of cell, classification of cell, ultra-structures of prokaryotic and eukaryotic cell and their functions. They will also study cell mechanisms like cell communications, cell division and their regulations.

Reference book:

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
3. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
4. Becker, W.M., Kleinsmith, L.J., Hardin, J. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.
5. Hardin J, Bertoni G and Kleinsmith L.J. (2010). Becker's World of the Cell. 8th edition. Pearson. Edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.

B. Biotechnology Practical-1SC1010101: INTRODUCTION TO BIOTECHNOLOGY AND CELL BIOLOGY:

1. Cell division in onion root tip/ insect gonads. (Preparation & study of permanent slides showing different stages of cell division – Meiosis and Mitosis)
2. Preparation of Nuclear, Mitochondrial & chloroplast cytoplasmic fractions by Sub cellular fractionation
3. Microscopy: Simple, compound and phase contrast; Basic components of microscope and their working principle
4. Staining techniques: Simple-Monochrome and Negative Differential- Grams and Acid Fast Special-Capsule, Spore, Cell wall, Granule, Nucleus, Spirochetes
5. Localization of Barr Body
6. Study of Bacterial Motility
7. Study of Salivary Gland chromosome of Dipterian Larva-Drosophila or Chironomas Spp.
8. Micrometry: Measurement of given biological sample.
9. Use of Hemacytometer and determination of cell densities of Yeast cell
10. Cytochemical staining of DNA – Feulgen