

Model Syllabus for Biotechnology (Minor) in consonance with Curriculum framework

w.e.f. AY 2026-27

COURSE STRUCTURE

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
II	III	1	Cell Biology & Biological Chemistry	3	3
			Cell Biology & Biological Chemistry-Practical	2	1

Dr. Anurag Singh

SEMESTER-III

COURSE 1: CELL BIOLOGY & BIOLOGICAL CHEMISTRY

Theory

Credits: 3

3 hrs/week

Course Objectives

1. To explain that the cell is the basic unit of life in all organisms.
2. To study the structure and functions of prokaryotic and eukaryotic cells.
3. To describe cell organelles, cell cycle, and cell division.
4. To understand the structure and importance of nucleic acids, proteins, carbohydrates, and lipids.
5. To learn about enzymes, energy metabolism, and how cells use energy.

Learning Outcomes

After completing this course, students will be able to:

1. Describe the structure and role of different types of cells.
2. Explain how organelles work and how cells divide.
3. Identify the structure and function of nucleic acids, proteins, carbohydrates, and lipids.
4. Understand how enzymes work and how energy is produced in cells.
5. Relate cell structure and biochemistry to the overall working of living organisms.

Syllabus

UNIT I – Cell as the Basic Unit of Life

Cell as a basic unit of living organisms. Ultra-structure of prokaryotic cell. Brief description of viral, bacterial, fungal, plant and animal cells. Cell wall and plasma membrane.

UNIT II – Sub-cellular Organization & Cell Division

Sub-cellular organelles: Nucleus, cytosol, endoplasmic reticulum, chloroplast, mitochondria, vacuoles, ribosomes, peroxisomes, lysosomes, Golgi complex. Cell Division: Mitosis and Meiosis. Cell Cycle – phases and regulation.

UNIT III – Nucleic Acids & Proteins

Nucleic acids: Chemical structure and base composition; Chargaff's rules. Watson-Crick Model (B-DNA), deviations, and alternate forms of DNA (A- DNA and Z-DNA). Organization of chromosome in eukaryotes. acids: Structure, classification (pH-based, polarity-based, nutrition-based). Proteins: Levels of organization – primary, secondary, tertiary, and quaternary structures.

UNIT IV – Carbohydrates & Lipids

Carbohydrates: Definition, classification, nomenclature. Structures of monosaccharides, disaccharides, and polysaccharides. Concept and examples of heteropolysaccharides. Lipids: Structure of saturated and unsaturated fatty acids, triglycerides, phospholipids. Chemistry of porphyrins – heme and chlorophylls.

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UNIT V – Enzymes & Bioenergetics

Enzymes: Classification and nomenclature. Factors affecting enzyme activity – substrate concentration, enzyme concentration, pH, and temperature. Enzyme inhibition – reversible inhibition (competitive, uncompetitive, non-competitive). Bioenergetics: Concepts of free energy, entropy, enthalpy, and redox potential. High-energy bonds – structure and role of ATP. Energy metabolism – glycolysis and Krebs's cycle.

Reference Books:

1. Bruce Alberts et al. – Molecular Biology of the Cell
2. Lodish, Berk, Kaiser, Krieger et al. – Molecular Cell Biology
3. Verma & Agarwal – Cell Biology, Genetics, Molecular Biology, Evolution and Ecology
4. Lehninger Principles of Biochemistry
5. Biochemistry – Donald Voet & Judith Voet
6. Satyanarayana & Chakrapani – Biochemistry

Chakrapani

SEMESTER-III

COURSE 1: CELL BIOLOGY & BIOLOGICAL CHEMISTRY

Practical

Credits: 1

2 hrs/week

Practical Component:

1. Principle and utilization of microscope
2. Preparation of blood smear and observation of cells
3. Study of divisional stages in mitosis
4. Study of divisional stages in meiosis
5. Observation of permanent slides of bacterial, fungal, plant and animal cells
6. Calculation of molarity, normality, and molecular weight of compounds.
7. Qualitative analysis of carbohydrates (sugars)
8. Quantitative analysis of carbohydrates
9. Quantitative estimation of protein - Lowery method
10. Estimation of DNA by diphenylamine reagent
11. Estimation of RNA by orcinol reagent

Ch. Jayarish

4- Year UG Honours MINOR

Syllabus

(2026-27)

Semester-III

Model Question Paper

Time : 3hrs

Marks:75

Part-A

Answer any Five Questions. Each Question carries 3 Marks.

5x3=15

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Answer the following questions. Each question carries 12 Marks

5x12=60

11. a) Unit-I
(Or)
b) Unit-I

12. a) Unit-II
(Or)
b) Unit-II

13. a) Unit-III
(Or)
b) Unit-III

14. a) Unit-IV
(Or)
b) Unit-IV

15. a) Unit-V
(Or)
b) Unit-V