

**Model Syllabus for 4-Year UG Honours in B.Sc. (Biotechnology) as Major
in consonance with Curriculum framework w.e.f. AY 2026-27**

COURSE STRUCTURE (for Semester III)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
II	III	5	Biophysical Techniques	3	3
			Biophysical Techniques-Practical	2	1
		6	Basic Molecular Biology	3	3
			Basic Molecular Biology-Practical	2	1
		7	Genetic Engineering	3	3
			Genetic Engineering-Practical	2	1

Bio-Tech. (Major)

SEMESTER - III

COURSE 5: BIOPHYSICAL TECHNIQUES

Theory

Credits: 3

3 hrs/week

Course Objectives:

1. To introduce the principles and applications of spectrophotometry in biological research.
2. To explain the theory, instrumentation, and uses of different types of chromatography.
3. To familiarize students with the principles and applications of electrophoresis techniques.
4. To provide knowledge about centrifugation methods, rotors, centrifuge types, and their applications.
5. To describe tracer techniques, radioactivity measurements, autoradiography, and the use of non-radioactive labels.

Learning Outcomes:

After completing this course, students will be able to:

1. Understand the principles of light absorption and apply UV-visible spectrophotometry.
2. Differentiate between various chromatographic techniques and apply them for biomolecule separation and analysis.
3. Perform and interpret results from gel electrophoresis, SDS-PAGE, isoelectric focusing, and related techniques.
4. Apply centrifugation methods for separation and analysis of cellular and molecular components.
5. Explain the principles of tracer techniques, radioactivity measurement, and non-radioactive labeling methods in biotechnology.

Syllabus

UNIT I

Spectrophotometry: Spectrum of light, absorption of electromagnetic radiations, Beer-Lambert's law: derivation and deviations, extinction coefficient, colorimeter, instrumentation of UV and visible spectrophotometry, double beam spectrometer, dual-wavelength spectrometer, applications of UV and visible spectrophotometry.

UNIT II

Chromatography: Principle, instrumentation and applications of paper chromatography, thin layer chromatography, gel filtration chromatography, ion-exchange chromatography, affinity chromatography, high performance liquid chromatography (HPLC).

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UNIT III

Electrophoresis: Migration of ions in electric field, factors affecting electrophoretic mobility, gel electrophoresis: types of gels, agarose gel electrophoresis, SDS-PAGE and Native-PAGE electrophoresis and their applications, isoelectric focusing, two-dimensional electrophoresis, pulsed-field gel electrophoresis.

UNIT IV

Centrifugation: Basic principles of centrifugation, types of rotors, types of centrifuges: clinical, high-speed and ultracentrifuges, preparative centrifugation: differential and density gradient centrifugation, analytical centrifugation and their applications.

UNIT V

Tracer Techniques: Radioactive and stable isotopes, rate of radioactive decay, units of radioactivity, measurement of radioactivity: Geiger-Muller counter, autoradiography, non-radioactive compounds: fluorescein, biotin, digoxigenin and their applications in biotechnology.

Reference books:

- Keith Wilson and John Walker – *Principles and Techniques of Biochemistry and Molecular Biology* – Cambridge University Press.
- R. K. Murray et al. – *Harper's Illustrated Biochemistry* – McGraw Hill (for basics of spectrophotometry and biochemistry techniques).
- David J. Holme and Hazel Peck – *Analytical Biochemistry* – Pearson Education.
- Boyer, R. – *Modern Experimental Biochemistry* – Pearson.
- Plummer, D.T. – *An Introduction to Practical Biochemistry* – Tata McGraw Hill.
- S. K. Sawhney and R. Singh – *Introductory Practical Biochemistry* – Narosa Publishing House.
- Ghosh, T.K. – *Biophysical Chemistry* – Books and Allied (for tracer techniques and centrifugation).

Chitambar

SEMESTER - III

COURSE 5: BIOPHYSICAL TECHNIQUES

Practical

Credits: 1

2 hrs/week

Practical Component:

1. Separation of plant pigments and amino acids by paper chromatography
2. Separation of lipids of TLC
3. Quantification of DNA using Spectrophotometer
4. Quantification of RNA using Spectrophotometer
5. Agarose gel electrophoresis

Chitambar

4- Year UG Honours, Major
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