

**ST. XAVIER'S COLLEGE (AUTONOMOUS), AHMEDABAD-9
FACULTY OF SCIENCE**



DEPARTMENT OF BIOCHEMISTRY – BIOTECHNOLOGY

SEMESTER – III SYLLABUS

OF

BSc BIOTECHNOLOGY (HONOURS)

**BASED ON UNDERGRADUATE CURRICULUM FRAMEWORK
(NEP – 2020)**

(Effective from Academic Year 2023)

Programme Outcomes

- PO1. Create a strong knowledge domain/ expertise
- PO2. Develop critical thinking, Problem solving and research aptitude
- PO3. Skill development
- PO4. Encouraging social interaction, service learning and develop equity centred national development (Social Extension work)
- PO5. Self-directed and lifelong learning
- PO6. Developing employability and entrepreneurial skills
- PO7. Promoting Ecological sustainability development
- PO8. Nurturing creativity and humane values

Programme Specific Outcome for BSc Biotechnology

- PSO1. Comprehensive and Procedural Knowledge: Discuss and interpret the basic concepts of all subjects under the aegis of current multidisciplinary Biotechnology to translate and apply the same for professional, entrepreneurial and societal benefits.
- PSO2. Skill development: Learn wide – ranging technical skills inclusive of digital learning skills through laboratory sessions/ research projects and develop self-directed experiential learning with an objective to associate biotechnology with improving life, industrial applications and environment.
- PSO3. Critical thinking, Creativity and Problem Solving: Develop competence to solve problems in familiar and non – familiar context especially to alleviate stress in all life forms, develop an analytical mind to use information from various sources and create plans/models to come up with innovations in the field of Biotechnology.
- PSO4. Communication and Collaboration: Ability to communicate the understanding of the learning to others confidently and precisely, interact with diverse multicultural groups working in the subject area as well as collaborate to achieve goals that have a wider outreach.
- PSO5. Leadership, Lifelong learning and ethics: Extend the applicability of Biotechnology to service learning and nation development through awareness programmes/ action - oriented projects in health, nutrition, and environment; be accountable, responsible and conscientious in leading roles both in profession and personal space.

Curriculum Framework for Semester – III BSc (Hon.) Biotechnology

Course	Title	Content	Hours/week	Credit
DSC-1 (Theory)	BT – 3501 Enzymology	Unit 1: Introduction to Enzymes Unit 2: Reaction mechanisms Unit 3: Kinetics and Regulation Unit 4: Metabolic Engineering	4 hrs	4
DSC-2 (Theory)	BT – 3502 Molecular Biology	Unit 1: Basic concepts in Molecular Biology Unit 2: DNA Replication and Repair Unit 3: Transcription and Genetic Code Unit 4: Translation and Gene expression regulation	4 hrs	4
DSC-1 (Lab)	BC – 35023L Enzymology and Basic Molecular Biology Lab	Practical based as per Theory syllabus.	8 hrs	4
SEC	BT – 3650 Biophysical Techniques	Unit 1: Electrophoresis Unit 2: Advanced Techniques	2 hrs	2
MDC <i>Offered by other Major Discipline</i>	Choice from Basket		4 hrs	4
AEC	English etc	(To be chosen from a basket of course)		2
VAC	Value Added Courses	(To be chosen from a basket of course)		2
Total Credits				22

BSC. (HONS.) BIOTECHNOLOGY SYLLABUS

SEMESTER - III

Skill Enhancement Course – 1: Biophysical Techniques

Course Title & Code	Credit Distribution of The Course			Eligibility Criteria	Prerequisite(s) of the Course (if any)
	Lecture	Tutorial	Practical / Practice		
BT – 3650: Biophysical Techniques	2 (30 hr)	0	0	10 + 2 from a recognized board in any stream	Nil

I. Course Learning Objectives

Thus, the knowledge from this course can help in the following:

- The students could pursue a career in industries that specialize in Instrumentation specifically for Life Science Research and Analysis
- Avail jobs in Production, Quality Control and R and D divisions of Pharmaceutical and Biotech companies, or start their own enterprises dealing with instruments
- The students can carry out basic research in various areas of biology due to their understanding of the techniques

II. Course Outcome

By the end of the paper, a student should be able to:

- CO 1: Understand the basic concepts of physics to be able to apply in understanding fundamental concepts
- CO 2: Appreciate that the discovery and advancement of biophysics has opened up understanding pathways and mode of actions of various biological systems.
- CO 3: Apply the techniques for production, analysis and modifications of biomolecules.
- CO 4: Design experiments with appropriate techniques in the methodologies and analyze the data obtained.

III. Course Content

Unit 1: Electrophoresis

(1 Credit)

Principle of electrophoresis, techniques, factors affecting electrophoresis, Detection, applications, advantages and disadvantages of: Gel electrophoresis (PAGE, agarose, starch gel), Isoelectric focusing, 2-D gel electrophoresis; Analysis of secondary data of PAGE and agarose gel electrophoresis

Unit 2: Advanced Techniques

(1 Credit)

Radioactive decay, units of radioactivity. Measurement of radioactivity (Geiger Muller Counter, scintillation counters, and autoradiography), Principle and applications of: Fluorescence based techniques Flow cytometry, FACS, FRET and FRAP, Patch-clamp technique, Mass spectrometry- ICP MS, GC MS, LC MS (Applications), X-ray crystallography for protein structure determination.

IV. Recommended learning Resources

1. Daniel, C Harris: Quantitative Chemical Analysis
2. David Freifelder: Physical biochemistry (2nd Ed) WH Freeman, USA)
3. Ghatak KL: Techniques and methods in Biology. PHI learning Pvt Ltd. 2011
4. Upadhyay and Nath: Biophysical chemistry: Principles and Techniques (3rd Ed)
5. Van Holde KE: Physical Biochemistry. Prentice Hall, NJ.
6. Vogel AI: A text book of quantitative inorganic analysis (3rd Ed), 1975.
7. Wharton and McCarty: Experiments and methods in Biochemistry
8. Willard and Merrit: Instrumental methods of analysis (4th Ed) 1971.
9. Wilson K and Walker J: Principles and Techniques of Biochemistry and Molecular Biology (6th Ed) 2006. Cambridge University Press.

V. Pedagogy

1. Classroom engagement through lectures and PowerPoints
2. Lecture videos and online resources
3. Workbooks/Group activities/Assignments/Class Tests

VI. Evaluation

The course paper is evaluated out of 50 marks, of which 50 percent weightage is of Internal Assessment and 50 percent weightage is of the End semester examination (External)

ASSESSMENT CRITERIA	INTERNAL EVALUATION	EXTERNAL EVALUATION
Continuous Internal Assessment (CIA) I and II	15	-
Assignment	05	-
Attendance	05	-
End Semester Exam	-	25
Total	25	25

**The assignment comprises activities designed by the faculty members concerned such as creating a working model based on the concepts learnt*