

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



DEPARTMENT OF BIOCHEMISTRY – BIOTECHNOLOGY

SEMESTER – II SYLLABUS

OF

BSc BIOCHEMISTRY (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 Biochemistry

- PSO1. Comprehensive and Procedural Knowledge: Discuss and interpret the basic concepts of all subjects under the aegis of current multidisciplinary Biochemistry 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 biochemistry 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 Biochemistry.
- 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 Biochemistry 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 – II BSc (Hon.) Biochemistry and BSc Biochemistry with Vocational Biotechnology

Course	Title	Content	Hours/ week	Credit
DSC-1 (Theory)	BC – 2501 Concepts in Cell Biology	Unit 1: Membrane Structure and Cytoskeleton Unit 2: Cell organelles Unit 3: Cell – cell Interaction and Communication Unit 4: Cell cycle and Cell Death	4 hrs	4
DSC-1 (Lab)	BC – 2502L Basic Techniques in Cell Biology	Practical based as per Theory syllabus.	8 hrs	4
Minor-1 (Theory + Lab) <i>Offered to students of other Major Discipline (Chemistry)</i>	BC – 2101 Theory: Ultrastructure of Cell	Unit 1: Membrane Structure and Cytoskeleton Unit 2: Cell Organelles	2 hrs	2
	Lab: Basic Cell Biology Lab	Practical based as per Theory syllabus.	4 hrs	2
Minor-1 (Theory + Lab) <i>Offered to students with Voc Biotech</i>	BT – 2101 Theory: Environmental Biotechnology	Unit 1: Renewable energy and Biofuels Unit 2: Bioremediation and Biofertilizers	2 hrs	2
	Lab: Basic Techniques in Environmental Biotechnology	Labs based on plant tissue culture and its analysis	4 hrs	2
SEC	BC – 2650 Biophysical Techniques - II	U-1: Spectroscopy U-2: Chromatography	2 hrs	2
MDC <i>Offered to students of other Major Discipline</i>	MDC – 201_1C (Sem 3) Nutrition and Health	U-1: Food groups and diet U-2: Nutrients in food U-3: Food adulteration and Food safety standards U-4: Activity Modules	4 hrs	4
AEC	English	(To be offered by the concerned subject Department)		2
VAC	Value Courses Added	(To be offered by the concerned subject Department)		2
Total Credits				22

BSC. (HONS.) BIOCHEMISTRY SYLLABUS

SEMESTER - II

Skill Enhancement Course – 1: Biophysical Techniques - II

Course Title & Code	Credit Distribution of The Course			Eligibility Criteria	Prerequisite(s) of the Course (if any)
	Lecture	Tutorial	Practical / Practice		
BC – 2650: Biophysical Techniques - II	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 Rand D divisions of Pharmaceutical and Biotech companies.
- The students can carry out basic research in various areas of biology due to their understanding of the techniques
- Start up companies supplying basic instruments like colorimeters, pH meters, etc.

II. Course Outcome

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

- CO 1: Understand the basic concepts of physics like adsorption, viscosity, surface tension, absorption of light to be able to apply in understanding concepts in biochemistry
- CO 2: Correlate the use of a particular technique to understand a fundamental.
- CO 3: Appreciate that the discovery and advancement of biophysics has opened up understanding pathways and mode of actions of various biological systems.
- CO 4: Apply the techniques for production, analysis and modifications of biomolecules.
- CO 5: Design experiments with appropriate techniques in the methodologies and analyze the data obtained.

III. Course Content

Unit 1: Colorimeter and Spectroscopy (Credit 1)

Beer-Lambert's law, principle, working of single cell and double cell colorimeter.

Principle, working, applications, advantages and disadvantages of spectrophotometers and spectrofluorimeters (expand in detail monochromators, light source)

Principle and applications of NMR, IR spectroscopy and atomic absorption spectroscopy

Analysis of spectra

Unit 2: Chromatography (1 Credit)

Principle of adsorption, orientation of molecules on a surface, factors affecting adsorption, application of adsorption

Principle, technique, applications, advantages and disadvantages of: Ion exchange, gel filtration, affinity chromatography. Adsorption chromatography. Thin layer chromatography, reverse phase chromatography, hydrophobic interaction chromatography, HPLC, GLC.

IV. Recommended learning Resources

1. Berg JM, and Tymoczko TJ, Stryer L,: Biochemistry (6th Ed)
2. Daniel, C Harris: Quantitative Chemical Analysis
3. David Freifelder: Physical biochemistry (2nd Ed) WH Freeman, USA)
4. Donald Voet and Voet J: Biochemistry (4th Ed) 2011
5. Ghatak KL: Techniques and methods in Biology. PHI learning Pvt Ltd. 2011
6. Nelson DL and Cox MM: Lehninger's Principles of Biochemistry (5th Ed) 2008
7. Oser: Hawks Physiological Chemistry (4th Ed) 1965.
8. Upadhyay and Nath: Biophysical chemistry: Principles and Techniques (3rd Ed)
9. Van Holde KE: Physical Biochemistry. Prentice Hall, NJ.
10. Vogel AI: A text book of quantitative inorganic analysis (3rd Ed), 1975.
11. Westand Todd: Text book of biochemistry ((4th Ed) 1970
12. Wharton and McCarty: Experiments and methods in Biochemistry
13. Willard and Merrit: Instrumental methods of analysis (4th Ed) 1971.
14. 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.*