

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



DEPARTMENT OF BIOCHEMISTRY – BIOTECHNOLOGY

SEMESTER – I 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 – I BSc (Hon.) Biochemistry and BSc Biochemistry with Vocational Biotechnology

Course	Title	Content	Hours/ week	Credit
DSC-1 (Theory)	BC – 1501 Fundamentals of Biomolecules	U-1: Scope of Biochemistry and Origin of Life U-2: Carbohydrates U-3: Lipids U-4: Amino acids and Proteins	4 hrs	4
DSC-1 (Lab)	BC – 1502L Basic Biochemistry Lab	Practical based as per Theory syllabus.	8 hrs	4
Minor-1 (Theory + Lab) <i>Offered to students of other Major Discipline (Chemistry)</i>	BC – 1101 Theory: Fundamentals of Biochemistry	U-1: Origin of Life, Nucleic Acids and Proteins U-2: Carbohydrates and Lipids	2 hrs	2
	Lab: Laboratory Analysis of Biomolecules	Practical based as per Theory syllabus.	4 hrs	2
Minor-1 (Theory + Lab) <i>Offered to students with Voc Biotech</i>	BT – 1101 Theory: Plant Cell and Tissue Culture	Unit 1: Basic concepts in Plant Tissue Culture Unit 2: Applications of Plant Tissue Culture	2 hrs	2
	Lab: Plant Tissue Culture	Labs based on plant tissue culture and its analysis	4 hrs	2
SEC	BC – 1650 Biophysical Techniques - I	U-1: Microscopy U-2: Centrifugation	2 hrs	2
MDC <i>Offered to students of other Major Discipline</i>	BC 1201 Nutrition and Health	U-1: Food groups and diet U-2: Nutrients in food U-3: Food adulteration and Food safety standards U-4: Tutorials/Activities	4 hrs	4
AEC	English	(To be offered by the concerned subject Department)		2
VAC	Value Added Courses	(To be offered by the concerned subject Department)		2
Total Credits				22

BSC. (HONS.) BIOCHEMISTRY SYLLABUS

SEMESTER - I

Skill Enhancement Course – 1: Biophysical Techniques - I

Course Title & Code	Credit Distribution of The Course			Eligibility Criteria	Prerequisite(s) of the Course (if any)
	Lecture	Tutorial	Practical / Practice		
BC – 1650: Biophysical Techniques - I	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: Correlate the concept of viscosity to various biological systems

CO 2: Correlate the use of centrifugation and microscopy to elucidate a fundamental or pathway or structure etc.

CO 3: Designing experiments using centrifugation and microscopy and analyze the data obtained

CO 4: Correlate the instrumentation design with its applications

III. Course Content

Unit 1: Centrifugation and Viscosity

Poiseuille's equation, unit of viscosity, relative viscosity and its determination, factors affecting viscosity, physiological importance

Principle of sedimentation, factors affecting sedimentation

Types of rotors used in centrifuges, separation methods in different rotors

Preparative centrifuges: Differential centrifugation, sub cellular fractionation, density gradient centrifugations; Applications, preparation of gradients, sample collection methods, zonal rotors
Analytical Centrifuges; Ultracentrifugation, working and applications

Unit 1: Microscopy

Parts of a compound microscope: condenser, objective, ocular lens systems; Basic principles of image formation; Relationship between magnification and numerical aperture; angular power and resolving power. Measurements and analysis through microscopy.

Principle, construction, working, limitations and applications of: dark-field microscopy, phase contrast microscopy, fluorescent microscopy, Inverted microscopy and Electron (TEM, SEM) microscopy.

Principle and applications of Confocal microscopy, AFM and Cryoelectric microscopy

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. West and 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
4. Using the basic instruments in the laboratory

V. 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 internal evaluation of CIA II and Assignment will be based on evaluative modules prepared by the concerned faculty members, which will be outlined during the course work.*