

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



DEPARTMENT OF BIOCHEMISTRY – BIOTECHNOLOGY

SEMESTER – II 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 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.) Biotechnology

Course	Title	Content	Hours /week	Credit
DSC-1 (Theory)	BT – 2501 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)	BT – 2502 Basic Cell Biology Techniques	Practical based as per Theory syllabus.	8 hrs	4
Minor-1 (Theory + Lab) <i>Offered as Biochemistry subject</i>	BC – 2102 Theory: Physiology - I	Unit 1: Hormones and its actions Unit 2: Circulatory and Respiratory System	2 hrs	2
	Lab: Basic Haematology	Practical based as per Theory syllabus.	4 hrs	2
SEC	BT – 2650 Spectroscopy and Chromatography	Unit 1: Spectroscopy Unit 2: Chromatography	2 hrs	2
MDC <i>Offered by other Major Discipline</i>	Multidisciplinary course	(To be chosen from a basket of courses)	4 hrs	4
AEC	English	(To be offered by the concerned subject Department)		2
VAC	Value Added Courses	(To be chosen from a basket of courses)		2
Total Credits				22

BSC. (HONS.) BIOTECHNOLOGY SYLLABUS

SEMESTER - II

Minor Course – 1: Physiology - I

Course Title & Code	Credit Distribution of The Course			Eligibility Criteria	Prerequisite(s) of the Course (if any)
	Lecture	Tutorial	Practical / Practice		
BC – 2102: Physiology - I	2 (30 hr)	0	2 (60 hrs)	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:

- An ability to carry out basic research in understanding various physiological actions in cells.
- Work in research institutions, hospitals which are involved in finding molecular targets to treat diseases.
- Opportunities to work in companies that are into discovery of drugs that target cells at the molecular level for therapeutics
- Work as skilled technicians in pathological laboratories, blood banks and hospitals.

II. Course Learning Outcomes

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

- CO 1: Correlate that physiological functions of cells are aided and regulated by signal molecules like hormones, owing to its specificity and transduction mechanisms, which in turn become a target for treatment of various ailments
- CO 2: Evaluate the molecular mechanisms involved in blood clotting, production of erythrocytes, leucocytes and thrombocytes. This also gives an insight into molecular mechanisms that could be induced to enhance production of cells *in vitro*.
- CO 3: Evaluate the coordination of circulatory system with respiration
- CO 4: Associate physiochemical properties to enable understand the basic concepts involved in signalling, transport, regulation and movement

III. Course Content

Part A: Theory

Unit I: Hormones

Introduction to Hormones : Chemical nature of hormones; Basic characteristics of hormones; Classification of hormones; Understanding Paracrine action, autocrine action, juxtacrine action and endocrine action with examples; Understanding feedback mechanism of hormones with examples; Differences between steroid hormones and peptide hormones; Importance of hormone – receptor complex. Class I hormones: Mode of Action through gene activation and use of intracellular receptors; Understanding the hormone action with examples of glucocorticoid and thyroid hormone – their synthesis and abnormalities associated with its malfunctioning or decreased production. Class IIa and IIb Hormones and their action: Introduction to Class II a and IIb; Association with membrane receptors coupled to G- protein; Activation of cAMP as a secondary messenger and its cascade mechanism; Understanding the hormone action with example of Glucagon; its physiological action and implications at the body level

Unit II: Circulatory and Respiratory System

Hematopoiesis: Erythropoiesis, Thrombocyte formation and leucopoiesis.

Hemostasis: Vasoconstrictions, Platelet plug formation, Clot – Clotting factors; intrinsic and extrinsic pathways for blood clotting. Clot retraction.

Role of surface tension in inhalation; (Theory of surface tension and its measurement); Role of hemoglobin in oxygen transport, dissociation curve of oxyhemoglobin and its significance. Bohr's effect, transport of oxygen and carbon dioxide, chloride shift.

Various buffer systems of the blood, acid base balance, factors affecting acid-base balance. Acidosis and alkalosis, Role of lung and kidney in regulation of acid base balance.

Part B: Lab sessions

Basic Hematology

1. Red blood cell count
2. White blood cell count
3. Differential counting
4. Estimation of Hb by Sahli's method
5. Determination of ESR
6. Determination of PCV
7. Determination of bleeding time, clotting time
8. Determination of blood group
9. Demonstration of measuring of Blood Pressure
10. Assessment of lung capacity by Spirometer
11. Analysis of Blood oxygen saturation and pulse rate
12. To make and understand working model of lung

IV. Recommended Learning Resources

1. Best and Taylor: Physiological basis of Medical practice
2. Bhagavan NV: Medical Biochemistry (4thed), Jones and Bartlett Publishers
3. Charterjee: Human Physiology Vol. 1 and 2.
4. Chatterjee and Shinde: Text book of Medical Biochemistry
5. Das AK: Human Physiology
6. Ganong WF: Review of Medical Physiology (12thed). Lange Medical Publishers
7. Guyton AG and Hall JE: Text book of Medical Physiology (11thed) Harcourt Asia.
8. Murray RK, Granner DK, Mayes PA and Rodwell, VW: Harper's Biochemistry (25thed) 2000, Prentice Hall publishers.
9. Sherwood: Human Physiology (5thed) 2004
10. Talwar PC: Text book of Biochemistry and Human Physiology
11. Tortora G and Derrickson B: Principles of Anatomy and Physiology (14thed) 2014. John Wiley and sons.

V. Pedagogy

A. For Theory

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

B. For Lab Sessions

1. Explanation of each laboratory experiment emphasising on the use of different reagents and instruments
2. Problem solving, group activities and presentations. There are defined activities for every laboratory experiment in the journal, which encourages self-learning, peer learning, team work, developing presentation skills and reading from science articles and research papers.

VI. Evaluation

The theory part of 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*

The laboratory part of 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
Internal Practical Examination*	20	-
Attendance	05	-
End Semester Practical Exam	-	25
Total	25	25

**The internal practical exam will entail the students to answer a question paper based on the experiments in their journal, and to perform one experiment. The journal duly completed and signed will also carry weightage in the end semester evaluation.*