

St. Xavier's College (Autonomous), Ahmedabad
Syllabus of Semester – II of the following departments under Faculty of Science
based on Under Graduate Curriculum Framework – 2023 (NEP)
to be implemented from the Academic Year 2023-24.

FACULTY OF SCIENCE

DEPARTMENT OF BIOCHEMISTRY

| Course | Title | Content | Hours/Week | Credit |
|--------------------------------------|---|---|------------|--------|
| Minor-I (Theory+ Lab) | BC – 2101 Theory: Ultrastructure of Cell | U-1: Membrane Structure and Cytoskeleton U-2: Cell Organelles | 2 hrs | 2 |
| | Lab: Basic Cell Biology Lab | Practical based as per Theory syllabus | 4 hrs | 2 |

BSC. (HONS.) BIOCHEMISTRY SYLLABUS

SEMESTER - II

Minor Course – 1: Ultrastructure of the Cell

For Chemistry Major Students

| Course Code | Title & | Credit Distribution of The Course | | | Eligibility Criteria | Prerequisite(s) of the Course (if any) |
|-------------|------------------------|-----------------------------------|----------|----------------------|--|--|
| | | Lecture | Tutorial | Practical / Practice | | |
| BC – 2101 | Ultrastructure of Cell | 2 (30 hr) | 0 | 2 (60 hrs) | 10 + 2 from a recognized board in any stream | Nil |

I. Course Learning Objectives

The course will give a detailed description of

- a) The detailed study of membrane biochemistry, transport across membranes and within cells by cytoskeleton
- b) Studying the organization of the cell and the structure and functions of various organelles.

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

- a) Research in elucidation of molecular mechanisms within a cell
- b) Research in cancer biology, tissue engineering, stem cells etc.
- c) Drug discovery targeting various anomalies due to malfunction of organelles

II. Course Learning Outcomes

The main outcome of the course will be to build the basic foundation for studying Cell Biology. By the end of the paper, a student should be able to:

- CO 1: Correlate the importance of semi permeable nature of plasma membrane in maintaining the integrity of a cell.
- CO 2: Evaluate how proper conformations of lipids and proteins in a membrane are needed for optimum functioning
- CO 3: Evaluate how important cytoskeleton and each organelle is to make cell the basic unit of life – the entire organization within a cell is a perfect example of division of labour with proper coordination and networking.

III. Course Content

Part A: Theory

Unit 1: Membrane Structure and Cytoskeleton (1 credit)

Membrane structure: Singer – Nicholson’s Fluid Mosaic Model, Structure and functions of membrane lipids and glycolipids – membrane fluidity and movement, lipid rafts.

Membrane proteins: structure and types; principles of membrane transport, Carrier proteins and active membrane transport, Ion channels

Membrane carbohydrates: Glycocalyx

Cytoskeleton: Nature of cytoskeleton, Intermediate filaments, Microtubules, Cilia and flagella, Actin filaments; Molecular motors associated with cytoskeleton

Unit 2: Cell Organelles (1 credit)

Detailed structure and functions of: Mitochondria and Chloroplast (Energy Conversions) and the Endosymbiont Theory, Endoplasmic reticulum: Rough and Smooth, Golgi apparatus, Ribosomes, Lysosomes, Peroxisomes, Nucleus; Endomembrane network system and its importance.

Part B: Lab sessions

1. Basic working of a Colorimeter
2. Staining and observation of yeast cells using Microscope
3. Growth curve of yeast cells by turbidometry
4. Cell count and Checking cell viability using Trypan blue
5. Staining and observation of buccal cells
6. Lipid extraction from yeast cells
7. Estimation of total lipids colorimetrically using phosphovanillic method
8. Protein estimation by Biuret method
9. Sugar estimation by DNSA
10. Extraction of soluble sugar from plant tissue and its quantification

IV. Recommended Learning Resources

1. [Molecular Cell Biology, 7th Edition.](#) Lodish, et. al.
2. Biochemistry, 4th edition. Donald Voet and Voet Judith
3. Lehninger's Principles of Biochemistry, 5th Edition. Nelson DL and Cox MM
4. [Biochemistry, 5th Edition.](#) Garrett and Grisham
5. Molecular Biology of Cell – Bruce Alberts
6. Gerald Karp's Cell and Molecular Biology
7. Origin of life on the earth and in the cosmos (2nded), Geoffrey Zubay:Academic Press
8. Molecular Biology of the Cell, 5th Edition, Bruce Alberts et. al.
9. Organelle structure and function, David E Sadava, Jones Bartlett publishers.
10. Cytology, P.S. Verma, V.K. Agarval, S. Chand Publications.
11. Cell and Molecular Biology, 8th Edition. De Robertis.
12. Cell and Molecular Biology, Sheeler and Bianchi
13. The Cell: A Molecular Approach, 6th Edition, G.M. Cooper
14. [Introduction to Practical Biochemistry. T. Plummer.](#)
15. [Practical Biochemistry - Satyanarayan](#)

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 activities are to be carried out as a group and presented as a team*

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.*