

St. Xavier's College (Autonomous), Ahmedabad
Syllabus of Semester – I 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)	BT – 1101 Theory: Plant Cell and Tissue Culture	U-1: Basic concepts in Plant Tissue Culture U-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

**BSC. (HONS.) BIOCHEMISTRY with
VOCATIONAL BIOTECHNOLOGY SYLLABUS**

SEMESTER - I

Minor Course – 1: Plant Tissue and Cell Culture

For Vocational Biotechnology Students

Course Code	Title &	Credit Distribution of The Course			Eligibility Criteria	Prerequisite(s) of the Course (if any)
		Lecture	Tutorial	Practical / Practice		
BT 1101: Plant Tissue and Cell Culture		2 (30 hr)	0	2 (60 hrs)	10 + 2 from a recognized board in any stream	Nil

I. Course Learning Objectives

The knowledge from this course can help in the following:

- a) The students could pursue a career in Agriculture sector, Environment Sector and Biotech industries related with plant products.
- b) The students can carry out basic research that can be translated to the field or industry, thereby going for higher studies in this field.
- c) Due to knowledge of techniques, they can proceed to study further and be part of teams that are involved in policy making related to the field.
- d) Plant Proteomics is an area that can be explored as a career option.
- e) Comprehend beginning entrepreneurship ventures in plant based products

II. Course Learning Outcomes

The main outcome of the course will be to build the basic foundation for micropropagation and plant biotechnology.

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

- CO 1: Relate the basic concepts and techniques in plant biotechnology, especially the standard operating procedures for successful culture establishment and appraise how industry has been able to scale up the production of commercially important plant based products.
- CO 2: Weigh the pros and cons of the various techniques in Agriculture, Environment and Industry/ Commercial set up.
- CO 3: Analyze how crops have been improved and evolved due to specialized techniques like hybridization, mutagenesis and transgenics
- CO 4: Evaluate the ethical concerns related to genetic modifications in plants
- CO 5: Design and carry out basic plant tissue culture experiments

III. Course Content

Part A: Theory

Unit-1: Basic concepts in Plant Tissue Culture

Basics terms and definitions in plant tissue culture; Introduction to in vitro cultures; Laboratory set up; Sterilization techniques; Media: Various kinds of media, Composition and significance of media components; Plant growth regulators; Micropropagation: Axillary bud, Shoot tip, Meristem culture, Introduction to organogenesis, Production of haploid plants and their applications ; Ovary and ovule culture, In vitro pollination and fertilization, Pollen culture, Anther culture, Embryo culture: History and methodology, Embryo rescue after wide hybridization, Applications, Somatic embryogenesis. Endosperm culture and production of triploids.

Unit-2 Applications of Plant Tissue Culture

Single cell suspension cultures, Mutant Selection, Scale up of cell cultures and bioreactors, Protoplast isolation and culture, DNA transformation methods in plants, Somaclonal variation and applications, Somatic Hybridization and its applications, Virus free plants, Germplasm conservation, Synthetic seeds, Applications of plant DNA transformation. Hairy root culture, Secondary metabolite production, Transgenics in crop improvement and ethics, Plant Proteomics.

Part B: Lab sessions

1. Study of laboratory equipment and set up
2. Stocks and Media preparation
3. Sterilization techniques in plant tissue culture
4. Explant selection, treatment and inoculation
5. Subculture of initiated cultures
6. Acclimatization of cultures
7. Extraction of proteins from plants and its estimation
8. Extraction of DNA/RNA from plants and its estimation

9. Estimation of peroxidase activity in plants
10. Study of β – amylase enzyme from germinated pulses
11. Establishing cell suspensions

IV. Recommended Learning Resources

1. Plant Tissue Culture, Theory and Practice, Rev Ed., S. S. Bhojwani, M.K. Razdan
2. Biotechnology, B.D. Singh
3. Introduction to Plant Biotechnology, 3rd Ed., H. S. Chawla
4. Plant Tissue Culture, development and Biotechnology, Edited by Robert N. Trigiano and Dennis J Gray.
5. Plant Propagation: Principles and Practices – Hartmann, H.T and Kester D. E. 6. Introduction to Practical Biochemistry. T. Plummer
6. Lab Manual prepared by the Department of Biochemistry – Biotechnology for the laboratory sessions

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 preparing posters on Industries of the plant biotechnology sector, their products and market/economic contributions.*

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.*