



SIES

College of Arts,
Science &
Commerce (Autonomous)

RISE WITH EDUCATION

NAAC REACCREDITED - 'A' GRADE

**Sion (West), Mumbai – 400022.
(Autonomous)**

Faculty: Science

Program: Bachelor of Science

Program code: SIUSBT

Subject: BIOTECHNOLOGY

Academic Year: 2023 – 2024

F.Y.B.Sc. Biotechnology

**Credit Based Semester and Grading Syllabi as per NEP
2020 approved by Board of Studies in Biotechnology to be
brought into effect from June 2023.**

PREAMBLE:

Biotechnology, broadly defined, includes any technique that uses living organisms, or parts of such organisms, to make or modify products, to improve plants or animals, or to develop microorganisms for specific use. The interdisciplinary nature of biotechnology integrates living systems including animal, plant and microbes and their studies from molecular biology to cell biology, from biochemistry to biophysics, from genetic engineering to stem cell research, from bioinformatics to genomics-proteomics, from environmental biology to biodiversity, from microbiology to bioprocess engineering, from bioremediation to material transformation and so on. Biotechnology is the science of today and tomorrow. It has applications in all major service sectors i.e. health, agriculture, industry, environment etc. Biotechnology as an application science has taken firm footing in many countries, abroad where a number of transgenic crops, genetically modified food and recombinant therapeutic molecules for human and animal health are available in the market. Biotechnology as a science of service to human society is yet to make inroads in India

With the advent of the World Wide Web in the early nineties and its subsequent growth, the latest research trends have become accessible from drawing rooms across the globe. This acted as a positive feedback mechanism in increasing the pace of research in all fields including Chemical Engineering and Biotechnology. This was the motivation for an in-depth analysis of what is actually required for today's technology. It is also important to take advantage of the freely available software to enhance the quality and quantity of material that can be covered in the classroom.

This restructured syllabus is therefore intended to combine the principles of physical, chemical and biological sciences along with developing advanced technology. The undergraduate curriculum is prepared to impart primarily basic knowledge of the respective subject from all possible aspects. In addition, students will be trained to apply this knowledge particularly in day-to-day applications of biotechnology and hence get a flavor of research.

SEMESTER I

Course Code	Course Type	Course Title	Credits	Lectures (Hrs.)/ week
SIUBTMJ111	DSC-Major	Basic Biotechnology I	3	3
SIUBTMJP111	DSC-Major	Practical in Basic Biotechnology I	1	2
SIUBTMN111	DSC-Minor	Bioorganic Chemistry I	3	3
SIUBTMNP111	DSC-Minor	Practical in Bioorganic Chemistry I	1	2
SIUBTOE111	OE	Food and Nutrition	4	4
SIUENAE111	AEC	English	2	2
SIUSFVE111	VEC	Environment Studies	2	2
SIUSFIK111	IKS	Indian knowledge system	2	2
SIUBTVS111	VSC	Microbial Techniques	1(Theory) + 1(Practical)	2
SIUBTSE111	SEC	Analytical Skills	1(Theory) + 1(Practical)	2
		Total	22	

SEMESTER II

Course Code	Course Type	Course Title	Credits	Lectures (Hrs.)/ week
SIUBTMJ121	DSC-Major	Basic Biotechnology II	3	3
SIUBTMJP121	DSC-Major	Practical in Basic Biotechnology I	1	2
SIUBTMN121	DSC-Minor	Bioorganic Chemistry-II	3	3
SIUBTMNP121	DSC-Minor	Practical in Bioorganic Chemistry-II	1	2
SIUBTOE121	OE	Introduction to Forensic Science	4	4
SIUENAE121	AEC	Language-English	2	2
SIUSFVE121	VEC	Understanding India	2	2
SIUBTVS121	VSC	Biofertilizers	1(Theory) + 1(Practical)	2
SIUBTSE121	SEC	Tissue Culture	1(Theory) + 1(Practical)	2
	Field projects/ Internships/ Apprenticeship / Community engagement and services	NCC/NSS/ Sports / Cultural	2	2
		Total	22	

Semester I

COURSE CODE	TITLE	CREDITS	LECTURES
SEC	Analytical skills	2 (1+1)	1 lecture = 1 hour
Course Outcomes	<p>On successful completion of the course, Students will:</p> <ul style="list-style-type: none"> examine, identify the parts and use different microscopes for the study of microorganisms which are among the basic skills expected from a practicing microbiologist. perform basic experiments to determine the concentration of biomolecules using colorimetry 		
Unit I	<p>Microscope: Simple and Compound – General Principle of optics, Various parts and their functions - objectives numerical aperture, resolving power, depth of focus working distance, aberration, oculars; condensers. Dark Field microscope, Phase Contrast microscope (6L)</p> <p>Stains and Staining Solutions: Definition of Dye and Chromogen, Functions of Mordant, Intensifiers and Fixative, Natural and Synthetic Dyes, Classification, Differential Staining (Gram staining, Romanowsky's staining & Acid-Fast Staining), Fluorescent stains, Principles of metachromatic granules (5L)</p> <p>Colorimetry: Principle, Beer-Lambert's Law, Measurement of Extinction, Derivation of $E = kcl$, Limitations of Beer-Lambert's Law, Instrumentation (4L)</p>	1	15
Practical	<ol style="list-style-type: none"> Components and working of Simple, Compound, Dark Field and Phase Contrast Microscope Verification of Beer Lambert's Law and determination of absorption maxima Special Staining Technique for Cell Wall, Capsule, Lipid granules and Endospores. Fungal Staining Monochrome Staining Negative staining Differential Staining: Gram Staining 	1	15

Semester II

COURSE CODE	TITLE	CREDITS	LECTURES
SEC	TISSUE CULTURE	2	1 lecture = 1 hour
Course Outcomes	On successful completion of the course, the student will understand the basic concepts of animal and plant tissue culture, design of tissue culture laboratory and applications.		
Unit I	<p>Basics of Plant Tissue Culture:</p> <p>Cell Theory, Cellular Totipotency, Concept of Cell Culture, Design of PTC lab with equipment, Plant tissue culture media and phytohormones. Applications of PTC - Clonal and micro-propagation, callus culture, development of synthetic seeds and GMO (7L)</p> <p>Basics of Animal Tissue Culture:</p> <p>Introduction to Animal Cell Culture; Terminologies - Primary cell culture, Passaging, Confluency, Cell line, Organ culture; Equipment - CO₂ Incubator, Laminar-Air flow, Inverted microscope, medium filtration devices, Cell counters, liquid-nitrogen-storage tanks; Design of ATC laboratory; Applications of ATC - Cell lines for vaccine production, therapeutic proteins, pharmaceutical agents, and anticancer agents (8L)</p>	1	15
Practical	<ol style="list-style-type: none"> 1. Preparation of Stock Solutions for the Preparation of MS Media for PTC. 2. Surface Sterilization and establishment of the explant under aseptic condition on basal MS media. 3. Isolation of the plant protoplast from the callus and study of its morphology under the microscope. 4. Trypsinization of Tissue and Viability Count 	1	15

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