SIES College of Arts, Science & Commerce

RISE WITH EDUCATION

Sion (West), Mumbai – 400022

(Empowered Autonomous)

Faculty: Science

Program: B.Sc.

Subject: BIOTECHNOLOGY

Academic Year: 2024 – 2025

S.Y.B.Sc. Biotechnology

Credit Based Semester and Grading Syllabi approved by Board of Studies in Biotechnology to be brought into effect from June 2024.

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 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 curricula 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.

PROGRAM SPECIFIC OUTCOMES

An undergraduate student upon completion of this program is expected to gain the following attributes:

- Understand and describe the nature of the basic concepts of Cell biology, Microbiology Chemistry and Biochemistry with an interdisciplinary perspective about of other branches of Life Sciences.
- Explain the application of Biotechnology in the field of Medicine, Agriculture, Environment, and Sustainable development.
- Describe and explain the concepts of Immunology, Neurochemistry, Recombinant DNA technology and correlate them towards diagnosis and therapy of diseases and understanding how they can contribute towards the alleviation of human suffering.
- Discover and examine the causes of environmental pollution and devise methods to control the release of biohazardous waste into the environment.
- Perform practical as per laboratory standards in Chemistry, Biochemistry, Microbiology and Molecular Biology – Understand and analyze the results.
- Effectively communicate using ICT enabled tools and critically analyze and explain the data in a lucid manner.

Semester III				
Course Type	**Course Code**	**Course Title**	**Credits**	**Lectures/week**
DSC Major I	SIUBTMJ211	Immunology	3	3
	SIUBTMJP211	Practical	1	2
DSC Major II	SIUBTMJ212	Cell biology and Cytogenetics	3	3
	SIUBTMJP212	Practical	1	2
DSC Minor	SIUBTMN211	Bio-organic chemistry	3	3
	SIUBTMNP211	Practical	1	2
VSC	SIUBTVS211	Biostatistics	1	1
		Practical	1	2
OE	SIUBTOE211	Food Science	2	2
AEC	SIUHNAE211	Hindi / Marathi	2	2
CC	SIUEXCC211	NCC/ NSS/ Sports /Cultural activities	2	
FP / CEP	SIUBTFP211	Field projects/ Internships/ Apprenticeship/ community engagement and services	2	
		Total	**22**	
Semester IV				
Course Type	**Course Code**	**Course Title**	**Credits**	**Lectures/week**
DSC Major I	SIUBTMJ221	Molecular Biology	3	3
	SIUBTMJP221	Practical	1	2
DSC Major II	SIUBTMJ222	Medical Microbiology	3	3
	SIUBTMJP222	Practical	1	2
DSC Minor	SIUBTMN221	Bioanalytical chemistry	3	3
	SIUBTMNP221	Practical	1	2
SEC	SIUBTSE221	Bioinformatics	1	1
		Practical	1	2
OE	SIUBTOE221	Food Processing and Safety	2	2
AEC		Hindi / Marathi	2	2
CC		NCC/ NSS/ Sports /Cultural activities	2	
FP / CEP		Field projects/ Internships/ Apprenticeship/ community engagement and services	2	
		Total	**22**	

SEMESTER III

COURSE CODE	TITLE	CREDITS	LECTURES
SIUBTVS211	**VSC: BIOSTATISTICS**	**2 (1+1)**	**1 lecture = 1 hour**
Course Outcomes	On successful completion of the course the learner will be able to: • implement measures of central tendency and dispersion in data • represent data using tables and graphs • use excel for basic calculations and plotting chart		
Basic Biostatistics	Definition & Importance of Statistics in Biology, Difference between Population and sample; Types of Population Sampling; Types of Data, Frequency Distribution, Representation of Data and Graphs (Bar Diagrams, Pie Charts and Histogram, Polygon and Curve, Concept of Box Plot) Concept of descriptive/summary statistics, Measures of Central Tendency (For Raw, Ungroup & Group Data): Mean, Median, Mode. Advantages & disadvantages. Importance of dispersion, Measures of Dispersion: Range, Variance, Coefficient of Variation, Standard Derivation (for population and sample)	**1**	**15**
Practical	1. Problems based on a. measures of central tendency b. measures of dispersion 2. Data representation by Graph - Bar graph, Line chart, Pie chart 3. Use of Excel for a. basic calculations b. plotting chart	**1**	

SEMESTER IV

COURSE CODE	TITLE	CREDITS	LECTURES
SIUBTSE221	**SEC : BIOINFORMATICS**	**2 (1+1)**	**1 lecture = 1 hour**
Course Outcomes	On successful completion of the course the learner will be able to: • demonstrate the understanding of biological databases, protein classification on the basis of its structure and protein visualization software • comprehend and identify various alignment matrices, decipher homology using BLAST and deduce phylogeny using multiple alignment of sequences		
Biological Databases and Alignment Techniques	**Biological Databases:** Classification of Databases- Raw and Processed databases; Primary (NCBI), Secondary (PIR) and Tertiary or Composite (KEGG) databases; Structure and Sequence databases. Specialized Databases - Protein Pattern Databases; Protein Structure and Classification Databases (CATH/SCOP), Protein Structure Visualization Software. **Alignment techniques:** Identity and Similarity; Alignment methods: Global and Local Alignment; Matrices: DOT-PLOT, PAM Matrix, BLOSUM, Needleman-Wunsch & Smith-Waterman algorithm Tools for pairwise alignment: FASTA & BLAST and its Types Multiple Sequence Alignment & Phylogenetic tree	**1**	**15**
Practical	1. Use of Primary and Secondary Databases 2. Pairwise Alignment 3. Multiple Sequence and Phylogeny 4. Classification of Proteins using CATH/SCOP 5. Visualization PDB Molecules using Rasmol/Raswin	**1**	

References

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Evaluation Scheme for Semester III and IV

Course Type	Internal	Sem-End	Practical	Participation / Report	Total
DSC Major I	25	50	25	-	100
DSC Major II	25	50	25	-	100
DSC Minor	25	50	25	-	100
OE	20	30	-	-	50
AEC	20	30	-	-	50
VSC	50	-	-	-	50
CC	-	-	-	50	50
FP / CEP	-	-	-	50	50
				Total	**550**