University of Madras

Chepauk, Chennai 600 005

[Est.1857, State University, NAAC 'A^{++}' Grade, CGPA 3.59, NIRF2019 Rank: 20]

website: www.unom.ac.in, Tel.:044-25399561

Undergraduate Programme

Curriculum and Syllabus for

B.Sc. Biotechnology

(With effect from the Academic Year 2023-24)

JUNE 2023

Note: The Board of Studies in Biotechnology (UG) designed the syllabus as per Common Model Syllabus provided by TANSCHE based on Learning Outcome based Curriculum Framework (LOCF) as prescribed by the UGC.

Preamble

Biotechnology is an area of biology that uses living processes, organisms or systems to manufacture products or technology intended to improve the quality of human life.

It is an integrated science with interdisciplinary knowledge of biochemistry, Molecular Biology, Microbiology, Genetics, Plant and Animal sciences, Environmental and Pharmaceutical sciences.

Biotechnology has the potential to bring a tremendous change in the socio-economic status of the people by creating a positive impact with food security, Animal husbandry, fisheries, assurance of quality food products to the consumers, environmental protection,healthcare etc.

The Biotechnology course has the opportunities in health care sector and diagnostics, Research with Institutes, Universities, Animal health, Vaccine industry, Agriculture, Food technology, Pharmaceutical industry, Industrial and Environmental Sciences, Bioinformatics, Biosafety and Education.

The syllabus of Biotechnology is framed in such a way so as to give a fundamental understanding in the different inter disciplinary areas of Cell Biology, Biochemistry, Microbiology, Genetics, Immunology, Animal and Plant Science, Environmental and Pharmaceutical sciences.

The practical syllabus has been designed to enable the students to link and support with their theory background. This also imparts the knowledge of handling instruments and the understanding of interdisciplinary facet of Biotechnology.

The syllabus is also equipped with Entrepreneurial development to help students to start their own enterprises as job providers, which will instill confidence, and to make smarter plans for future development.

Aim of the Programme:

The aim of the programme is to provide students with a wide knowledge in different areas of Biotechnology and to prepare them for employment and research in this rapidly growing field. This programme enables the students with innovative ideas for business creation, creating job opportunities, and the importance of entrepreneurship for facing the challenges and to improve the economy of the nation.

Nature and extent of the Programme:

The field of Biotechnology is an interdisciplinary science and is growing at a tremendous rate with application in medicine, agriculture, environment and nanotechnology. This tremendous growth is because of the integration of new technologies in biological research.

New upcoming thrust areas like Marine Biotechnology, Research Methodology, Bio entrepreneurship and Nanotechnology is introduced in this programme. The programme also offers students the freedom to choose the electives based on their preferences. This will help the students to start, grow their own enterprises and make smarter plans for future development.

Graduate attributes:

The graduate after completing the course becomes a full-fledged Bio entrepreneur with a complete understanding of the various concepts of Biotechnology. This course is designed in such a way as to kindle creative thinking abilities with problem solving capacity and also research attitude. This programme will enable the students to be self-employed, and bring constructive changes to their professional life, work place and to the community at large.

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME	
Programme:	B.Sc. BIOTECHNOLOGY
Programme Code:	
Duration:	3 Years [UG]
Programme Outcomes:	**PO1:** Students understand the major concepts in Biology and understand the fundamental principles.
	PO2: Students will develop scientific outlook not only with respect to life science, but in all aspects related to life.
	PO3: Students are trained to apply and adapt appropriate techniques, resources, and instrumentation which will help them to pursue higher education or jobs after the programme.
	PO4: Students develop the ability to effectively communicate scientific information with strong ethics in written and oral formats.
	PO5: Students will understand their roles and responsibilities especially the protection of the people.
	PO6: Students become eligible to pursue higher education in their respective fields and engage in lifelong learning and enduring proficient progress.
Programme Specific Outcomes:	**PSO1:** Recall the fundamentals of Biotechnology which would enable them to comprehend the emerging and advanced biotechnology concepts in life sciences.
	PSO2: Inculcate deeper knowledge in practical skills enabling them to work with disciplinary and interdisciplinary aspects of biotechnology.
	PSO3: Enhance students' learning abilities, technological solutions in domains of biotechnology for their applications in industry and research and entrepreneurial skills.
	PSO4: Evaluate the need and impact of scientific techniques on the environment and the society, keeping in view their sustainable development.
	PSO5: Analyze the knowledge gained in Biotechnology for lifelong learning.

B.Sc. – BIOTECHNOLOGY - COURSE STRUCTURE

FIRST SEMESTER

Course Content	Name of the Course	Ins. Hrs	Credits	Int. Marks	Ext. Marks	Total
Part – I	Language Paper – I	6	3	25	75	100
Part - II	100L1Z: English Paper – I	6	3	25	75	100
Part III	123C1A: Core Paper I - Cell and Molecular Developmental Biology	5	5	25	75	100
	123C11: Core Practical I - Cell and Molecular Developmental Biology and Biological Chemistry	6	5	40	60	100
	123E1A: Elective-I-Biological Chemistry (Theory)	3	3	25	75	100
Part IV	123S1A: SEC-I: Mushroom Cultivation *	2	2	25	75	100
	100L1L: Basic Tamil-I (Other Language Students) *					
	100L1M: Advanced Tamil-I (Other Language Students) *					
	123B1A: Foundation Course: Introduction to Biotechnology	2	2	25	75	100
		30	23			

*** PART-IV: SEC-1 / Basic Tamil / Advanced Tamil (Any one)**

1. Students who have studied Tamil upto XII STD and also have taken Tamil in Part I shall take SEC-I.
2. Students who have **not** studied Tamil upto XII STD and have taken any Language other than Tamil in Part-I shall take **Basic Tamil** comprising of Two Courses (level will be at 6^{th} Std.).
3. Students who have studied Tamil upto XII STD and have taken any Language other than Tamil in Part-I shall take **Advanced Tamil** comprising of Two Courses.

SECOND SEMESTER

Course Content	Name of the Course	Ins. Hrs	Credits	Int. Marks	Ext. Marks	Total
Part – I	Language Paper – II	6	3	25	75	100
Part - II	English Paper – II	6	3	25	75	100
Part - III	123C2A: Core Paper II - Genetics	5	5	25	75	100
	123C21: Core Practical II - Genetics and Fundamentals of Microbiology	5	5	40	60	100
	123E2A: Elective Paper II - Fundamentals of Microbiology	4	3	25	75	100
Part IV	123S2A: SEC-2 – Clinical Aromatherapy	2	2	25	75	100
	100L2L: Basic Tamil-II (Other Language Students) *					
	100L2M: Advanced Tamil-II (Other Language Students) *					
	123S2B: SEC -3 – Biotechnology for Society	2	2	25	75	100
		30	23			

THIRD SEMESTER

Course Content	Name of the Course	Ins. Hrs	Credits	Int. Marks	Ext. Marks	Total
Part–I	Language Paper – III	6	3	25	75	100
Part-II	English Paper – III	6	3	25	75	100
Part-III	223C3A: Core Paper III - Immunology and Immunotechnology	5	5	25	75	100
	223C31: Core Practical III - Immunology and Immunotechnology and Bioinstrumentation	5	4	40	60	100
	223E3A: Elective paper III – Bioinstrumentation	4	3	25	75	100
Part-IV	223S3A: SEC-4 - Entrepreneurial based - Organic Farming and Health Management	1	1	25	75	100
	223S3B: SEC-5 - Food and Nutrition	2	2	25	75	100
	Environmental Studies	1	--	--	--	--
	Total	30	21			

FOURTH SEMESTER

Course Content	Name of the Course	Ins. Hrs	Credits	Int. Marks	Ext. Marks	Total
Part – I	Language Paper – IV	6	3	25	75	100
Part - II	English Paper – IV	6	3	25	75	100
Part - III	223C4A: Core Paper IV – Genetic Engineering and rDNA Technology	5	5	25	75	100
	223C41: Core Practical IV - Genetic Engineering and rDNA Technology and Bioinformatics and Biostatistics	4	4	40	60	100
	223E4A: Elective Paper IV - Bioinformatics and Biostatistics	4	3	25	75	100
Part-IV	223S4A: SEC-6 - Discipline specific - Herbal Medicine	2	2	25	75	100
	223S4B: SEC-7 - Discipline specific – Environment Management in Industries	2	2	25	75	100
	Environmental Studies	1	2	25	75	100
	Total	30	24			

FIFTH SEMESTER

Course Content	Name of the Course	Ins. Hrs	Credits	Int. Marks	Ext. Marks	Total
Part - III	323C5A: Core Paper V – Plant & Animal Biotechnology	5	4	25	75	100
	323C5B: Core Paper VI – Bioentrepreneurship	5	4	25	75	100
	323C51: Core Practical V– Plant Biotechnology and Animal Biotechnology	4	4	40	60	100
	323C5D: Project work	4	4	20	80	100
	*Elective V- 323E5A: Nano Biotechnology / 323E5B: Enzymology	5	3	25	75	100
	*Elective VI- 323E5C: Bioethics and Biosafety / 323E5D: Good Laboratory Practices	5	3	25	75	100
Part- IV	Value Education	2	2	25	75	100
	■ Summer Internship / Industrial training	-	2	-	-	-
	Total	30	26			

* Choose any one Elective

■ Students undergo summer vacation after IV Semester for 2 weeks.

SIXTH SEMESTER

Course Content	Name of the Course	Ins. Hrs	Credits	Int. Marks	Ext. Marks	Total
Part-III	323C6A: Core Paper VIII - Environmental and Industrial Biotechnology	6	5	25	75	100
	323C6B: Core Paper IX – Pharmaceutical Biotechnology	6	5	25	75	100
	323C61: Core Paper VI - Practical Environmental and Industrial Biotechnology	6	4	40	60	100
	* Elective VII - 323E6A: Marine Biotechnology / 323E6B: Food Technology	5	3	25	75	100
	* Elective VIII - 323E6C: Medical Biotechnology / 323E6D: Forensic biotechnology/ 323E6E: Cancer Biology	5	3	25	75	100
Part IV	323S6A: Professional competency skill	2	2	--	--	--
Part V	Extension Activities	-	1	--	--	--
	Total	30	23			

*Choose any ONE subject from each Elective - VI & VII

SCHEME OF EVALUATION

Evaluation Pattern for Internal Assessment (25 Marks)

- Internal Assessment - Best 2 Exam marks taken out of 3 (10 Marks)
- Assignment / Power point presentation / Case study (10 Marks)
- Attendance (5 Marks)

Evaluation Pattern for External Assessment (75 Marks)

- Section - A (Multiple Choice Questions) (1 x 10 = 10 Marks)
- Section - B (Five Mark Questions with choice) (7 x 5 = 35 Marks)
- Section - C (Ten Mark Questions with choice) (3 x 10 = 30 Marks)

*****

MANDATORY SUBJECTS

1) Cell and Molecular Developmental Biology
2) Biological Chemistry
3) Genetics
4) Fundamentals of Microbiology
5) Immunology and Immunotechnology
6) Bioinstrumentation
7) Genetic Engineering and rDNA Technology
8) Bioinformatics and Biostatistics
9) Plant Biotechnology
10) Animal Biotechnology
11) Environmental and Industrial Biotechnology
12) Nano Biotechnology
13) Enzymology
14) Bioethics and Biosafety
15) Cancer Biology
16) Bio entrepreneurship
17) Pharmaceutical Biotechnology
18) Marine Biotechnology
19) Food Technology
20) Forensic science
21) Good Laboratory Practices