

SRI KRISHNA ARTS AND SCIENCE COLLEGE

An Autonomous College, Affiliated to Bharathiar University
Coimbatore – 641 008, Tamil Nadu, India.

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (LOCF)

**M. Sc. Biotechnology
(I to IV Semester)**

for 2022 - 23 admitted students

DEPARTMENT OF BIOSCIENCE



SRI KRISHNA ARTS AND SCIENCE COLLEGE
COIMBATORE – 641 008
DEPARTMENT OF BIOTECHNOLOGY

I. Programme Educational Objectives (PEOs)

Post Graduates from the Biotechnology Programme are expected to achieve the following PEOs within three to five years of graduation

PEO 1	To update, extend and deepen students 'knowledge thorough a flexible, research - intensive program.
PEO 2	To enhance career opportunities in industry, clinical settings both locally and globally or as a preparation for further higher education through in – house state of the art laboratory exposures and outbound dissertation activities.
PEO 3	To enable critical thinking and full - fledged grasp of essential aspects of bioethics
PEO 4	To enrich the global thinktanks with right mixes of innovative ability, existing policies at generating and safeguarding the product of their intellect, equipped with entrepreneurship abilities.

II. Programme Learning Outcomes (PLOs)

The following Programme Learning Outcomes have been identified for M. Sc. Biotechnology:

PLO 1	Knowledge: Provide education that leads to comprehensive understanding of the principles and practices of biotechnology. (Cognitive)
PLO 2	Critical Thinking: To empower students with the ability to think and solve problems in the field of biotechnology. (Cognitive)
PLO 3	Practical Skills: Demonstrate skills to use modern analytical tools/ software/ equipment's and analyze and solve problems in various courses of biotechnology. (Psychomotor)
PLO 4	Teamwork Skills: Function and contribute as a team in the diversified environment in taking competitive decision. (Affective)
PLO 5	Communication Skills: Apply written and oral communication skills to communicate effectively in healthcare, industry, academia and research. (Affective)
PLO 6	Digital Skills: Demonstrate the ability to use state-of-the-art digital tools and software to mine the data, procure, analyse and present the biological data. (Affective)
PLO 7	Numeracy Skills: Develop an ability to solve, analyse and interpret data generated from experiments done in project work or practical courses. (Cognitive)
PLO 8	Leadership Skills: Ability to work in team towards solving broad societal and national issues (Affective)
PLO 9	Lifelong Learning: Students will be able to understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases. (Affective)
PLO 10	Entrepreneurial Skills: Students will be able to gain hands on experience in gene cloning, protein expression and purification. This experience would enable them to begin a career in industry that engages in genetic engineering as well as in research laboratories conducting fundamental research. (Affective)
PLO 11	Ethics and Professionalism: Adopt code of ethics in professional and social context and demonstrate exemplary professional, ethical and legal behaviors in decision making. (Affective)

III. Programme Learning Outcomes Vs Graduate Attributes Vs Taxonomy of Verbs

PLO	Graduate Attributes											Blooms		
	Knowledge	Critical Thinking	Practical Skills	Team work Skills	Communication Skills	Digital Skills	Numeracy Skills	Leadership Skills	Lifelong Learning	Entrepreneurial Skills	Ethics & Professionalism	Cognitive	Psychomotor	Affective
1	✓											✓		
2		✓										✓		
3			✓										✓	
4				✓										✓
5					✓									✓
6						✓								✓
7							✓					✓		
8								✓						✓
9									✓					✓
10										✓				✓
11											✓			✓

IV. Mapping of PEOs and PLOs

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11
PEO1	3		3			3					
PEO2		3					3				
PEO3				3				3		2	3
PEO4					3				2		

V. Additional Programme Outcomes (APOs)

The Additional Programme Outcomes for M.Sc. Biotechnology are:

APO 1	The students will acquire knowledge on the basics of sound and solid base biotechnology which enables them to understand the emerging and advanced concepts of life sciences.
APO 2	They will be acquiring knowledge in the biotechnology domain that enables their applications in industry and research.
APO 3	They will have the ability to acquire technical know-how by link biotechnology, disciplinary and interdisciplinary aspects
APO 4	They will recognize the importance of bioethics, IPR, entrepreneurship, communication to bring India industrialists to the next generation.
APO 5	They will be developing scientific temperament and social responsibilities.

VI. Programme Specific Outcomes (PSOs)

On the completion of M.Sc. Biotechnology, the graduates will be able to

PSO 1	Ability to apply biotechnology skills (including molecular and micro biology, immunology and genetic engineering, bioprocess and fermentation, enzyme and food technology and bioinformatics) and its applications in core and allied fields.
PSO 2	To impart in-depth practical oriented knowledge to students in various thrust areas of biotechnology, so as to meet the demands of industry and academia.

VII. Curriculum Structure for M.Sc. Biotechnology

Course Components, Credits & Marks Distribution

Course Type	Number of Courses	Credits per Course	Total Credits	Marks	Semester
Discipline Specific Courses (DSC)	19	2-6	75	1850	I to IV
Discipline Specific Elective Courses (DSE)	2	4	8	200	II & III
Generic Electives Courses (GEC)	3	2-4	7	200	II & III
DTC – Drive Through Courses (SWAYAM - NPTEL, Coursera, any courses certified by statutory bodies, etc.)	Additional 4 Credits per Course will be given on submission of Certificate				I to IV
Total			90	2250	

1. Discipline Specific Courses (DSC)

These courses are to be studied compulsorily by the students as a core requirement. The students are required to take DSCs across four semesters. The courses designed under this category aim to cover the basics that a student is expected to imbibe in the particular discipline.

S. No.	Course Code	Course Title	Semester	Contact Hours	Credits	Marks
1	22BTP01	Advances in Cell Biology	1	4	4	100
2	22BTP02	Advanced Biochemistry	1	4	4	100
3	22BTP03	Microbial Biotechnology	1	4	4	100
4	22BTP04	Inheritance Biology	1	4	4	100
5	22BTP05	Immunotechnology	1	4	4	100
6	22BTP06	Lab in Cell Biology and Microbial Biotechnology	1	5	4	100

7	22BTP07	Lab in Biochemistry and Immunotechnology	1	5	4	100
8	22BTP08	Environmental Biotechnology	2	4	4	100
9	22BTP09	Bioprocess Engineering and Technology	2	4	4	100
10	22BTP10	Genetic Engineering and Bioethics	2	4	4	100
11	22BTP11	Lab in Bioprocess Technology and Environmental Biotechnology	2	5	4	100
12	22BTP12	Lab in Genetics and Genetic Engineering	2	5	4	100
13	22BTP15	Plant Biotechnology	3	4	4	100
14	22BTP16	Animal Biotechnology	3	4	4	100
15	22BTP17	Medical Biotechnology	3	4	4	100
16	22BTP18	Food and Pharmaceutical Biotechnology	3	4	4	100
17	22BTP19	Lab in Plant and Animal Biotechnology	3	5	5	100
18	22BTP22	Internship Training	3	-	-	Completed
19	22BTP23	Project Work and Viva Voce	4	30	6	150
Total					75	1850

Project Work and Viva Voce

During the fourth semester, each of the students has to undertake a Project Work individually. A guide will be allotted to each student by the department. Student can select any relevant topic in discussion with the guide. The project report shall be subject to internal evaluation followed by a viva-voce. The project should be demonstrated at the time of examination.

3 Reviews	– 60 Marks
Report	– 20 Marks
Attendance	– 20 Marks
Total	– 100 Marks will be converted to 75 (Internal) Marks

End Semester Viva-Voce will be conducted for 75 (External) Marks.

(Dissertation - 50 Marks & Viva - Voce - 25 Marks)

2. Discipline Specific Electives (DSE) (2 Courses)

Discipline Specific Elective Courses offered under the main discipline of study which may be specialized or advanced or supportive to the discipline of study. Students can choose any THREE courses from the following list.

Students can opt one course from each group.

S. No.	Course Code	Course Title	Semester	Contact Hours	Credits	Marks
1	22BTP13	Enzyme and Enzyme Technology	II	4	4	100
	22BTP14	Bionanotechnology				
2	22BTP20	Protein Engineering	III	4	4	100

	22BTP21	Stem Cell Technology and Tissue Technology				
Total					8	200

3. Generic Elective Courses (GEC) (3 Courses)

Generic Elective Courses are interdisciplinary in nature. They are additional courses based on expertise, specialization, requirements, scope, and need of the department. The students will have the choice of taking THREE GECs.

Group	Course Code	Course Title	Semester	Contact Hours	Credits	Marks
I	22GEP02	Biological Statistics and Research Methodology	2	4	4	100
	22GEP05	Quantitative Aptitude				
II	22GEP27	A. Bioinformatics	3	3	2	50
	22GEP28	B. Lab in Bioinformatics		2	2	50
	22GEP29	A. Molecular Sequencing		3	2	50
	22GEP30	B. Lab in Molecular Sequencing		2	2	50
Total					8	200

4. Drive Through Course (DTC)

i. (DTC) I & II – Online Certification - Additional Credits

These courses are intended to bring out and promote the self-learning initiative of the students – where their own motivation is what drives them to complete the course and not external compulsions. This fosters the habit of keeping oneself updated always by means of self-study. It gives opportunities to the students to explore new areas of interest and earn additional credits. Students can take any number of courses under this cafeteria system. The credits will not be taken for CGPA calculation. Additional 4 credits per Course will be given on submission of certificate.

- SWAYAM - NPTEL
- Coursera
- Any courses certified by statutory bodies.

ii. (DTC – III) – Article Publication - To be Completed

Students individually or with the maximum of four members per batch are asked to publish article in Scopus or Web of Science Journals (Or) Publish Book Chapters. Additional 4 Credits per Course will be given on submission of proof of the Published Paper (or) Book Chapter.

VIII. Semester-wise Scheme

Semester I										
Course Code	Course Title	T/P	Ins. Hrs/ week	Examination				Credits	SD/EM/EN	L/R/N/G
				Dur. Hrs	CIA	ES	Total Marks			
22BTP01	DSC - I: Advances in Cell Biology	T	4	3	50	50	100	4	SD	N
22BTP02	DSC - II: Advanced Biochemistry	T	4	3	50	50	100	4	SD	N
22BTP03	DSC - III: Microbial Biotechnology	T	4	3	50	50	100	4	SD	G
22BTP04	DSC - IV: Inheritance Biology	T	4	3	50	50	100	4	SD	N
22BTP05	DSC - V: Immunotechnology	T	4	3	50	50	100	4	EN	G
22BTP06	DSC Practical - I: Lab in Cell Biology and Microbial Biotechnology	P	5	5	50	50	100	4	EM	G
22BTP07	DSC Practical - II: Lab in Biochemistry and Immunotechnology	P	5	5	50	50	100	4	EM	G
DTC I - Additional Credit Courses (NPTEL/ Coursera)										
Total			30				700	28		
Semester II										
Course Code	Course Title	T/P	Ins. Hrs/ week	Examination				Credits	SD/EM/EN	L/R/N/G
				Dur. Hrs	CIA	ES	Total Marks			
22BTP08	DSC - VI: Environmental Biotechnology	T	4	3	50	50	100	4	EN	N
22BTP09	DSC - VII: Bioprocess Engineering and Technology	T	4	3	50	50	100	4	EM	G
22BTP10	DSC - VIII: Genetic Engineering and Bioethics	T	4	3	50	50	100	4	EM	G
22BTP11	DSC Practical - III: Lab in Bioprocess Technology and Environmental Biotechnology	P	5	5	50	50	100	4	EM	G
22BTP12	DSC Practical - IV: Lab in Genetics and Genetic Engineering	P	5	5	50	50	100	4	EM	G
22BTP13	DSE - I: Biomolecules and Nanotechnology A. Enzyme and Enzyme Technology	T	4	3	50	50	100	4	SD	G
22BTP14	B. Bionanotechnology									
22GEP02	GEC - I: Biological Statistics and Research Methodology	T	4	3	50	50	100	3	EM	G
22GEP05	Quantitative Aptitude								SD	G
DTC II - Additional Credit Courses (NPTEL/ Coursera)										
Total			30				700	27		
Semester III										
Course Code	Course Title	T/P	Ins. Hrs/ week	Examination				Credits	SD/EM/EN	L/R/N/G
				Dur. Hrs	CIA	ES	Total Marks			

22BTP15	DSC - IX: Plant Biotechnology	T	4	3	50	50	100	4	SD	G
22BTP16	DSC - X: Animal Biotechnology	T	4	3	50	50	100	4	EM	G
22BTP17	DSC - XI: Medical Biotechnology	T	4	3	50	50	100	4	EM	G
22BTP18	DSC - XII: Food and Pharmaceutical Biotechnology	T	4	3	50	50	100	4	EN	N
22BTP19	DSC Practical - V: Lab in Plant and Animal Biotechnology	P	5	5	50	50	100	5	EM	G
22BTP20 22BTP21	DSE - II: Macromolecular and Tissue Engineering A. Protein Engineering B. Stem Cell Technology and Tissue Technology	T	4	3	50	50	100	4	SD	G
22GEP27	GEC-2: A. Bioinformatics	T	3	3	25	25	50	2	SD	G
22GEP28	B. Lab in Bioinformatics	P	2	3	25	25	50	2		G
22GEP29	A. Molecular Sequencing	T	3	3	25	25	50	2		
22GEP30	B. Lab in Molecular Sequencing	P	2	3	25	25	50	2		G
22BTP22	DSC - XIII: Internship Training	P	-	-	Completed			-	SD	N
Total			30				700	29		
Semester IV										
Course Code	Course Title	T/P	Ins. Hrs/ week	Examination				Credits	SD/EM/EN	L/R/N/G
				Dur. Hrs	CIA	ES	Total Marks			
22BTP23	DSC - XIV: Project Work and Viva Voce	P	30	3	75	75	150	6	EM	N
DTC III – Paper Publications / Book Publications										
Total			3				150	6		
Total							2250	90		
Drive - Through Course (DTC): Courses offered in SWAYAM - NPTEL, Coursera OR Any courses certified by statutory bodies.				Additional 4 Credits per Course will be given on submission of Certificate				During Semester I to Semester IV		

The Courses focus on the following needs	
SD	Skill Development
EM	Employability
EN	Entrepreneurship
L	Local
R	Regional
N	National
G	Global

Semester-wise Distribution

Semester	Total Marks	Total Credits
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I	700	28
II	700	27
III	700	29
IV	150	6
Total	2250	90

List of Courses Offered by Mathematics

SEM	Course Code	Course Title	T/P	Ins. Hrs/ week	Examination				Credits
					Dur. Hrs	CIA	ES	Total Marks	
II	22GEP02	Biological Statistics and Research Methodology	T	4	3	50	50	100	4
	22GEP05	Quantitative Aptitude							

List of Courses Offered by Bioinformatics

SEM	Course Code	Course Title	T/P	Ins. Hrs/ week	Examination				Credits
					Dur. Hrs	CIA	ES	Total Marks	
III	22GEP27	A. Bioinformatics	T	3	3	25	25	50	2
	22GEP28	B. Lab in Bioinformatics	P	2	3	25	25	50	2
	22GEP29	A. Molecular Sequencing	T	3	3	25	25	50	2
	22GEP30	B. Lab in Molecular Sequencing	P	2	3	25	25	50	2