

# **SRI KRISHNA ARTS AND SCIENCE COLLEGE**

An Autonomous College Affiliated to Bharathiar University  
Coimbatore-641008, Tamil Nadu, India.

## **LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (LOCF)**

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

**for 2024-25 admitted Students**

**DEPARTMENT OF BIOSCIENCE**



**SRI KRISHNA ARTS AND SCIENCE COLLEGE**  
**COIMBATORE – 641008**  
**DEPARTMENT OF BIOTECHNOLOGY**  
**(2024-2025)**

**I. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)**

Post Graduates from the M.Sc. Biotechnology Programme are expected to achieve the following PEOs

<b>PEO 1</b>	To update, extend and intensify students 'knowledge through a flexible, research - intensive program.
<b>PEO 2</b>	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.
<b>PEO 3</b>	To enable critical thinking and full - fledged grasp of essential aspects of bioethics.
<b>PEO 4</b>	To elevate the interpersonal and inculcative abilities of molecular aspects in core domains.
<b>PEO 5</b>	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 Post Graduates of M.Sc. Biotechnology programme will be able to:

<b>PLO1</b>	<b>Knowledge:(Cognitive)</b> Provide education that leads to comprehensive understanding of the principles and practices of biotechnology.
<b>PLO2</b>	<b>Critical Thinking Skills:(Cognitive)</b> To empower students with the ability to think and solve problems in the field of biotechnology.
<b>PLO3</b>	<b>Practical Skills:(Psychomotor)</b> Demonstrate skills to use modern analytical tools/ software/ equipment's and analyze and solve problems in various courses of biotechnology.
<b>PLO4</b>	<b>Teamwork Skills:(Affective)</b> Function and contribute as a team in the diversified environment in taking competitive decision.
<b>PLO5</b>	<b>Communication Skills:(Affective)</b> Apply written and oral communication skills to communicate effectively in healthcare, industry, academia and research.
<b>PLO6</b>	<b>Digital Skills:(Affective)</b> Demonstrate the ability to use state-of-the-art digital tools and software to mine the data, procure, analyse and present the biological data.
<b>PLO7</b>	<b>Numeracy Skills:(Cognitive)</b> Develop an ability to solve, analyse and interpret data generated from experiments done in project work or practical courses.
<b>PLO8</b>	<b>Leadership Skills:(Affective)</b> Ability to work in team towards solving broad societal and national issues.
<b>PLO9</b>	<b>Lifelong Learning Skills:(Affective)</b> 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.
<b>PLO10</b>	<b>Entrepreneurial Skills:(Affective)</b> 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.
<b>PLO11</b>	<b>Ethics &amp; Professional Skills:(Affective)</b> Adopt code of ethics in professional and social context and demonstrate exemplary professional, ethical and legal behaviors in decision making.

### III. PROGRAMME LEARNING OUTCOMES VS GRADUATE ATTRIBUTES VSTAXONOMY OF VERBS

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

### IV. PROGRAMME LEARNING OUTCOMES VS PROGRAMME EDUCATIONAL OBJECTIVES

	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5
PLO 1	√				
PLO 2		√			
PLO 3	√				
PLO 4			√		
PLO 5				√	
PLO 6	√				
PLO 7		√			
PLO 8			√		
PLO 9				√	
PLO 10					√
PLO 11					√

**V. ADDITIONAL PROGRAMME OUTCOMES (APOs)**

<b>APO 1</b>	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.
<b>APO 2</b>	They will be acquiring knowledge in the biotechnology domain that enables their applications in industry and research.
<b>APO 3</b>	They will have the ability to acquire technical know-how by link biotechnology, disciplinary and interdisciplinary aspects
<b>APO 4</b>	They will recognize the importance of bioethics, IPR, entrepreneurship, communication to bring India industrialists to the next generation.
<b>APO 5</b>	They will be developing scientific temperament and social responsibilities.
<b>APO 6</b>	They will be developing professional skills and values in biotechnological domain
<b>APO 7</b>	They will be developing entrepreneurial skills in various domains of biotechnology
<b>APO 8</b>	They will be developing professional ethics in societal aspects for people welfare

**VI. PROGRAMME SPECIFIC OUTCOMES (PSO's)**

<b>PSO 1</b>	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.
<b>PSO 2</b>	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.
<b>PSO 3</b>	To apply their professional ethics and values in context to societal benefits for the betterment of the people,

**VII. Mapping of PEOs with PSOs**

	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>
<b>PEO 1</b>	√		
<b>PEO 2</b>	√		
<b>PEO 3</b>		√	
<b>PEO 4</b>		√	
<b>PEO 5</b>			√

**VIII. Curriculum Structure for M.Sc. Biotechnology****Course Components, Credits & Marks Distribution**

Group	Basic Structure: Distribution of Courses	Number of Courses	Total Marks	Total Credits
1	DSC – Discipline Specific Courses	21	1950	79
2	DSE – Discipline Specific Electives	2	100	4
3	GEC – Generic Elective Courses	3	200	7
4	Drive Through Courses (DTCs) – (SWAYAM-NPTEL, Coursera, any courses certified by statutory bodies, etc.)	Any number	-	Additional Credits
<b>Total</b>		<b>26</b>	<b>2250</b>	<b>90</b>

**Group 1. Discipline Specific Courses (DSCs)(19 Courses)**

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. It includes major project.

S. No.	Course Code	Course Title	Semester	Contact Hours	Marks	Credits
1	24BTP01	Cell and Molecular Biology	I	4	100	4
2	24BTP02	Biochemistry	I	4	100	4
3	24BTP03	Microbiology	I	4	100	4
4	24BTP04	Genetics	I	4	100	4
5	24BTP05	Immunotechnology	I	4	100	4
6	24BTP06	Lab in Cell Biology and Microbiology	I	5	100	4
7	24BTP07	Lab in Biochemistry and Immunotechnology	I	5	100	4
8	24BTP08	Environmental Biotechnology	II	4	100	4
9	24BTP09	Bioprocess Engineering and Technology	II	4	100	4
10	24BTP10	Genetic Engineering	II	4	100	4
11	24BTP11	Lab in Bioprocess Technology and Environmental Biotechnology	II	5	100	4
12	24BTP12	Lab in Genetics and Genetic Engineering	II	5	100	4
13	24BTP15	Plant Biotechnology	III	4	100	4
14	24BTP16	Animal Biotechnology	III	4	100	4
15	24BTP17	Medical Biotechnology	III	4	100	4
16	24BTP18	Food and Pharmaceutical Biotechnology	III	4	100	4

17	24BTP19	Lab in Plant and Animal Biotechnology	III	5	100	5
18	24BTP22	Internship Training	III	-	Completed	-
19	24BTP23	Research Methodology for Life Science	IV	5	50	2
20	24BTP24	Bioethics, Biosafety and IPR	IV	5	50	2
21	24BTP25	Project Work and Viva Voce	IV	20	150	6
<b>Total</b>					<b>1950</b>	<b>79</b>

### Project Work

During the fourth semester each student should undertake a project work and submit the report. A guide will be allotted to each student by the Department. A student can select any research 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.

#### **Internal Evaluation:**

Reviews (2)	– 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 Marks.

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

### Group 2. Discipline Specific Elective (DSEs) (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 one course from two courses each in the list of following DSEs.

S. No.	Course Code	Course Title	Ownership Department	Contact Hours	Marks	Credits
1	24BTP13	<b>DSE - I: Biomolecules and Nanotechnology</b> Enzyme and Enzyme Technology	Biotechnology	4	50	2
	24BTP14	Bionanotechnology	Biotechnology			
2	24BTP20	<b>DSE-II: Macromolecular and Tissue Engineering</b> Protein Engineering	Biotechnology	4	50	2
	24BTP21	Stem Cell Technology and Tissue Engineering	Biotechnology			
<b>Total</b>					<b>100</b>	<b>4</b>

**Group 3. Generic Elective Courses (GECs)(3 Courses)**

Generic Elective Courses are interdisciplinary in nature. They are additional courses based on expertise, specialization, requirements, scope, and need of the department.

Sl. No.	Course Code	Course Title	Semester	Ownership Department	Contact Hours	Marks	Credits
1	24GEP02	<b>GEC - I:</b> Biological Statistics and Research Methodology	2	Mathematics	4	100	3
	24GEP03	Quantitative Aptitude					
2	24GEP29	<b>GEC - II:</b> Bioinformatics	3	Bioinformatics	3	50	2
	24GEP30	Lab in Bioinformatics			2	50	2
	24GEP31	Molecular Sequencing			3	50	2
	24GEP32	Lab in Molecular Sequencing			2	50	2
<b>Total</b>						<b>200</b>	<b>7</b>

**Group 4.****i) Drive-Through Courses (DTCs) I & II– 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 4/3/2 credits per course will be given on submission of certificate.

1. Coursera
2. NPTEL
3. Any courses certified by statutory bodies.

**ii) Drive-Through Course (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/E	Ins. Hrs/ Week	ESE Dur. Hrs	CIA Marks	ES Marks	Total Marks	Credits	SD/ EM/ EN	L/ R/ N/ G
24BTP01	<b>DSC - I:</b> Cell and Molecular Biology	T	4	3	25	75	100	4	SD	N
24BTP02	<b>DSC - II:</b> Biochemistry	T	4	3	25	75	100	4	SD	N
24BTP03	<b>DSC - III:</b> Microbiology	T	4	3	25	75	100	4	SD	G
24BTP04	<b>DSC - IV:</b> Genetics	T	4	3	25	75	100	4	SD	N
24BTP05	<b>DSC - V:</b> Immunotechnology	T	4	3	25	75	100	4	EN	G
24BTP06	<b>DSC Practical - I:</b> Lab in Cell Biology and Microbiology	P	5	5	40	60	100	4	EM	G
24BTP07	<b>DSC Practical - II:</b> Lab in Biochemistry and Immunotechnology	P	5	5	40	60	100	4	EM	G
Drive Through Course : NPTEL / Coursera							Additional Credits			
<b>Total</b>			<b>30</b>				<b>700</b>	<b>28</b>		
Semester II										
Course Code	Course Title	T/P/E	Ins. Hrs/ Week	ESE Dur. Hrs	CIA Marks	ES Marks	Total Marks	Credits	SD/ EM/ EN	L/ R/ N/ G
24BTP08	<b>DSC - VI:</b> Environmental Biotechnology	T	4	3	25	75	100	4	EN	N
24BTP09	<b>DSC - VII:</b> Bioprocess Engineering and Technology	T	4	3	25	75	100	4	EM	G
24BTP10	<b>DSC - VIII:</b> Genetic Engineering	T	4	3	25	75	100	4	SD	G
24BTP11	<b>DSC Practical - III:</b> Lab in Bioprocess Technology and Environmental Biotechnology	P	5	5	40	60	100	4	EM	G
24BTP12	<b>DSC Practical - IV:</b> Lab in Genetics and Genetic Engineering	P	5	5	40	60	100	4	EM	G
24BTP13	<b>DSE - I: Biomolecules and Nanotechnology</b> Enzyme and Enzyme Technology	T	4	3	10	40	50	2	SD	G
24BTP14	Bionanotechnology									
24GEP02	<b>GEC - I:</b> Research Methodology	T	4	3	25	75	100	3	SD	G



	for Bioscience									
24GEP03	Quantitative Aptitude								EM	G
Drive Through Course II: NPTEL / Coursera							Additional Credits			
<b>Total</b>			<b>30</b>				<b>650</b>	<b>25</b>		
Semester III										
Course Code	Course Title	T/P/E	Ins. Hrs/Week	ESE Dur. Hrs	CIA Marks	ES Marks	Total Marks	Credits	SD/EM/EN	L/ R/ N/ G
24BTP15	<b>DSC - IX:</b> Plant Biotechnology	T	4	3	25	75	100	4	SD	G
24BTP16	<b>DSC - X:</b> Animal Biotechnology	T	4	3	25	75	100	4	EM	G
24BTP17	<b>DSC - XI:</b> Medical Biotechnology	T	4	3	25	75	100	4	EM	G
24BTP18	<b>DSC - XII:</b> Food and Pharmaceutical Biotechnology	T	4	3	25	75	100	4	EN	N
24BTP19	<b>DSC Practical - V:</b> Lab in Plant and Animal Biotechnology	P	5	5	40	60	100	5	EM	G
24BTP20 24BTP21	<b>DSE-II: Macromolecular and Tissue Engineering</b> Protein Engineering Stem Cell Technology and Tissue Engineering	T	4	3	10	40	50	2	SD	G
24GEP29	<b>GEC - II:</b> Bioinformatics	T	3	3	10	40	50	2	SD	G
24GEP30	Lab in Bioinformatics	P	2	3	20	30	50	2		
24GEP31	Molecular Sequencing	T	3	3	10	40	50	2		
24GEP32	Lab in Molecular Sequencing	P	2	3	20	30	50	2		
24BTP22	<b>DSC – XIII:</b> Internship Training	P	-	-	Completed			-	SD	N
<b>Total</b>			<b>30</b>				<b>650</b>	<b>27</b>		
Semester IV										
Course Code	Course Title	T/P/E	Ins. Hrs/Week	ESE Dur. Hrs	CIA Marks	ES Marks	Total Marks	Credits	SD/EM/EN	L/ R/ N/ G
24BTP23	<b>DSC - XIV:</b> Research Methodology for Life Science	T	5	3	10	40	50	2	SD	N
24BTP24	<b>DSC - XV:</b> Bioethics, Biosafety and IPR	T	5	3	10	40	50	2	EN	G
24BTP25	<b>DSC - XVI:</b> Project Work and Viva Voce	P	20	3	75	75	150	6	EM	N
<b>Total</b>			<b>30</b>				<b>250</b>	<b>10</b>		

	2250	90		
<b>Drive - Through Course (DTC):</b> Courses offered in SWAYAM - NPTEL, Coursera	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 of Marks and Credits**

Semester	Total Marks	Total Credits
I	700	28
II	650	25
III	650	27
IV	250	10
<b>Total</b>	<b>2250</b>	<b>90</b>

**OFFERED BY**

**List of Courses Offered by Mathematics Department**

Semester	Course Code	Course Name	Programme	T/P/E	Ins. hrs	CIA	ES	Total Marks	Credit	SD/ EM/ EN	L/ R/ N/ G
II	24GEP02	<b>GEC - I:</b> Research Methodology for Bioscience	M.Sc BT & M.Sc BI	T	4	25	75	100	3	SD	G
	24GEP03	Quantitative Aptitude								EM	

**List of Courses Offered by Bioinformatics Department**

Semester	Course Code	Course Name	Programme	T/P/E	Ins. hrs	CIA	ES	Total Marks	Credit	SD/ EM/ EN	L/ R/ N/ G
III	24GEP29	<b>GEC - II:</b> Bioinformatics	M.Sc BT	T	3	10	40	50	2	SD	G
	24GEP30	Lab in Bioinformatics		P	2	20	30	50	2		
	24GEP31	Molecular Sequencing		T	3	10	40	50	2	SD	G
	24GEP32	Lab in Molecular Sequencing		P	2	20	30	50	2		