

# **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. BIOINFORMATICS (I and II Semester)**

**for 2023 - 24 admitted students**

## **DEPARTMENT OF BIOSCIENCE**



**SRI KRISHNA ARTS AND SCIENCE COLLEGE**  
**COIMBATORE – 641008.**  
**DEPARTMENT OF BIOINFORMATICS**

### I. Programme Educational Objectives (PEOs)

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

<b>PEO 1</b>	Graduates will acquire knowledge and awareness of the basic principles and concepts of biology, computer science and mathematics.
<b>PEO 2</b>	Graduates with an ability to use software effectively to extract information from large databases and to use this information in computer modelling.
<b>PEO 3</b>	Graduates will have problem-solving skills, including the ability to develop new algorithms and analysis methods.
<b>PEO 4</b>	Graduates will understand of the intersection of life and information sciences, the core of shared concepts, language and skills the ability to speak the language of structure-function relationships, information theory, gene expression, and database queries.

### II. Programme Learning Outcomes (PLOs)

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

<b>PLO 1</b>	<b>Knowledge:</b> By understanding the broad principles of science and technology and apply them in varied contexts. <b>(Cognitive)</b>
<b>PLO 2</b>	<b>Critical Thinking:</b> Contribute to the advancement of science, through formulating clear study goals or hypotheses and designing research to meet the goals <b>(Cognitive)</b>
<b>PLO 3</b>	<b>Practical Skills:</b> Develop a passion for hardware and software design and be part of the electronic design industry/software company to become leaders in indigenous product development. <b>(Psychomotor)</b>
<b>PLO 4</b>	<b>Team-work Skills:</b> Demonstrate capability to locate, evaluate, manage, and use information/data and research to develop and guide their own knowledge, learning and practice. <b>(Affective)</b>
<b>PLO 5</b>	<b>Communication Skills:</b> Communicate ideas clearly and effectively to diverse audiences in visual, written, oral, and computational formats. <b>(Affective)</b>
<b>PLO 6</b>	<b>Digital Skills:</b> Will be able to use of computers to collect, analyse and interpret biological information at the molecular and proteome level. <b>(Affective)</b>
<b>PLO 7</b>	<b>Numeracy Skills:</b> Establish the literacy and numeracy skills necessary to understand and interpret information/data and communicate according to the context. <b>(Cognitive)</b>
<b>PLO 8</b>	<b>Leadership Skills:</b> Function effectively as a leader and as well as team member in diverse/ multidisciplinary environments. <b>(Affective)</b>
<b>PLO 9</b>	<b>Lifelong Learning:</b> Develop pipelines of analysis tools to analyse real-world biological data sets, and show familiarity with the syntax and options required to generate meaningful interpretations. <b>(Affective)</b>
<b>PLO 10</b>	<b>Entrepreneurial Skills:</b> To inculcate the scientific temperament in the students and outside the scientific community to be a researcher, academician or entrepreneur. <b>(Affective)</b>
<b>PLO 11</b>	<b>Ethics &amp; Professionalism:</b> Model ethical professional behaviour, including transparency and honesty in analysis and reporting of results, ethical reasoning during study design, and engaging respectfully with others. <b>(Affective)</b>

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

PLO	Graduate Attributes											Blooms		
	Knowledge	Critical Thinking	Practical Skills	Teamwork Skills	Communication Skills	Digital Skills	Numeracy Skills	Leadership Skills	Lifelong Learning	Entrepreneurial Skills	Ethics & Professionalism	Cognitive	Psychomotor	
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. Bioinformatics are:

APO 1	Graduates will be introduced to the concepts of Bioinformatics and its significance in Biological data analysis.
APO 2	Graduates will gain knowledge about various Biological databases that Provide information about nucleic acids and protein.
APO 3	Graduates will gain knowledge about various concepts employed in drug discovery and its applications towards personalized medicine which involves specific analysis of genes important for drug response and drug effect.
APO 4	Graduates will be exposed to computational methods, tools and algorithms employed for Biological Data Interpretation
APO 5	Graduates will be provided with hands on training on various computational tools and techniques employed in Biological sequence analysis

## VI. Programme Specific Outcomes (PSOs)

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

<b>PSO 1</b>	Graduates will be able to comprehend about a system level understanding of complex interactions within biological systems and to model the biological systems employing computational and mathematical concepts.
<b>PSO 2</b>	Graduates will be able to analyze about various approaches used in the simulation of metabolic pathways Explain about gene regulatory networks
<b>PSO 3</b>	Graduates will be able to find about the various methods and tools used for the study of genetic diversity and phylogenetic analysis

## VII. Curriculum Structure for M. Sc. Bioinformatics

## Course Components, Credits &amp; 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)	2	3-4	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
<b>Total</b>			<b>90</b>	<b>2250</b>	

## 1. Discipline Specific Courses (DSC)

These courses are to be studied compulsorily by the students as a core requirement. 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.	23BIP01	Fundamentals of Biological Sciences	I	4	4	100
2.	23BIP02	Computational Biology	I	4	4	100
3.	23BIP03	Computer Programming in C	I	4	4	100
4.	23BIP04	Genomics and Proteomics	I	4	4	100
5.	23BIP05	Immunoinformatics	I	4	4	100
6.	23BIP06	Lab in Biological Techniques	I	5	4	100
7.	23BIP07	Lab in C Programming	I	5	4	100
8.	23BIP08	Biomolecular Structure and Interaction	II	5	5	100
9.	23BIP09	Python for Bioinformatics	II	4	4	100
10.	23BIP10	Lab in Python	II	3	3	100
11.	23BIP11	Lab in Biological Data Analytics	II	5	4	100
12.	23BIP12	Algorithms in Bioinformatics	II	5	5	100

**Discipline Specific Electives (DSE)**

Discipline Specific Elective Courses offered under the main discipline of study which may be specialized or advanced or supportive to the discipline of study.

S. No.	Course Code	Course Title	Semester	Contact Hours	Credits	Marks
1	23BIP13	rDNA Technology	II	4	4	100
2	23BIP14	Metabolomics				

**Generic Elective Courses (GEC)**

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

Group	Course Code	Course Title	Semester	Contact Hours	Credits	Marks
I	23GEP02	Biological Statistics and Research Methodology	II	4	3	100
	23GEP03	Quantitative Aptitude				

**4. Drive Through Course (DTC)****(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.

**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			
23BIP01	<b>DSC I:</b> Fundamentals of Biological Sciences	T	4	3	25	75	100	4	EM	N
23BIP02	<b>DSC II:</b> Computational Biology	T	4	3	25	75	100	4	EN	G
23BIP03	<b>DSC III:</b> Computer Programming in C	T	4	3	25	75	100	4	SD	N
23BIP04	<b>DSC IV:</b> Genomics and Proteomics	T	4	3	25	75	100	4	EM	G
23BIP05	<b>DSC V:</b> Immunoinformatics	T	4	3	25	75	100	4	SD	N
23BIP06	<b>DSC Practical I:</b> Lab in Biological Techniques	P	5	5	40	60	100	4	SD	N
23BIP07	<b>DSC Practical II:</b> Lab in C Programming	P	5	3	40	60	100	4	SD	N
<b>DTC I - Additional Credit Courses (NPTEL/ Coursera)</b>										
<b>Total</b>			<b>30</b>				<b>700</b>	<b>28</b>		

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				
23BIP08	<b>DSC VI:</b> Biomolecular Structure and Interaction	T	5	3	25	75	100	5	SD	N	
23BIP09	<b>DSC VII:</b> Python for Bioinformatics	T	4	3	25	75	100	4	SD	G	
23BIP10	<b>DSC Practical III:</b> Lab in Python	P	3	3	40	60	100	3	SD	G	
23BIP11	<b>DSC Practical IV:</b> Lab in Biological Data Analytics	P	5	3	40	60	100	4	SD	N	
23BIP12	<b>DSC VIII</b> Algorithms in Bioinformatics	T	5	3	25	75	100	5	EM	G	
	<b>DSE I: Genetic Modifications and Metabolomic interactions</b>										
23BIP13 23BIP14	<b>A.</b> rDNA Technology <b>B.</b> Metabolomics	T	4	3	25	75	100	4	SD SD	N N	
23GEP02	<b>GEC - I:</b> Biological Statistics and Research Methodology	T	4	3	25	75	100	3	SD	N	
23GEP03	Quantitative Aptitude								SD	N	
<b>DTC II - Additional Credit Courses (NPTEL/ Coursera)</b>											
<b>Total</b>			<b>30</b>				<b>700</b>	<b>28</b>			
<b>Drive-Through Course (DTC):</b> 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	
<b>SD</b>	Skill Development
<b>EM</b>	Employability
<b>EN</b>	Entrepreneurship
<b>N</b>	National
<b>G</b>	Global

### Semester-wise Distribution

Semester	Total Marks	Total Credits
I	700	28
II	700	28

### List of Courses Offered by **Mathematics**

SEM	Course Code	Course Title	T/P	Ins. Hrs/week	Examination			Credits	
					Dur. Hrs	CIA	ES		
II	23GEP02	Biological Statistics and Research Methodology	T	4	3	25	75	100	3
	23GEP03	Quantitative Aptitude	T	4	3	25	75	100	3

List of Courses Offered by Computer Technology

SEM	Course Title		T/P	Examination				Credits	
	Course Code			Ins. Hrs/ week	Dur. Hrs	CIA	ES	Total Marks	
I	23BIP03	Computer Programming in C	T	4	3	25	75	100	4
	23BIP07	Lab in C Programming	P	5	3	40	60	100	4
II	23BIP09	Python for Bioinformatics	T	4	3	25	75	100	4
	23BIP10	Lab in Python	P	3	3	40	60	100	3

