# 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

PEO 1	Graduates will acquire knowledge and awareness of the basic principles and concepts of biology, computer science and mathematics.
PEO 2	Graduates with an ability to use software effectively to extract information from large databases and to use this information in computer modelling.
PEO 3	Graduates will have problem-solving skills, including the ability to develop new algorithms and analysis methods.
PEO 4	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:

	Knowledge: By understanding the broad principles of science and technology and apply							
PLO I	them in varied contexts. (Cognitive)							
	Critical Thinking: Contribute to the advancement of science, through formulating clear							
FLO Z	study goals or hypotheses and designing research to meet the goals (Cognitive)							
	Practical Skills: Develop a passion for hardware and software design and be part of the							
PLO 3	electronic design industry/software company to become leaders in indigenous product							
	development. (Psychomotor)							
	Team-work Skills: Demonstrate capability to locate, evaluate, manage, and use							
PLO 4	information/data and research to develop and guide their own knowledge, learning and							
	practice. <i>(Affective)</i>							
	Communication Skills: Communicate ideas clearly and effectively to diverse audiences							
FLO J	in visual, written, oral, and computational formats. (Affective)							
	Digital Skills: Will be able to use of computers to collect, analyse and interpret biological							
	information at the molecular and proteome level. (Affective)							
	Numeracy Skills: Establish the literacy and numeracy skills necessary to understand and							
1201	interpret information/data and communicate according to the context. (Cognitive)							
	Leadership Skills: Function effectively as a leader and as well as team member in							
	diverse/ multidisciplinary environments. (Affective)							
	Lifelong Learning: Develop pipelines of analysis tools to analyse real-world biological							
PLO 9	data sets, and show familiarity with the syntax and options required to generate							
	meaningful interpretations. (Affective)							
	Entrepreneurial Skills: To inculcate the scientific temperament in the students andoutside							
PLO 10	the scientific community to be a researcher, academician or entrepreneur.							
	(Affective)							
	Ethics & Professionalism: Model ethical professional behaviour, including							
PLO 11	transparency and honesty in analysis and reporting of results, ethical reasoning during							
	study design, and engaging respectfully with others. (Affective)							

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

					Grad	luate A	Attribute	es				Blooms		
PLO	Knowledge	<b>Critical Thinking</b>	Practical Skills	Teamwork Skills	Communication Skills	Digital Skills	Numeracy Skills	Leadership Skills	Lifelong Learning	Entrepreneurial Skills	Ethics & Professionalism	Cognitive	Psychomotor	
1	✓	Ì										✓		
2		✓										✓		
3			✓										✓	
4				✓										✓
5					✓									<ul> <li>✓</li> </ul>
6						✓								✓
7							$\checkmark$					✓		
8								✓						✓
9									<ul> <li>✓</li> </ul>					<ul> <li>✓</li> </ul>
10										✓				$\checkmark$
11											$\checkmark$			$\checkmark$

#### 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 able to

PSO 1	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.
PSO 2	Graduates will be able to analyze about various approaches used in the simulation of metabolic pathways Explain about gene regulatory networks
PSO 3	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 & Marks Distribution										
Course Type	Number of Courses	Credits per Course	Total Credits	Total Credits Marks						
Discipline Specific Courses (DSC)	19	2-6	75	1850	I to IV					
Discipline Specific Elective Courses (DSE)	2	4	8	200	&					
Generic Electives Courses (GEC)	2	3-4	7	200	&					
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									
Total			90	2250						

#### 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.	Course	Course Title	Semester	Contact	Credits	Marks	
No.	Code		Comostor	Hours	oreans		
1	23BIP13	rDNA Technology		4	4	100	
2	23BIP14	Metabolomics		•	•	100	

#### 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	=	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.

- a. SWAYAM NPTEL
- b. Coursera
- c. Any courses certified by statuary bodies.

#### Semester-wise Scheme

Semester I											
			Ins.		Exam	ination	า		SD/		
Course Code	Course Title	T/ Hrs/ P wee k	Dur Hrs	CIA	ES	Total Mark s	Credits	EM/ EN	L/R/ N/G		
23BIP01	<b>DSC I</b> : Fundamentals of Biological Sciences	Т	4	3	25	75	100	4	EM	Ν	
23BIP02	<b>DSC II</b> : Computational Biology	Т	4	3	25	75	100	4	EN	G	
23BIP03	DSC III: Computer Programming in C	Т	4	3	25	75	100	4	SD	Ν	
23BIP04	<b>DSC IV:</b> Genomics and Proteomics	т	4	3	25	75	100	4	EM	G	
23BIP05	DSC V: Immunoinformatics	Т	4	3	25	75	100	4	SD	N	
23BIP06	DSC Practical I: Lab in Biological Techniques	Р	5	5	40	60	100	4	SD	Ν	
23BIP07	DSC Practical II: Lab in C Programming	Р	5	3	40	60	100	4	SD	Ν	
DTC I - Additi	onal Credit Courses (NPTEL/ C	ourse	ra)								
	Total		30				700	28			

	Semester II										
			Ins.		Exam	nination	ı		SD/		
Course Code	Course Title	T/ P	Hrs/ wee k	Dur Hrs	CIA	ES	Total Mark s	Credits	EM/ EN	L/R/ N/G	
23BIP08	<b>DSC VI</b> : Biomolecular Structure and Interaction	Т	5	3	25	75	100	5	SD	Ν	
23BIP09	DSC VII: Python for Bioinformatics	Т	4	3	25	75	100	4	SD	G	
23BIP10	DSC Practical III: Lab in Python	Ρ	3	3	40	60	100	3	SD	G	
23BIP11	<b>DSC Practical IV</b> : Lab in Biological Data Analytics	Ρ	5	3	40	60	100	4	SD	Ν	
23BIP12	DSC VIII Algorithms in Bioinformatics	Т	5	3	25	75	100	5	EM	G	
	DSE I: Genetic Modifications and Metabolomic interactions										
23BIP13 23BIP14	A. rDNA Technology B. Metabolomics	Т	4	3	25	75	100	4	SD SD	N N	
23GEP02	GEC - I: Biological Statistics and Research Methodology	т	4	3	25	75	100	3	SD	Ν	
23GEP03	Quantitative Aptitude								SD	Ν	
DTC II - Addit	ional Credit Courses (NPTEL/ C	Course	era)								
Total			30				700	28			
Driv Courses offe OR Any co	ve-Through Course (DTC): ared in SWAYAM - NPTEL, Cours aurses certified by statutory bodies	era 3.	Additional 4 Credits per Course will be given on submission of Certificate				During Semester I to Semester IV				

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The Courses focus on the following needs						
SD Skill Development						
EM Employability						
EN	Entrepreneurship					
Ν	National					
G	Global					

#### **Semester-wise Distribution**

Semester	Total Marks	Total Credits			
I	700	28			
II	700	28			

# List of Courses Offered by Mathematics

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

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

# List of Courses Offered by Computer Technology