

AC/07/08/2024/RS1



College of Arts,
Science &
Commerce (Autonomous)

RISE WITH EDUCATION

NAAC REACCREDITED - 'A' GRADE

**SIES College of Arts, Science and Commerce
(Autonomous)**

Affiliated to University of Mumbai

Syllabus under NEP effective from June 2024

Programme: B.Sc.

Subject: Biochemistry

Skill Enhancement Course

Class: S.Y.B.Sc. Semester: IV

Choice Based Credit System (CBCS)

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Preamble

Biochemistry is a branch of biological science that delves into the chemical processes and information pathways governing the survival and propagation of life. It is an interdisciplinary science providing the learner an opportunity to elucidate molecular mechanisms and explore the intricate world of biomolecules and their applications. Under the aegis of New Education Policy-2020, the department offers a three-year BSc program and a four-year BSc Honours program with Biochemistry (major or minor). At the second-year level, along with the core Biochemistry course, the department also offers Vocational skill enhancement course and Skill enhancement course. In this program, we will embark on a comprehensive journey from the structure and function of biomolecules to their interactions and implications in health and disease. Through lectures, laboratory sessions, and interactive discussions, the student will not only gain insights of the biochemical processes and pathways, but also develop skills for employability and aptitude for research.

Objectives:

The goal of this interdisciplinary Biochemistry program is

1. Foundational knowledge: To build the foundation of Biochemistry and physiology in order to enable the student to pursue Biochemistry at a higher level.
2. Application of Biochemistry: To enable the student to recognize the application of biochemistry in areas of nutrition and food, pharmaceuticals, diagnostics, clinical research, bioinformatics, forensics, etc.
3. Laboratory skills: To develop essential laboratory skills for the experimental analysis of biochemical principles.

Program-Specific Outcome

At the end of the second year, the student should be able to:

- Comprehend the concepts in human physiology and understand the role of biomolecules regulating the myriad physiological processes
- Understand the physical and chemical properties of biomacromolecules
- Co-relate the structure of biomolecules with their properties and functions
- Explain the role of biomolecules in maintaining cellular integrity
- Know the significance of the various biochemical pathways that govern life.
- Apply the experimental skills in studying biomolecules and cellular processes
- Recognize the application of biochemistry in diverse fields of food, nutrition, clinical research, drug discovery, diagnostics, forensics, genomics, proteomics and bioinformatics
- Understand the concept of data collection and types of data presentation
- Employ statistical concepts to analyse experimental data.

Evaluation: Student's understanding of biochemistry will be evaluated through a combination of examinations, quizzes, laboratory reports, and class participation. These assessments are designed to gauge learner's comprehension of both theoretical concepts and practical applications.

Overall Credit Structure for S.Y. B.Sc.

Semester	Core I	Core II	Minor	OE	VSC, SEC (VSEC)	AEC, VEC, IKS	OJT, FP, CEP, CC	Credits/ semester	Degree/ cumulative credits
I	4C	4C	4C	2C	VSC-2C	AEC-2C	FP-2C CC-2C	22C	UG Diploma 88C
II	4C	4C	4C	2C	SEC-2C	AEC-2C	FP-2C CC-2C	22C	
Total Credits	8C	8C	8C	4C	4C	4C	8C	44C	

OE: Open Elective/Generic open elective

VSC: Vocational Skill Course

SEC: Skill Enhancement Course

AEC: Ability Enhancement Course

VEC: Value Education Course

IKS: Indian Knowledge System

OJT: On-job training

FP: Field Project

CEP: Community engagement and service

CC: Co-curricular courses

**Credit Structure of courses offered by Biochemistry department for
S.Y. B.Sc. Biochemistry**

Name of Program: B.Sc. Biochemistry			Department: Biochemistry			
Class	Semester	Course Code	Course Title	Credits	No. of lectures/ per week	Marks
SYBSc	I	SIUBCMJ211 and SIUBCMN211	Biomacromolecules	03	03	75
		SIUBCMJP211 and SIUBCMNP211	Biomacromolecules Practical	01	01	25
		SIUBCMJ212	Human Physiology	03	03	75
		SIUBCMJP212	Human Physiology practical	01	01	25
		SIUBCVS211	Introduction to biostatistics	02 (01Th + 01P)	03 (01Th + 02P)	50
SYBSc	II	SIUBCMJ221	Bioanalytical techniques	03	03	75
		SIUBCMJP221	Bioanalytical techniques Practical	01	01	25
		SIUBCMJ222 and SIUBCMN221	Membrane Biology	03	03	75
		SIUBCMJP222 and SIUBCMNP222	Membrane biology and Microbiology Practical	01	01	25
		SIUBCSE221	Introduction to bioinformatics	02 (01Th + 01P)	03 (01Th + 02P)	50

SI: SIES

U: Undergraduate

BC: Biochemistry

CC: Core Course

VS: Vocational Skill Course

SE: Skill Enhancement Course

Summary of syllabus
SEMESTER III

Course Title & Course Codes	Units	Topic Headings	Credits	Hours/Week
Biomacromolecules SIUBCMJ211 and SIUBCMN211	I	Protein Biochemistry	3	3
	II	Enzymes		
	III	Nucleic acids		
Core Practical SIUBCMJP211 and SIUBCMNP211		Biomacromolecules Practical	1	2
Human Physiology SIUBCMJ212	I	Digestion and Absorption	3	3
	II	Excretion and Respiration		
	III	Cardiovascular system and Nervous system		
Core Practical SIUBCMJP212		Human Physiology practical	1	2
VSC SIUBCVS211		Introduction to biostatistics	2	2 (tutorial)

Summary of syllabus
SEMESTER IV

Course Title & Course Codes	Units	Topic Headings	Credits	Hours/Week
Bioanalytical Techniques SIUBCMJ221	I	Spectroscopy & Centrifugation	3	3
	II	Electrophoresis		
	III	Chromatography		
Core Practical SIUBCMJP221		Bioanalytical techniques Practical	1	2
Membrane biology SIUBCMJ222 and SIUBCMN222	I	Composition and function of plasma membrane	3	3
	II	Membrane transport		
	III	Bioenergetics		
Core Practical SIUBCCMJP222 and		Membrane biology and Microbiology practical	1	2
SEC SIUBCSE221		Introduction to bioinformatics	2	1 +2(Practical)

Semester IV
Syllabus- Skill Enhancement Course (SEC)

Course Title: Introduction to Bioinformatics	Course code: SIUBCSE221
Credits: 02	Hours/week: 02 L

Course Outcome:

On completing the Course, the learner should be able to

1. *Express the scope, applications and potentials of bioinformatics.*
2. *Collect data/information from the biological and chemical data bases*
3. *Analyse biological data (gene and protein sequence) using basic bioinformatics tools*

Total hours per week: 2	Contents	Credits :2
Sr No	Title	
1	Introduction to bioinformatics	
2	History of bioinformatics, genomics and proteomics	
3	Databases: types- public domain database, chemical database (Pubchem); sequence database, structural database, motif database, genome database, proteome database, annotated sequence database- GenBank, EMBL, PIR, SWISS PROT, PDB, GDB Problems related to above databases.	
4	Sequence analysis tools: BLAST, FASTA, L- ALIGN, CLUSTAL- X & W, RASMOL, Software for protein sequencing- PROPECT, AMMP, COPIA. Problems on sequence analysis	
5	Applications of bioinformatics in sequence analysis, molecular modelling and drug designing, phylogeny/ evolution, ecology & population studies, medical informatics and agriculture	

References for SEC SIUBCSE211

1. Bioinformatics: Sequence and Genome Analysis by Mount DCold Spring Harbor Laboratory Press, New York. 2004 2.
2. Bioinformatics- a Practical Guide to the Analysis of Genes and Proteins by Baxevanis, A.D. and Francis Ouellette, B.F., Wiley India Pvt Ltd. 2009 3.
3. Introduction to bioinformatics by Teresa K. Attwood, David J. Parry-Smith. Pearson Education.
4. Introduction to bioinformatics by Teresa K. Attwood, David J. Parry-Smith, Pearson Education. 1999 2.
5. Bioinformatics for Dummies by Jean-michel Claverie Cedric Notredame. Publisher: Dummies (Jan 2007) 1999

General Scheme of Examination

Credits	Course Type	Distribution of Credits	Sem end	Internal	Practical	Total
4	Core I with Practical (Major+ Minor)	with Practical 3T+1P	50	25	25	100
4	Core 2 with Practical (Major)	with Practical 3T+1P	50	25	25	100
2	VSC/ SEC	without sem end exam	---	50	---	50
2	Field project		Present ation and Viva voce (30M)	-	Field work 20M	50

Semester end, Internal and Practical as in the above Table, will be separate heads of passing.

1. Details for Internal Assessment:

Weightage for Internal (marks)	Min. marks required for passing	Pattern of Evaluation
40 (Core)	16	20 marks- class test (No retest) + 20 marks- Assignment/ Project/ Viva
25 (Core)	10	10 marks- class test (No retest) + 15 marks- Assignment/ Project/ Viva
50 (with sem end exam) OE	20	20 marks- class test (No retest) + 30 marks- Assignment/ Project/ Practical exam/ Open to Department
50 (without sem end exam) VSC, SEC	20	20 marks- class test (No retest) + 30 marks- Open to Department OR 50 marks from Practical- journal+ viva+ exam etc (continuous evaluation)

20 (IKS/ VEC/ AEC)	8	Open to Conveners of IKS, VEC, AEC
50 Field Project	20	20M Field Project; 30 M Report, presentation and Vive voce

Internal evaluation: Quizzes, Presentations, Surveys, Internship, Tutorials, Role Play

2. Details for Semester End Exam:

- For semester end exam, Two types of Patterns are given.
- Any one pattern can be adapted depending on the number of units in the syllabus.
- Arts and Commerce faculty will follow Type II.
- Students should be informed by the concerned department about the pattern.
- Questions of Objective type (MCQ/ Fill in the blanks/ match the following pairs etc) should not be asked in semester end exam.

Sem End	Min. Re.	Duration	Pattern	
			Type I	Type II
60	24	2 hrs.	<ul style="list-style-type: none"> ● 4 units: 4 questions of 15 marks each on each unit. ● 3 units: 3 questions of 15 marks on each unit and one question of mixed type for 15 marks. 	4 questions for 10 marks each and 5th question is 4 Short Notes for 5 marks each.
50	20	2 hrs.	<ul style="list-style-type: none"> ● 4 units: 4 questions of 12, 13, 12, 13 marks on 4 units. ● 3 units: 3 questions on 3 units of 12 marks each and 4th question of mixed type for 14 marks. ● 2 units: 2 questions of 20 marks each on each unit and one question of mixed type for 10 marks. 	4 questions for 10 marks each and 5 th question is 2 Short notes for 5 marks each.
30	12	1 hr.	<ul style="list-style-type: none"> ● 3 units: 3 questions of 10 marks each on each unit. ● 2 units: 2 questions of 15 marks each on each unit / 2 questions of 10 marks each on each unit and one question of mixed type for 10 marks. 	2 questions for 10 marks each and 3rd question is 2 Short Notes for 5 marks.