ST. JOSEPH'S COLLEGE (AUTONOMOUS)

BENGALURU-27

Re-accredited with **'A++' GRADE with 3.79/4 CGPA** by NAAC
Recognized by UGC as College of Excellence

DEPARTMENT OF BIOCHEMISTRY

SYLLABUS FOR OPEN ELECTIVE UNDERGRADUATE PROGRAMME

UNDER NEP

For Batch 2021-2024

FOREWORD

Board of Studies

The Biochemistry syllabus for the batch 2021-2024 has been approved by the board of studies meeting held on 7th May 2022.

The members of the board are:

1. Prof. V. R. Devaraj, Professor of Biochemistry, Bangalore City University.
2. Prof. Sarada Subramanian, Professor of Neurochemistry, National Institute of Mental Health and Neurosciences (NIMHANS) Bangalore
3. Dr. Vishnu Janardhan, Industry Representative
4. Prof. Mohanadas, Professor of Chemistry, Department of Biochemistry, St. Joseph's College (Autonomous), Bangalore
5. Prof. Sandra Misquith, Professor of Chemistry, Department of Biochemistry, St. Joseph's College (Autonomous) Bangalore.
6. Dr. Shraddha K. N. Assitant Professor of Chemistry, Department of Biochemistry, St. Joseph's College (Autonomous) Bangalore.

Advisory Board Members:

The department would also like to place on record that the syllabus was designed keeping in mind the wide scope of the subject, the job potential and the future of the students who graduate in the subject. After consultation of several syllabi and obtaining the opinion of several prominent people in the field the syllabus was designed.
The members of the department would like to acknowledge all those who have greatly contributed to the framing of the syllabus. These include:

1. Prof. Jenny Loertscher, Prof. of Biochemistry, University of Seattle, USA
2. Prof. Drubojyothi Chatterjee Professor of Biochemistry, Vice Chancellor Amity University Kolkata.
3. Prof. Siddhartha Sarma, Chairman, Molecular Biophysics Unit, Indian Institute of Science, Bangalore
4. Prof. D. N. Rao. Hon. Professor of Biochemistry, IISc, Convenor, Talent Development Centre, The Advisor, Challakere campus
5. Prof. Devaraj, Chairman and Professor of Biochemistry, BCU
6. Prof. Sarada Subramanian, Professor of Neurochemistry, NIMHANS
7. Dr. Vishnu Janardhan Industry Representative (Scientist – 1)
8. Prof. Harpreet Singh, Director of Physiology, Ohio State University, USA.

Part A		
1	Title of the Academic Program	BSc Biochemistry Honours
2	Program Code	**SJC BSc (To be given by Examination Section)**

3	Name of the College	St. Joseph's College (Autonomous)	
4	Objective of the College	1. Academic Excellence 2. Character Formation 3. Social Concern	
5	Vision of the College	"Striving for a just, secular, democratic and economically sound society, which cares for the poor, the oppressed and the marginalized"	
6	Mission of the College	M 1	St. Joseph's College (Autonomous) seeks to form men and women who will be agents of change, committed to the creation of a society that is just, secular and democratic.
		M 2	The education offered is oriented towards enabling students to strive for both academic and human excellence.
		M 3	The college pursues academic excellence by providing a learning environment that constantly challenges the students and supports the ethical pursuit of intellectual curiosity and ceaseless enquiry.
		M 4	Human excellence is promoted through courses and activities that help students achieve personal integrity and conscientise them to the injustice prevalent in society.
7	Name of the Degree	Bachelor of Science (B.Sc.,)	
8	Name of the Department offering the program	Biochemistry	
9	Vision of the Department offering the Program	"The Department intends to arouse in students an interest in the world of sciences. To get a better understanding of how living things exist. To appreciate the reactions that take place in the living system. To correlate the laws of nature and the physical laws that blend together in all life forms"	
10	Mission of the Department offering the Program	● The Department of Biochemistry aims at developing the young mind to question, to seek and to understand how living things function. ● The department also looks at developing students into the realms of analytical thinking and self-reliance. ● At the end of the course, students have developed skills to handle the subject as part of academics or industry.	
11	Duration of the Program	3 years (Six semesters)	
12	Total No. of Credits	36	
13	Program Educational Objectives (PEOs)	PEO 1	
		PEO2	
		PEO 3	

Programme Educational Objectives: PEOs are statements that describe Institution's Mission aligned with the programme(To be Prepared in consultation with other departments (Languages and Optional subjects) 2-5 PEOs can be written.

- **Guidelines for the PEOs**
  - PEOs should be consistent with the mission of the Institution
  - The number of PEOs should be manageable
  - PEOs should be achievable by the program
  - PEOs should be specific to the program and not too broad

14	Graduation Attributes	The Following graduate attributes reflect the particular quality and feature or characteristics of an

			individual, that are expected to be acquired by a graduate through studies at St. Joseph's College. • **Disciplinary knowledge** • **Communication Skills** • **Critical thinking** • **Problem solving** • **Analytical reasoning** • **Research-related skills** • **Cooperation/Team work** • **Reflective thinking** • **Information/digital literacy** • **Self-directed learning and Lifelong learner** • **Multicultural competence** • **Moral and ethical awareness/reasoning** • **Leadership readiness/qualities** • **International Outlook**
15	Program Outcomes (POs)	PO1	
		PO2	
		PO3	
		PO4	

Programme Outcomes: POs are statements that describe what the students graduating from any of the educational Programmes should be able to do (To be Prepared in consultation with other departments (Languages and Optional subjects. 4-10 POs can be written

- **Guidelines for the POs**
  - Program outcomes basically describe **knowledge, skills and behavior** of students as they progress through the program as well as by the time of graduation.
  - POs should not be too broad
  - They must be aligned with the **Graduation Attributes**

16	Program Specific Outcomes (PSOs)	PSO1	The first semester will be a bridge course to help students relearn the basic concepts in chemistry so that they are thorough in their understanding of the subject and will with ease be able to correlate the same with the functioning of the living system.
		PSO2	Students will be introduced to organic chemistry, they will also learn some aspects of physical chemistry. These will act as foundation to understanding how the biological processes function. In practical classes they will develop skills in determining several parameters in physical chemistry that have a direct implication in the living system. RBPT component will also be introduced to augment skills already developed in the first semester.

Programme Specific Outcomes: PSOs are statements that describe what the graduates of a specific educational Programme should be able to do.
These statements are to be written by individual departments offering optional programmes. In addition Language departments also to write general statements for BA, BSc and Commerce Programs. For the Microbiology optional for MCB/MCZ PSOs have been shown as examples. 4-10 PSOs can be written

- **Guidelines for the PSOs**
  - Program Specific outcomes basically describe **knowledge and skills of** students as they progress through the program as well as by the time of graduation.
  - POs should not be too broad
  - They must be aligned with the **Graduation Attributes**

Part B

B.Sc. Biochemsitry Honours Curriculum

Courses and course completion requirements	No. of credits
General English	
Second language: Introductory Kannada/Kannada/ Hindi/ Sanskrit/ Tamil/ Additional English/French/German.	
Biochemistry Honours (4 year UG degree program)	68
Open elective courses (non-professional)	12
Foundation courses	
Term paper	
Soft skills (IGNITORS)	
Human resource development (HRD)/Theology	
Outreach activity	
Extra and Co-curricular activities	

SUMMARY OF CREDITS IN BIOCHEMISTRY

DEPARTMENT OF BIOCHEMISTRY (UG) (2020-2023)								
Semester 1	**Code Number**	**Title**	**No. of Hours of Instructions**	**Number of Hours of teaching per week**	**Number of credits**	**Continuous Internal Assessment (CIA) Marks**	**End Semester Marks**	**Tota mar**
Theory	BCHOE-1	Fundamentals of Forensic science	45	03	03	40	60	100
Semester 2	**Code Number**	**Title**	**No. of Hours of Instructions**	**Number of teaching h /week**	**Number of credits**	**Continuous Internal Assessment (CIA) Marks**	**End Semester Marks**	**Tota mar**
Theory	BCHOE-2	Vital signs: Understanding what our body is telling us.	45	03	03	40	40	100

CORE COURSES (CC)	
Course Title	Code Number

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE)	
Course Title	Code Number

GENERIC ELECTIVE COURSES (GSE)[For Physical Sciences, Arts and Commerce UG Students]	
Course Title	Code Number
Introduction to Forensic Sciences	BCHOE- 1
Vital signs; Understanding what our body is telling us.	BCHOE – 2

SKILL ENHANCEMENT COURSE (SEC) – Any practical oriented and software based courses offered by departments to be listed below	
Course Title	Code Number

VALUE ADDED COURSES (VAC) Certificate courses that add value to the core papers can be listed	
Course Title	Code Number

Online courses offered or recommended by the department to be listed	
Course Title	Code Number
Principles of Biochemistry	EDX course (Harvard University)
Learning how to learn	Coursera
Introduction to statistics	Coursera (Stanford university)
Introduction to mathematical thinking	Coursera (Stanford university)
Introduction to ordinary differential equations	Coursera (KAIST)

Semester	I, II, III and IV
Paper Code	**BCHOE-1**
Paper Title	**Introduction to Forensic Science**
Number of teaching hours per week	03
Total number of teaching hours per semester	45
Number of credits	03

Objectives of the paper:
This is a 45 hour paper offered for all students. It will introduce them to biochemistry and how it is used to solve forensic data. They will learn to assess cases and try to apply what they have studied to real life situations.

Course content:

Introduction:

In this unit students will be exposed to the following questions:
What is forensic science? What are the branches of forensic science? A short preview on the development of the subject will be presented: important persons and their contribution to the field. How it developed in India.
A brief overview will be discussed to help students get acquainted with terms used in science.
8h
Analysis of evidence found at the crime scene:

Using an interdisciplinary approach of biology, chemistry, physics and genetics students will be able to identify and analyse material at the crime scene. They will learn how to record data and write a report of their findings.**7 h**

Qualitative analysis of evidence:

In this unit students will be introduced to various methods (chemical and biochemical) used to identify non-human biological material.
They will be introduced to different toxins/poisons commonly used and identified in forensic laboratories. They will also be given a short overview of the mechanism by which these toxins act that result in death. Students will learn of overdose of drugs. Drugs will be classified by their mode of action or nature. Commonly used drugs like analgesics, cannabis, antihistamines, antidepressants, benzodiazepines and "Z" drugs, stimulants, alcohol etc. will be identified by spot tests.
10 h

Study of body fluids using separation analysis and optical methods:

Students will be introduced to different body fluids (with special emphasis on blood) that are collected at the crime scene.
They will learn how these fluids are identified and what information can be obtained from their analysis. They will understand the workings of the techniques used for the identification of body fluids including, chromatographic and electrophoretic techniques, and microscopy. **10 h**

DNA testing to find out relationship between two humans or between animals:

In this section students will develop an understanding of what DNA is (brief structure discussion). They will also be given a basis for the method by which DNA is tested – PCR, sequencing (finger printing) and cloning.**10 h**

References:

1. Forensic Science: - A Very short introduction Jim Fraser 2nd Edition Publishers: Oxford University Press
2. Introduction to criminal investigations: Processes, practices and thinking R. Gehl and D. Plecas Publishers: BC Campus
3. Forensic Analysis and DNA in Criminal Investigations: Including Cold Cases Solved by RJ Parker, Hartwell Editing (Editor), Publishers: R J Parker

BLUEPRINT

Code number: **BCHOE-1**

Title of the paper: **Introduction to Forensic Science**

Topic	Number of Hours	Total marks for which the questions are to be asked (including bonus questions)
Introduction	8	11

Analysis of evidence	7	11
Qualitative analysis of evidence	10	14
Study of body fluids using separation analysis and optical methods	10	14
DNA testing	10	14
TOTAL	**45**	**64**

Course Outcomes: At the end of the course, the student should

CO1	Knowledge	Have developed an understanding of basic concepts in forensic science.
CO1	Understand	Have developed a very good understanding of methodologies used to solving forensic problems
CO1	Apply	Be able to logically deduce the methodologies used in this field
CO1	Analyze	Be able to analyse data and be able to conclude the reasons behind the analysis.
CO1	Evaluate	Be able to critically evaluate the results obtained and decide the quality of the analysis
CO1	Create	Be able to develop strategies for studying and understanding case studies in forensic science.