**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.

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| **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
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| 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 | M1  | 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.  |
| M2 | The education offered is oriented towards enabling students to strive for both academic and human excellence. |
| M3 | 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. |
| M4 | 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.
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| 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
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| 14 | Graduation Attributes | The Following graduate attributes reflect the particular quality and feature or characteristics of anindividual, 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**
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| 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**
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| 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. |
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| **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**
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**Part B**

B.Sc. Biochemsitry Honours Curriculum

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| 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**

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| **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** | **Total marks**  |
| 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** | **Total marks**  |
| Theory | BCHOE-2 | Vital signs: Understanding what our body is telling us. | 45 | 03 | 03 | 40 | 40 | 100 |

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| **CORE COURSES (CC)** |
| Course Title | Code Number |

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| **DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE)** |
| Course Title | Code Number |

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| **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 |
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| **SKILL ENHANCEMENT COURSE (SEC) –** **Any practical oriented and software based courses offered by departments to be listed below**  |
| Course Title | Code Number |
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| **VALUE ADDED COURSES (VAC)****Certificate courses that add value to the core papers can be listed** |
| Course Title | Code Number |
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| **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) |

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| Semester | I , II, III and IV |
| Paper Code | **BCHOE-2** |
| Paper Title | **What we eat is what we are** |
| 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 an understanding of how the body functions will help them to lead healthier lives. In this paper we look at biomolecules and how their concentration, distribution and presence in different body fluids act as indicators of health and disease. Students will be able to understand the standard clinical tests that are prescribed for their aging relatives and also make sense of tests they have to take. They will be made aware of signs that hint at possible abnormalities that could be There will be case studies by which students will be able to interpret what are the underlying causes that assure a healthy life.

**Course content:**

**Basic Biochemistry Concepts. 5h**

Biochemistry: What You Need to Know and Why.

Seems So Basic: Water Chemistry and pH.

Fun with Carbon: Organic Chemistry.

**Biomolecules and importance of a balanced diet. 15h**

An introduction to amino acids and proteins, enzymes, carbohydrates, lipids, nucleic acids and the code of life.

Balanced diet. Starvation diets and their consequences. Special diets for pregnant and lactating mothers. Infants, geriatrics. Suggested diets for lifestyle diseases – diabetics and hypertension.

Vitamins – Dietary sources, normal daily requirement and dangers of hyper and hypo vitaminosis. Hormones and neurotransmitters: The Body's Messengers.

**Biomarkers 10 h**

Blood tests and what they reveal

Urine tests – what comes out can be revealing

Liver function and kidney function tests – the indispensable tool of enzyme assays.

**Circardian clock. 5 h**

Importance of sleep for a healthy life.

Molecules involved in the sleep wake cycle and their correlation with molecules causing lifestyle diseases such as hypertension and diabetes.

Sleep disorders – biomolecules that are responsible.

**Abnormal cells how different are they from the normal. 10 h**

Biomarkers at the cell surface. Genetic factors and how they can be detected. Cancerous cells what has lead to uncontrolled cell growth and differentiation. Congenital conditions and modern methods to treat these defects.

References:

* + - 1. Biochemistry for dummies J. T. Moore, R. H. Langley 2nd edition Wiley
			2. Textbook of biochemistry with clinical correlations. T. M. Devlin (editor) 7th Edition Wiley
			3. Functional biochemistry in health and disease. E. Newsholme A. Leech Wiley =-Blackwell

BLUEPRINT

Code number: **BCHOE-2**

Title of the paper: **Vital signs: Understanding what our body is telling us.**

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| --- | --- | --- |
| Topic | Number of Hours | Total marks for which the questions are to be asked (including bonus questions) |
| **Basic Biochemistry Concepts.** | 5 | 07 |
| **Biomolecules and importance of a balanced diet.** | 15 | 22 |
| **Biomarkers** | 10 | 14 |
| **Circardian clock.** | 05 | 07 |
| **Abnormal cells how different are they from the normal.** | 10 | 14 |
| **TOTAL** | **45** | **64** |

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

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| CO4 | Knowledge  | Have developed an understanding of basic concepts in chemistry backbone of biochemical functioning |
| CO4 | Understand | Have developed a very good understanding of biomolecules and the importance of a balanced diet, sleeping and waking at the correct time. How to read clinical reports and spot a healthy heart. |
| CO4 | Apply | Be able to apply their understanding to real life by changing lifestyle to lead a healthy life |
| CO4 | Analyze | Be able to analyse data and be able to conclude the reasons behind the analysis. |
| CO4 | Evaluate | Be able to critically evaluate the various clinical indicators and figure out how things are within their system. |
| CO4 | Create | Be able to develop strategies for studying and understanding case studies in nutritional and clinical biochemistry |