4. Program Educational Objectives:

The program educational objectives (PEO) are the statement that describes the career and professional achievement after the program of studies (graduation/ post-graduation). The PEO s are driven form question no. (ii) of the Mission statement (What is the purpose of organization). The PEOs can be minimum three and maximum five.

PEO1: To have advance knowledge of biochemistry domain.

PEO2: To provide the professional services to industry, research organization, institutes.

PEO3: To provide the professional consultancy and research support for the relevant organization in the domain of super specialization.

PEO4: To opt for higher education, disciplinary & multi-disciplinary research and to be a life-long learner.

PEO5: To provide, value based and ethical leadership in the professional and social life.

5. Program Outcomes:

The program outcomes (PO) are the statement of competencies/ abilities. POs are the statement that describes the knowledge and the abilities the graduate/ post-graduate will have by the end of program studies.

a. In-depth and detailed functional knowledge of the fundamental theoretical concepts and experimental methods of Biochemistry.
b. Apply/implement interface between, on the one hand, the history of Biochemistry and natural science and, on the other hand, issues pertaining to the areas of modern technology, health, and environment.
c. Skills in planning and conducting advanced chemical experiments and applying structural-chemical characterization techniques.
d. Skill in examining specific phenomena theoretically and/or experimentally,
e. Generation of new scientific insights or to the innovation of new applications of Biochemistry research.

6. Course- Program outcome Matrix:

The Program Outcomes are developed through the curriculum (curricular/co-curricular-extra-curricular activities). The program outcomes are attained through the course implementation. As an educator, one must know, ***"to which POs his/her course in contributing?"***. So that one can design the learning experiences, select teaching method and design the tool for assessment. Hence, establishing the Corse-PO matrix is essential

step in the OBE. The course-program outcomes matrix indicates the co-relation between the courses and program outcomes. The CO-PO matrix is the map of list of courses contributing to the development of respective POs.

COURSE-PO MATRIX

Course Title	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
Biomolecules	*	*	*				
Molecular Biology	*	*	*				
Cell Biology Physiology	*	*	*				
Bioenergetics Metabolism	*	*	*				
Bio-analytical Chemistry	*	*	*				
Plat Biochemistry	*	*	*				
Advance Enzymology			*	*	*		
Advance Molecular Biology			*	*	*		
Biostatistics, Computer and Bioinformatics	*		*	*	*		
Methods in Molecular Biology			*	*	*		
Immunochemistry			*	*	*		
Plat Biotechnology			*	*	*		
Nutritional Biochemistry			*	*	*		
Clinical Biochemistry			*	*	*		
Biochemical and Environmental Toxicology	*	*	*	*	*		
Microbial Biochemistry			*	*	*		
Project	*	*	*	*	*		

7. Course Outcomes (for all courses):

The course outcomes are the statement that describes the knowledge & abilities developed in the student by the end of course (subject) teaching. The focus is on development of abilities rather than mere content. There can be 5 to 7 course outcomes of any course. These are to be written in the specific terms and not in general. The list of Course Outcomes is the part of ***Annexure-B*** attached herewith.

8. Set Target levels for Attainment of Course Outcomes:

The course outcome attainment is assessed in order to track the graduates' performance w.r.t target level of performance. The CO-PO attainment is the tool used for continuous improvement in the graduates' abilities through appropriate learning & teaching strategies. In order to assess students' performance with respect to abilities (at the end of course teaching/by the end of program) the course outcome attainment are measured/calculated. In order to calculate the program outcome attainment, the course outcome attainment is calculated. Prior to that, the course-program outcome mapping is done.

9. Set Target level for Attainment of Program Outcomes:

The program outcome attainment is assessed in order to track the graduates' performance w.r.t target level of performance. The CO-PO attainment is the tool used for continuous improvement in the graduates' abilities through appropriate learning & teaching strategies. In order to assess students' performance with respect to abilities (at the end of course teaching/by the end of program) the course outcome attainment and program outcome attainment is measured/calculated. The program outcome attainment is governed by curricular, co-curricular and extra-curricular activities including the stakeholders' participation. The direct method and indirect method is adopted to calculate the PO attainment. The direct method implies the attainment by course outcomes contributing to respective program outcomes. And indirect method is the satisfaction/feed-back survey of stakeholders. In order to calculate the program outcome attainment, the course outcome attainment is calculated. Prior to that, the course-program outcome mapping is done.

The set target level is the set benchmark to ensure the continuous improvements in the learners/ graduates' performance.

10. Course Attainment Levels:

a. CO attainment is defined/set at three levels;
b. The CO attainment is based on end term examination assessment and internal assessment;
c. The Co attainment is defined at three levels in ascending order-
    i. e.g. For end term and internal examination;
    ii. Level-1: 40% students scored more than class average
    iii. Level-2: 50% students score more than class average;
    iv. Level-3: 60% students score more than class average.
d. The target level is set (e.g. Level-2). It indicates that, the current target is level-2; 50% students score more than class average. The CO attainment is measured and the results are obtained. Based on the results of attainment, the corrective measures/remedial action are taken.
e. CO Attainment= 80% (Attainment level in end term examination) + 20% (Attainment level in internal examination).

11.Program attainment Level:

a. PO attainment is defined at five levels in ascending order;
b. The PO attainment is based on the average attainment level of corresponding courses (Direct Method) and feed-back survey (Indirect method);
c. The PO attainment levels are defined / set as stated below;
    i. Level-1: Greater than 0.5 and less than 1.0 (0.5>1)- Poor
    ii. Level-2: 1.0>1.5-Average
    iii. Level-3: 1.5>2.0-Good
    iv. Level-4: 2.0>2.5-Very Good

v. Level-5: 2.5>3.0 -Excellent

d. The PO attainment target level is set/defined (say, Level-4). It implies that, the department is aiming at minimum level-4 (very good) in the performance of abilities by the graduates. Based upon the results of attainment, the remedial measures are taken;

e. PO Attainment= 80% (Average attainment level by direct method) + 20% (Average attainment level by indirect method).

2. The Results of CO Attainment:

The Results CO attainment are provided on Annexure-C

For Example,

1003

e.g. For end term and internal examination;

i. Level-1: 40% students scored more than class average
ii. Level-2: 50% students score more than class average; iv.
iii. Level-3: 60% students score more than class average

Average Marks in External examination: 35.77 = i.e. 35

% Students score more than 37 is 11/18 i.e. 61.11% i.e. Levl-3

Average Marks in Internal examination= 10.27= i.e. 10.00

% Students score more than.10.00 is 11/18= 61.11%, i.e. Level-3

A(CO)1003= 80% (3)+20(3)

=2.4+0.6

=3.0

Table No. 1.0: CO Attainment Level

Course Title	CO Attainment Value	Target Attainment level	Fully Attained/Not attained	Remedial measures
Biomolecules	3	2	Fully Attained	
Molecular Biology	2.2	2	Fully Attained	
Cell Biology	3	2	Fully Attained	
Physiology				
Bioenergetics Metabolism	2	2	Fully Attained	
Bio-analytical Chemistry	2.8	2	Fully Attained	
Plat Biochemistry	2.8	2	Fully Attained	
Advance Enzymology	3	2	Fully Attained	

Advance Molecular Biology	2	2	Fully Attained	
P1	3	2	Fully Attained	Not Applicable
P2	3	2	Fully Attained	
Biostatistics, Computer and Bioinformatics	3	2	Fully Attained	
Methods in Molecular Biology	2.2	2	Fully Attained	
Immunochemistry	3	2	Fully Attained	
Plat Biotechnology	3	2	Fully Attained	
Nutritional Biochemistry	3	2	Fully Attained	
Clinical Biochemistry	3	2	Fully Attained	
Biochemical and Environmental Toxicology	3	2	Fully Attained	
Microbial Biochemistry	3	2	Fully Attained	
P3	3	2	Fully Attained	
Project	3	2	Fully Attained	

3.The Results of PO Attainment:

The Results of PO attainment are provided in Annexure-C

For Example,

The level descriptions are stated in point No. 11 above.

PO Attainment= 80% (Average attainment level by direct method) + 20% (Average attainment level by indirect method).

A(PO)b= 80% (3+2.2+3+2+2.8+2.8+3+3+3)/9 +20% (2.58)

= 80% (2.75555) + 20 %(2.75)

= 2.20+0.55

=2.75

Table No. 2.0 PO Attainment Level

PO/PSO number	PO Attainment Value	Target Attainment level	Fully attained/ Not Attained	Remedial Measures
a	2.78	4	Fully attained	Not Applicable
b	2.76	4	Fully attained	
c	2.80	4	Fully attained	
d	2.87	4	Fully attained	
e	2.87	4	Fully attained	

14. Planned Actions for Course Attainment: NA

15.Planned Actions for Program Outcome Attainment:NA

ANNEXURE-B

COURSE OUTCOMES

Biomolecules

1. To explain the connection between molecular properties and cellular activities;
2. To describe/demonstrate the connection between cellular activities and biological responses;
3. Identify by experimentation, the Cellular structure and function, including chemical composition, physiochemical and functional organization of organelles, and basic cellular metabolism;
4. Describe and apply Major cellular processes, including DNA replication, gene regulation, protein structure and function, cell signaling, and differentiation; and
5. Explain the Contemporary techniques used in cell and molecular biology.

Molecular Biology

1. To describe and explain chemical and molecular processes that occurs in cells
2. Explain the meaning for the characteristics of living organisms.
3. Apply molecular and cell-based methods in experimentation mode.
4. Select, adapt and conduct molecular and cell-based experiments to either confirm or reject the hypotheses.
5. Apply the principles and techniques of molecular biology in basic research, or the health professions.

Cell Biology and Physiology

1. To Describe the concept and principles of cell biology and physiology
2. To Describe Biological applications in medical science.
3. To apply the concept and principles of cell biology in the Modern pharmaceutical, biomedical, and biotechnological industry.
4. To experiment and analyse biochemical, molecular, cell biological and physiological techniques.
5. There is an increasing need for knowledge of cell biology and physiology within biomedical research, where neuroscience is an important priority.

Bioenergetics and Metabolism

1. Describe the fundamental concept of energetics of biochemical processes
2. Describe the chemical logic of metabolic pathways.
3. Recognize the basic mechanisms of pathway regulation.
4. Establish the relation between biochemical defects and metabolic disorders.
5. Implement the integration of metabolic processes in cellular systems.

6. Describe the basic tools for investigating metabolic processes.
7. Explain the role of membrane processes in metabolism

Bioanalytical Chemistry

1. Explain the concept of bioanalytical methods.
2. Describe the application of bioanalytical methods within pharmacology, biopharmaceutics, pharmacokinetics, pharmacodynamics, metabolism and toxicology
3. Experiment the effect of the biological sample on analysis methodology and - results
4. Describe and apply liquid-liquid extraction and solid phase extraction for sample pretreatment
5. Optimise the separation methods; liquid solid chromatography, ion exchange chromatography, gas chromatography and capillary electrophoresis
6. Relate the principles and applications of spectroscopic, electrochemical and mass spectrometric detection at quantitative and qualitative analysis in the area of bioanalysis
7. Describe the basic principles and applications of immunological methods for determination of drugs and related subjects.

Plant biochemistry

1. To explain the biochemistry of photosynthetic process and its relation to man and it's environment;
2. To describe the biochemistry of plant growth and development;
3. To explain plant hormones and secondary metabolites to plant growth and development and also its significance in human nutrition and health;
4. To evaluate the potential application of some plants in medicine and assessing their safety in the delivery of quality health care services.
5. To describe the biochemical events associated with growth regulators and herbicides.

Enzymology

1. To describe structure, functions and the mechanisms of action of enzymes.
2. To describe kinetics of enzyme catalyzed reactions and enzyme inhibitory and regulatory process.
3. To perform immobilization of enzymes.
4. To describe the applications of enzymes in industry.

Advanced Molecular Biology

1. To describe key principles of how cells work, including gene regulation, protein synthesis and signal transduction.

2. To locate, analyse, evaluate and synthesise information from a wide variety of sources to understand the key principles of Molecular Biology.
3. To develop effective, creative and innovative solutions, both independently and cooperatively, to current and future research problems in Molecular Biology.
4. To foster intellectual curiosity in Molecular Biology and related fields that extends well beyond the course.
5. To develop an understanding of the observational and experimental character of science, including an appreciation of the need for good experimental design and scientific research practices.
6. To develop practical laboratory skills, generate raw experimental data, and work safely and efficiently in a molecular biology laboratory.

Biostatistics and Research methodology

1. To classify the research studies.
2. Design a research study proposal
3. To measure and analyze data
4. To explain the principles of conducting ethical research
5. Apply concepts of hypothesis testing, p values, descriptive statistics
6. Estimate the effect of sample size and statistical power
7. Apply statistical tools in solving problems

Methods in Molecular Biology

1. To correctly maintain an accurate record of laboratory procedures, techniques and exercises.
2. To perform experiments and evaluate data collected from advanced DNA processing and manipulation techniques in molecular biology
3. To demonstrate an advanced understanding of molecular biology experimental design and data analysis.
4. T0 demonstrate an understanding of advanced molecular biology techniques, including advanced background information and theory, applications, limitations, advantages and disadvantages, common problems and troubleshooting.

Immunochemistry

1. To describe immunological techniques routinely used for analysis in plant biotechnology applications.
2. To describe immune system, antigen-antibody interaction and their applications in various immunoassay systems.
3. To implement the study of protein-protein, protein-DNA/RNA interactions and tools used in microscopic sectioning and imaging.
4. To develop an integrated analytical approach for studying the molecular interactions in a biological system

ANNEXURE-C

RESULTS OF CO-PO ATTAINMENT

M. SC. BIOCHEMISTRY

Course Title	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
Biomolecules	3	3	3				
Molecular Biology	2.2	2.2	2.2				
Cell Biology Physiology	3	3	3				
Bioenergetics Metabolism	2	2	2				
Bio-analytical Chemistry	2.8	2.8	2.8				
Plat Biochemistry	2.8	2.8	2.8				
Advance Enzymology			3	3	3		
Advance Molecular Biology			2	2	2		
P1			3	3	3		
P2			3	3	3		
Biostatistics, Computer and Bioinformatics	3		3	3	3		

Methods in Molecular Biology			2.2	2.2	2.2		
Immunochemistry			3	3	3		
Plat Biotechnology			3	3	3		
Nutritional Biochemistry			3	3	3		
Clinical Biochemistry			3	3	3		
Biochemical and Environmental Toxicology	3	3	3	3	3		
Microbial Biochemistry			3	3	3		
P3	3	3	3	3	3		
Project	3	3	3	3	3		
	2.78	2.76	2.8	2.87	2.87		