

## Course Outcomes – Program Outcomes (COPO) Mapping

### Program Outcomes (PO): B.S.C. (Hons) Biochemistry

#### Undergraduate Curriculum Framework (UGCF)

#### National Education Policy (NEP)

The Preamble of the Undergraduate Curriculum Framework-2022 underlines the historical perspective, philosophical basis, and contemporary realities of higher education as enshrined in the National Education Policy 2020 and endeavours to synchronize these cornerstones while charting the road ahead for the state of higher education.

### ABBREVIATIONS / NOMENCLATURE

Sno.	Nomenclature	Description	Aggregate Courses
1	PO	Program Outcome	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10
2	CO	Course Outcome	CO1, CO2, CO3, CO4, CO5
3	DSC	Core Courses	DSC1, DSC2, DSC3.....DSC11, DSC12
4	DSE	Discipline Specific Electives	DSE1, DSE2
5	GE	General Electives	GE1

Sno.	Program Outcomes (PO): B.A. (H) Economics	Statements
1.	PO1	Inculcate the basic concepts of biochemistry including an understanding of the fundamental biochemical principles and their applications in a systematic, methodical, scientific, evidence-based process. The programme will also provide a general understanding of the related disciplines with a holistic knowledge generation in biological sciences.
2.	PO2 (Laboratory Outcome)	Develop problem solving and analytical skills through case studies, research papers and hands-on-experience, especially integrated into skill enhancement courses.
3.	PO3 (Laboratory Outcome)	Students will gain proficiency in basic laboratory techniques and be able to apply the scientific method to the processes of experimentation, hypothesis testing, data interpretation and logical conclusions.
4.	PO4(Laboratory Outcome)	Provide requisite knowledge of laboratory safety, data replication and quality control, record keeping and other aspects of “responsible conduct of research”.
5.	PO5	Ability to employ modern library search tools to locate and retrieve primary literature on a topic and critically evaluate the literature.
6.	PO6	Students will be able to apply and effectively communicate scientific reasoning and data analysis in both written and oral forms. They will be able to communicate effectively with 11 well-designed posters and slides in talks aimed at scientific audiences as well as the general public.
7.	PO7	Students will learn to work collaboratively in a team.
8.	PO8(Laboratory Outcome)	Students will gain knowledge of ethical and good laboratory practices, health and biohazard regulations, plagiarism and intellectual property rights related issues practiced in modern era of scientific investigation.
9.	PO9	Graduates will be able to apply the major theories and research procedures to contemporary societal issues.
10.	PO10	The programme will prepare students to plunge into various fields of higher education or related profession in various disciplines, armed with plethora of knowledge, hands-on experience and scientific attitude, at national and global levels.

## Course Outcomes (CO): B.S.C (Hons) Biochemistry

<b>SEMESTER I:</b>			
<b>DSC1: Biomolecules</b>			
<b>Unique Paper Code</b>	<b>Name of the Paper</b>	<b>Course Outcome: CO</b>	<b>Statement</b>
<b>2492011101</b>	<b>Biomolecules (DSC1)</b>	CO1	Able to comprehend the structure, function and acid base properties of amino acids.
		CO2	Introduced to the structure, properties and roles of carbohydrates, lipids and nucleic acids.
		CO3	Aware of the importance of vitamins in biological systems.
		CO4	Able to independently identify various biomolecules in the laboratory.
		CO5	Acquainted with chemical and molecular foundations of life and appreciate the role of water in biological systems.
<b>DSC2: Proteins</b>			
<b>2492011102</b>	<b>Proteins (DSC2)</b>	CO1	Understand the diverse functions of proteins in a cell.
		CO2	Understand the hierarchy of protein architecture—primary, secondary, tertiary & quaternary structure, with the ability to distinguish features of globular & fibrous proteins.
		CO3	Be able to comprehend the fundamental mechanisms of protein folding and stability and their relation to conformational diseases.
		CO4	Understand specialized proteins like membrane proteins, defense proteins and motor proteins.
		CO5	Gain comprehension of structure-function relationship of proteins and their significance in physiology, diseases and applications in industry and medicine.
<b>DSC3: Biochemical Techniques</b>			

<b>2492011103</b>	<b>Biochemical Techniques (DSC3)</b>	CO1	Acquire knowledge about the principles and applications of spectrophotometric and chromatography techniques used in a biochemistry lab.
		CO2	Learn about the principle and application of electrophoresis, centrifugation techniques, cell culture and microscopic techniques.
		CO3	Will be able to identify biochemical techniques for separation and purification of biomolecules.
		CO4	Students will obtain hands on experience to develop their experimental skills expected from any biochemistry student working in a research lab.

**GE1 : Public Health Biology**

<b>2494001002</b>	<b>Public Health Biology (GE 1)</b>	CO1	Students will get a holistic overview of the interdisciplinary nature of Public health
		CO2	They will understand public health issues in India particularly related to Malnutrition, Sanitation issues and related burden of infectious disease, and the role of pollution as a public health concern.
		CO3	The students will also get an understanding of the public policies applicable and implemented in India.
		CO4	They will also be able to appreciate the social aspects that govern many public health issues and implementation of policies.
		CO5	The students will get hands- on training in epidemiology, preparation of questionnaire and collection of primary and secondary data relevant to public health issues.
		CO5	They will also learn to present the relevant data after subjecting it to statistical analysis.

**SEMESTER I: COPO MAPPING**

Papers	(PO)										
	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
DSC1	CO1	✓						✓			
	CO2	✓						✓			
	CO3	✓						✓			

	CO4	✓		✓				✓			
	CO5	✓						✓			
<b>DSC2</b>	CO1	✓						✓			
	CO2	✓						✓			
	CO3	✓				✓	✓	✓			
	CO4	✓						✓			
	CO5	✓				✓	✓	✓		✓	
<b>DSC3</b>	CO1	✓				✓		✓			
	CO2	✓						✓			
	CO3	✓						✓			
	CO4	✓	✓	✓	✓	✓		✓			
<b>GE 1</b>	CO1	✓						✓			
	CO2	✓						✓			
	CO3	✓				✓	✓	✓			
	CO4	✓						✓			
	CO5	✓				✓	✓	✓		✓	

## SEMESTER II

### DSC4:- Enzymes

<b>2492011201</b>	<b>Enzyme (DSC4)</b>	CO1	Students will learn the nature and importance of enzymes in living systems.
		CO2	Students will gain insight into the thermodynamic and molecular basis of catalysis by enzymes and the underlying basis of their specificity.
		CO3	Students will understand the mechanisms of enzyme action, kinetics of enzyme catalyzed reactions and clinical importance of enzyme inhibitors.
		CO4	Students will also learn to appreciate how enzymes are regulated and the physiological importance of enzyme regulation in the cell.
		CO5	The course will introduce students to the applications of enzymes in research and medicine as well as in industry, which will bolster their foray into industrial and biomedical research.

### DSC5:- Metabolism of Carbohydrates

2492011202	<b>Metabolism of Carbohydrates (DSC5)</b>	CO1	Concept of metabolism, characteristics of metabolic pathways and strategies used to study these pathways.
		CO2	Detailed knowledge of various pathways involved in carbohydrate metabolism with the enzyme involved and regulation
		CO3	Diseases caused by defects in metabolism with emphasis on the metabolic control and cure of diseases.
		CO4	Understanding of various metabolic pathways in animals.
<b>DSC6:- Basic Concepts of cell Biology</b>			
2492011203	<b>Basic Concepts of cell Biology (DSC6)</b>	CO1	Insights into the basic structure and function of the cell and cellular organelles
		CO2	Introduction to the concept of model systems, cell division and cell to cell interaction.
		CO3	Understanding of the structural framework of the cell as cytoskeletal structure.
		CO4	Knowledge of various techniques used in cell biology experiments.

<b>SEMESTER II: COPO MAPPING</b>											
<b>Papers</b>	<b>(PO)</b>										
	<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>DSC4</b>	CO1	✓						✓			
	CO2	✓						✓			
	CO3	✓						✓			
	CO4	✓						✓			
	CO5	✓	✓				✓	✓	✓		✓
<b>DSC5</b>	CO1	✓						✓			
	CO2	✓						✓			
	CO3	✓					✓	✓		✓	
	CO4	✓						✓			
<b>DSC6</b>	CO1	✓						✓		✓	
	CO2	✓						✓		✓	
	CO3	✓						✓			

	CO4	✓	✓	✓	✓				✓		
--	-----	---	---	---	---	--	--	--	---	--	--

<b>Semester:- III</b>			
<b>DSC7- Metabolism of Lipids</b>			
<b>2492012301</b>	<b>Metabolism of Lipids (DSC7)</b>	CO1	Explain the concepts of metabolism of lipids, characteristics of metabolic pathways and strategies used to study these pathways.
		CO2	Apply the knowledge of various catabolic and anabolic pathways in lipid metabolism and their regulation.
		CO3	Describe the diseases caused by defects in metabolism with emphasis on metabolic control.
<b>DSC8:- Bioenergetics</b>			
<b>2492012302</b>	<b>Bioenergetics (DSC8)</b>	CO1	Describe the basic tenets of thermodynamics and energy transformations that are taking place in the cell
		CO2	Explain the biological oxidation-reduction reactions and the mechanisms of electron transfer by electron carriers.
		CO3	Appreciate the concept of chemiosmotic theory and the mechanism of oxidative phosphorylation and ATP synthesis.
		CO4	Elaborate the basic mechanisms photophosphorylation in plants and microbes.
<b>DSC9:- Membrane Biology</b>			
<b>2492012303</b>	<b>Membrane Biology (DSC9)</b>	CO1	Explain the general composition and structure of biomembranes.
		CO2	Describe the basic properties of membranes such as membrane fluidity.
		CO3	Elaborate various types of membrane transport mechanisms.

		CO4	Apply the knowledge gained about the molecular mechanism of vesicular transport and membrane fusion to understand the functioning of cells.
<b>DSE1:- Microbiology</b>			
<b>2493012003</b>	<b>Microbiology (DSE1)</b>	CO1	Identify different types of microbes.
		CO2	Perform routine microbiological practices including sterilization, media preparation, maintenance of microbial culture, microbial growth etc.
		CO3	Carry out basic research using microbes.
		CO4	Describe varied applications of microbes.

<b>SEMESTER III: COPO MAPPING</b>											
<b>Papers</b>	<b>(PO)</b>										
	<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>DSC7</b>	CO1	✓				✓		✓			
	CO2	✓				✓		✓			
	CO3	✓				✓		✓		✓	
<b>DSC8</b>	CO1	✓						✓			
	CO2	✓						✓			
	CO3	✓				✓		✓		✓	
	CO4	✓				✓		✓		✓	
<b>DSC9</b>	CO1	✓				✓		✓		✓	
	CO2	✓						✓			
	CO3	✓						✓			
	CO4	✓				✓		✓		✓	
<b>DSE 1</b>	CO1	✓		✓	✓						
	CO2	✓		✓	✓				✓		
	CO3	✓		✓	✓	✓			✓		
	CO4	✓		✓	✓	✓			✓	✓	

**Semester:- IV**

**DSC10:- Metabolism of Amino Acids and Nucleotides**



2492012401	<b>Metabolism of Amino Acids and Nucleotides (DSC10)</b>	CO1	Explain the importance of nitrogen cycle.
		CO2	Explain the degradation and biosynthetic pathways of amino acids and nucleotides in humans.
		CO3	Discuss the importance of amino acids as precursors to a variety of important biomolecules.
		CO4	Examine the role of inhibitors of nucleotide metabolism as chemotherapeutic drugs.
		CO5	Discuss the integration of the amino acid, nucleotide, carbohydrate and lipid metabolism.
<b>DSC11-Hormones: Biochemistry and Function</b>			
2492012402	<b>Hormones: Biochemistry and Function (DSC11)</b>	CO1	Explain the molecular mechanism and signaling pathways mediating Hormone Action.
		CO2	Describe the physiological role of each hormone in regulating growth, appetite, metabolism and reproduction.
		CO3	Examine the regulatory mechanisms regulating Hormone secretion and release.
		CO4	Discuss the basis of endocrine diseases taking case studies.
<b>DSC12-Gene Organization, Replication and Repair</b>			
2492012403	<b>Gene Organization, Replication and Repair (DSC12)</b>	CO1	Analyse the structure of DNA and various forms of DNA and learn about organisation of genome in various life forms, supercoiling of DNA and its significance.
		CO2	Perform isolation of DNA and analyse the purity of isolated DNA sample.
		CO3	Evaluate the molecular basis of processes like DNA replication, recombination and transposition and demonstrate the significance of these processes.
		CO4	Perform various methods of DNA estimation.
		CO5	Discuss the various ways in which the DNA can be damaged leading to

			mutations, lesions and repair mechanisms.
<b>DSE2- Nutritional Biochemistry</b>			
<b>2493012005</b>	<b>Nutritional Biochemistry (DSE2)</b>	CO1	Critically analyse and evaluate concepts in nutritional biochemistry that are important for an understanding of human nutrition.
		CO2	Demonstrate the relationship between nutrition and health.
		CO3	Discuss the macro and micronutrients and their nutritional deficiencies.
		CO4	Describe techniques used in the assessment of nutritional status and nutritional disorders.
		CO5	Explain drug nutrient interactions.

<b>SEMESTER IV: COPO MAPPING</b>											
<b>Papers</b>	<b>(PO)</b>										
	<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>
<b>DSC10</b>	CO1	✓						✓			
	CO2	✓						✓			
	CO3	✓				✓		✓			
	CO4	✓				✓	✓	✓		✓	
	CO5	✓				✓	✓	✓			
<b>DSC11</b>	CO1	✓				✓		✓			
	CO2	✓				✓		✓			
	CO3	✓				✓		✓	✓		
	CO4	✓	✓			✓		✓	✓		
<b>DSC12</b>	CO1	✓						✓			
	CO2	✓	✓	✓	✓			✓			
	CO3	✓				✓		✓			
	CO4	✓	✓	✓	✓	✓		✓	✓		
	CO5	✓				✓		✓			✓
<b>DSE2</b>	CO1	✓						✓			
	CO2	✓				✓		✓			
	CO3	✓						✓			
	CO4	✓	✓	✓	✓		✓	✓			
	CO5	✓					✓	✓		✓	✓