

## **Chhatrapati Shahu Ji Maharaj University**

### **M.Sc. Biochemistry**

#### **M.Sc. Biochemistry Program**

##### **Program Outcomes (POs)**

**PO1: To develop analytical and technical skills:** Students will acquire ability to handle/use appropriate tools/techniques/equipment with an understanding of the standard operating procedures, safety aspects/limitations.

**PO2: Resource Utilisation:** The program will help in learning the resources including library, e-learning resources, ICT and novel tools to enhance knowledge base and stay learn recent developments.

**PO3: Critical thinking and Problem solving:** Identify and critically analyse relevant problems in biochemistry and scientific discipline using appropriate tools and techniques as well as explore and work on approaches to address conclusions/solutions.

**PO4: Domain knowledge:** Demonstrate knowledge of basic concepts, principles and applications of the science-specific discipline.

**PO5: Project Management:** To develop the zeal and ability to work safely and effectively in a laboratory. Acquire knowledge in technical and scientific areas to identify research problems, design experiments, use appropriate methodologies, analyse and infer the data and explore the solutions. The program will also enhance the ability of organizational skills and management of time and resources.

**PO6: Individual and team work:** The program will enhance the skills to effectively accomplish tasks independently and as a team member in multidisciplinary areas of research and development.

**PO7: Effective Communication:** M. Sc. Biochemistry program will educate and develop the ability to write dissertations, reports, make effective presentations and documentation. In addition to that the program will educate and build the ability to effective communication with scientific community as well as society at large.

**PO8: Environment and Society:** To analyse the impact of scientific and technological advances on the environment and society and the need for sustainable development.

**PO9 Life-long learning:** Ability to engage in life-long learning in the context of the rapid developments in the discipline.

**PO10 Ethics:** Program has a very important part to learn and develop professional ethics and responsibility and serve the society.

#### **M.Sc. Biochemistry (Two-Year)**

##### **Programme Specific Outcome**

At the end of the programme, the student will be able to

**PSO1:** Acquire deep scientific knowledge in subjects like cell biology, enzymology, biotechnology, Metabolism, endocrinology, immunology, genetics, genetic engineering and clinical biochemistry.

**PSO2:** Describe the biochemical basis of diseases, regulation of metabolic pathways and gene expression regulation.

**PSO3:** Undertake biochemical / scientific experiments using classical and modern instruments of biochemistry and molecular biology, record and interpret the results, draw the conclusions.

**PSO4:** Learn and develop work collaboratively as a team in classroom and scientific laboratory.

**PSO5:** Communicate biochemical concepts through effective written, dissertation and oral presentation.

### **M.Sc. Biochemistry (Two-Year)**

#### **Course Outcomes**

##### **BCH101: General Biochemistry**

- Understanding fundamental properties of elements, their role in formation of biomolecules and in chemical reactions within living organisms.
- Exposure with the nature of various biomolecules present in living cells.
- To know about the unique property of water as a universal solvent and its importance in biological system
- Understanding of concepts of acids, bases, indicators, pKa values, etc.
- To understand the properties of carbohydrates, proteins, lipids, DNA, RNA, and their importance in biological systems

##### **BCH102: Cell Biology and Membrane biochemistry**

- Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles
- Students will understand how these cellular components are used to generate and utilize energy in cells
- Students will understand the cellular components underlying mitotic cell division.
- Students will apply their knowledge of cell biology to selected examples of changes in cell function.

##### **BCH 103: Biophysical chemistry techniques and application**

- The objective of this course is to familiarize students with the basic concepts and applications of modern techniques used in Biochemistry, Biophysics, Cell and Molecular Biology.
- To learn the application of different techniques and tools in different areas of scientific research.
- The students will be able to understand the principle and working of different chromatography techniques.

- The students will be able to understand the principle and working of different centrifugation techniques.
- The students will be able to understand the principle and working of different Electrophoretic and molecular biology techniques.

#### **BCH 104: General Microbiology**

- To illustrate the characteristic features of microorganisms and the disease they cause.
- To explore mechanism by which microorganisms cause disease.
- To show how the human immune system counteracts infection by specific and non-specific mechanisms.
- To explore the routes of transmission of infection in hospital, communities and populations and the methods used to control the spread of infection.
- To demonstrate the principles of vaccine preparation and the use of vaccine in immunization.
- To show the methods for sterilization of equipments.
- To show the antimicrobial activity of disinfectants.
- To demonstrate the contribution of the microbiologists and the microbiology laboratory to the diagnosis of infection including specimen collection and the role of nurse in carrying this out.
- Enable students to acquire expertise in the field of microbiology.

#### **BCH 201: Bioenergetics and Intermediary Metabolism**

- Explain the role of catabolic and anabolic pathways in cellular metabolism.
- Distinguish between kinetic and potential energy.
- Distinguish between exergonic and endergonic reactions in terms of available energy change.
- Describe the structure of ATP and identify the major class of macromolecules to which ATP belongs.

#### **BCH202: Enzymology**

- To learn about general properties of enzymes like activation energy, active site, etc.; definition of enzyme activity and its various units; classes of enzymes and international nomenclature, the types of enzyme assays; and the various kinds of techniques employed for purification
- To know about the concepts of enzyme kinetics
- To study about Mechanism of enzyme action
- To understand the concept of Enzyme Regulation
- To know about Multienzyme complexes and isozymes

#### **BCH203: Plant Biochemistry**

- The course is designed to know the structure and function of plant cell and role of different organelles.

- Students will be able to learn the general process of photosynthesis in the plants and energy transfer.
- To know the general metabolism in plants such as respiration, lipid biosynthesis and other key process such as nitrogen metabolism
- Students will also gather information on metabolites and hormones, important in the development of plants.

### **BCH204: Biostatistics, computer application and IPR**

- Develop learning and experience on computers, and biostatistics in students for their future personal and professional development.
- Construct knowledge about the various applications of softwares and statistics to the students.
- Solve mathematical and statistical problems with fellow class mates as well as individually.
- To recognize the importance of IP and to educate the people on basic concepts of Intellectual Property Rights.
- To learn the procedure of obtaining Patents, Copyrights, Trade Marks and industrial design
- To enable the students to keep their IP rights alive

### **BCH301: Physiology and Clinical biochemistry**

- Understand and explain the acid-base and water-electrolyte balance in the body.
- Understand the difference between plasma, serum, normal and abnormal constituents in various body fluids. blood clotting mechanism and anticoagulants.
- Explain the nature and function of various enzymes, normal levels and elevated levels in various diseases. Also, learning on various systems of the body.
- Comprehend that blood is a universal fluid for carrying different minerals, nutrients, proteins etc to and from various tissues.
- Learn that many diseases result from imbalance in certain biomolecules and helps in diagnosis of liver, cardiac, gastrointestinal, kidney diseases.
- The course will also aid to learn about kidney diseases like uremia and glomerulonephritis; liver diseases like jaundice, hepatitis, neurological diseases like epilepsy, Parkinson and Alzheimer's disease.

### **BCH302: Molecular Biology**

- The course has been devised to familiarize students with molecular biology which mainly deals with interactions among various systems of the cell, including those between DNA, RNA and proteins and learning how these are regulated.
- To gain an understanding of biochemical and molecular processes that occurs in and between cells.
- To gain insight into the most significant molecular and cell-based methods used today to expand our understanding of biology.
- Will be able to design and implement experimental procedures using relevant techniques.
- To learn and acquire knowledge on tools and techniques related to molecular biology.

### **BCH303: Immunology**

- The students will be able to identify the cellular and molecular basis of immune responsiveness.
- The students will be able to describe the roles of the immune system in both maintaining health and contributing to disease.
- The students will be able to describe immunological response and how it is triggered and regulated.
- The students will be able to transfer knowledge of immunology into clinical decision-making through case studies presented in class.

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### **BCH304: Advanced Biotechnology**

- To understand various techniques of Cell and Tissue Culture, their types and applications,
- To learn about the basic techniques used in recombinant DNA technology (RDT) and to know about vectors and their applications for cloning, recognize the extraordinary power of restriction and other enzymes in molecular cloning and genetic manipulations
- To know about the isolation of genes, their sequencing and synthesis
- To learn about Strategies for transferring genes as well as transgenic animals, and plants.
- To understand about the various applications of biotechnology in various fields of biology specially industrial.

### **BCH401: Environmental Biochemistry**

- Development of understanding on ecology and environmental biology
- Appreciate the inter-relationship between organism in population and communities.
- Understand principles of toxicology and the harmful effects of toxic metals on humans and environment.
- It will also enable the learners to acquire awareness and sensitivity to the total environment and its allied problems.
- The course will acquaint the students with the various environmental hazards like environmental pollution, greenhouse effect and ozone layer depletion.

### **BCH402: Bioinformatics**

- Students will be able to understand the basics of computer
- To understand the alignment between two sequences
- To gain knowledge about the functioning of NCBI and EMBL
- To demonstrate the role of computer in genomics and proteomics

### **BCH403 A: Industrial Biochemistry**

- The course will enhance learning and understanding of the fundamentals of microbiology like important characteristics and biology of bacteria, fungi, mycoplasma, viruses etc.

- This course will help students to acquire basic knowledge of fermentation process and industrial application of microbes for the production various useful products.
- Learn different immobilization techniques and Industrial and clinical scope of enzymes.
- Develop understanding of state-of-the-art technique/instruments used in various reputed research institutions. and industries

### **BCH403 B: Human Genetics**

- The student will learn and understand the genome organization, cytogenetics, genetic control of development.
- The student will learn and understand the principles of Mendelian inheritance, linkage and genetic mapping; extrachromosomal inheritance, sex-linked inheritance and genetic disorders, somatic cell genetics, population genetics.
- The course will aid to learn about physical and chemical mutagens, drug metabolism and detoxification; DNA damage, DNA repair mechanisms, oncogenes, proto-oncogenes, and tumour suppressor genes from humans.
- The student will learn and understand the Human Genome Project, gene therapy, genetic testing, and genetic counseling.

### **BCH403 C: Biochemical Engineering and Fermentation Technology**

- Learn about Genetic engineering and prospects of improving crop productivity, resistance, resistance to disease and environmental stresses, methods for production of transgenic animals.
- Students will learn sterilization of air and medium; sterilization of fermentor, thermal death kinetics of microorganisms.
- The course will develop knowledge on enzyme kinetics with one or two substrates, modulation and regulation of enzyme activity, enzyme reactions in heterogeneous systems, immobilized enzyme technology, and industrial application of enzymes.
- This course will help students to acquire basic knowledge of microbial fermentation kinetics, bioreactors bioprocess system and commercial production of bioproducts.