

BIOTECHNOLOGY

1. *Name of Department:* **Department of Biotechnology**

2. *Title of Programme:* **B.Sc. - Biotechnology**

3. *Programme Outcomes:*

- a) Enable learners to explore diverse careers in Education, Research and Industrial sectors.
- b) Imparting hands-on skills required for enabling learner transition into professional scientist.
- c) Demonstrate proficiency in basic laboratory skills common to clinical and non-clinical research laboratories, including aseptic technique, making accurate and precise measurements using balances and macro- and micro-pipetting, using a microscope, preparing solutions, operating current instrumentation, preparing samples for various analyses, and maintaining a proper scientific laboratory notebook.

4. *Programme Specific Outcomes:*

- Demonstrate knowledge for in-depth analytical and critical thinking to identify, formulate and solve the issues related to Biotechnology Industry, Pharma Industry, Medical or hospital related organizations, Regulatory Agencies, & Academia
- Develop an ability to solve, analyse and interpret data generated from experiments done in project work or practical courses
- Appreciate and execute their professional roles in society as biotechnology professionals, employers and employees in various industries, regulators, researchers, educators and managers.

5. Course Outcomes:

Title of the course	Course credit	Course outcome
Basic Chemistry I	2	1. To acquaint the students with basic concepts of Chemistry like Classification and Nomenclature of Chemical compounds and to impart hands-on skills in preparation of Buffers and Solutions.
Basic Chemistry II	2	1. To acquaint students with Concepts of Stereochemistry and to impart knowledge of Titrimetric and Volumetric Estimations and handling of basic Analytical Techniques like Chromatography and Colorimetry
Basic Life Sciences-I : Biodiversity and Cell Biology	2	1. To acquaint students with concept of Biodiversity and Cell Biology and to impart skill in handling and culture of Microorganisms
Basic Life Sciences-II : Microbial Techniques	2	1. To acquaint students with basic techniques in Staining and Sterilization and to impart the knowledge of growth of microorganisms
Basic Biotechnology-I : Introduction to Biotechnology	2	1. To acquaint students with various fields of Biotechnology and their applications and to impart the knowledge of Food Technology and Fermentation Techniques
Basic Biotechnology-II : Molecular Biology	2	1. To acquaint students with DNA Replication, Repair and Genetic Engineering and to Impart the knowledge of molecular Biology Techniques
Societal Awareness	2	1. To acquaint the students with concepts of Societal Awareness and to impart knowledge of Society and make students aware about the Problems in Society
Chemistry-I : Bioorganic Chemistry	2	1. To acquaint students with Bioorganic Molecules and to impart the knowledge of Classification, Structure and Characterization of Biomolecules
Chemistry-II : Physical Chemistry	2	1. To acquaint students with concepts in Thermodynamics, Kinetics and Redox Reactions and to impart skills in Kinetics and Chemical Reactions

Life Sciences-I : Physiology and Ecology	2	1. To acquaint students with Physiological Processes in Plants and Animals and to impart the knowledge of Physiology and Ecology
Life Sciences-II : Genetics	2	1. To acquaint students with concepts in Genetics and to impart skills in Techniques in Genetic Analysis and Population Genetics
Biotechnology-I : Tissue Culture & Scientific Writing and Communication Skills	2	1. To acquaint students with Techniques of Plant and Animal Tissue Culture and to impart the skills of PTC, ATC and Science Communication
Biotechnology-II : Enzymology, Immunology and Biostatistics	2	1. To acquaint students with concepts in Enzymology, Immunology and Biostatistics and impart the skills in Enzyme Kinetics, Immunological Techniques and Biostatistics
Globalization, Ecology and Sustainable Development	2	1. To acquaint the students with concepts of Globalization, Ecology and Environment and to impart knowledge of Globalization make students aware about the Problems in Society
Biophysics	2	1. Develop an understanding of the different aspects of classical Physics. Be able to relate principles of Physics to applications and techniques in the field of Biology such as Microscopy, Spectroscopy and Electrophoresis.
Applied Chemistry -I	2	1. Develop an understanding of the different aspects of Organic and Green Chemistry. 2. Discuss role of Organic Compound sin Biology and Synthesis of Organic Compounds. 3. Discuss role of Green Chemistry and its application in Industry.
Immunology	2	1. Understand the role of different types of Cells, Effector Molecules and Effector Mechanisms in Immunology. 2. Understand the principles underlying various Immuno techniques.
Cell Biology and Cytogenetics	2	1. Develop an understanding of the Cytoskeleton and Cell Membrane. 2. Discuss the structure of Chromosomes and types of Chromosomal Aberrations. 3. Discuss the principles underlying Sex Determination, Linkage and Mapping.

Molecular Biology	2	<ol style="list-style-type: none"> 1. Discuss the mechanisms associated with Gene Expression at the level of Transcription and Translation. 2. Discuss the mechanisms associated with Regulation of Gene Expression in Prokaryotes and Eukaryotes
Bioprocess Technology	2	<ol style="list-style-type: none"> 1. Develop an understanding of the various aspects of Bioprocess Technology. Develop skills associated with screening of Industrially Important Strains. Understand principles underlying design of Fermentor and Fermentation Process.
Research Methodology	2	<ol style="list-style-type: none"> 1. Understand basic principles of Research Methodology and identify a Research Problem. 2. Understand a general definition of Research Design. Identify the overall Process of Designing a Research Study from its inception to its Report.
Biochemistry	2	<ol style="list-style-type: none"> 1. Discuss the Metabolic Pathways of Carbohydrates, Amino Acids, Lipids and Nucleotides. 2. Explain the Role of Energy Rich Molecules in Metabolism.
Applied Chemistry –II	2	<ol style="list-style-type: none"> 1. Develop an understanding of the different aspects of Analytical Chemistry. 2. Gain knowledge of Natural Product Chemistry and related acquired skills. Gain an understanding of basic concepts in Polymer Chemistry and Nanomaterials.
Medical Microbiology	2	<ol style="list-style-type: none"> 1. List the factors playing a role in causing a disease. 2. Discuss the various aspects of Systemic Infections including Causative Agents, Symptoms and Prophylaxis. 3. Gain the technical capability of handling, isolating and identifying various Bacteria.
Environmental Biotechnology	2	<ol style="list-style-type: none"> 1. Gain an understanding of the causes, types and control methods for Environmental Pollution. 2. Application of different life forms in Environmental Remediation.

Bioinformatics and Biostatistics	2	<ol style="list-style-type: none"> 1. Gain an understanding of the basic concepts of Bioinformatics and Biostatistics. 2. Understand the tools used in Bioinformatics. 3. Apply the various Statistical Tools for Analysis of Biological Data.
Molecular Diagnostics	2	<ol style="list-style-type: none"> 1. Gain an understanding of the basic Principles used in Molecular Diagnosis. 2. Gain critical thinking and analytical skills to understand new Diagnostic Methods. 3. Apply the knowledge and skills gained in the course should be useful in developing new Diagnostic Kits.
Entrepreneurships Development	2	<ol style="list-style-type: none"> 1. Develop an understanding of the systematic process and to select and screen a Business Idea. 2. Design strategies for successful implementation of ideas. 3. Write a Business Plan.
Cell Biology	2.5	<ol style="list-style-type: none"> 1. Gain knowledge about the cell multiplication and death at molecular level. 2. Understand the molecules involved in cell signalling. 3. Gain an understanding of the basic concepts of events during fertilization and early embryonic development. 4. Gain insight into the biology of cancer cells.
Medical Microbiology and Instrumentation	2.5	<ol style="list-style-type: none"> 1. By the end of the course the student will be able to: 2. Learn the different type of virus cultivation 3. Understand the development and mode of action of antimicrobial, antifungal and antiviral drugs. 4. Get an insight into the various spectroscopic methods used in biological studies. 5. Understand the principle and applications of chromatographic and tracer techniques.

Genomics and Molecular Biology	2.5	<ol style="list-style-type: none"> 1. By the end of the course the student will be able to: 2. Use molecular biology tools and techniques in the field of biotechnology. 3. Gain knowledge regarding recent developments in genome sequencing and editing. 4. Understand the basis of gene cloning and development of transgenic animals and plants.
Marine Biotechnology	2.5	<ol style="list-style-type: none"> 1. By the end of the course the student will be able to: 2. Gain insight in the field of marine biotechnology.
Biochemistry	2.5	<ol style="list-style-type: none"> 1. By the end of the course the student will be able to: 2. Understand the biosynthetic pathways and regulation of biomolecules like carbohydrates and lipids. 3. Learn the various functioning of endocrine gland secretions with their associated disorders. 4. Understand the functioning of vitamins and minerals in the body and gain an insight in the concept of nutrition.
Industrial Microbiology	2.5	<ol style="list-style-type: none"> 1. By the end of the course the student will be able to: 2. Gain insight in the various processes involved in production of commercially available dairy products. 3. Have an in depth understanding of downstream processes. 4. Understand and gain insight in the various processes involved in production of commercial products. 5. Understand the importance of GMP and its relevance in bioprocesses.
Basic pharmacology and Neuro chemistry	2.5	<ol style="list-style-type: none"> 1. By the end of the course the student will be able to: 2. Understand the mechanisms of drug delivery and action in the body. 3. Get an understanding in the concepts of bioavailability and distribution. 4. In depth knowledge on toxic substances and poisons 5. Understand the biochemistry of nerve impulses and brain functioning.

Environmental Biotechnology	2.5	<ol style="list-style-type: none">1. By the end of the course the student will be able to:2. Get an insight on the different traditional and new sources of renewable energy.3. Understand the principles and practices involved in treatment of industrial effluent4. Gain an insight in the management and treatment of wastewater.5. Understand the disposal of waste from different industries.
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