



**MANDSAUR  
UNIVERSITY**  
MAKING FUTURE READY!

**Faculty of Life Sciences  
Mandsaur University, Mandsaur**

**B.Sc. (Hons.) Biotechnology**

**MANDSAUR UNIVERSITY**

**FACULTY OF LIFE SCIENCES**

**B.Sc. (Hons.) Biotechnology**

**PEOs, POs, PSOs, COs**



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**About Faculty of Life Sciences:**

The Faculty of Life Sciences (FLS) was established in the year 2016. It offers B.Sc. (Hons.) Biotechnology & Microbiology and M. Sc. Biotechnology & Microbiology courses. The intakes for bachelor programs are 30; while in postgraduate programs are 18. It offers top-class infrastructure, highly qualified and dedicated faculty members, and an excellent environment for academic and intellectual growth. FLS has international and national MoUs with various institutes and industries. The faculty has developed a modest academic infrastructure comprising of smart classrooms and Hi-tech laboratories with advanced instrumentation facilities to teach and conduct research in multifarious areas such as Molecular Diagnostics, Molecular Biology & Genetic Engineering, Microbiology, Biochemistry, Chemistry, Bioinformatics, Immunology, Food Science & Technology, Bioinstrumentation, Bioprocess technology and Biosafety. FLS endeavours not only to produce excellent academic results but also to produce entrepreneur and skilled professionals. The faculty has organized many workshops, seminars, staff/faculty/entrepreneur development programmes, adjunct and guest lectures sponsored by the industries related to Biotechnology. The faculty of life sciences is considered as a research hub by the Mandsaur University for guiding research scholar leading to Ph.D.

**Programme Details:**

<b>Programme Name</b>	<b>Duration</b>
B. Sc. (Hons.) Biotechnology	3 Years (Six Semesters)

**Programme Structure:**

<b>Years</b>	<b>Odd Semester</b>	<b>Even Semester</b>
First Year	Semester I	Semester II
Second Year	Semester III	Semester IV
First Year	Semester V	Semester VI



**B.Sc. (Hons.) Biotechnology**

**PEOs, POs, PSOs, COs:**

<b>Program Educational Objectives (PEOs)</b>	
The B.Sc. (Hons.) Biotechnology program describe accomplishments that graduates are expected to attain the following:	
<b>PEO1</b>	Have massive prospects to become a successful researcher in the field of Life Sciences.
<b>PEO2</b>	Attain skills to compete in diverse Government administrative and technical examinations viz., MPPSC, UPSC and SSC etc.,
<b>PEO3</b>	Become responsive to the society and country at large, intellectually as well as morally.
<b>PEO4</b>	Turn into budding industrialists and entrepreneur.
<b>PEO5</b>	Graduates will imbibe skills to face the international exposure and challenges through recent teaching learning methodologies.

<b>Program Outcomes (POs)</b>	
On successful completion of the B.Sc. (Hons.) Biotechnology program, the students are expected to attain the following:	
<b>PO1</b>	The learners should be able to exhibit expertise in basic science and elemental biotechnological devices
<b>PO2</b>	The graduates will be able to comprehend the effective standards of highly developed biological sciences
<b>PO3</b>	The graduates will obtain industrial exposure required in diverse fields like pharma, food and agricultural productions.
<b>PO4</b>	The learners will get inspired in the direction of intense learning, academics and research in the field of life sciences
<b>PO5</b>	The graduates will be conscious about health and environment responsiveness and will become socially responsible.



**B.Sc. (Hons.) Biotechnology**

<b>Program Specific Outcomes (PSOs)</b>	
After the successful completion of B.Sc. (Hons.) Biotechnology program, the students are expected to attain the following:	
<b>PSO1</b>	Graduates will attain analytical skills needed to resolve societal problems and technical issues.
<b>PSO2</b>	Graduates will acquire interest in intensive lifelong learning.
<b>PSO3</b>	Graduates will demonstrate an capability to propose and carry out experiments
<b>PSO4</b>	Graduates will be supplemented with skill based realistic knowledge which will support them to become self-sufficient.
<b>PSO5</b>	Graduates will achieve vital understanding on the composition, function and handling of living organisms and thereby highlight its benefit in academia and industry alike.



**B.Sc. (Hons.) Biotechnology**

**SEMESTER-I**

<b>BIT010</b>	<b>Cell Biology &amp; Biochemistry</b>	<b>Theory</b>	<b>Credit 4(3+1)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Be able to understand the Function and properties of Monosaccharides, Disaccharides and Polysaccharides.		
<b>CO2</b>	Be able to develop structure and properties of Amino acids.		
<b>CO3</b>	Be able to understand classification, nomenclature and properties of fatty acids, essential fatty acids. Phospholipids, sphingolipids, glycolipids, cerebrosides, gangliosides, Prostaglandins, Cholesterol		
<b>CO4</b>	Be able to understand nomenclature and classification of Enzymes.		
<b>CO5</b>	Be able to discuss the important reactions, energetics and regulation of glycolysis		

<b>BIT020</b>	<b>Microbial Tools &amp; Techniques</b>	<b>Theory</b>	<b>Credit 4(3+1)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Be able to understand the various aspects of organisms by cell structure, cytosol, compartmentalization of eukaryotic cells, cell fractionation. Cell Membrane and Permeability.		
<b>CO2</b>	Be able to develop skills associated with fluid Mosaic Model, membrane as a dynamic entity, cell recognition and membrane transport Membrane Vacuolar system, Cytoskeleton and cell motility.		
<b>CO3</b>	Be able to understand principles underlying structure, biogenesis and functions including role in protein secretion,		
<b>CO4</b>	Be able to understand the structure and function of Chloroplasts, Nucleus, Nuclear envelope, nuclear pore complex, nuclear lamina, chromosomes.		
<b>CO5</b>	Be able to discuss the important aspects of molecules that mediate cell adhesion, membrane receptors for extra cellular matrix, macromolecules, regulation of receptor expression.		



**B.Sc. (Hons.) Biotechnology**

<b>BIT032</b>	<b>Biotechnology &amp; Human Welfare</b>	<b>Theory</b>	<b>Credit 4(3+1)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Be able to understand the various aspects of interaction between plants and microbes.		
<b>CO2</b>	Be able to know about chlorinated and non-chlorinated organ pollutant degradation.		
<b>CO3</b>	Be able to understand about industry important process including enzyme and polysaccharide synthesis.		
<b>CO4</b>	Be able to understand about application and process of DNA finger printing.		
<b>CO5</b>	Be able to discuss the important aspects in development of non-toxic therapeutic agents, recombinant live vaccines, gene therapy, diagnostics		

**SEMESTER-II**

<b>BIT040</b>	<b>Mammalian Physiology</b>	<b>Theory</b>	<b>Credit 4(3+1)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Be able to understand the various aspects of mechanism of digestion & absorption of carbohydrates, Proteins, Lipids and nucleic acids.		
<b>CO2</b>	Be able to know about mechanism of working of heart.		
<b>CO3</b>	Be able to understand about structure of cardiac, smooth & skeletal muscle and their physical, chemical & electrical events of mechanism of muscle contraction.		
<b>CO4</b>	Be able to understand the mechanism of generation & propagation of nerve impulse.		
<b>CO5</b>	Be able to discuss the important aspects of Hypothalamus, pituitary, pineal, thymus, thyroid, parathyroid and adrenals, hypo & hyper-secretions		



**B.Sc. (Hons.) Biotechnology**

<b>BIT050</b>	<b>Plant Physiology</b>	<b>Theory</b>	<b>Credit 4(3+1)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Be able to understand the various aspects of plant anatomy.		
<b>CO2</b>	Be able to know about various transport processes including diffusion, osmosis, plasmolysis, imbibition, guttation, and transpiration.		
<b>CO3</b>	Be able to understand about mechanism of uptake of nutrients, mechanism of food transport.		
<b>CO4</b>	Be able to understand importance of photophosphorylation, Calvin cycle, CAM plants, photorespiration.		
<b>CO5</b>	Be able to discuss the important aspects of physiological role and mode of action of auxins, gibberellins, cytokinins, abscisic acid, and ethylene.		

<b>BIT152</b>	<b>Environmental Studies</b>	<b>Theory</b>	<b>Credit 4(3+1)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Be able to understand the various aspects of biotic and abiotic component of Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).		
<b>CO2</b>	Be able to know various aspects of renewable and nonrenewable energy sources.		
<b>CO3</b>	Be able to understand principles underlying levels of biological diversity.		
<b>CO4</b>	Be able to understand about causes, effects and controls of Air, water, soil and noise pollution.		
<b>CO5</b>	Be able to discuss the important aspects of Role of Indian and other religions and cultures in environmental conservation.		



**B.Sc. (Hons.) Biotechnology**

<b>BIT062</b>	<b>Developmental Biology</b>	<b>Theory</b>	<b>Credit 4(3+1)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	To understand the basic concepts and theories related to developmental biology		
<b>CO2</b>	To understand reproductive organs, gametogenesis, fertilization and illustrate cleavage, blastulation and gastrulation		
<b>CO3</b>	To differentiate the embryology of chick, frog and humans and understand the concept of cell differentiation and gene action in development		
<b>CO4</b>	State the techniques on experimental embryology, prenatal diagnostic procedures and different types of placentation in mammals.		
<b>CO5</b>	Describe the organization and structure of the endocrine systems and their relation to other organ systems		





**B.Sc. (Hons.) Biotechnology**

**SEMESTER-III**

<b>BIT180</b>	<b>Genetics</b>	<b>Theory</b>	<b>Credit 3(3+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Students will study the detailed structure of nucleic acids.		
<b>CO2</b>	Students will learn in detail the molecular processes such as replication, transcription and translation. Describe the importance of genetic code and wobble hypothesis.		
<b>CO3</b>	Students will learn Mutagenesis, Mutation and mutants and their significance in microbial evolution.		
<b>CO4</b>	Students will learn Application of bacterial and eukaryotic plasmids in research. Handle and independently work on lab protocols involving molecular techniques.		
<b>CO5</b>	Students will learn the molecular mechanisms underlying mutations, detection of mutations and DNA damage and repair mechanisms.		
<b>CO6</b>	Students will learn the concept of recombination, linkage mapping and elucidate the gene transfer mechanisms in prokaryotes and eukaryotes.		

<b>BIT190</b>	<b>General Microbiology</b>	<b>Theory</b>	<b>Credit 3(3+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Be able to understand the various aspects of morphology and cell structure of microorganisms: Bacteria, Algae, Fungi, Protozoa and Unique features of viruses.		
<b>CO2</b>	Be able to develop skills associated with screening, cultivation and maintenance of microorganisms.		
<b>CO3</b>	Be able to understand principles underlying factors affecting growth of bacteria.		
<b>CO4</b>	Be able to understand the Transformation, Transduction and Conjugation.		
<b>CO5</b>	Be able to discuss the important aspects of Molds, Yeasts, bacteria. Major food borne infections and intoxications.		



**B.Sc. (Hons.) Biotechnology**

<b>BIT200</b>	<b>Chemistry I</b>	<b>Theory</b>	<b>Credit 4(4+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	The student will be able to understand rules for filling electrons in orbital's & electronic configuration of atoms.		
<b>CO2</b>	The student will understand methods of preparation and properties of aliphatic and aromatic compounds.		
<b>CO3</b>	The student will understand about various covalent and non-covalent interaction found in molecules.		
<b>CO4</b>	The student will understand the various physical properties of s p, d, f block elements.		
<b>CO5</b>	The student will learn the various physical properties of noble gases.		

<b>BIT212</b>	<b>Industrial Fermentation</b>	<b>Theory</b>	<b>Credit 4(4+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Be able to understand the various aspects of bioprocess technology including Upstream and downstream processing.		
<b>CO2</b>	Be able to develop skills associated with screening and production of industrial chemicals, biochemicals and chemotherapeutic products.		
<b>CO3</b>	Be able to understand principles underlying metabolic engineering of secondary metabolism for highest productivity.		
<b>CO4</b>	Be able to understand fermentation process and downstream processing including enzyme and cell immobilization techniques in industrial processing.		
<b>CO5</b>	Be able to discuss the important aspects in bioprocess technology including mathematical derivation of growth kinetics		



**B.Sc. (Hons.) Biotechnology**

<b>BIT061</b>	<b>Entrepreneurship Development</b>	<b>Theory</b>	<b>Credit 2(2+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Be able to understand the various aspects of meaning, needs and importance of entrepreneurship.		
<b>CO2</b>	Be able to develop skills associated with screening of industrially important strains.		
<b>CO3</b>	Be able to understand principles underlying the project identification, selection of the product, project formulation, assessment of project feasibility.		
<b>CO4</b>	Be able to understand various aspects related to finance / loans and repayments, characteristics of business finance, fixed capital management: sources of fixed capital, working capital its sources.		
<b>CO5</b>	Be able to discuss the important aspects of marketing research and importance of survey.		



**B.Sc. (Hons.) Biotechnology**

**SEMESTER-IV**

<b>BIT220</b>	<b>Molecular Biology</b>	<b>Theory</b>	<b>Credit 3(3+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	CO1: Have a conceptual knowledge about DNA as a genetic material.		
<b>CO2</b>	CO2: The students will be able to understand DNA replication and recombination at molecular level.		
<b>CO3</b>	CO3: Will be able to discuss the molecular mechanisms underlying mutations, detection of mutations and DNA damage and repair mechanisms		
<b>CO4</b>	CO4: Understand the molecular mechanisms involved in transcription and translation.		
<b>CO5</b>	CO5: Describe the importance of genetic code and wobble hypothesis.		
<b>CO6</b>	CO6: Will understand the significance of central dogma of gene action.		

<b>BIT230</b>	<b>Immunology</b>	<b>Theory</b>	<b>Credit 3(3+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Be able to understand the various aspects of physical and chemical structure of DNA; Types of DNA: A, B and Z; RNA structure and functions; Classes of RNA: mRNA, rRNA, tRNA and hnRNA.		
<b>CO2</b>	Be able to know various phase of DNA replication.		
<b>CO3</b>	Be able to understand principles underlying types and mechanism of DNA repair		
<b>CO4</b>	Be able to understand fermentation process and downstream processing.		
<b>CO5</b>	Be able to discuss the important aspects of transcription.		



**B.Sc. (Hons.) Biotechnology**

<b>BIT240</b>	<b>Chemistry II</b>	<b>Theory</b>	<b>Credit 4(4+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Be able to understand the various types of types of isomerism.		
<b>CO2</b>	Be able to know various concepts of Valence Bond theory, Hybridization, VSEPR theory and MOT.		
<b>CO3</b>	Be able to understand various properties including oxidation state, magnetic property of transition element.		
<b>CO4</b>	Be able to understand about types of thermodynamic processes, & their applications in daily life.		
<b>CO5</b>	Be able to discuss the important aspects of spectroscopy.		

<b>BIT213</b>	<b>Basics of Forensic science</b>	<b>Theory</b>	<b>Credit 4(4+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Demonstrate competency in the collection, processing, analyses, and evaluation of evidence.		
<b>CO2</b>	Demonstrate competency in the principles of crime scene investigation, including the recognition, collection, identification, preservation, and documentation of physical evidence.		
<b>CO3</b>	Demonstrate an understanding of the scientific method and the use of problem-solving within the field of forensic science.		
<b>CO4</b>	Identify the role of the forensic scientist and physical evidence within the criminal justice system.		
<b>CO5</b>	Demonstrate the ability to document and orally describe crime scenes, physical evidence, and scientific processes.		
<b>CO6</b>	Identify and examine current and emerging concepts and practices within the forensic science field.		



**B.Sc. (Hons.) Biotechnology**

<b>BIT031</b>	<b>Bioethics &amp; Biosafety</b>	<b>Theory</b>	<b>Credit 2(2+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	To understand the fundamentals of bioethics and ethical issues related to molecular technologies.		
<b>CO2</b>	To have the concept on the ethical issues concerned with clinical trials, medical errors, negligence etc.		
<b>CO3</b>	To understand the safety issues and ethical use of animals in the laboratory.		
<b>CO4</b>	To get an insight into the good laboratory practices in different biological laboratories.		
<b>CO5</b>	To get an insight in to the guidelines and precautions on using radioisotopes in laboratory practices.		



**B.Sc. (Hons.) Biotechnology**

**SEMESTER-V**

<b>BIT250</b>	<b>Bioprocess Technology</b>	<b>Theory</b>	<b>Credit 4(4+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Be able to understand the various aspects of bioprocess technology.		
<b>CO2</b>	Be able to develop skills associated with screening of industrially important strains.		
<b>CO3</b>	Be able to understand principles underlying design of Fermentor,		
<b>CO4</b>	Be able to understand fermentation process and downstream processing.		
<b>CO5</b>	Be able to discuss the important aspects in bioprocess technology for commercialization purpose of biotechnology products		

<b>BIT260</b>	<b>Recombinant DNA Technology</b>	<b>Theory</b>	<b>Credit 4(4+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Students will study Restriction enzymes- nomenclature, types, and applications. Students will learn application of DNA Modifying enzymes- alkaline phosphatase, polynucleotide kinase and terminal deoxynucleotidyl transferase.		
<b>CO2</b>	Students will study the process of gene cloning and expression. Students will study How to construct Gene libraries and Gene delivery.		
<b>CO3</b>	Students will learn types of gene delivery & Transcription. Perform PCR amplification of DNA sample. Describe blue/white screening and antibiotic selection methods of cloning.		
<b>CO4</b>	Students will study the process of various hybridization techniques. Describe the principle of gene silencing, gene knockouts and gene therapy. Review various applications of genetic engineering		
<b>CO5</b>	Students will able to Isolate DNA from cell and Perform agarose gel electrophoresis. Explain the process of constructing genomic and c-DNA library, Differentiate various DNA sequencing methods		



**B.Sc. (Hons.) Biotechnology**

<b>BIT271</b>	<b>Bioinformatics</b>	<b>Theory</b>	<b>Credit 3(3+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	To understand the contents and properties of bioinformatics databases; perform text- and sequence-based searches, and analyze and discuss the results in light of molecular biological knowledge.		
<b>CO2</b>	To learn about the major steps in pair wise and multiple sequence alignment, and execute pair wise sequence alignment by dynamic programming.		
<b>CO3</b>	To learn the techniques of predicting the secondary and tertiary structures of protein sequences.		
<b>CO4</b>	To become familiar with the use of a wide variety of internet applications, biological database that can be applied in solving research problems.		
<b>CO5</b>	To understand the theoretical and practical development of useful tools for automation of complex computer jobs, and making these tools accessible on the network from a Web browser.		

<b>BIT272</b>	<b>Environmental Biotechnology</b>	<b>Theory</b>	<b>Credit 3(3+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	To get an insight in to the multidisciplinary nature of environmental studies and its importance in other branches of sciences mainly to create public awareness regarding environment.		
<b>CO2</b>	To have an idea about the concept of biodiversity at global, national and local levels; threats to biodiversity and conservation strategies.		
<b>CO3</b>	To get an insight in to the burning issue of environmental pollution describing the concept of pollutants, cause, effects and control measures of air, water, soil, noise, thermal and nuclear pollution.		
<b>CO4</b>	To gain knowledge on Bio-fertilizers, role of symbiotic and asymbiotic nitrogen fixing bacteria in the enrichment of soil, Nitrogen fixation, Nitrogenase complex, Plant Growth Promoting bacteria.		
<b>CO5</b>	To understand the Bioleaching and to understand the significance of genetically modified microbes, plants and animals.		





**B.Sc. (Hons.) Biotechnology**

<b>BIT281</b>	<b>Animal Biotechnology</b>	<b>Theory</b>	<b>Credit 3(3+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Students will learn different methods of gene transfer and their applications in improvement in livestock.		
<b>CO2</b>	To get an insight into transgenesis and applications of transgenic animals for the manufacturing of products that have huge industrial significance.		
<b>CO3</b>	To provide fundamental knowledge about animal diseases and the role of biotechnology to cure the diseases.		
<b>CO4</b>	To familiarize with the techniques of animal cell culture, artificial insemination, embryo transfer techniques and stem cell technology used for quality improvements and production of genetically modified organisms (GMO).		
<b>CO5</b>	To provide fundamental insight into the concept of gene therapy, different vectors in gene therapy, and important aspects of molecular engineering and human genetic engineering.		
<b>CO6</b>	To provide the knowledge of ethics and safety issues related to animal cell culture.		

<b>BIT282</b>	<b>Plant Diversity</b>	<b>Theory</b>	<b>Credit 3(3+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Be able to understand about the characteristics, classification and economic importance of algae		
<b>CO2</b>	Be able to understand about the characteristics, classification and economic importance of Fungi		
<b>CO3</b>	Be able to understand about the characteristics, classification and economic importance of Bryophytes & Pteridophytes		
<b>CO4</b>	Be able to understand about the characteristics, classification and economic importance of Gymnosperms		
<b>CO5</b>	Be able to know about various plant diseases, their symptoms and control.		



**B.Sc. (Hons.) Biotechnology**

<b>BIT283</b>	<b>Biostatistics</b>	<b>Theory</b>	<b>Credit 3(3+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Have a conceptual knowledge about principal concepts about biostatistics and its Relationship with the other sciences.		
<b>CO2</b>	The students will be able to understand about how to collect data relating to variables which will be examined and calculate descriptive statistics from these data.		
<b>CO3</b>	Will be able to define the principal concepts of probability and interpret data via normal distribution.		
<b>CO4</b>	Understand to identify convenient sample by Correlation and regression.		
<b>CO5</b>	Will understand about how to arrange the results of the hypothesis testing and make a statistical decision.		



**B.Sc. (Hons.) Biotechnology**

**SEMESTER-VI**

<b>BIT300 Bio</b>	<b>Analytical Tools</b>	<b>Theory</b>	<b>Credit 3(3+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Handling and use of microscopes for the study of microorganisms, which are among the basic skills expected from a practicing microbiologist. They also get introduced a variety of modifications in the microscopes for specialized viewing.		
<b>CO2</b>	To understand the basic concept of qualitative and quantitative analysis of a given sample using the principle of spectrophotometry.		
<b>CO3</b>	To understand the importance, principle, and types of chromatography techniques and their role in the study of the biological system.		
<b>CO4</b>	To develop the concept on principle and types of electrophoretic techniques and their role in the study of the biological system. It also helps in learning the method of separating of DNA bands by agarose gel electrophoresis on the basis of their molecular weight.		
<b>CO5</b>	To familiarize with the important analytical instruments which are extensively used in the Industrial and R & D sectors		

<b>BIT310</b>	<b>Genomics &amp; Proteomics</b>	<b>Theory</b>	<b>Credit 3(3+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	To have the basic concept of Genomics and proteomics.		
<b>CO2</b>	To learn different DNA sequencing methods used in sequencing of genome like manual & automated: Maxam & Gilbert and Sangers method.		
<b>CO3</b>	To understand the process of Managing and Distributing Genome Data such as Web based servers and softwares for genome analysis: ENSEMBL, VISTA, UCSC Genome Browser, NCBI genome.		
<b>CO4</b>	To develop the knowledge of protein structure, function and different methods of analyzing proteins using molecular tools and techniques.		
<b>CO5</b>	To get the basics of analytical Proteomics and its application.		



**B.Sc. (Hons.) Biotechnology**

<b>BIT321</b>	<b>Industrial Chemistry</b>	<b>Theory</b>	<b>Credit 4(4+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	The knowledge acquired knowledge of design and development of drugs.		
<b>CO2</b>	The student able to understand industrial uses of catalysis reactions.		
<b>CO3</b>	Students will be able to understand various types of distillation processes.		
<b>CO4</b>	Students are able to identify and understand about adulterants in common food items.		
<b>CO5</b>	Students able to understand about green chemistry and designing a Green Synthesis using principles of green chemistry.		

<b>BIT322</b>	<b>Ecology &amp; Environmental Management</b>	<b>Theory</b>	<b>Credit 4(4+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	To understand the environment around us and the organisms living in normal and extreme conditions of the environment and to understand the principle of ecosystem.		
<b>CO2</b>	To gain knowledge on the energy transfer in an ecosystem, food chain, food web and to gain knowledge on different geochemical cycles.		
<b>CO3</b>	To get an insight into the evolutionary processes in ecology and their significance.		
<b>CO4</b>	To get an insight in to the burning issue of environmental pollution describing the concept of pollutants, cause, effects and control measures of air, water, soil, noise, thermal and nuclear pollution.		
<b>CO5</b>	To understand the role of biotechnologies in protection and preservation of environment.		



**B.Sc. (Hons.) Biotechnology**

<b>BIT331</b>	<b>Animal Diversity</b>	<b>Theory</b>	<b>Credit 4(4+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	To explain the classification of non-chordates and various characteristic features of phylum protozoa and Porifera.		
<b>CO2</b>	To describe the taxonomic classification, general features, and life functions of Coelenterate, Platyhelminthes & Aschelminths		
<b>CO3</b>	To explain the taxonomic classification of Annelida, Arthropoda & Mollusca and their general features it also gets insight into metamorphosis in insects and their structural diversity.		
<b>CO4</b>	To explain classification and general characters of Echinodermata, Hemichordates & Proto-chordates.		
<b>CO5</b>	To explain the classification of phylum Pisces, Amphibia, Reptilia, Aves & Mammalia Classification including their Origin, adaptation and migration.		

<b>BIT331</b>	<b>Animal Diversity</b>	<b>Theory</b>	<b>Credit 4(4+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Be able to understand the various aspects of gene transfer methods in animals including microinjection, embryonic stem cell, gene transfer, retrovirus & gene transfer.		
<b>CO2</b>	Be able to know about characteristics and applications of transgenic Animals e.g. Mice, Cow, Pig, Sheep, Goat, Bird, Insect.		
<b>CO3</b>	Be able to understand various animal diseases including foot-and mouth disease, Coccidiosis, Trypanosomiasis, Theileriosis. Role of Biotechnology to cure the diseases		
<b>CO4</b>	Be able to understand various concepts of animal propagation including artificial insemination, animal clones.		
<b>CO5</b>	Be able to discuss the important aspects of genetic modification in medicine - gene therapy, types of gene therapy, vectors in gene therapy, molecular engineering.		



**B.Sc. (Hons.) Biotechnology**

<b>BIT332</b>	<b>Plant Biotechnology</b>	<b>Theory</b>	<b>Credit 4(4+0)</b>
<b>After successful completion, this course enables students:</b>			
<b>CO1</b>	Be able to understand the concept of plant tissue culture and applications of different plant tissue culture techniques for the plant regeneration		
<b>CO2</b>	Be able to explain the concept and steps of micropropagation technique and its importance in plant tissue culture		
<b>CO3</b>	Be able to understand the methodology of in vitro haploid plant productions and its importance		
<b>CO4</b>	Be able to explain the procedure of hybrid plant production through protoplast fusion and its importance		
<b>CO5</b>	Be able to know about the applications of genetic engineering for crop improvements		