



**MANDSAUR  
UNIVERSITY**  
MAKING FUTURE READY!

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

**B.Sc. (Hons.) Microbiology**

**MANDSAUR UNIVERSITY**

**FACULTY OF LIFE SCIENCES**

**B.Sc. (Hons.) Microbiology**

**PEOs, POs, PSOs, COs**



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**B.Sc. (Hons.) Microbiology**

**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.) Microbiology	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.) Microbiology**

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

<b>PROGRAM EDUCATIONAL OBJECTIVES (PEOs)</b>	
The B.Sc. (Honours) Microbiology program describe accomplishments that graduates are expected to attain the following:	
<b>PEO1</b>	Dynamic and primary investigator
<b>PEO2</b>	Ingenious educationalist
<b>PEO3</b>	Managerial / administrative official
<b>PEO4</b>	Headship brilliance
<b>PEO5</b>	Knowledgeable proficiency in various awarenesss
<b>PEO6</b>	Businessperson
<b>PEO7</b>	Principal microbiologist in scientific analytical and value control sector



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<b>PROGRAMME OUTCOMES (POs)</b>	
On successful completion of the B.Sc. (Honours) Microbiology programme the students are expected to attain the following:	
<b>PO1</b>	Obtain suitability for higher education, research / technical and administrative appointment in government and private sectors.
<b>PO2</b>	Accomplish aptitude to be positioned in numerous Microbiological / Biotechnological industries.
<b>PO3</b>	Attain practical knowledge to become a businessperson by institutional training / internship.
<b>PO4</b>	Comprehend the vital role of knowledge in life.
<b>PO5</b>	Apprise and create steadiness of nature and in fact form a fit environment with the knowledge of Microbiology.
<b>PO6</b>	Obtain abilities essential to accomplish the personal, civil and social responsibilities.
<b>PO7</b>	Enhance information in ethical thinking, quantitative analytical skills and its application to the issues in society.
<b>PO8</b>	Acquire knowledge on harmful and beneficial role played by microbes in human health.
<b>PO9</b>	Recognize the impact of gene technology in microbiology for societal development.
<b>PO10</b>	Comprehend the importance of up to date technologies in microbiological applications & research data management.



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<b>PROGRAMME SPECIFIC OUTCOMES (PSOs)</b>	
After the successful completion of B.Sc. (Honours) in Microbiology, the students are expected to attain the following:	
<b>PSO1</b>	To segregate and find out the various types of microorganisms including bacteria, fungi and algae.
<b>PSO2</b>	To get accustomed to the latest information about the nomenclatural cataloguing of microorganisms.
<b>PSO3</b>	To attain domain knowledge about recent microbial practices and bioinstrumentation which make the learners skilled to be placed in various Microbiological / Biotechnological industries.
<b>PSO4</b>	To achieve hands-on exposure during the inhouse training.
<b>PSO5</b>	To reap the benefits of the knowledge gained through clinical investigation and diagnosis of various infectious diseases.
<b>PSO6</b>	To attain knowledge on health care, inhibition and control of various pathogenic microbes which cause periodic occurrences of epidemics and pandemics etc.
<b>PSO7</b>	To comprehend hypothetical and practical exposure in the allied subjects Biostatistics and Computer Applications; Biochemistry in addition to the core course subjects in the field of Microbiology.



**B.Sc. (Hons.) Microbiology**

**SEMESTER-I**

<b>MIC010 Introduction to Microbiology &amp; Microbial Diversity Theory Credit 4(3+1)</b>	
<b>After successful completion, this course enables students:</b>	
<b>CO1</b>	To understand the basics of microbiology and to learn the systemic classification of microorganisms.
<b>CO2</b>	To understand the general characteristics of acellular microorganisms.
<b>CO3</b>	To understand the general characteristics of algae.
<b>CO4</b>	To understand the general characteristics of fungi.
<b>CO5</b>	To understand the general characteristics of protozoan.

<b>MIC020</b>	<b>Bacteriology</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 detailed structure of Gram-positive and Gram-negative.		
<b>CO2</b>	Be able to know about cultivation, maintenance and preservation/stocking of pure cultures.		
<b>CO3</b>	Be able to understand about Growth, nutrition and reproduction in bacteria.		
<b>CO4</b>	Be able to understand the Bacterial systematics aim and principles of classification, systematics and taxonomy, concept of species		
<b>CO5</b>	Be able to understand general characteristics, phylogenetic overview of important archaeal and eubacterial groups.		



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<b>MIC030</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 structure and function of a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)		
<b>CO2</b>	Be able to know Renewable and Non-renewable Resources.		
<b>CO3</b>	Be able to understand threats to biodiversity; Conservation of biodiversity: and Ecosystem and biodiversity services.		
<b>CO4</b>	Be able to understand the Environmental Pollution, Policies and Practices including Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.		
<b>CO5</b>	Be able to know about human population growth, impacts on environment, human health and welfare, resettlement and rehabilitation of project affected persons.		

<b>MIC04</b>	<b>Introduction &amp; Scope of Microbiology</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 basics of development and history of microbiology and to learn the systemic classification of microorganisms.		
<b>CO2</b>	To understand the microscopy and different types of sterilization methods in microbiology.		
<b>CO3</b>	To understand the different microbes in relation to human health and to understand the basics of environmental microbiology.		
<b>CO4</b>	To understand the importance of microorganisms in food and dairy microbiology.		
<b>CO5</b>	To understand the concept of fermentation and its industrial applications.		



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**SEMESTER-II**

<b>MIC050</b>	<b>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 structure and function of monosaccharide, disaccharide and polysaccharide.		
<b>CO2</b>	Be able to know about structure, properties and functions of essential fatty acids, Triacylglycerols, lipid.		
<b>CO3</b>	Be able to understand about functions of proteins, Level of organization of proteins, primary, secondary (alpha helix and beta pleated sheet), tertiary and quaternary Forces holding the polypeptide together.		
<b>CO4</b>	Be able to understand the Enzyme kinetics, significance of hyperbolic, double reciprocal plots of enzyme activity and Km.		
<b>CO5</b>	Be able to know about Classification, function and sources of Vitamins.		

<b>MIC060</b>	<b>Virology</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 about nature and properties of viruses.		
<b>CO2</b>	Be able to know about diversity, classification of Bacteriophages one step multiplication curve, lytic and lysogenic phages (lambda phage),		
<b>CO3</b>	Be able to understand about viral transmission, Salient features of viral nucleic acids and Replication.		
<b>CO4</b>	Be able to understand the concepts of oncogenes, proto-oncogenes and tumor suppressor genes.		
<b>CO5</b>	Be able to gain better understanding of antiviral compounds and their mode of action, Interferon and their mode of action, General principles of viral vaccination.		





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<b>MIC072</b>	<b>Industrial &amp; Food Microbiology</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 concept of fermentation and its industrial applications.		
<b>CO2</b>	To understand the preservation and maintenance methods of industrially important strains of microbes in microbiology.		
<b>CO3</b>	To understand the different downstream processing and production of industrially important enzymes.		
<b>CO4</b>	To understand the parameters that affect microbial growth in food, and to learn about food infection and intoxications.		
<b>CO5</b>	To understand the principles and methods of food preservation and food sanitation		



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**SEMESTER-III**

<b>MIC250</b>	<b>Microbial Physiology and Metabolism</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 microbial growth in response to nutrition and energy: Autotroph, heterotrophy Chemolithoautotroph, Chemolithoheterotroph, Chemoheterotroph, Chemolithotroph, photolithoautotroph and Photoorganoheterotroph.		
<b>CO2</b>	Be able to interpret about the passive and facilitated diffusion, Primary and secondary active transport, concept of uniport, symport and antiport.		
<b>CO3</b>	Be able to understand concept of aerobic respiration. Central metabolic pathways: EMP, ED, Pentose phosphate pathway and TCA cycle. Electron transport chain		
<b>CO4</b>	Be able to understand the role of anaerobic respiration and fermentation. Anaerobic respiration with special reference to dissimilatory nitrate reduction		
<b>CO5</b>	Be able to understand chemolithotrophic and phototrophic Metabolism.		

<b>MIC260</b>	<b>Cell &amp; Molecular Biology</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 various aspects of structure and organization of cell.		
<b>CO2</b>	Be able to know various concepts related to protein glycosylation, protein sorting and export.		
<b>CO3</b>	Be able to understand various processes of replication involving mechanism of DNA replication in prokaryote and eukaryotes.		
<b>CO4</b>	Be able to understand the role and process of transcription in Prokaryotes and Eukaryotes.		
<b>CO5</b>	Be able to know about regulation of gene expression in prokaryotes and Eukaryotes.		



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<b>MIC270</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>MIC29</b>	<b>Microbes in Environment</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 different types of microorganisms along with their habitat and to understand about extremophiles.		
<b>CO2</b>	To understand the microbe interactions and to learn about different microbe-Plant interaction.		
<b>CO3</b>	To understand the different biogeochemical and nutrient cycles.		
<b>CO4</b>	To understand the management of different types of solid waste and to understand the sewage and its disposal methods.		
<b>CO5</b>	To understand the principles and degradation of common pesticides and to understand the bioremediation.		



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<b>MIC292</b>	<b>Medical Microbiology &amp; Immunology</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 identify normal microflora of the human body and host pathogen interaction		
<b>CO2</b>	The student will be able to identify common infectious agents and the diseases that they cause.		
<b>CO3</b>	The student will be able to assess treatment strategies including the appropriate use of antimicrobial agents and common mechanisms of antimicrobial action and resistance.		
<b>CO4</b>	Understand the overall organization of the immune system.		
<b>CO5</b>	Conceptualize how the collection of individual clones of lymphocytes arises from rearrangement within two genetic loci: the Ig gene in B cells and the antigen receptor in T cells.		
<b>CO6</b>	To make them understand the salient features of antigen antibody reaction & its uses in diagnostics and various other studies.		

<b>MIC281</b>	<b>Microbial Quality Control in food &amp; Pharmaceutical Industries</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 various aspects of Good laboratory practices, Good microbiological practices.		
<b>CO2</b>	Be able to interpret about culture and microscopic methods including standard plate count, Most probable numbers, Direct microscopic counts, Biochemical and immunological methods.		
<b>CO3</b>	Be able to diagnose microbial pathogens through microscopic study and differential culturing including enrichment culture technique.		
<b>CO4</b>	Be able to understand the quality test for milk.		
<b>CO5</b>	Be able to know about - principles, flow diagrams, limitations of Hazard analysis of critical control point (HACCP).		



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<b>MIC282</b>	<b>Microbial Diagnosis in Health Clinics</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 diagnose microbial diseases of human body through symptoms		
<b>CO2</b>	Be able to interpret about the type of clinical sample required and its collection for disease diagnosis		
<b>CO3</b>	Be able to diagnose microbial pathogens through microscopic study and differential culturing		
<b>CO4</b>	Be able to understand the role of serological and molecular method in diagnosis		
<b>CO5</b>	Be able to apply appropriate technique for rapid detection of microbial diseases		

<b>MIC283</b>	<b>Biofertilizers &amp; Biopesticides</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 various aspects of the microbes used as biofertilizers for various crop plants and their advantages over chemical fertilizers		
<b>CO2</b>	Be able to interpret about the type of Non - Symbiotic Nitrogen Fixers.		
<b>CO3</b>	Be able to know about various concepts related to Phosphate solubilizing microbes.		
<b>CO4</b>	Be able to understand the role of mycorrhizae and associated plants		
<b>CO5</b>	Be able to know about microbes used as bioinsecticides and their advantages over synthetic pesticides.		



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**SEMESTER-IV**

<b>MIC300</b>	<b>Microbial Genetics</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 genome organization in prokaryotic and eukaryotic cells.		
<b>CO2</b>	To understand the plasmids and its types.		
<b>CO3</b>	To understand the different mechanisms of genetic exchange.		
<b>CO4</b>	To understand the structure of phage and its genetics		
<b>CO5</b>	To understand the different prokaryotic and eukaryotic transposable elements.		

<b>MIC310</b>	<b>Microbes in Sustainable Agriculture and Development</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 importance of soil microbes in influencing soil fertility.		
<b>CO2</b>	Be able to understand the mechanism of organic matter decomposition by soil microbes and their role in biogeochemical cycles.		
<b>CO3</b>	Be able to know about the role of microbes as biocontrol agent against plant diseases.		
<b>CO4</b>	Be able to understand the applications of various microorganisms as biofertilizer for plant growth promotion.		
<b>CO5</b>	Be able to know about the application of agriculture biotechnology through secondary metabolite products and GM crops.		



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<b>MIC320</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>MIC331</b>	<b>Food Fermentation Techniques</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 advantages, types, and beneficial health applications of fermented food.		
<b>CO2</b>	To provide knowledge about industrially important microorganisms and the production process of various dairy and milk products.		
<b>CO3</b>	To provide knowledge about microorganisms used in the production of grain-based fermented foods and their production process.		
<b>CO4</b>	To learn about the microorganisms used in the production of Pickles, Sauerkraut, and the production process.		
<b>CO5</b>	To understand the types, and microorganisms involved and the processing of fermented meat and fish.		



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<b>MIC332 Management of Human Microbial Disease</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 Categories of Human diseases.		
<b>CO2</b>	To get an insight into the different types of Microbial diseases		
<b>CO3</b>	Be able to know the different kinds of therapeutics of bacterial diseases		
<b>CO4</b>	Be able to know the Treatment using antiviral agents.		
<b>CO5</b>	To get an insight into the prevention of microbial diseases.		

<b>MIC333 Microbiological Analysis of Air &amp; Water</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 aero microbiology and microbes present in air.		
<b>CO2</b>	To understand the different sample collection from air and its analysis.		
<b>CO3</b>	To understand the different control measures of airborne microbes.		
<b>CO4</b>	To understand the microbiology of water.		
<b>CO5</b>	To understand the different control measures of waterborne microbes.		





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<b>MIC341 Genetic Engg. &amp; Biotechnology</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 probe and hybridization technique and learn the process of various hybridization techniques. 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>MIC342 Instrumentation and Biotechniques</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 importance, principle and types of microscopy techniques.		
<b>CO2</b>	To understand the importance, principle and types of chromatography techniques and their role in the study of biological system.		
<b>CO3</b>	To develop the knowledge on principle and types of electrophoretic techniques and their role in the study of biological system.		
<b>CO4</b>	To acquire knowledge on spectrophotometric techniques, their principles and applications.		
<b>CO5</b>	To get an insight in to the principle and types of centrifugation techniques and their role in the study of biological system.		



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**SEMESTER-V**

<b>MIC350</b>	<b>Microbial Biotechnology</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 concept of microbial biotechnology and its applications in different fields.		
<b>CO2</b>	To understand the different recombinant microbial production processes in pharmaceutical industries.		
<b>CO3</b>	To understand the applications of microbes in bio-transformations of sterols and steroids.		
<b>CO4</b>	To understand the purification process of different microbial products.		
<b>CO5</b>	To understand the different microbes for bioenergy production and their relationship with environment.		

<b>MIC360</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>CO6</b>	Students will study probe and hybridization technique and learn the process of various hybridization techniques		



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<b>MIC370</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>MIC381</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>	Basic understanding of Moments, Skewness, central tendency kurtosis by moments.		
<b>CO2</b>	Well versed in the concepts Probability and Probability Distribution along with its application		
<b>CO3</b>	Understand the Statistical Quality Control, Correlation and regression analysis.		
<b>CO4</b>	Good understanding and analytical knowledge in applying & testing of Hypothesis and Analysis of variance.		
<b>CO5</b>	Basic understanding of Moments, Skewness, central tendency kurtosis by moments.		



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<b>MIC382</b>	<b>Advances in Microbiology</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 evolution of Microbial Genomes.		
<b>CO2</b>	To understand the brief history and development of metagenomics.		
<b>CO3</b>	To understand the molecular Basis of Plant-Microbe Interactions.		
<b>CO4</b>	To understand the Secretion system of animal Pathogens and role and formation of biofilms.		
<b>CO5</b>	To understand the networking in biological systems, quorum sensing in bacteria, future implications of synthetic biology with respect to bacteria and viruses.		



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**SEMESTER VI**

<b>MIC400</b>	<b>Medical Microbiology</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 normal microflora of different parts of the human body.		
<b>CO2</b>	To have knowledge on different cell culture media and their preparation methods.		
<b>CO3</b>	To gain knowledge on various bacterial and viral diseases .		
<b>CO4</b>	To understand the different protozoan and fungal diseases and their causative agents.		
<b>CO5</b>	To get an insight into the various antimicrobial, antifungal agents and their mode of action.		

<b>MIC410</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.		



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<b>MIC420</b>	<b>Plant Pathology</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 basics and history of plant pathology.		
<b>CO2</b>	Be able to know the different types of stages involved in the development of Plant diseases and its epidemiology.		
<b>CO3</b>	To get an insight into the microbial pathology and factors involved in pathogenesis		
<b>CO4</b>	Be able to understand about the interaction occurs during development of plant diseases and plants internal defence mechanism.		
<b>CO5</b>	Be able to understand the concept of physical, biological and cultural control of plant pathogen.		

<b>MIC431</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>	Understanding and remembering about biological databases and its application in various sectors.		
<b>CO2</b>	Remembering, understanding and creating sequence alignment by applying appropriate algorithms.		
<b>CO3</b>	CO3 Creating phylogenetic trees by applying and evaluating suitable methods.		
<b>CO4</b>	Analyze, apply, and create protein structure and perform drug designing.		
<b>CO5</b>	Understanding and remembering about biological databases and its application in various sectors.		



**B.Sc. (Hons.) Microbiology**

<b>MIC432 Biosafety and Intellectual Property Rights</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 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.		