M.Sc. Microbiology

MANDSAUR UNIVERSITY

FACULTY OF LIFE SCIENCES

M.Sc. Microbiology

PEOs, POs, PSOs, COs

Faculty of Life Sciences
Mandsaur University, Mandsaur

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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:

Programme Name	Duration
M.Sc. Microbiology	2 Years (Four Semesters)

Programme Structure:

Years	Odd Semester	Even Semester
First Year	Semester I	Semester II
Second Year	Semester III	Semester IV

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PEOs, POs, PSOs, COs:

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)	
The M. Sc. Microbiology program describe accomplishments that graduates are expected to attain the following:	
PEO1	To deliver a fineness in their microbiology domain along with research
PEO2	To develop skills in the fields of clinical microbiology and also quality controller in industries
PEO3	The apprentices shall become an entrepreneur and also a businessperson commercializing his/her own pathogenic product
PEO4	To deliver the students with subject expertise, environmental alertness, ethical codes and guidelines, along with holistic learning for professional development as well as personal growth.

PROGRAMME OUTCOMES (POs)	
On successful completion of M. Sc. Microbiology degree course, the students are attaining the following:	
PO1	Gain domain specific knowledge on microorganisms and its application in various fields of Microbiology
PO2	Emphasize on innovation and entrepreneurial thinking in order to succeed in competitive world.
PO3	Acquire knowledge in qualitative, quantitative, analytical skills and to create the necessity of Life Sciences stream through clearing NET/ SLET and other competitive exams.
PO4	Learn the innovative and scientific techniques to meet the social and industrial needs.
PO5	Communicate information on systematic problems and its implication on ethical thinking.
PO6	Employ the microbes using numerous molecular biology procedures for the benefit of living organisms.
PO7	Measure up development of microbial metabolites using scientifically imperative microorganism adopting bioprocess expertise.
PO8	Integrate bioinformatics implements for evaluating molecular biology data of Microbes
PO9	Comprehend the amalgamation of Nano-materials and the influence on microbiological applications.
PO10	To highlight the standing of artificial intelligence and machine learning in microbiology and allied applications.

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PROGRAMME SPECIFIC OUTCOMES (PSOs)	
After the successful completion of M. Sc. Microbiology degree course, the students are attaining the following:	
PSO1	Recall the vital facets in the various areas of Microbiology, which enable them to be accustomed with developing and progressive scientific notions in the field of Life Sciences.
PSO2	Initiate the attained theoretical information through linking interdisciplinary areas of Microbiology
PSO3	Estimate the requirement and its efficiency of scientific request towards the betterment of society
PSO4	Examine the development in Microbiology in terms of research benefits which will lead to new creations
PSO5	Generate advanced ideas in technical areas of Microbiology, to become an manufacturer, businessperson and in the long run an ideal citizen beneficial for the country.

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SEMESTER I

MIC080	**Microbial Physiology & Biochemistry**	**Theory**	**Credit 4(3+1)**
After successful completion, this course enables students:			
CO1	Understanding the laws of thermodynamics, concepts of entropy, enthalpy and free energy changes and their application to biological systems and various biochemical studies and reactions.		
CO2	Students will be able to demonstrate an understanding of fundamental biochemical principles, such as the structure/function of bimolecular, metabolic pathways, and the regulation of biological/biochemical processes.		
CO3	Students will gain proficiency in basic laboratory techniques in both chemistry and biology, and be able to apply the scientific method to the processes of experimentation and hypothesis testing.		
CO4	Students will be able to apply and effectively communicate scientific reasoning and data analysis in both written and oral forums.		
CO5	Students will understand and practice the ethics surrounding scientific research.		

MIC090	**Bacteriology & Virology**	**Theory**	**Credit 4(3+1)**
After successful completion, this course enables students:			
CO1	To familiarize with basics of enzymes, their kinetics, mechanism of inhibition, enzyme units and underlying principle of measurement of enzyme activity.		
CO2	To learn the laboratory method of Isolation and purification of extracellular enzymes and determination of Km and Vmax value for that enzyme.		
CO3	To understand sources of industrial important enzymes and their applications in various industrial and medical fields.		
CO4	To understand the importance, principle and types of chromatography techniques and their role in the study quantitave and qualitative analysis of different biomolecules.		
CO5	To develop the concept on principle and types of electrophoretic techniques and their role in the study of the biological system.		

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MIC100 Microbial Growth, Enzymology & Bioinstrumentation Theory Credit 4(3+1)	
After successful completion, this course enables students:	
CO1	To familiarize with basics of enzymes, their kinetics, mechanism of inhibition, enzyme units and underlying principle of measurement of enzyme activity.
CO2	To learn the laboratory method of Isolation and purification of extracellular enzymes and determination of Km and Vmax value for that enzyme.
CO3	To understand sources of industrial important enzymes and their applications in various industrial and medical fields.
CO4	To understand the importance, principle and types of chromatography techniques and their role in the study quantitave and qualitative analysis of different biomolecules.
CO5	To develop the concept on principle and types of electrophoretic techniques and their role in the study of the biological system.

MIC110 Pharmaceutical Microbiology Theory Credit 4(3+1)	
After successful completion, this course enables students:	
CO1	To understand the anatomy, identification, growth factors of microorganisms which include bacteria, virus, and fungus and discuss the cultivation and identification of the microorganisms in the laboratory
CO2	To explain different methods of sterilization, its properties and applications in pharmaceutical microbiology
CO3	To get an insight view of the concepts and types of antibody, antigen -antibody reactions, vaccines, immunization programme and antibiotics.
CO4	To understand the identification of diseases by performing the diagnostic tests and estimation of potency of antibiotic by various microbial assay
CO5	To understand infectious diseases its history, pathogenesis, treatment and control methods.

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SEMESTER II

MIC120	**Microbial Genetics**	**Theory**	**Credit 4(3+1)**
After successful completion, this course enables students:			
CO1	Students will learn the creative use of modern tools and techniques for manipulation and analysis of genomic sequences.		
CO2	Students will learn the basic application of recombinant DNA technology in biotechnological research.		
CO3	Students will learn the process of cloning and expression of gene and other techniques in genetic engineering & Biotechnology.		
CO4	Students will learn DNA extraction from bacterial cell and estimation of purity.		
CO5	Students will learn PCR assays and DNA manipulations techniques. Explain the application of modern biotechnological tools in cutting-edge research.		

MIC130	**Molecular Biology & Genetic Engg.**	**Theory**	**Credit 4(3+1)**
After successful completion, this course enables students:			
CO1	Students will study the detailed structure of nucleic acids.		
CO2	Students will learn in detail the molecular processes such as replication, transcription and translation. Describe the importance of genetic code and wobble hypothesis.		
CO3	Students will study mutagenesis. Students will learn Mutagenesis, Mutation and mutants and their significance in microbial evolution		
CO4	Students will learn gene regulation methods in microbes.		
CO5	**CO5 -** 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. Explain the process of gene cloning and expression.		

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MIC140	**Environmental Microbiology**	**Theory**	**Credit 3(3+0)**
After successful completion, this course enables students:			
CO1	To understand the basic principles of environmental microbiology and distribution of microorganisms in order to use them as bioindicators of contamination and other environmental impacts.		
CO2	Explain the systematic process for wastewater treatment and microbiological analysis of water.		
CO3	Students will understand various plant-microbe interactions especially rhizosphere, phyllosphere, and mycorrhizae, and their applications such as biofertilizers and their production techniques		
CO4	Students will be able to summarize the significance of the biorefinery concept and explain how plant biomass can be converted to fermentable substrates and subsequently microbially transformed into biochemicals, biopolymers, and biofuels.		
CO5	Students will understand the important applications of microorganisms in various processes such as bioremediation, bioleaching, biosorption, etc. for the solution of different environmental problems.		

MIC150	**Food & Dairy Microbiology**	**Theory**	**Credit 3(3+0)**
After successful completion, this course enables students:			
CO1	To understand the principles of microorganisms during various food-processing and preservation steps.		
CO2	To comprehend the interactions between microorganisms, food, environment, and factors influencing their growth and survival.		
CO3	To get an insight view of the concepts and types of antibody, antigen -antibody reactions, vaccines, immunization programme and antibiotics.		
CO4	To understand the identification of diseases by performing the diagnostic tests and estimation of potency of antibiotic by various microbial assay		
CO5	To understand infectious diseases its history, pathogenesis, treatment and control methods.		

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SEMESTER- III

MIC190	**Medical Microbiology**	**Theory**	**Credit 3(3+0)**
After successful completion, this course enables students:			
CO1	Upon completion, students gained the knowledge of most common medically important organism and the infections they cause.		
CO2	Different approaches, techniques and tools used to identify pathogens and control them.		
CO3	Diagnostic approaches for microbial pathogens.		
CO4	To understand eveloping efficient vaccines and new drugs and learning methods for antimicrobial susceptibility testing.		
CO5	Develop competence to retrieve information from biological databases and integrate this biological information with computational software's.		

MIC200	**Immunology**	**Theory**	**Credit 3(3+0)**
After successful completion, this course enables students:			
CO1	Be able to know the concept and fundamentals of immunology.		
CO2	Be able to understand the concept of antigen, antibody and hypersensitivity reaction.		
CO3	Be able to understand the role of MHC molecule in graft transplantation and cancer immunology.		
CO4	Be able to perform the antigen antibody reaction including agglutination, precipitation, immuno-electrophoresis		
CO5	Be able to understand technologies like hybridoma.		
CO6	Be able to know the concept and fundamentals of immunology.		

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MIC210	**Soil & Agriculture Microbiology**	**Theory**	**Credit 3(3+0)**
After successful completion, this course enables students:			
CO1	Be able to understand the importance of soil microbes in influencing soil fertility.		
CO2	Be able to understand the mechanism of organic matter decomposition by soil microbes and their role in biogeochemical cycles.		
CO3	Be able to know about the role of plant associated microbes in the plant growth promotion.		
CO4	Be able to understand the applications of various microorganisms as biofertilizer for plant growth promotion.		
CO5	Be able to diagnose plant diseases caused by various microbes and concept of biopesticides to cure these diseases.		

MIC230	**Mycology**	**Theory**	**Credit 4(4+0)**
After successful completion, this course enables students:			
CO1	Be able to demonstrate scientific literacy in major concepts and processes relative to the major groups of fungi and fungus-like organisms		
CO2	Be able to locate and evaluate sources of scientific information on fungi and fungal-like organisms.		
CO3	Be able to classify the important fungal organisms on the basis of reproduction, taxonomy, macroscopic and microscopic morphology.		
CO4	Be able to understand the applications of various fungi in different sectors for starting entrepreneurship		
CO5	Be able to understand economic importance of fungi		

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MIC221	**Fermentation Technology**	**Theory**	**Credit 4(4+0)**
After successful completion, this course enables students:			
CO1	Know about the design of bioreactors, factors affecting growth, strategies of upstream processing and downstream processing, and design for microbial fermentation.		
CO2	Evaluate factors that contribute to the enhancement of cell and product formation during the fermentationprocess.		
CO3	To explore the different production approaches for industrial products like organic acid, alcohol, enzymes, single-cell protein, fermented food, and dairy products. etc.		
CO4	Get equipped with a theoretical and practical understanding of industrial microbiology.		
CO5	To develop the concept for genetic improvement of industrially useful microbes as well as the process and role of enzyme immobilization in food industries.		

BIT382	**IPR, Biosafety & Bioethics**	**Theory**	**Credit 3 (3+0)**
After successful completion, this course enables students:			
CO1	Be able to understand the Intellectual Property right (IPR) and different types of IPR.		
CO2	Be able to know the basics of patents and different types of patents.		
CO3	To get an insight into the Patent filing and Infringement		
CO4	Be able to understand the basics of biosafety and bioethics and its impact on all the biological sciences and the quality of human life.		
CO5	Be able to understand the Introduction of bioethics and ethical conflicts in biological sciences.		