



BHARATI VIDYAPEETH'S
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DEPARTMENT OF MICROBIOLOGY

M.Sc. General Microbiology

M.Sc. General Microbiology

***** Program Outcome *****

This is a two-year M. Sc. program covering all general aspects of Microbiology.

1. It helps in developing competent Microbiologists who can progress to diverse fields of microbiological interests in various fields of industries, research, teaching, medical science and entrepreneurship. The course is aimed at adding to the knowledge base of Microbiology graduates through significant inputs of latest information on the subject.
2. It also envisages that the students read original research publications and develop the ability of critical evaluation of the study. Development of communication skills as well as laboratory work and team work, creativity, planning and execution are also a major objective of this program.
3. In the core courses, the students study the basics of Microbiology along with the basics of subjects allied to and useful in Microbiology (Techniques, Biostatistics, Computer handling and Bioinformatics, Biosafety, Scientific writing and Agricultural and Clinical Microbiology). The specializations include topics on various fields of Industrial Microbiology, Fermentation Technology, Quality assurance, Recombinant DNA Technology and Pharmaceutical Microbiology.
4. During this program students undertake a on job training, Research Project, field projects which the student is expected to study research methodology through experimental work, literature survey and report writing.
5. In On job training, the student is to take training in the industry for a period of at least two weeks which will help student to study Microbiological aspects in the industry.
6. Educational tour to various institutes and or industries provides actual microbiological applications in various fields of Microbiology.

*****Program specific Outcome*****

1. Understand the nature and basic concepts of Microbial systematic, Immunology, Environmental Microbiology and Research methodology.
2. Perform procedures as per laboratory standards in the areas of Microbial systematic, Immunology, Environmental Microbiology and Research methodology.
3. Acquire basic Microbiology laboratory skills and expertise in the use of instruments applicable to research, clinical methods and analysis of the observations. Understand the applications of basic microbial techniques in microbial systematics, environmental microbiology and research.
4. The knowledge can be gained about systematics of bacteria. The understanding new trends in systematics of bacteria can be done. Learning different approaches in bacterial systematics is possible.
5. Understand the role of microorganisms in human health, immune response to infection, Antibody diversity, Immune deficiency and autoimmunity, Hypersensitivity reactions and Vaccine.
6. Overall, the Program is reasoning and applications oriented, equipping the students eligible for higher studies, jobs in various sectors and entrepreneurship abilities.

*****Course Outcomes*****

Course	Outcomes
MIC-101: MICROBIAL SYSTEMATICS	<ol style="list-style-type: none"> 1. To gain knowledge of systematics of bacteria 2. To understand new trends in systematics of bacteria 3. To learn different approaches bacterial systematics 4. To understand basics of microbial systematics
MIC-102: IMMUNOLOGY	<ol style="list-style-type: none"> 1. Understand classes of immunoglobulin, organization and expression of immunoglobulin genes. 2. Know details of major histocompatibility complex and disease susceptibility. Understand cytokines and their medical significance. 3. Understand hypersensitivity reactions. Know immunodeficiencies and auto immunity. 4. Understand details of transplantation immunology and immunity to cancer.
MIC-103-C: ENVIRONMENTAL MICROBIOLOGY	<ol style="list-style-type: none"> 1. Understand concept of aeromicrobiology, biosafety and waste water management. 2. Understand bioremediation and biodegradation processes. 3. Know environmental laws. 4. Understand the methods of air sampling
RM-MIC-106 RESEARCH METHODOLOGY	<ol style="list-style-type: none"> 1. Understand the strategies and planning for developing research. 2. Understanding the methods of data collection and analysis. 3. Knowing the research ethics in biological field. 4. Understanding the essential methods of scientific writing.

MIC-201: GENETICS AND MOLECULAR BIOLOGY	<ol style="list-style-type: none"> 1. This course focuses on the current state of knowledge on the genetics of microorganisms and higher living beings. 2. The course provides knowledge about molecular basics of transcription, translation and replication process. First two units are devoted to classical genetics. 3. The last two units contain latest information on molecular biology techniques and newer trends in genetics and molecular biology. 4. This course helps to develop strong foundation in genetics which also helps in comprehending more modern concepts of molecular biology and recombinant technology.
MIC-202: FERMENTATION TECHNOLOGY	<ol style="list-style-type: none"> 1. Understanding about basic information of fermenter design and working. 2. Knowing fermentation media its economics and intellectual property of it. 3. Understanding production of industrially important microbial compounds. 4. Knowing about basic concepts in metabolic pathways.
MIC-203-C: MICROBIAL ECOLOGY	<ol style="list-style-type: none"> 1. Microbial ecology emerged as an energetic and dynamic branch of science which helps students to understand global ecosystems. 2. The course of Microbial ecology creates platform for students to investigate and explore microbial interactions and their activities for welfare of human being. 3. It also helps to understand practical implications and biotechnological applications of microbial ecology. 4. This course is helpful to understand microbial ecology in details.

*****Practical Course*****

Course	Outcomes
PRACTICAL COURSE – I: (MIC – 104)	<ol style="list-style-type: none"> 1. Students get to know about operating high end laboratory instruments. 2. They can learn basic practical skills in biochemistry. 3. They able to learn basic practical techniques of immunological methods. 4. Hence this lab course can make students aware and skilled in this subject.
PRACTICAL COURSE – II: (MIC – 105)	<ol style="list-style-type: none"> 1. Student will know the basic software's used in bacterial systematics. 2. Students came to know about cultivation of extremophiles. 3. Students gain knowledge about detection of pollution strength. 4. Students able to explore their knowledge in solving problems occurred bacterial taxonomy.
PRACTICAL COURSE – III: (MIC – 204)	<ol style="list-style-type: none"> 1. Students will be trained for isolation of RNA and DNA form bacteria. 2. Students will understand the basic production method in fermentation. 3. Students can be aware in quantitative and qualitative studies of water and air. 4. Students are skillful to use spectroscopies instruments.
PRACTICAL COURSE – IV: (MIC – 205)	<ol style="list-style-type: none"> 1. Student will be known to use chromatography knowledge for purification of biomolecules. 2. Students know how to preserve microorganisms. 3. Students will learn how to do environmental monitoring. 4. Students will learn basic computational techniques such as molecular docking and drug designing.

M.Sc. II General Microbiology

*****Program specific Outcome*****

1. Understand the nature and basic concepts of Biostatistics, Enzymology, Fermentation technology and Quality Control Microbiology.
2. Perform procedures as per laboratory standards in the areas of Biostatistics, Enzymology, Fermentation technology and Quality Control Microbiology.
3. Acquire basic Microbiology laboratory skills and expertise in the use of instruments applicable to research, methods in biochemistry and biostatistical analysis. Understand the applications of basic microbial techniques in Biostatistics, Enzymology, Fermentation technology and Quality Control Microbiology.
4. The knowledge can be gained about Biostatistical analysis and learning different software used in bioinformatics.
5. Understand the techniques and testing involved in Industrial wastewater treatment and learn testing required in Pharmaceutical Quality Control.
6. Overall, the Program is reasoning and applications oriented, equipping the students eligible for higher studies, jobs in various sectors and entrepreneurship abilities.

*****Course Outcomes*****

Course	Outcomes
MIC-301: Biostatistics, Bioinformatics and Scientific Writing	<ol style="list-style-type: none">1. To gain knowledge basic knowledge about basic biostatistical methods involved in microbiology.2. To gain details related to different statistical test involved in Biostatistics.3. To perceive information regarding to Bioinformatics and its application.4. To gain knowledge about Scientific Writing and Publication ethics
MIC-302: Enzymology and Enzyme Technology	<ol style="list-style-type: none">1. To understand basics about enzymes and their types.2. To gain knowledge about enzyme kinetics.3. To understand concept about enzyme structure.4. To know the applications of enzymes in different industries.
MIC-303: Fermentation Technology	<ol style="list-style-type: none">1. Understanding about basic information of fermenter design and working.2. Knowing fermentation media its economics and intellectual property of it.3. Understanding production of industrially important microbial compounds.4. Knowing about basic concepts in metabolic pathways.
MIC-304: Quality Control Microbiology.	<ol style="list-style-type: none">1. The course focuses on providing detail about Biosafety Laboratory and code of practices in biosafety labs.2. To understand good microbiological techniques.3. To gain knowledge about sterilization and sterility assurance.4. To obtain details about Biosafety Guidelines.

MIC-401: Food and Dairy Microbiology	<ol style="list-style-type: none"> 1. To gain detail about spoilage of varieties of food and learn about preservation techniques. 2. To understand importance of milk contamination and learn about fermented food product. 3. To acquire a detailed knowledge about food borne diseases and prevention. 4. To know about probiotics and enzymes involved in food industries.
MIC-402: Industrial Waste Management	<ol style="list-style-type: none"> 1. To know about types of industrial wastes and strategies regarding self-purification. 2. To understand microbiology and biochemistry of wastewater treatment and impact of pollutants. 3. To learn about different methods of wastewater treatment. 4. To gain knowledge of zero waste discharge concept.
MIC-403: Recombinant DNA technology	<ol style="list-style-type: none"> 1. To obtain knowledge about basic tools in rDNA Technology. 2. To understand basic cloning strategies. 3. To learn cloning strategies in Eukaryotes and Animals. 4. To learn scope and applications of rDNA technology.
MIC-404: Quality control Microbiology-II	<ol style="list-style-type: none"> 1. To gain information regarding Pharmaceutical Drug Regulatory affairs. 2. To know about cleanrooms and environmental monitoring. 3. To understand concepts of bioburden and pharmaceutical product testing. 4. To learn about quality management and auditing in pharma industries.

*****Practical Course*****

Course	Outcomes
Practical course V-MIC-305	<ol style="list-style-type: none"> 1. To obtain skill of using biostatistical methods in analysis. 2. To gain skill to use basic tools of bioinformatics. 3. To learn the use of software's needed in Scientific Writing. 4. To learn estimation and assays regarding to enzyme and study different enzymatic activities.
Practical course VI-MIC-306	<ol style="list-style-type: none"> 1. To learn about calibration and validation of devices used in laboratory. 2. To know the preparation of SOP's of instruments. 3. To learn disinfection preparation and validation. 4. To learn basic testing of pharma industries.
Practical course VII-MIC-405	<ol style="list-style-type: none"> 1. To gain skills to determine adulterants in food. 2. To learn basic tests, need in dairy industry. 3. To learn preparation of different fermentation media and products. 4. Learn to determine different wastewater characteristics with proper methods.
Practical course VIII-MIC-406	<p>To undertake a project with their own ideas or Industrial training should be done.</p>