**M.Sc in MICROBIOLOGY: COURSE OUTCOME AND COURSE OBJECTIVES**

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| **Sem** | **Paper Code** | **Paper** | **Outcome1** | **Outcome2** | **OBJECTIVE** |
| 1 | MIBCC101 | General Microbiology | Understanding of basics of microbiology and microorganisms | Understanding about history of microbiology | This course will provide basic information, in general about different types of microbes, and their significance.  |
| 1 | MIBCC102 | Mycology and Phycology |  To understand morphology, classification, medical and economical importance of algae and fungi |  To learn the role of algae and fungi in different environments, and their applications. | This course will make the learner informed about the eukaryotic microbes like fungus and algae for their role in environment and applications.  |
| 1 | MIBCC103 | Virology |  To understand the structure and multiplication of viruses |  To understand etiology, transmission, clinical syndrome, diagnosis, treatment and prevention of human virus infections | This course will enable the learner with detail information on viruses, their structure, and replication methods, along with disease pathology. |
| 1 | MIBCC104 | Microbial physiology and biochemistry |  To understand microbial physiology and metabolism. |  To understand the diverse metabolic pathways in different microorganisms, that have significance in environment, health and industry.  | This course will provide the basic principles of microbial physiological pathways and metabolic reactions, which will make the basis to apply this information in genetic engineering, or industry, environment, and health. |
| 1 | 105 | General Microbiology and Analytical Biochemistry |  Understanding of culture and growth characteristics of microorganisms, staining preparations and microscopical observations of microbes | To understand preparation buffer, chromatographic techniques, estimation of protein, sugar.  | This course has objective to provide practical skills to the learners with focus on concepts and techniques learned in course 101, 102, 103 and 104.  |
| 2 | MIBCC 201 | Cellular Microbiology and Immunology |  To understand cell signaling mechanism, communications and interactions as cellular level between host and microbes. |  To understand cellular details of immune system, immunity, and immunization | This course will enable the learner with details of interactions at cellular level. Interactions during microbial diseases and physiology at cellular level shall be useful to design novel methods for control and cure. |
| 2 | MIBCC 202 | Molecular biology and recombinant DNA technology |  To understand macro molecule, protein synthesis and cloning strategies. |  To learn and design strategy and methods for recombination techniques in DNA biology  | This course will enable the learner to understand the concept of molecular biology of microbes, and also to design manipulative strategies on its basis for application in different area of biotechnology and microbiology. |
| 2 | MIBCO 203 | Basic and Applied Microbiology |  To understand basic microbiology and important human pathogens  |  To learn pure culture methods of bacteria and metagenomics.To learn the benefits of the microbes, and their application in industry and environment | This is an open choice paper taken by students of other departments. Therefore it deals with basics of microbial world, harmful and beneficial roles of microbes. This course is designed so that students of other streams may understand microbiology and use it for interdisciplinary study. |
| 2 | MIBCC 204 | Microbial Enzyme TechnologyMicrobial Enzyme Technology |  To learn large scale enzyme production and recovery from microbial sources |  To understand enzyme based diagnostic assays and immune enzyme methods. | This course will lead to understanding of the enzymatic mechanisms, regulation of activities, and their roles in industrial applications. |
| 2 | MIBCC 205 | Immunology and Molecular Biology |  To learn isolation of DNA, RNA, separation of nucleic acid and protein. |  Learning of antigen antibody reactions and various serological methods and assays for detection of infection. Immunological diseases  |  This course has objective to provide practical skills to the learners with focus on concepts and techniques learned in course 201, 202, 203 and 204. |
| 3 | MIBCC301 | Parasitology Medical and Veterinary Microbiology | To understand medically important microbes, clinical condition and diagnosis. Bacterial, viral and fungal diseases and their greater details. | Learn the pathogenesis, cause and control of parasites.  |  This will enable the learner to deal with infectious disease and work in medical related industry/hospital set ups/research |
| 3 | MIBCC302 | Food Microbiology |  To learn importance of microorganisms in fermented food. |  To understand food spoilage, contamination and prevention of spoilage, aong with food borne infections, food intoxications. |  This course will provide technical expertise to the candidate to work in the area of food microbiology and allied industry. |
| 3 | MIBCC303 | Microbial Genetics and Genomics |  To learn Bacterial gene transfer mechanisms, gene regulations |  To understand gene silencing and next generation sequencing. | This course provides the understanding of gene transfer mechanisms which will be useful in RDT research. The advance sequencing technologies for Genomic and metagenomic studies to understand and use the unculturable microbes is also envisaged.  |
| 3 | MIBCC304 | Bioinstrumentation and Bioinformatics |  Learning of different instrumentation techniques and basics of bioinformatics | To learn basic mechanism and handling of sophisticated instruments used in industry and research. |  This course will enable the students to handle sophisticated instruments.  |
| 3 | MIBCC305 | Clinical Microbiology and Bioinformatics |  To learn cultural characterization and biochemical reaction based identification of bacteria. |  To learn application of different software used from bioinformatics |  This course has objective to provide practical skills to the learners with focus on concepts and techniques learned in course 301, 302, 303 and 304. |
| 4 | MIBCC 401 | Soil and Environmental Microbiology | To understand basics of aero, soil and aquatic microbiology.  |  To learn about plant microbe interaction, production of biofertilizer and biopesticide. | This course will enable the students to understand the role of microbes in environment, and its application for green agriculture and environment restorations.  |
| 4 | MIBCC 402 | Industrial Microbiology and Fermentation Technology |  To understand industrially important microorganisms, primary and secondary metabolites. | To understand downstream processing, industrial processes for microbe-based commercial applications |  This course will provide technical expertise to the candidate to work in the different microorganisms-based industry. Also, student will learn quality control and quality assurance of said processes. |
| 4 | MIBCC 404 | Environmental and Industrial Microbiology |  To learn isolation and enumeration of microorganism from soil and environment | To learn basic microbiological techniques used in industry |  This course has objective to provide practical skills to the learners with focus on concepts and techniques learned in course 401 and 402. |
| 4 | MIBCC | Dissertation |  To learn designing experiment, develop hypothesis and carry out research work in most relevant areas of microbiology |  To learn about the research literature, research process, practice research methodology, writing thesis / scientific documents. |  This course trains the candidate and provide the platform to take up higher research after successful completion of course.  |