

## **M.Sc. (MICROBIOLOGY)**

### **Vision**

- To be a center of excellence in teaching as well as practical training in Microbiology
- To enhance the logical and analytical skills in solving problems and thereby inculcating research culture among the students.
- To provide service, research, education and training of quality in the field of Microbiology.

### **Mission**

- To evaluate, add to and transmit Knowledge in the field of Microbiology
- To develop technically skilled human resources in the field of Microbiology
- To educate and train students in the discipline of Microbiology and to expand the body of knowledge of this scientific field through research.

### **PROGRAM EDUCATIONAL OBJECTIVES (PEOS)**

**PEO 1:** To impart basic and applied knowledge of the subject

**PEO 2:** To apply the subject knowledge for human welfare

**PEO 3:** To develop new ideas for sustainable utilization of available resources

**PEO 4:** To prepare students with in-depth knowledge and research skills for professional careers in Microbiology

### **PROGRAM OUTCOMES (POS)**

**PO 1:** Analyzing the problems with the help of gained subject knowledge

**PO 2:** Improvisation of problem solving approach

**PO 3:** Practicing good management of resources

**PO 4:** Meeting the demand of dynamic technological world

### **PROGRAM SPECIFIC OUTCOMES (PSOS)**

**PSO 1: Subject Knowledge:** Apply the knowledge of Basic and Applied Microbiology to the solution of complex problems in Agricultural, Medical, Environmental and Industrial fields.

**PSO 2: Microbiology and Society:** Apply reasoning acquired by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the field

**PSO 3: Environment and Sustainability:** Understanding the impact of the professional solutions in societal and environmental contexts, and demonstrate the knowledge of need for sustainable development.

**PSO 4: Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological changes.

<b>BACTERIOLOGY</b>	<p>On completion of the course, students are able to:</p> <ul style="list-style-type: none"> <li>• Get an idea about the historical events in microbiology</li> <li>• Understand the diversity, scope in microbiology</li> <li>• Understand the taxonomic classification of bacteria</li> <li>• Develop basic skill in aseptic techniques, staining techniques, cultivation technique Microbial taxonomy – concepts and techniques for identification</li> <li>• Evaluation of sterilization techniques, Temperature relation with microorganism- TDT, TDP</li> </ul> <p>Concept related to bacteria, cyanobacteria, actinobacteria, mycoplasma, rickettsia, Chlamydia, enterobacteria, methanogens, methophiles, photosynthetic bacteria, s bacteria, n bacteria, spore forming bacteria, extremophiles and archeobacteria.</p>
<b>MYCOLOGY</b>	<p>On completion of the course, students are able to:</p> <ul style="list-style-type: none"> <li>• Get an idea about features of fungi and fungus like organisms</li> <li>• Understand the phylogeny , physiology of reproduction in fungi</li> <li>• Fungal diversity- structure, reproduction, life cycle and significance of major taxonomic group, Understand Fungal genetics</li> </ul> <p>Get an idea about Fungi and biotechnology: production of alcoholic beverages, antibiotics, organic acids, ergot alkaloids, the cultivation of fungi for food</p>
<b>VIROLOGY</b>	<p>On completion of the course, students are able to:</p> <ul style="list-style-type: none"> <li>• Understand the architecture of viruses</li> <li>• Know the methods used in studying viruses</li> <li>• Charactersitaion and significance of virus</li> <li>• Isolation of bacteriophage</li> <li>• Predict the replication cycle of a virus based on the genes it carries.</li> <li>• Know how viruses are classified</li> <li>• Discern the replication strategies of representative viruses from the seven Baltimore classes</li> <li>• Comprehend the intricate interaction between</li> </ul>

	<p>viruses and host cells</p> <ul style="list-style-type: none"> <li>• Explain vaccine strategies and mechanisms of antiviral drugs and interferons</li> <li>• Know how viruses can be used as tools to study biological processes , as cloning vectors and for gene transfer</li> </ul>
<b>MICROBIALBIOCHEMISTRY</b>	<p>On completion of the course, students learn about:</p> <ul style="list-style-type: none"> <li>• Develop fundamental knowledge about various biomolecules</li> <li>• Understand the basic concepts related to enzymes ,Enzyme kinetics and inhibitions Industrial applications of enzymes</li> <li>• Vitamin as cofactor, its role metabolism,</li> <li>• Various methods used for enzyme purification</li> <li>• Biochemical analysis of sugar, protein, by various methods</li> <li>• Quantitative and qualitative estimation of nucleic acid</li> <li>• Purification of enzymesNucleic acid and protein separation techniques</li> </ul>
<b>MOLECULAR BIOLOGY AND R DNA TECHNOLOGY</b>	<p>On completion of the course, students learn about:</p> <ul style="list-style-type: none"> <li>• Basic concept of molecular biology</li> <li>• Tools of molecular biology for r DNA technology</li> <li>• Principals and applications of various molecular techniques</li> <li>• Concept, methods and application of r-DNA technology• Methods used in molecular biology. • DNA amplification using PCR technique• Isolation of plasmid and fungal DNA</li> <li>• Protein and DNA separation techniques</li> <li>• Gene library and gene mapping</li> </ul>
<b>BIostatISTICS AND COMPUTER APPLICATION</b>	<p>On completion of the course, students will develop skill regarding:</p> <ul style="list-style-type: none"> <li>• Different computational methods used in basic biostatistics</li> <li>• Basic concept in Bioinformatics &amp; Software used in the bioinformatics</li> <li>• Biological databases for protein and nucleic acid</li> <li>• Multivariate analysis in biostatistics</li> </ul>
<b>MICROBIAL GENETICS</b>	<p>On completion of the course, students learn about:</p> <ul style="list-style-type: none"> <li>• Understand concept of genes and chromosomes</li> </ul>

	<p>Familiar with concept of mutations</p> <ul style="list-style-type: none"> <li>• Genome organization and vocabulary</li> <li>• DNA damage and repair</li> <li>• Gene regulations in bacteria, virus and eukaryotes</li> <li>• Process of transcription, translation,</li> </ul>
<b>MICROBIAL METABOLISM</b>	<p>On completion of the course, students learn about:</p> <ul style="list-style-type: none"> <li>• Concept of bioenergetics</li> <li>• Anabolism and catabolism with examples</li> </ul> <p>Metabolism of carbohydrates, lipids, amino acid, nucleotide. Metabolic pathways and Bioenergetics</p> <ul style="list-style-type: none"> <li>• Know various biochemical pathway</li> <li>• Understand the concept of microbial metabolism• Bacterial photosynthesis</li> <li>• Understand how microbial metabolism is important to a relevant societal issue (e.g., health and disease, bioremediation, agriculture, etc.).</li> <li>• Understand how the waste product of one microorganism serves as an important substrate for another organism</li> </ul>
<b>ENVIRONMENTAL MICROBIOLOGY</b>	<p>On completion of the course, students learn about:</p> <ul style="list-style-type: none"> <li>• Get an idea regarding microbial interaction ,microbes and their relation with environment</li> <li>• Understand the enumeration technique for microbes</li> <li>•• Soil microbiology and xenobiotics</li> <li>• Microbial waste treatment methods.</li> <li>• Different techniques used to treat waste water</li> <li>• Biological conversion of lignocellulosic waste,</li> <li>• Bioremediation and biodegradation of xenobiotic compound, biomarkers and bioreporters</li> </ul>
<b>INDUSTRIAL AND FOOD MICROBIOLOGY</b>	<p>On completion of the course, students learn about:</p> <p>Principals in upstream process in fermentation industries.</p> <ul style="list-style-type: none"> <li>• Design and application of bioreactor</li> <li>• Downstream processing and recovery</li> <li>• Production of few microbial products</li> <li>• Method of sampling, investigation and examination of food• Milk microbiology- technique used in milk industry,</li> <li>• Food microbiology – technique used in food industries,</li> <li>• Microbial food poisoning</li> <li>• Techniques used in industries</li> </ul>

<b>MEDICAL MICROBIOLOGY</b>	<p>On completion of the course, students learn about:</p> <ul style="list-style-type: none"> <li>• Various concepts of medical microbiology</li> <li>• Concept related to cells and organs related to immune system</li> <li>• Immune response and immune mechanism</li> <li>• Antibiotics sensitivity and resistance test</li> <li>• Isolate and identify microorganism from laboratory sample, Detection of parasite, Handling of blood and body fluids</li> <li>• Immune response to infections and diseases</li> <li>• Perform MIC of antibiotics,</li> <li>• Various antigen antibody reaction,</li> <li>• Different immunological techniques</li> <li>• Various bacterial , viral , fungal and protozoal diseases their causative agent, mode of infection, epidemiology, treatment, labdiagnosis, prophylaxis</li> </ul>
<b>AGRICULTURAL MICROBIOLOGY</b>	<p>On completion of the course, students learn about:</p> <p>Various methods used in agriculturally important microbes</p> <ul style="list-style-type: none"> <li>• Approaches used in agriculture to control disease in plant</li> <li>• Microbial ecology and microbial interaction</li> <li>• Pathogenic interactions with plant, Various plant pathogens and disease</li> <li>• Microbial biocontrol agents , integrated pest management</li> </ul>
<b>DISSERTATION</b>	<p>On completion of the course, students will develop skill regarding:</p> <ul style="list-style-type: none"> <li>• Selection of research topic</li> <li>• Collection and compilation of literature</li> <li>• Designing of experiment with objectivity</li> <li>• Compilation and interpretation of results</li> <li>• Presentation of research data in report form</li> </ul>