



## **PG DEPARTMENT OF MICROBIOLOGY**

### **MSc., Applied Microbiology**

#### **Program Objectives (POs):**

- ✚ The objective of the Master's Programme in Microbiology is to equip the students to apply knowledge of prokaryotic and eukaryotic cellular processes, classification, interaction of microorganisms among themselves, with physical and chemical agents and higher order organisms.
- ✚ The laboratory training in addition to theory is included to prepare them for careers in the industry, agriculture, and applied research where biological system is increasingly employed.
- ✚ Basics and current molecular updates in the areas of Industrial Microbiology, Fermentation Technology, Agriculture & Environmental Microbiology are included to train the students and also sensitize them to scope for research.
- ✚ To provide basic understanding of the principles of modern applied microbiology. To provide teaching and research activities in applied microbiology.
- ✚ The Master's Programme in Microbiology will address the increasing need for skilled scientific manpower with an understanding of research ethics involving microorganisms to contribute to application, advancement and impartment of knowledge in the field of microbiology.

#### **Program Specific Outcomes (PSOs):**

- ✚ The two years study of Master in Microbiology will impart in-depth understanding of basic aspects of microbiological science pertaining to industrial applications. The student will be able to assess treatment strategies including the appropriate use of antimicrobial agents and common mechanisms of antimicrobial action and resistance.
- ✚ The courses of Industrial Microbiology & Fermentation Technology, Genetic Engineering, Microbial Genetics, Bio-analytical Techniques, Molecular Microbial Physiology, Agriculture & Environmental Microbiology, Animal Biotechnology, and Vaccinology will make the students ready to contribute to; Molecular, Biochemical, Industrial, medical and other basic and applied applications of better understanding of the key principles of microbial functioning at an advanced level.
- ✚ Production of substantial original research of significance and quality sufficient for publication. Awareness of ethical issues in Microbiology research and careers options.

**NEW PRINCE SHRI BHAVANI ARTS AND SCIENCE COLLEGE,**

**MEDAVAKKAM, CH-100**

**PG Department of Microbiology**

**M.Sc., Course Objectives & Course Outcomes**

**YEAR: I M.Sc.,**

**SEMESTER: I**

**SUBJECT: MICROBIAL TAXONOMY**

**SUBJECT CODE: MDT1A**

**COURSE OBJECTIVE:**

The purpose of studying the paper is to gain detailed taxonomic classification of microbes.

**COURSE OUTCOMES:**

**CO-1.** Understanding and gaining knowledge in concepts and techniques for identification.

**CO-2.** Concepts related to extremophilic microbes and archea.

**CO-3.** Significance and characteristics of algae and fungi.

**CO-4.** Characteristics of virus.

**YEAR: I M.Sc.,**

**SEMESTER: I**

**SUBJECT:**

**SUBJECT CODE: MDT1B**

**GENERAL MICROBIOLOGY & LABORATORY ANIMAL SCIENCE**

**COURSE OBJECTIVES:**

- Explain the theoretical basis of the tools technologies and methods common to general microbiology and immunology.
- Demonstrate practical skills in the use of tools, technologies and methods common to Microbiology and immunology.
- Describe methodological information.
- Apply concepts, basic research findings through description interpretation and analysis.

**COURSE OUTCOMES:**

**CO-1.** Understand the structures and functions of biomolecules.

**CO-2.** To know the functions of DNA replication, recombination and their repair mechanism.

**CO-3.** Gain the knowledge about protein synthesis and protein regulations.

**CO-4.** To Study the concepts of Genetic code, Gene silencing and gene regulations.

**YEAR: I M.Sc.,**

**SEMESTER: II**

**SUBJECT: Immunology**

**SUBJECT CODE: MDT1C**

**COURSE OBJECTIVES:**

- Knowledge the structure and function of organ systems.
- Study the pathogenesis of diseases, effective treatment and mechanisms of health maintenance to prevent diseases.
- To provide knowledge on how the immune system works building on their previous knowledge from biochemistry, genetics, cell biology and microbiology.
- Overview of the Immune system learning.

**COURSE OUTCOMES:**

**CO-1.**Gain knowledge about immune system.

**CO-2.**Studied the structure and functions of Antibody and Antigen.

**CO-3.**Skills in immunological techniques.

**CO-4.**Provided knowledge in various mechanism of immune function.

**CO-5.**Importance in public health and awareness about immunological diseases.

**YEAR: I M.Sc.,**

**SEMESTER: I**

**SUBJECT:**

**SUBJECT CODE: MDT11**

**Practical-I: GENERAL MICROBIOLOGY & LABORATORY ANIMAL SCIENCE**

**COURSE OBJECTIVES:**

- To develop skills and competencies in standard microbiological laboratory techniques.
- Train students in the proper use and maintenance of the research grade laboratory microscope with emphasis on oil immersion methods.
- Train students in aseptic technique, prophylaxis, and the proper methods relating to the safe manipulation and maintenance of microorganism.
- Train students in fundamental laboratory methodology to include the use of differential media, metabolic/enzymatic testing and associated reagents.
- Provide students with a hands-on familiarity with basic research procedure and associated critical and investigative thinking skills utilizing identification of unknown

microorganismal specimens & Provide students with an understanding of important facts, concepts, and the investigative procedures of a microbiology producing accurate, skilled clinical laboratory workers with strong ethical and professional values.

### **COURSE OUTCOMES:**

After successful completion of the course, students will be able to:

- CO-1.** Properly prepare and view microbiological specimens for examination using bright field microscopy.
- CO-2.** Use pure culture and selective techniques to enrich for and isolate microorganisms, using proper aseptic technique.
- CO-3.** Estimate the number of microorganisms in a sample using viable plate counts
- CO-4.** Evaluate a microbiological problem in the context of an unknown microorganism, using appropriate media-based methods for identification. Accurately document and report observations and interpretations made during laboratory exercises.
- CO-5.** Use appropriate microbiological lab equipment and methods, in order to conduct and analyze experimental measurements relevant to microbiology. Practice safe microbiology, using appropriate protective and emergency procedures.

**YEAR: I MSc**

**SEMESTER: I**

**SUBJECT: Metabolic Pathway**

**SUBJECTCODE: MDTAA**

### **COURSE OBJECTIVE:**

Students will learn about the fundamental energetic of biochemical process biosynthesis of various aminoacids, carbohydrate and lipid metabolism, understand about pathway regulation

### **COURSE OUTCOMES:**

- CO-1:** Students gain knowledge about enzymes, mechanism and regulation of enzyme
- CO-2:** Understand and learn about bioenergetics and phosphorylation,
- CO-3:** Students again knowledge about various biosynthesis process of biomolecules
- CO-4:** Students have clear idea about respiration and fermentation and about energy yield
- CO-5:** Students can describe aminoacid structure, properties, interconversion of an aminoacid.

**YEAR: I M.Sc.,**

**SEMESTER: I**

**SUBJECT: MICROBIAL DIVERSITY**

**SUBJECT CODE: MDTAB**

**COURSE OBJECTIVE:**

The course helps students to acquire knowledge on the classification, cell wall membranes, genetic functionality, characteristic feature and adaptation features of different extremophiles for their survivability in their different ecosystems.

**COURSE OUTCOMES:**

- CO-1.** Describes the common groups of bacteria and archaea and their distribution and ecological niche.
- CO-2.** Understand the classification, habitats, biogeochemical process and applications of thermophiles and methanogens.
- CO-3.** It provides knowledge on the classification, cell wall membrane, solutes and osmoadaptation of halophiles and barophiles.
- CO-4.** Understand the objectives of space research, life detection methods for metabolism, photosynthesis, ATP production and Sulphur uptake.
- CO-5.** Learn about Antarctica as a model for mars and to search for life on mars by sending various mission, landers and conducting biology box experiment. As well monitoring of microflora in Martian environment and within astronauts.

**YEAR: I M.Sc.,**

**SEMESTER: II**

**SUBJECT: Virology**

**SUBJECT CODE: MDT2A**

**COURSE OBJECTIVES:**

- To understand the architecture of viruses.
- Understand the interactions between viruses and the host immune system.
- The terms Oncogenes and tumor suppressor genes, and how tumor viruses interact with these products and their intersecting pathways and cause oncogenesis.
- To know about the vaccine strategies and mechanisms of antiviral drugs and interferons.
- To know how viruses can be used as tools to study biological processes, as cloning vectors and for gene transfer.
- To study of epidemiology, diagnosis and treatment of viral diseases.

**COURSE OUTCOMES:**

- CO-1.** The process of entry into the cells, control of gene transcription and where relevant translation and gene product stability, control of and mechanism of genome replication, virion assembly and release from the cell.
- CO-2.** Define the growth behavior differences between normal cells and cells transformed by oncogenic DNA and RNA Viruses.
- CO-3.** Define the process of virus latency and describe in molecular terms control of the process and activation of viral genomes during reactivation.
- CO-4.** Describe the processes involved in the anti-tumor effects of “anti-tumor” viruses.

**YEAR: I M.Sc.,****SEMESTER: II****SUBJECT: Medical Systematic Bacteriology****SUBJECTCODE: MDT2B****COURSE OBJECTIVES:**

- Proforma development and direct examination of infectious human samples.
- Exposure of laboratory methods used in identifying infectious agents.
- Antibiotic sensitivity testing for pathogens.
- Epidemiology of infectious agents.
- Employing different staining methods for bacterial and fungal pathogens.
- Studies on the viral infections and cultivation.

**COURSE OUTCOMES:**

- CO-1.** Rationale and basis of classification of bacteria and to enumerate the order, family, genus and species.
- CO-2.** The morphology, cultural, biochemical and other biological properties and characteristics of medically important bacteria.
- CO-3.** The mechanism of virulence and pathogenesis and pathology.
- CO-4.** The disease caused by them, epidemiology, treatment, prevention and control.

**YEAR: I M.Sc.,**

**SEMESTER: II**

**SUBJECT: Mycology & Parasitology**

**SUBJECT CODE: MDT2C**

**COURSE OBJECTIVES:**

- Describe basic morphology, physiology of fungi and parasites.
- Classify parasites and fungi.
- Principles of safety, quality assurance and quality control.

**COURSE OUTCOMES:**

**CO-1.** To provide students both academic instruction and professional training in the field of laboratory medicine.

**CO-2.** To carry out the education of each student in a manner this encourages further education, participation in community service and maintenance of special interests in the field.

**CO-3.** Evaluate specimen acceptability.

**YEAR: I M.Sc.,**

**SEMESTER: II**

**SUBJECT: BIOSTATISTICS & BIOINFORMATICS**

**SUBJECT CODE: MDTBA**

**COURSE OBJECTIVES:**

- This course helps students emphasis on the application of bioinformatics and biological databases to problem solving in real research problems.
- This course helps students to learn computational tools to find sequences, analysis of protein and nucleic acid sequences by various software packages (BLAST, FASTA, Gen Bank etc.,)
- This course helps students gain knowledge on the different protein structure – MOTIFS, DNA Microarray and System Medicines.

**COURSE OUTCOMES:**

**CO-1.** Describes the contents and properties of the most important bioinformatics databases, perform text- and sequence-based searches.

**CO-2.** Understand the major steps in pairwise and multiple sequence alignment by dynamic programming and predict the secondary and tertiary structures of protein and DNA sequences.

**CO-3.** Familiarized with various tools in identifying sequences for enhancing the advancements in system medicines.

**YEAR: I M.Sc.,**

**SEMESTER: II**

**SUBJECT: Practical-II Systematic Bacteriology    SUBJECT CODE: MDT21**  
**Mycology, Virology & Parasitology**

**COURSE OBJECTIVES:**

- Identify common infectious agents
- Evaluate methods used to identify infectious agents
- Specific mechanisms by which an infectious agent causes disease
- Epidemiology of infectious agents
- Appropriate use of antimicrobial agents and common mechanisms of antimicrobial action and resistance
- Infection control measure and vaccines.

**COURSE OUTCOMES:**

**CO-1.** Rationale and basis of classification of bacteria and to enumerate the order, family, genus and species.

**CO-2.** The morphology, cultural, biochemical and other biological properties and characteristics of medically important bacteria.

**CO-3.** The mechanism of virulence and pathogenesis and pathology.

**CO-4.** The disease caused by them, epidemiology, treatment, prevention and control.

**YEAR: I M.Sc.,**

**SEMESTER: II**

**SUBJECT: Industrial and pharmaceutical Microbiology    SUBJECT CODE: MDTAC**

**COURSE OBJECTIVES:**

- Enable Graduates to enter industry with an appropriate level of understanding of the need for both the science.
- Ability to apply the techniques used in industries.
- To produce new drug.

## **COURSE OUTCOMES:**

- CO-1.** Get equipped with a theoretical and practical understanding of industrial microbiology.
- CO-2.** Know about design of bioreactor, factors affecting growth and production.
- CO-3.** Understand the rationale in medium formulation and design for microbial fermentation, sterilization of medium and air.
- CO-4.** Discuss microbial contamination , product spoilage and antimicrobial preservation of cosmetic products.

**YEAR: II M.Sc.,**

**SEMESTER: III**

**SUBJECT: MICROBIAL GENETICS**

**SUBJECT CODE: MDT3A**

## **COURSE OBJECTIVES:**

- To understand the structure and function of Plasmids and Transposons.
- Understand the importance of mutations.
- Understand how gene expression is controlled.
- To understand the mechanism of transfer of genetic material from one species to another.
- To understand the organization of gene and chromosome.
- To understand the mechanism, control and models in molecular recombination.

## **COURSE OUTCOMES:**

- CO-1.** To analyze processes involved in gene mutation and transfer in microorganisms.
- CO-2.** To apply valid microbial genetic knowledge to commercial applications.
- CO-3.** Students can able to identify and distinguish genetic regulatory mechanisms at different levels
- CO-4.** To gain the knowledge of gene mapping and strain construction.
- CO-5.** Students can able to differentiate phenotypic and genotypic relationship.
- CO-6.** Students can gain the knowledge of organization of chromosome in Prokaryotes and Eukaryotes.

**YEAR: II M.Sc.,**

**SEMESTER: III**

**SUBJECT: Genetic Engineering**

**SUBJECT CODE: MDT3B**

**COURSE OBJECTIVE:**

The purpose of this course is to introduce the basic molecular biological concepts and techniques used in the fields of genetic engineering.

**COURSE OUTCOMES:**

- CO-1.** Gaining an appreciable knowledge of dealing with ethical issues relating to science
- CO-2.** Gaining and understanding basic molecular and cellular biology concepts and techniques.
- CO-3.** Gaining the knowledge about current experimentation in genetic engineering.

**YEAR: II M.Sc.,**

**SEMESTER: III**

**SUBJECT: Molecular Biology**

**SUBJECT CODE: MDT3C**

**COURSE OBJECTIVES:**

- Provide knowledge about molecular biology and inheritance at the molecular, cellular and phenotypic levels.
- Gain laboratory skills in molecular biology techniques such as micro pipetting, PCR and electrophoresis.
- Study about the terminology of cell and molecular biology.

**COURSE OUTCOMES:**

- CO-1.** Understand the structures and functions of biomolecules.
- CO-2.** To know the functions of DNA replication, recombination and their repair mechanism.
- CO-3.** Gain the knowledge about protein synthesis and protein regulations.
- CO-4.** To Study the concepts of Genetic code, Gene silencing and gene regulations.

**YEAR: II M.Sc.,**

**SEMESTER: III**

**SUBJECT: Microbial Genetics, Molecular Biology  
Engineering**

**SUBJECTCODE: MDT31 And Genetic**

**COURSE OBJECTIVE:**

The purpose of this course is to provide knowledge about various separation, isolation techniques students will learn about electrophoresis and also advanced techniques.

**COURSE OUTCOMES:**

- CO-1:** Students can able to isolate DNA, RNA and perform electrophoresis.
- CO-2:** Students can isolate and estimate RNA.
- CO-3:** Students can perform SDS-PAGE, and also separate amino acids by thin layer chromatography and paper chromatography.
- CO-4:** They can able to separate proteins, immobilized enzyme, isolation of protoplast and spleroplast.
- CO-5:** Have clear idea about competent cells and also perform transformation.

**YEAR: II M.Sc.,****SEMESTER: III****SUBJECT: Soil & Agricultural Microbiology****SUBJECT CODE: MDTAD****COURSE OBJECTIVE:**

This course helps students to gain knowledge on the types of soil, microbial interactions in soil, nitrogen fixing organisms, bio fertilizer and bio pesticide production using microbes and plant disease management to promotes prevention and enhance the plants growth.

**COURSE OUTCOMES:**

- CO-1.** Understand the properties of different types of soil and interaction of microbes with plants, insects and microbes itself.
- CO-2.** Insight knowledge on nitrogen fixing organisms, their cultivation on usage for biofertilizer and biopesticides.
- CO-3.** Learn the types of pathogen causing plant disease and their defense mechanism by pathology, biochemical and molecular aspects.
- CO-4.** Efficient in understanding the different symptoms, epidemiology and management of various plant diseases like Tobacco Mosaic Diseases, Leaf spot of paddy etc.,

**YEAR: II M.Sc.,****SEMESTER: III****SUBJECT: ENVIRONMENTAL BIOTECHNOLOGY  
MDTBB****SUBJECT CODE:**

**COURSE OBJECTIVE:** To provide knowledge for environmental engineering, bioremediation control and monitoring, study on microbial growth kinetics.

**COURSE OUTCOME:**

**CO-1:** Students gain knowledge on biofilm occurrence, effect and control measures.

**CO-2:** Understand and learn about various bioreactor and its usage, effluent recycle

**CO-3:** Able to learn about waste water treatment, drinking water treatment, denitrification process.

**CO-4:** Learn about various hazardous chemical and biodegradation process

**CO-5:** Gains knowledge about control and bioremediation of various industry

**YEAR: II M.Sc.,**

**SEMESTER: IV**

**SUBJECT: FOOD, DAIRY & ENVIRONMENTAL**

**SUBJECT CODE: MDT4A**

**MICROBIOLOGY**

**COURSE OBJECTIVES:**

- This course helps students to learn the microflora in different foods and their role in spoilage, contamination, preservation and disease causing nature
- This course concentrates on the preparation of different fermented products (cheese, yogurt etc.) dairy microbiology, food sanitation process and different food control agencies and their regulations.
- The course provides knowledge on Micro flora in air – techniques to assess air quality, air sanitation and air borne disease causing pathogen
- It helps students learn about water microbiology – fauna and flora in aquatic habitat and ecology factors on environment.
- As a part of serving nation this course provides knowledge on treatment of liquid and solid wastes by different method (composting, silage, saccharification etc.,)
- It also helps students to study how to degrade xenobiotic compounds like petroleum, paper, wood etc., to reduce the load of pollutants in environment
- To provide students knowledge on bioaccumulation of heavy metals, biofouling and bioleaching to control pollution.

**COURSE OUTCOMES:**

**CO-1.** Understand the role of intrinsic and extrinsic factors on growth and survival of microorganisms in foods, their spoilage mechanism and preservation and prevention methods.

**CO-2.** Learn the basis of food safety regulations and the use of standard methods and procedures

for the microbiological analysis of food.

**CO-3.** Know the beneficial role of microorganisms as well as the methods of processing and preparing different fermented foods like cheese, soy sauce etc.,

**CO-4.** Acquire the knowledge of different air micro flora and how to sanitize and assess the quality of air by various techniques.

**CO-5.** Learning about water microbiology helps to understand the different methods of water quality check and their related factors of microflora.

**CO-6.** Enhances the knowledge of students on waste treatment methods and methods to control pollution on the earth.

**CO-7.** Understand the role of microflora in degradation of xenobiotic compounds like petroleum, paper, wood etc., to reduce the load of pollutants in environment as well as emphasis on biofouling and bioleaching to control pollution.

**YEAR: II M.Sc.,**

**SEMESTER: IV**

**SUBJECT:**

**SUBJECT CODE: MDT41**

**SOIL, AGRICULTURAL, FOOD AND ENVIRONMENTAL MICROBIOLOGY  
(PRACTICAL-IV)**

**COURSE OBJECTIVES:**

- It will provide an introduction to the microbial world and its impacts, both positive and negative on humans.
- Discuss about soil micro organisms
- Describe Food and dairy microorganisms and its impacts.

**COURSE OUTCOMES:**

**CO-1.** Introduction to a wide range of microbial life, to the techniques used to study microorganisms and to the interactions, both beneficial and adverse, between microbes and humans.

**CO-2.** Learn how to manipulate data from Microbiological experiments and how the results may be used for the benefits of mankind.

**CO-3.** Evaluate specimen acceptability.

**YEAR: II M.Sc.,**

**SEMESTER: IV**

**SUBJECT: Research Methodology**

**SUBJECT CODE: MDTAE**

**COURSE OBJECTIVES:**

- Problem identification.
- Reviewing information.
- Recent techniques in applied biology.

**COURSE OUTCOMES:**

**CO-1.** An overview of Education Research.

**CO-2.** Knowledge of the various research designs.

**CO-3.** Knowledge of how to do quality scholarly research including, identifying a research problem, review of literature, hypotheses, data collection, analysis the data, reporting and evaluating research.

