**JAMAL MOHAMED COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI - 620 020**
**P.G. & RESEARCH DEPARTMENT OF MICROBIOLOGY**

## Course Learning Outcomes (CLO) (2017-2018)

## B.Sc (MICROBIOLOGY)

| SEM | COURSE CODE | COURSE | COURSE TITLE | Course Learning Outcomes (CLO) |
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| **SEMESTER - I** | | | | |
| | 17UMB1C1 | **Core - I** | Basic Microbiology | 1. Understand the events in microbiology and Microscope.<br>2. Know about the Methods of Sterilization and Disinfection.<br>3.Gain Knowledge about the Cultivation of Microbes.<br>4. Perform Pure Culture Techniques.<br>5. Analyse the Quantitative Measurement of Bacteria. |
| | 17UMB1C2P | **Core - II** | Basic Microbiology Practical | 1. Understanding the laboratory practices and precautions.<br>2. Learning and understanding the culture media preparation.<br>3. Handling the instruments and also the microbes from different media.<br>4. Isolation and identified the microbes from the culture media.<br>5. Identified the microbes from the staining method. |
| | 17UMB1A1 | **Allied - I** | General Biochemistry | 1. Understand the structure and function of Carbohydrates.<br>2. Know about the Classification and Properties of Aminoacids.<br>3.Gain Knowledge about the Enzymes and its function.<br>4. Understand the structure, function, Properties and Classification of Lipids.<br>5. Understand the structure and importance of Nucleicacids. |
| | I7UMB1A2P | **Allied - II** | General Biochemistry Practical | 1. Studying the general basic biochemical test.<br>2. Learning and understanding the qualitative analysis of carbohydrates.<br>3. Demonstrate and learning the vitamins.<br>4. Understanding and preparing the buffer solution.<br>5. Estimating and handling the biological sample (microbes). |
| **SEMESTER - II** | | | | |

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| | 17 UMB2C3 | **Core - III** | Bacteriology | 1.To provide an overview on bacterial Morphology.<br>2.To learn the general structures of bacterial cell wall.<br>3.To understand the staining types and its techniques.<br>4.To learn the taxonomy of Archaea.<br>5.To understand the concept of maintenance and preservation of culture |
| | 17UMB2C4P | **Core - IV** | Bacteriology Practical | 1.To understand about the micrometry<br>2.To provide knowledge on motility of bacteria.<br>3.To know about the preparation of media.<br>4.To learn about the staining techniques.<br>5.To expand the knowledge on determination of bacterial growth. |
| | 17 UMB2A3 | **Allied - III** | Cell Biology | 1.To provide an overview about cell.<br>2.To understand about the structure and function of cellular components.<br>3.To provide knowledge on structural organization of chromosomes and cell division.<br>4.To learn about the types of cell signaling.<br>5.To understand about the cytological techniques. |
| | I7 UMB2A4P | **Allied - IV** | Cell Biology Practical | 1.To understand the cellular components.<br>2.To learn about the various stages of cell division.<br>3.To learn the sectioning of plant.<br>4.To provide knowledge on microscopic identification of chromosome.<br>5.To understand the isolation of chloroplast and mitochondria. |
| **SEMESTER - III** | | | | |
| | 17UMB3C5 | **Core - V** | Microbial Diversity | 1. Describe the history and development of evolutionary thought.<br>2. Explain concept of life diversity.<br>3. Know how protozoans are classified and its importance.<br>4. Discern the strategies of fungi life cycle<br>5. Understand the architecture of algae. |

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| | 17 UMB3C6 | **Core - VI** | Haematology | 1. To find out Blood grouping.<br>2. To perform haematological tests on biological specimens.<br>3.To understand the blood cells formation.<br>4.Describe the significance of blood cells.<br>5.To study the morphological features of a blood film. |
| | 17UMB3A5 | **Allied - V** | Microbial Metabolism | 1.Understand the utilization, transport of energy and cell wall synthesis.<br>2.Know the different phases of bacterial growth.<br>3.Describe carbohydrate metabolism,photosynthesis and ATP production.<br>4.To enrich the Knowledge about nitrogen utilization, synthesis of aminoacids and proteins.<br>5.Understand the process of anaerobic respiration and fermentation. |
| | 17UMB3A6P | **Allied - VI** | Microbial Metabolism Practical | 1.students should have acquired skill in testing the effect of pH on microbial growth.<br>2.To find out effect of various temperature on microbial growth.<br>3.To acquaint practical knowledge on biochemical character of bacteria.<br>4.Providing basic coverage of urea and Gelatin.<br>5.To understand the casein hydrolysis. |
| | I7UMB3N1 | Non Major Elective - I | Basic Bioinformatics | 1.Gain Knowledge in the internet.<br>2.To familiarize the students with biological database.<br>3.To enable the students to be aware on structure database.<br>4.Enlighten the students on gene Expression.<br>5.To inculcate knowledge on Homology Modeling and Molecular Docking. |
| **SEMESTER - IV** | | | | |
| | 17UMB4C7 | **Core - VII** | Clinical Microbiology | 1.To understand the pathogenesis and epidemiology of Microbes.<br>2.To provide knowledge on awareness against Pathogenic bacteria.<br>3.To understand the pathogenesis of Enterobacteriace.<br>4.To learn the pathogenesis of fungal disease .<br>5.To create awareness on viral Diseases. |

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| | 17UMB4C8P | **Core - VIII** | Clinical Microbiology Practical | 1.To expand the knowledge on clinical microbiology .<br>2.To understand the isolation and identification of pathogens .<br>3.To learn the testing sensitivity of bacteria to antibiotics.<br>4.To assess the minimum concentration of antibiotics against pathogens.<br>5.To learn the mounting technique for Dermatophytes. |
| | 17UMB4A7 | **Allied - VII** | Immunology | 1.To understand the function of immune system.<br>2. Perform the key concept of preparation of antibodies.<br>3.Perform HLA Typing and MHC in graft rejection.<br>4.Gain knowledge on types of allergy.<br>5.Employ antigen antibody reaction for serological testing and diagnosis. |
| | 17UMB4A8P | **Allied - VIII** | Immunology Practical | 1.Making students to know and perform blood grouping test<br>2.To enable the students to perform Latex agglutination<br>3.To acquire practical knowledge on the precipitation<br>4.Enable the students to get sufficient knowledge on antibody isolation .<br>5. To learn about ELIZA technique. |
| | I7UMB4N2 | Non Major Elective - II | Endocrinology | 1.To provide the knowledge and to understand the Endocrine glands.<br>2.To understand the interrelationships of pituitary gland.<br>3.To learn the knowledge about hormones.<br>4. Understanding the efficacy and duration of various types of contraception.<br>5. Learning the Demographic terminologies used in family planning . |
| **SEMESTER - V** | | | | |
| **V** | 17 UMB5C9 | **Core - IX** | Virology | 1.To know about the structure and properties of virus.<br>2.To understand the classification and lifecycle of bacterial viruses.<br>3.To gain knowledge about plant viruses.<br>4.To understand mechanism of virus infection and diagnosis.<br>5.To acquire knowledge in characterization and quantification of viruses. |

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| | 17 UMB5C10 | **Core - X** | Environmental Microbiology | 1.To understand the vital role and applications of various microbial ecosystem.<br>2.To provide knowledge on airborne microorganism<br>3.To understand the role of microbes in water purification and causing disease<br>4.To learn the microbial processes on treatment of waste materials<br>5.To create awareness on Bioremediation |
| | 17 UMB5C11 | **Core - XI** | Soil and Agricultural Microbiology | 1.To understand the vital role and application of microorganisms in agricultural field.<br>2.To learn about the Biochemical cycle<br>3.To learn the microbial processes and its interaction with various hosts.<br>4.To provide knowledge on Plant Pathology.<br>5.To know the role of microorganisms as Biofertilizer. |
| | 17 UMB5C12P | **Core - XII** | Virology, Environmental Microbiology, Soil and Agricultural Microbiology Practical | 1.To understand the technique of isolation and characterization of Phages.<br>2.To know the isolation and staining method of soil microorganisms.<br>3.To know the technique of testing and identification of Soil and Air microbes.<br>4.To gain knowledge in isolation of Algae.<br>5.To perform the Assessment of water quality. |
| | **17 UMB5M1A** | Major Based Elective - I | Social and Preventive Medicine | 1. To understand the types and concepts of Medicine and health.<br>2. To gain knowledge in principles and methods of Epidemiology.<br>3. To know the mechanism of disease cycle and disinfection.<br>4. To obtain knowledge in Genetics and health.<br>5. To acquire knowledge in Demography and Family planning. |

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| | I7UMB5S2A | Skill Based Elective - II | Bioinstrumentation | 1. To know the principles of Microscopy including Light and Electron microscopes.<br>2. To understand the Principles, Mode of operation and applications of laboratory instruments.<br>3. To gain knowledge in basic principles of centrifugation.<br>4. To understand the operation and applications of Colorimetry and Spectrometry.<br>5. To know the Concept of Chromatography and Electrophoresis. |
| | 17UMB5S3A | Skill Based Elective - III | Textile Microbiology | 1.To provide the knowledge about types of microorganisms found on textile fibres.<br>2.To know the concept of bioprocessing of natural fibres.<br>3.To understand about the bioprocessing of organic cotton textiles.<br>4.To acquire knowledge in biomaterials for hygienic and health care textiles.<br>5.To gain knowledge in Textile and fabric antimicrobial microbiology testing. |
| | 17UMB 5EC1 | **Extra Credit Course - I** | Vermiculture Technology | 1.To provide the knowledge on application of vermi composting.<br>2. To acquire the knowlledge for vermicompost preparation.<br>3. To study the Effect of earthworms in soil structure.<br>4. To learn the Earthworms in organic waste management.<br>5.To promote the students to become an entrepreneurship. |
| **SEMESTER - VI** | | | | |

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| VI | 17 UMB6C13 | **Core - XIII** | Microbial Genetics | 1. To provide key concepts on Genetics and genetic materials.<br>2.To provide knowledge on replication of DNA.<br>3.To understand the principles of genetics exchanges and its expression in host.<br>4.To provide an idea about research on molecular genetics.<br>5.To provide an idea about gene regulations and its control. |
| | 17 UMB6C14 | **Core - XIV** | Molecular Biology | 1. Student gain elaborate knowledge on nucleic acids.<br>2. Impart knowledge of mutation.<br>3.Acquire knowledge about repair of DNA<br>4.Enlighten the students on gene Recombination.<br>5.To learn the Concept relating to Transposons. |
| | 17 UMB6C15 | **Core - XV** | Food and Dairy Microbiology | 1.To learn major types of microbes involved in food materials.<br>2.To provide an understanding the causes of food spoilage.<br>3.To Acquire the knowledge of contamination of food.<br>4. To study the pasteurization process.<br>5.To provide and understanding the control measures for bacterial food poisoning. |
| | 17 UMB6C16P | **Core - XVI** | Microbial Genetics, Molecular Biology, Food and Dairy Microbiology Practical | 1. To observe the bacterial genome.<br>2. To study the electrophoresis techniques.<br>3. To analyze the quantitative methods of DNA.<br>4. To identifying the restriction digestion.<br>5. To observing the spheroplast.<br>6. To detecting the food borne pathogens. |
| | 17UMB6M2 | Major Based Elective - II | Industrial Microbiology | 1.To promote understanding of general concepts in industrial Microbiology.<br>2.To know the concept of Industrial Sterilization.<br>3.To gain knowledge about the Fermentors.<br>4.To acquire knowledge in the Production of industrial products.<br>5.To understand about downstream process. |
| | 17UMB6M3 | Major Based Elective - III | Genetic Engineering | 1. To understand the concepts in Biotechnology and Gene manipulation.<br>2. To gain information on tools involved in genetic manipulation of organisms.<br>3. To understand the strategies of gene cloning.<br>4. To know the mechanism of Gene Transfer Techniques.<br>5. To gain knowledge in Immunological and Genetic Methods. |

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| | 17UMB 6EC2 | **Extra Credit Course-II** | Mushroom Technology | 1.To learn the Scope and development of mushroom.<br>2.To provide the knowledge about Food value and composition of mushroom.<br>3.To Acquire the knowledge about cultivation of button mushroom<br>4.To gain in knowledge in Pests and diseases of Edible mushrooms<br>5.To promote the students to become an Entrepreneurship. |

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**M.Sc (MICROBIOLOGY)**

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|---|---|---|---|---|
| SEMESTER - I | | | | |
| | 17PMB1C1 | **Core - I** | Fundamentals of Microbiology | 1.Assessing the characteristics of pre-life earth and which adaptations allowed early microbial life to flourish.<br>2.Identifying, group and properly name organisms via a standardized system.<br>3.Understanding the evolutionary history, classification and distinguished features prokaryotes<br>4.Identifying the defining characteristics, main structures and how fungi reproduce.<br>5.Acquiring relevant knowledge about main structure and characteristics about algae. |
| | 17PMB1C2 | **Core - II** | Microbial Physiology and Cell biology | 1. Learning the different domains of Eubacteria and Archae bacteria and its components.<br>2. Understanding overall culture performance in terms of specific growth rate under different physicochemical conditions.<br>3.Identifying the sum of all chemical reactions, both catabolic and anabolic that take place within an organism.<br>4.Acquiring knowledge about different kinds of pigments produced by microorganism.<br>5.Exploring the knowledge of different adaptations of microbes with stressful environmental conditions. |

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| | 17PMB1C3 | **Core - III** | General Biochemistry | 1. Acquiring knowledge about living organism and its physico chemical regulation.<br>2.Understanding the role of basic carbohydrate and protein, chemical alteration and maintenance in living cell.<br>3.Learning the lipid and nucleic acid structure, property, types and its biosynthesis regulation.<br>4.Gaining the knowledge about the chemical nature of hormones and vitamins and their property and function in cell.<br>5.Learning the principles, different types of molecule that acts cell signaling and its termination signaling pathway. |
| | 17PMB1C4P | **Core - IV** | Fundamentals of Microbiology, Microbial Physiology and Cell Biology and General Biochemistry Practical | 1.Understanding the principles and methodology for isolation and characterization of Microorganisms.<br>2.Acquiring knowledge about Microorganism and its biochemical regulation.<br>3.Understanding the environmental effects on bacterial growth.<br>4.Focusing the apparatus to obtain reproducible data from biochemical experiments.<br>5.Understanding the principles that govern the structures of macromolecules and their participation in chemical reaction. |
| | 17PMB1CE1 | **Core Based Elective -I** | Virology | 1.Focusing the concept covered in virus discovery, taxonomy, properties, structure, classification and replication strategies.<br>2. Exploring the knowledge about virus infecting plant, transmission of plant virus and its economic impact.<br>3.Acquiring knowledge about human and animal viruses and its transcription, translation and maturation of progeny virion.<br>4.Identifying the characteristics of bacteriophage that distinguish from other viruses and from bacterium.<br>5.Learning the knowledge about how viruses are cultivated and quantified and its Biosafety facility in virology lab. |
| **SEMESTER - II** | | | | |

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| | 17PMB2C5 | **Core -V** | Microbial Genetics and Molecular Biology | 1.Student gain elaborate knowledge on nucleic acids<br>2.Get knowledge on DNA replication and repair of DNA<br>3.Able to know about principles of gene transfer<br>4.Impart knowledge of mutation<br>5.Better understanding of gene regulation and expressions |
| | 17PMB2C6 | **Core VI** | Microbial Biotechnology | 1.Students come out with basic ideas on cloning vehicle<br>2.Familiar in the construction of recombinant DNA.<br>3.Able to perform amplification of DNA<br>4.Get knowledge on recombinant molecules<br>5.Better understanding of gene silencing and gene therapy. |
| | 17PMB2C7 | **Core VII** | Environmental and Agricultural Microbiology | 1.Understand the role of microbes and biogeochemical cycles prevail in environment.<br>2.To expose extensive knowledge on recycling waste management<br>3.Acquire Knowledge on microbial leaching and biodegradation<br>4.Gives ideas and knowledge on nitrogen fixing bacterial mechanism<br>5.To provide a detailed study on biofertilizer |
| | 17PMB2C8P | **Core -VIII** | Microbial Genetics and Molecular biology, Microbial Biotechnology, Environmental and Agricultural Microbiology Practical | 1.Trained in isolation and characterization of DNA.<br>2.Able to know and perform protein characterization.<br>3.Able to carry out PCR.<br>4.Able to estimate BOD, COD in waste water.<br>5.Deliver practical knowledge on indicators and water quality. |
| | 17PMB2CE2 | **Core Based Elective -II** | Drug Discovery and Design | 1.To understand the types and concepts of Drug Discovery<br>2.To gain knowledge in principles and methods of Epidemiology.<br>3.To know the mechanism of Drug Design.<br>4.To obtain the knowledge of Antibiotics<br>5.To acquire knowledge in Demography and Docking. |
| **SEMESTER - III** | | | | |

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| | 17PMB3C9 | **Core -IX** | Medical Microbiology | 1.To learn the Fundamentals of Medical Microbiology.<br>2.To understand the viral diseases.<br>3.To create awareness against Pathogenic Microbes.<br>4.To provide the knowledge about Fungal Diseases.<br>5.To Discuss about the protozoan Diseases. |
| | 17PMB3C10 | **Core - X** | Immunology | 1.To understand the overall organization of the immune system.<br>2.To provide the Knowledge about Immunoglobulins<br>3.To make them understand the Immune cell activation.<br>4.To learn the Regulation of Immune response.<br>5.To Demonstrate to understand Immunological techniques. |
| | 17PMB3C11 | **Core - XI** | Bioenergetics and Enzymology | 1.To know the basics on thermodynamics<br>2.To understand the Energy conversion of mitochondria.<br>3.To understand the types and use of enzymes.<br>4.To demonstrate the enzyme pathways.<br>5.To make them understand Enzyme Kinetics. |
| | 17PMB3C12P | **Core - XII** | Medical Microbiology, Immunology, Bioenergetics and Enzymology Practical | 1.To expand the knowledge on clinical microbiology.<br>2.To study the Immunological techniques.<br>3.To understand the Immobilization technique.<br>4. To identify the fungal pathogen.<br>5.To Assess the Minimum Inhibitory concentration. |
| | 17PMB3CE3 | **Core Based Elective -III** | Microbial Ecology | 1.To study the concepts and components of ecosystem<br>2.To understand the Knowledge of Aerobiology.<br>3.To Analyze the fresh and marine water zone.<br>4.To explore the functional ubiquity and diversity of microorganisms.<br>5.To understand the natural selection and genetic variation. Of microbial ecology. |
| | 17PMB3EC1 | **Extra Credit -I** | Cyanobacteriology | 1.To understand the basic knowledge of taxonomy and molecular biology methods of Cyanobacteria.<br>2.To Analyze the Reproduction of Cyanobacteria.<br>3.To identify the molecular biology of cyanobacteria.<br>4.To Asses the molecular regulation of cyanobactria.<br>5.To study the application of microalgae. |
| **SEMESTER - IV** | | | | |

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| | 17PMB4C13 | **Core - XIII** | Fermentation Technology | 1. Isolate and screen industrially important bacteria.<br>2. Know about the working principle of Fermentor.<br>3.Gain Knowledge on formulation of fermentation medium.<br>4. Explore the knowledge on primary metabolite production.<br>5.Gain Knowledge on secondary metabolite production. |
| | 17PMB4C14 | **Core - XIV** | Food and dairy Microbiology | 1.Understanding the principles of preservation process stop or slow down food spoilage and allowing for longer food storage.<br>2.Learning the changes occur in different foods through contamination and spoilage.<br>3. Focusing the list of pathogens associated with food borne infection and its control measures.<br>4. Applying the knowledge about the basic biochemical principle and the role of microorganism in an industrial food fermentation.<br>5.Monitoring the knowledge about selection of microorganism used dairy fermentation, processing ,preservation and their nutritional value |
| | 17PMB 4C15 | **Core - XV** | Biostatistics and Bioinformatics | 1.To understand the basic definitions and applications of Biostatics.<br>2.To equip statistical skills to solve biological problems.<br>3.To gain insight about computer based technology for the study of biological molecules.<br>4.To understand the sequence queries against biological databases.<br>5.To study the biochemical pathway databases. |
| | 17PMB4EC2 | Extra Credit II | Microbial products and Quality Control | 1.Understand the concept of industrial microbes<br>2.Know about the bioplastics and Biopolymers.<br>3.Gain Knowledge on probiotics and fermented foods.<br>4.Explore the knowledge on quality Analysis.<br>5.Gain Knowledge patenting and Biosafety. |

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## M.Phil (MICROBIOLOGY)

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|---|---|---|---|---|
| SEMESTER - I | | | | |
| | 17MPMB1C1 | **Core - I** | Research Methodology | 1. Gain an understanding the Research methodology.<br>2. Handle Microscope and interpretate microscopical observations<br>3. Understand and perform separation of biomolecules<br>4. Understand basic bioinformatics and handle bioinformatics tools for analysis<br>5. To become familiar with quality standards |
| | 17MPMB1C2 | **Core - II** | Applied Microbiology | 1. Understand concept of bioeremidiation<br>2. Become familiar with antibiotics and vaccines<br>3. Develope knowledge on genetic engineering<br>4. Understand role of microbes in food Industry<br>5. Apply and evaluate microbial enzymes in medical industries |
| | 17MPMB1C4 | **Core - IV** | Teaching and learning Methodology | 1. Understand concept of importance-types of networking<br>2. Improves Communication and Interaction<br>3. Understand concept of Teaching and learning<br>4. Develop knowledge on teaching strategies<br>5. To gain the Knowledge to accessing teaching tools |