Department of Microbiology

Name of Programme	Program Outcome(PO)	Program Specific Outcome(PSO)	Course Outcome(CO)
M.Sc Microbiology	➢ The two year course aims to provide an advanced understanding of the core principles and topics of Microbiology and their experimental basis to enable students and acquiring a specialized knowledge by means of Lecture series and subject oriented practicals and projects. ➢ The objective of the two year study of Master of Microbiology will impart in depthunderstanding of basic aspects of Microbiological Science pertaining to industrial applications. ➢ It will equipped the students with the knowledge of fermentation technology, Genetic engineering, Microbial Genetics, Bio analytical techniques, Microbial Physiology, Immunology, Biostatics and Computer Applications, Food and Dairy Technology,Pharmaceutical	**MSc-I Semester** **Paper-I** **Bacteriology** ➢ Ultra structure, Classification of Bacteria its cultivation, nutrition, reproduction,growth characteristics. **Paper-II** **Virology** ➢ Basics of virus classification, architecture of viruses, methods used in studying viruses. ➢ Discern the replication strategies of Bacteriophages and its morphology, Viral Vaccine, Animal and Plant Virus. **Paper-III** **Mycology and Phycology** ➢ General features, classification, structure, reproduction of Fungi. Salient features, Life cycle and economic importance of representative members of various divisions. Fungi and Ecosystem,	➢ Students will acquire and demonstrate competency in laboratory skills ➢ Microbiological research will able to communicate sci concepts clearly and concisely both verbally and writing will involve in internship activities will be able to retain knowledge on distribution morphology and physiology of microorganism in addition to skills in aspetic procedures isolation and identification. ➢ The course also includes some more area covering bacteriology virology immunology mycology microbial genetics and physiology food dairy enzyme and fermentation technology ➢ After the completion of this course student will mastered a set of fundamental skill which would be useful to function actively as professionals and to their continue development and learning with in the field of Microbiology. ➢ This skills include scientific nature and scientific enquiry laboratory skills data collection and analysis skills critical thinking ability problem solving skill communication skill cooperation and social responsibilities moral values.

	Microbiology and Environmental Microbiology.	Bioremediation, Fungal diseases, Mycorrhiza, Classification nutrition, reproduction, pigmentation of algae and Lichens. **Paper-IV** **Fundamentals of Immunology** ➢ Key concepts in immunology. overall organization of the immune system. ➢ Host parasite relationships. ➢ Structure types and properties of immunoglobulins ➢ Salient features of antigen antibody reaction & its uses in diagnostics. ➢ Organ and tissue transplantations in Humans. ➢ Immunohaematology, Autoimmunity. ➢ Hypersensitivity reactions, cytokines and Lymphokines.	**Employability sector** ➢ Quality control executive ➢ Hospitals and laboratories ➢ Pathology and cytology laboratories ➢ Waste management techniques ➢ Pharmaceutical companies ➢ Agrochemical companies ➢ Food standard agencies ➢ Food and beverages companies ➢ Preservation Sectors ➢ Microbiologist ➢ Assistant Professors ➢ Water Companies ➢ Environmental Consultants

		Msc-II Semester **Paper-I** **Molecular biology** ➢ Terms and terminologies related to molecular biology, properties, structure and function of DNA and RNA at the molecular level. ➢ Conceptual knowledge about DNA as a genetic material, ➢ Superhelicity in DNA replication strategies, molecular mechanisms involved in transcription and translation, importance of genetic code and wobble hypothesis,. ➢ Regulation of gene expression in Prokaryotes. **Paper-II** **Microbial Genetics** ➢ Molecular mechanisms underlying mutations,detection of mutations and DNA damage and repair mechanisms ➢ Concept of recombination, gene transfer mechanisms in	

		Prokaryotes. ➢ Plasmids as a vector and their replication, Structure of Phage and Life cycle,Genetics of Phage **Paper-III** **Microbial Physiology** ➢ Basics aspects of Bioenergetics, Brief account of photosynthesis and photosynthetic pigments, Metabolic pathways of carbohydrate anabolism, Chemolithotrophy, methanogenesis and luminescence, Respiratory metabolism & various pathways, Fermentation of carbohydrate, Nitrogen metabolism, Synthesis of amino acids and polysaccharides. **Paper-IV** **Biostatistics and Computer Application** ➢ Statistical inference, Presentation of data, Basics of Measures of tendency and dispersion, Correlation regression, Significance test analysis of Variance Introduction to computer and internet	

		Msc-III Ssemster **Paper-I** **Cellular microbiology** ➢ Cellular biology underlying prokaryotic and eukaryotic ultrastructure genome expression structure pathogenesis ➢ Genome evolution in microbes phylogenetic trees ➢ Prokaryotic and eukaryotic signaling mechanism- eukaryotic cell to cell signaling endocrine signaling, cyclins ➢ Bacterial invasion of host cell survival after invasion. Transport by vesicle formation Exocytosis , Endocytosis. ➢ Protein toxin; agents of disease and examples ➢Immune responses ➢ Macrophages; Cytokines and interferon ➢ Acquired immune response ➢Cell cycle Apoptosis, Oncogenes **Paper-II** **Medical Microbiology** ➢ Microbial Flora of Human Body,	

		Host microbe interaction, Sources of Infection. Pathogenesis, Classification of pathogenic bacteria organisms belonging to different classes. ➢ General properties of Virus Structure of different viruses Fungal Infections. ➢ Laboratory Diagnosis protozoal disease, nosocomial infection Laboratory control and antimicrobial therapy Paper-III Food and Diary Microbiology ➢ Food as substrate of microorganism, Principles of Food preservation, Factors influencing microbial growth in food, Contamination and spoilage, Food borne infections, food sanitation. ➢Application of microbial enzymes, Food produced by microbes, Role of Microorganism in beverages **Paper-IV** **Instrumentation** ➢ Microscopy, pH meter, Centrifugation, Chromatography and its types, Electrophoresis and its	

		types, Spectroscopy and its types, Radio isotopic techniques **MSc-IV Semester** **Paper-I** **Environmental Microbiology** ➢ Concept of Biotic and Abiotic Environment,Concept of Biosphere,Communities & Ecosystem, Microbiology of Wastewater and solid Waste water, Bioaccumulation of heavy metals, Xenobiotics, Soil Pollution, Genetically modified organism, Ozone depletion, Biogeochemical cycle. **Paper-II** **Enzyme Technology** ➢ Enzyme classification ➢ Enzyme Purification, Enzyme fractionation by precipitation ➢ Enzyme crystallization techniques ➢ Enzyme kinetics; Micheles Menten equation. ➢ Mechanism of enzyme action ➢ Metalloenzymes and metal ions as co-factors and enzyme activators Properties of immobilized enzymes ➢ Microbial enzymes in textile	

		,leather wood industries and detergents ➢ Enzymes in clinical diagnostic ➢ Enzymes as therapeutic agents. **Paper-III** **Fermentation and Microbial technology** ➢ Metabolic pathways,Industrial production of citric acid ,Lactic acid enzymes etc,Microbial production of therapeutic compounds, Biotransformation of steroids and vitamins, production of Bioplastic and Bio insecticides, Biopolymer, Biofertilizer, Single Cell Protein, Biofuels, Microbial Production of Hydrogen gas, Biodiesel, Intellectual Property right ,Patents and copyrights. **Paper- IV** **Pharmaceutical Microbiology** ➢ Antibiotics and synthetic antimicrobial agents antifungal antibiotics antitumor substances, chemical disinfectants antiseptics and preservatives. Mechanism of action of antibiotics, Molecular Principle of drug targeting,	

		Quinolinones , Mode of action of antimicrobial agents, Microbial Contamination and spoilage of pharmaceutical products, New vaccine technologies, DNA vaccine, Financing RD capital, Government regulatory practices, Reimbursement of Drug, Rational drug design, Biosensor, Application of Microbial Enzymes in pharmaceutical.	

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B.Sc Microbiology	➢ To study structural organization and economic importance of microbes including Bacteria, Viruses, Algae, Fungi, Protozoa and microbial techniques as well as scope of Microbiology with practical knowledge.	**B.Sc Part-I** **Paper-I** **General Microbiology** ➢ Understanding the basic microbial structure and function and study the characteristics of prokaryotes (Including Bacteria, Virus, algae Fungi and Protozoa) as well as economic importance of microbes. ➢ Various Culture media and their applications and also understand various physical and chemical means of sterilization ➢ General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and algae ➢ Master aseptic techniques and be able to perform routine culture handling tasks safely and effectively ➢ Various Physical and Chemical growth requirements of bacteria and get equipped with various methods of bacterial growth measurement.	**Upon completion of this course students will be able :** ➢ To acquire, articulate, retain and apply specialized language and knowledge relevant to microbiology. ➢ To understand the complete picture about the taxonomical classification of microbes. ➢ To communicate scientific concepts, experimental results clearly both verbally and writing. ➢ To understand the relation between human immune response towards infection of microorganism. ➢ To develop idea of role of microorganism in ecosystem and their impact on environment. ➢ To develop the ability to handle various instruments and cultures including preservation and maintenance ➢ Carry out Bacterial and Fungal fermentation **Employability sector** ➢ Waste management companies ➢ Pharmaceutical companies ➢ Water Purifier plants ➢ Agrochemical industries ➢ Educational Institutes

	➢ To study biomolecules, enzymes and their metabolism as well as overall organization of the immune system with practical knowledge.	**B.Sc Part-I** **Paper-II** **Biochemistry and Immunology** ➢ Overview of major biomolecules carbohydrates, lipids, proteins, aminoacids, nucleic acids, classification, structure, function of the above mentioned biomolecules ➢ Demonstrate an understanding of key concepts in immunology. ➢ Understand the overall organization of the immune system ➢ To make them understand the Salient features of antigen antibody reaction & its uses in diagnostics and various other studies.	

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	➢ To study the structure and transport of plasma membrane, metabolism, genetic recombination and process of DNA repair and required practicals are done relevant to this topics.	**B.Sc Part-II** **Paper-I** ➢ Understand the structure of plasma membrane and its transport systems and the modes and mechanisms of energy conservation in microbial metabolism. ➢ Various Physical and Chemical growth requirements of bacteria and get equipped with various methods of bacterial growth measurement. ➢ Have a conceptual knowledge of plasmid,replication , transposons. ➢ Molecular mechanisms underlying DNA damage and repair mechanisms ➢ Concept of recombination, elucidate the gene transfer mechanisms in prokaryotes.	
	➢ To study the principle & working of various instruments.	**B.Sc Part-II** **Paper-II** ➢ Basics of Spectrophotometer, Chromatography, Centrifugation, Microscopy, Tissue culture techniques, Electrophoresis and Radioisotopic techniques	

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	➢ To study the process of genetic engineering, mutations & Functions of macromolecules.	**B.Sc Part-III** **Paper-I** ➢ Terms and terminologies related to molecular biology. ➢ Understand the properties, structure and function of genes in living organisms at the molecular level ➢ Significance of central dogma of gene action ➢ Have a conceptual knowledge about DNA as a genetic material, enzymology, and replication strategies ➢ Understand the molecular mechanisms involved in transcription and translation ➢ Importance of genetic code and wobble hypothesis ➢ Molecular mechanisms underlying mutations,detection of mutations and DNA damage and repair mechanisms ➢ Concept of recombination,Plasmid and Phage Vectors &Gene cloning.	

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	➢ To study Air, water, Soil Microbiology, Food spoilage and waste treatment with the practical Knowledge.	**B.Sc Part-III Paper-II Environmental and Medical Microbiology** ➢ Appreciate the diversity of microorganism and microbial communities inhabiting a multitude of habitats and occupying a wide range of ecological habitats. ➢ Understand various plant microbes interactions especially rhizosphere, phyllosphere and mycorrhizae and their applications especially the biofertilizers and their production techniques ➢ Understand the basic principles of environment microbiology and be able to apply these principles to understanding and solving environmental problems – waste water treatment and bioremediation ➢ The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.	