SEMESTER I

M.Sc Microbiology

Remember, Understand, Apply, Analyze, Evaluate, Create : R, U, Ap, Az, E, C

THEORY

Name of the Course: P I General Microbiology and Microbial Physiology			
Sem- I	**Credits: 3**	**Course Code : MB 101**	**Year/Group: I M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Understand the scope and importance of microorganisms and their diversity and learn the cell structure, function, microbial growth and metabolism, and the ways to control their growth by Physical and chemical means.		
CO2	Conceptualize growth pattern and culture methods for purification and preservation of Microorganisms.		
CO3	Comprehend basic concepts of classification, identification of microorganisms and learn the mode of nutrition and metabolism.		

PRACTICALS

Name of the Course: P I General Microbiology and Microbial Physiology			
Sem-I	**Credits: 2**	**Course Code: MB 151**	**Year/Group: I M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Develop proficiency in laboratory techniques including the preparation of media, isolation and cultivation of pure cultures, and the use of staining methods for bacterial identification.		
CO2	Analyze microbial growth and environmental parameters on microbial growth, generation time and analyze bacterial growth curves, enhance the understand on microbial physiology and ecology in diverse environments.		

THEORY

Name of the Course: P II - Virology (Core)			
Sem-I	**Credits: 3**	**Course Code:** MB 102	**Year/Group: I M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Understand the structural architecture of viruses, their classification and the methods used for identification and quantification of all the viruses including emerging viruses.		
CO2	Discern the replication strategies of representative viruses from the seven Baltimore classes and understand the intricate interaction between viruses and host cells.		
CO3	Comprehend the role of viruses in oncogenesis, and ways of preventing/ treating viral infections and to know how viruses can be used as tools to study biological processes, as cloning vectors		

	and for gene transfer.

PRACTICALS

Name of the Course: P II - Virology (Core)				
Sem-I	**Credits: 2**	**Course Code: MB 152**	**Year/Group: I M.Sc Microbiology**	**HPW: 4**
Course Outcomes				
CO1	Cultivate advanced laboratory skills in the isolation, quantification, and cultivation of bacteriophages and animal viruses, enabling students to understand viral etiology, growth patterns, and cytopathological effects.			
CO2	Explore the practical applications of viruses in biotechnology and agriculture, including their roles as biopesticides and in public health awareness, while fostering an understanding of viral pathogenesis and the importance of preventive measures such as vaccination.			

THEORY

Name of the Course: P III				
Sem- I	**Credits: 3**	**Course Code** MB 103	**Year/Group: I M.Sc Microbiology**	**HPW: 4**
Course Outcomes				
CO1	To equip students with a basic understanding of the underlying principles of quantitative and qualitative research methods			
CO2	Understand the concepts of normal curve, and interpret the tests of significance in statistics and differentiate the parametric and nonparametric tests.			
CO3	Enable students to acquire expertise in the use and application of the methods of data collection and analysis by statistical and computational tools.			

PRACTICALS

Name of the Course: P III				
Sem-I	**Credits: 2**	**Course Code:** MB 153	**Year/Group:I M.Sc Microbiology**	**HPW: 4**
Course Outcomes				

CO1	Develop skills in qualitative and quantitative data analysis and presentation.
CO2	Learn basic word processing, Spreadsheet and Presentation Graphics Software skills.

THEORY

Name of the Course: P IV Microbial Biochemistry (Core)			
Sem- I	**Credits: 3**	**Course Code : MB 104**	**Year/Group: I M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Develop an understanding of Explain about the pH, buffers, laws of thermodynamics and their importance in daily life		
CO2	Summarize major biomolecules, their classification, structure, function, metabolism and significance		
CO3	Articulate the concepts of enzyme properties, kinetics, regulation in the field of enzyme engineering and large scale industrial processes.		

PRACTICALS

Name of the Course: P IV Microbial Biochemistry (Core)			
Sem I	**Credits: 2**	**Course Code: MB 154**	**Year/Group: I M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Characterize enzymes from microbial sources, including their kinetics, mechanisms, and regulatory pathways.		
CO2	Design experiments, analyze data, and troubleshoot problems in microbial biochemistry research.		

SEMESTER II

M.Sc Microbiology

Remember, Understand, Apply, Analyze, Evaluate, Create : R, U, Ap, Az, E, C

THEORY

Name of the Course: P I Molecular Biology and Microbial Genetics (Core)			
Sem- I	**Credits: 3**	**Course Code MB 201**	**Year/Group: I M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Understand the molecular concepts about DNA as a genetic material, enzymology, and central Dogma of gene action.		
CO2	Describe the fine structure analysis of gene molecular mechanisms underlying mutations, Gene regulation and expression and concept of recombination.		

CO3	Relate and Appraise protocols involving molecular techniques in genetic engineering and rDNA technology

PRACTICALS

Name of the Course: P I Molecular Biology and Microbial Genetics (Core)			
Sem- I	**Credits: 2**	**Course Code MB 251**	**Year/Group: I M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Handle lab experiments and work on lab protocols involving molecular techniques		
CO2	Design lab protocols involving genetic engineering and rDNA technology		

THEORY

Name of the Course: P II			
Sem-II	**Credits: 3**	**Course Code MB 202**	**Year/Group: I M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Understand the Structure and Function of the molecules, cells, and organs involved in Immunity		
CO2	Comprehend various Immunological reactions, MHCs & antigen presentation.		
CO3	Understand the basics of tumor immunity, Immunodeficiency diseases and principles of autoimmunity		

PRACTICALS

Name of the Course: P II			
Sem-II	**Credits: 2**	**Course Code: MB 252**	**Year/Group: I M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Apply the knowledge of all haematological tests in clinical labs.		
CO2	Competently perform serological diagnostic tests such as RIA, ODD, RE.		

THEORY

Name of the Course: P III Industrial Microbiology			
Sem- I	**Credits: 3**	**Course Code : MB 203**	**Year/Group: I M.Sc Microbiology HPW: 4**

Course Outcomes	
CO1	Develop knowledge of significance of microorganisms in food, pharmaceutical and industrial processes.
CO2	Learn about the different types of fermenters, conceptualize the fermentation processes, and downstream methods and detection assays.
CO3	Comprehend basic concepts of industrial oriented methods and get acquainted with processes involved in industrial production of microbial products.

PRACTICALS

Name of the Course: P III Industrial Microbiology			
Sem-II	**Credits: 2**	**Course Code: MB 253**	**Year/Group: I M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Apply Fermentation Techniques by hands-on experience in isolating and screening microorganisms as well as conducting fermentation processes to produce ethanol and wine, emphasizes the development of practical skills in microbial fermentation, product recovery, and the evaluation of fermentation efficiency.		
CO2	Analyze and Quantify various methods for estimating microbial metabolites and enhance their understanding of microbial applications in biotechnology and quality assessment of fermented products.		

THEORY

Name of the Course: P IV - Pharmaceutical Microbiology (Core)			
Sem-II	**Credits: 3**	**Course Code: MB 204**	**Year/Group: I M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Understand the role of microorganisms in pharmaceutical /cosmetic industry, their sources, and methods of disinfection, sterilization and preservation of pharmaceutical formulations. And evaluate methods of sterility testing, microbial content testing and gain knowledge of GxP practices and SOPs.		
CO2	Illustrate and understand the classification and mechanism of action of Non-therapeutic antimicrobial and therapeutic antimicrobial agents and elucidate the antibacterial spectrum and chemical assays of antimicrobial drugs.		
CO3	Demonstrate a knowledge and understanding of microbiological assays of growth promoting and growth inhibiting substances and recognize the biochemical and genetic basis for antibiotic resistance and ways of controlling spread of antibiotic resistance.		

PRACTICALS

Name of the Course: P IV Pharmaceutical Microbiology				
Sem	**Credits: 2**	**Course Code: MB 254**	**Year/Group: I M.Sc Microbiology**	**HPW: 4**
Course Outcomes				
CO1	Analyze students with hands-on experience in microbiological testing and evaluation methods used in the pharmaceutical and cosmetic industries, focusing on bioburden, sterility, microbial contamination, and the effectiveness of antimicrobial agents.			
CO2	Prepare students with the ability to perform bioassays and determine key parameters such as MIC, LD50, D value, and Z value for sterilization and drug efficacy, while developing a strong understanding of antibiotic sensitivity, resistance, and the action of disinfectants.			

SEMESTER III

M.Sc Microbiology

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THEORY

Name of the Course: P I Environmental and Agricultural Microbiology			
Sem-III	**Credits: 5**	**Course Code : MB 301**	**Year/Group: II M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Appreciate the diversity of microorganisms and learn the abundance, distribution and significance of microorganism in the environment habitats of water, air and soil and Comprehend about water pollution and methods employed in waste water treatment		
CO2	Understand the biogeochemical cycles -Carbon cycle and Nitrogen cycle and gain knowledge on applications of diazotrophs as biofertilizers and their production techniques.		
CO3	Learn in detail the conceptual knowledge of Sustainable agriculture and its practices and also understand the various strategies of Microbial bioremediation of environmental pollutants.		

PRACTICALS

Name of the Course: P I Environmental and Agricultural Microbiology			
Sem-III	**Credits: 2**	**Course Code: MB 351**	**Year/Group: II M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Develop skills and design experimental protocols for characterization of microbial communities from various environmental samples.		
CO2	Evaluate the beneficial contributions of microbial communities to soil health and fertility promoting sustainable agricultural practices.		

THEORY

Name of the Course: P II - Medical Bacteriology (Core)			
Sem-III	**Credits: 3**	**Course Code: MB 302**	**Year/Group: I M.Sc Microbiology HPW:4**
Course Outcomes			
CO1	Gain knowledge on medically important organisms and principles of diagnostic microbiology.		
CO2	**U**nderstand the importance of pathogenic bacteria in human disease with respect to pathogenicity and prophylaxis of skin and soft tissue, respiratory tract, gastrointestinal tract, urinary tract infections		
CO3	Comprehend the relationship of this infection to symptoms, modes of transmission, relapse and the accompanying pathology of wound and waterborne bacterial disease.		

PRACTICALS

Name of the Course: P II - Medical Bacteriology			
Sem-III	**Credits: 2**	**Course Code: MB 352**	**Year/Group: I M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Train students in the preparation and use of various culture media and diagnostic techniques for the isolation, identification, and characterization of pathogenic bacteria, focusing on clinical microbiology and infectious disease diagnostics.		
CO2	Furnish students with the skills to perform biochemical, serological, and molecular diagnostic tests, such as IMViC, WIDAL, VDRL, and PCR, for the identification of bacterial pathogens, antibiotic sensitivity testing, and disease diagnosis.		

THEORY

Name of the Course: P III Cell and Molecular Biotechnology (Elective)			
Sem-III	**Credits: 3**	**Course Code: 303**	**Year/Group: II M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Understand the underlying principles of cell signalling, second messengers and signal transduction mechanisms		
CO2	Elucidate the molecular techniques involved in rDNA technology,		
CO3	Interpret various biological databases and compare biological data using bioinformatics tools and appraise knowledge about drug designing and discovery and toxicological assays.		

PRACTICALS

Name of the Course: P III Cell and Molecular Biotechnology (Elective)			
Sem III	**Credits: 2**	**Course Code: 353**	**Year/Group: II M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Interpret various genetic engineering techniques using omics technology		

CO2	Formulate bioinformatics practicals using different softwares and tools.

THEORY

Name of the Course: P IV Applied Biotechnology (Elective II B)			
Sem-IV	**Credits: 3**	**Course Code : MB 304**	**Year/Group: II M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Develop an understanding of Microbial Biotechnology and nanotechnology & get acquainted with processes involved in industrial production of microbial products.		
CO2	Conceptualize plant transformation & Plant Tissue culture techniques & discuss significance of transgenic plants as bioreactors & its applications in Crop improvement		
CO3	Comprehend basic concepts of Animal cell culture, types, media preparation and gene transfer methods for the production of transgenic animals & applications.		

PRACTICALS

Name of the Course: P IV Applied Biotechnology (Elective II B)			
Sem IV	**Credits: 2**	**Course Code: MB 304**	**Year/Group: HPW: 4**
Course Outcomes			
CO1	Learn and apply the Fermentation techniques for Microbial Production of various microbial products & gain knowledge on Bio fabrication of Nanoparticles.		
CO2	Understand the principles of various plant and animal cell/tissue culture techniques & Design of tissue culture laboratory.		

SEMESTER IV

M.Sc Microbiology

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THEORY

Name of the Course: P I Food Microbial Technology			
Sem- IV	**Credits: 3**	**Course Code : MB 401**	**Year/Group: II M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Understand the significance and activities of microorganisms in various food and role of intrinsic and extrinsic factors on microbial growth in foods leading to spoilage, and understand the principles underlying the preservation methods		

CO2	Develop the knowledge on beneficial role of microorganisms in different types of fermented foods and their applications as probiotics.
CO3	Understand of the basis of food safety regulations and discuss the rationale for the use of standard methods and procedures for the microbiological analysis of food.

PRACTICALS

Name of the Course: P I Food Microbial Technology				
Sem-IV	**Credits: 2**	**Course Code: MB 451**	**Year/Group: II M.Sc Microbiology**	**HPW: 4**
Course Outcomes				
CO1	Conduct comprehensive microbiological assessment, spoilage mechanism, and safety measures of various food products.			
CO2	Explore various food preservation techniques and importance of microbiological techniques in developing safe and high-quality food products, along with exploring the beneficial roles of probiotics in food and health.			

THEORY

Name of the Course: P II - Medical Virology and Parasitology (Core)			
Sem-IV	**Credits: 3**	**Course Code: MB 402**	**Year/Group: II M.Sc Microbiology** **HPW: 4**
Course Outcomes			
CO1	Understand the essential concepts of viral diagnostics and know the pathogenesis, diagnosis and prophylaxis of air borne viral infections		
CO2	Gain knowledge on Pathogenicity, Diagnosis, Prevention and Control of Water, Zoonotic and Sexually transmitted viral diseases.		
CO3	Acquire knowledge about pathogenesis and epidemiology in relation to fungal and parasitic infections.		

PRACTICALS

Name of the Course: P II- Medical Virology and Parasitology				
Sem IV	**Credits: 2**	**Course Code: MB 452**	**Year/Group: II M.Sc Microbiology**	**HPW: 4**
Course Outcomes				
CO1	Develop proficiency in advanced diagnostic techniques for detecting viral, parasitic, and fungal infections using methods such as cell culture, PCR, ELISA, and rapid immunodiagnostic assays, while understanding their applications in clinical and research.			
CO2	Provide hands-on experience in the identification of pathogens through microscopic examination and biochemical tests, while familiarizing students with the handling of laboratory animals and the cultivation of viruses for diagnostic and therapeutic purposes.			

THEORY

Name of the Course: P III Bioinformatics and Nanotechnology (Elective)

Sem-IV	Credits: 3	Course Code MB 403	Year/Group: I M.Sc Microbiology HPW: 4
Course Outcomes			
CO1	Understand the computational tools used in biology and learn basics of data mining, machine learning, and artificial neural networks		
CO2	Elucidate the concept of nanosize, nanoparticle-structure and properties and Synthesis of Nanoparticles		
CO3	Characterization of nanoparticles and their varied applications in allied field		

PRACTICALS

Name of the Course: P III Bioinformatics and Nanotechnology (Elective)			
Sem-IV	**Credits: 2**	**Course Code: MB 453**	**Year/Group: II M.Sc Microbiology HPW: 4**
Course Outcomes			
CO1	Study the nanoscale nature of the particles, and synthesis nanoparticles and must be able to relate the applications of nanoparticles in allied fields.		
CO2	Formulate bioinformatics practicals using different softwares and tools.		