SACRED HEART COLLEGE (AUTONOMOUS)

Tirupattur – 635 601, Tamil Nadu, S.India

Resi : (04179) 220103
College : (04179) 220553
Fax : (04179) 226423

Ready for
Every Good Work

A Don Bosco Institution of Higher Education, Founded in 1951 * Affiliated to Thiruvalluvar University, Vellore * Autonomous since 1987

Accredited by NAAC (4th Cycle – under RAF) with CGPA of 3.31 / 4 at 'A+' Grade

M.Sc Applied Microbiology

S No	Title of the Paper	Course Code	Course Objective	Course Outcome	Relevance
1	GENERAL MICROBIOLOGY AND MICROBIAL DIVERSITY	MB701	• To impart basic knowledge about the History and classification of Microbiology. • To make students to understand the fundamentals and diversity of Microbiology. • To learn the Taxonomy, Ultrastructure, Classification of microorganisms. • To provide insights on cultivation techniques and antibiotics. • To recognize the fundamentals on Economic importance of microorganisms.	• Knowledge on Landmark discoveries in Microbiology and different domains classification of living organisms. • Define and examine the structure, properties and classification of Bacteria, Fungi, Algae, Protozoa and Viruses. • Broad knowledge on the structure and functions of organelles of Prokaryotes and Eukaryotes. • Discuss the Economic importance of Fungi, Algae and Protozoa. • Explore and recommend the Staining techniques, Culture medium and Biochemical tests applied in identification of microorganisms.	**Global developmental needs**

				• Demonstrate a clear understanding of microbial control mechanisms through Sterilization techniques and Antibiotics.	
2	MICROBIAL PHYSIOLOGY AND METABOLISM	MB702	• To illustrate Bacterial nutrition and their utilization. • To discuss cultivation methods and factors related to microbial growth. • To study the Microbial growth, nutrition and its uptake. • To demonstrate the concepts of Microbial metabolism and Respiration. • To understand the Photosynthesis reaction in microorganisms.	• Help learners to define and understand the objectives of Microbial physiology, Microbial nutrition and Microbial metabolism. • Analyze and understand the basic concepts of Nutrient requirements and Nutrition types of microorganisms. • Provide students with learning experiences that help in still deep interests in learning Transport of nutrients in Microorganisms. • Develop broad and balanced knowledge and understanding of Microbial growth, Factors influencing growth, Growth measurement and Preservation of microorganisms. • Equip students with appropriate knowledge on major fermentation and metabolic pathways for energy generation in microbial cells. • Recommend students to find the reactions of Intermediate metabolism and Photosynthesis in microorganisms.	**Local and Global developmental needs**

3	IMMUNOLOGY	MB703	• To provide overview of immune system, antigen antibody structure and interactions. • To inculcate the principles of vaccine development. • To provide insights to the Human Defense Mechanisms against Infections. • To strengthen the knowledge of students through a detailed study on Antigens, Antibodies and Immunoassays. • To integrate immunology with health and enrich the knowledge for autoimmune disorders, hypersensitivity reaction.	• Discuss cells and organs of immune system and its role in types of Immunity. • Evaluate the reactions between various antigens and antibodies and apply the knowledge in diagnosing diseases and disorders. • Analyse the concepts and factors influencing immunity, HLA typing and its applications. • Compare the role of MHC in graft rejection in transplantation and plan appropriate strategies. • Describe the principles of immunity for vaccine development and analyse types of hypersensitivity reactions. • Develop theoretical knowledge of various diseased conditions generated due to interplay of immune system components.	**Global developmental needs**
4	MOLECULAR MICROBIOLOGY	MB704	• To make the students to understand the Molecular Biology and Genetic Engineering. • To focus on Genome organization, Transcription and Translation process in Prokaryotes. • To introduce the basic principles of DNA Replication,	• Analyze and understand the basic principles of DNA Replication, Transcription, Translation, Mutation and DNA Repair mechanisms. • Describe the central cell biological processes and how they are regulated. • Evaluate the role of Vectors in Gene Cloning.	**National and Global developmental needs**

			Transcription, Translation, Mutation and DNA Repair mechanisms. • To explain the application of various Gene cloning vectors. • To be highly experienced in Prokaryotic and Eukaryotic Genetic Transformation.	• Apply the principles of selection, construction, screening of recombinants and application of artificial transformation techniques. • Better understanding of Gene expressions. • Development of Molecular Techniques for DNA and Protein analysis.	
5	ELECTIVE: MICROBIAL INSTRUMENTATION	MB705A	• To understand the principles and applications of various instruments used in Life science. • To learn the techniques for operating the instruments. • To study the concepts of Biological and Radiation hazard materials. • To explain the principles and applications of types of centrifuge and chromatography techniques. • To learn principles, types and applications of Spectroscopy.	• Determine the Safety measures in Microbiology laboratory. • Define and explain the principles and applications of various instruments used in Life science. • Explain the Working principles and Applications of Various Microbiology laboratory instruments. • Analyzing the principles and applications of types of Chromatography techniques. • Evaluate the Working principle and Applications of Electrophoresis techniques. • Perform the detailed analysis on Calorimeter and Spectrophotometer.	**National and Global developmental needs**

6	ELECTIVE: BIOSTATISTICS	MB705B	• To demonstrate the importance of data collection and presentation of data • To perform methods used for measuring central tendency, deviation and error • To discuss Probability theory and applications • To explain Correlation, regression and hypothesis testing methods • To identify appropriate method for analysis of variance and learn few statistical packages	• Classify the data and understanding the role of Biostatistics in research. • Provide basic knowledge of statistics and tools used for several quantitative analysis in Microbiology. • Apply and provide knowledge of data collection and presentation of data in various fields of Microbiology. • Assess and implement central tendency, deviation and error in the data collected during research. • Apply and develop the knowledge of probability theory and its applications in research data analysis. • Predict the significance of the biological phenomenon on the basis of available data set.	**Global developmental needs**
7	MEDICAL BACTERIOLOGY	MB801	• To impart in-depth understanding of normal flora and its importance, learn bacterial classification and virulence factors contributing to pathogenicity. • To provide insights into processing of samples and laboratory diagnosis of pathogenic bacteria. • To illustrate methods involved	• Introducing the knowledge of the Medically important bacteria. • Differentiate normal flora from pathogens, analyse the factors contributing to pathogenicity and acquire the skill of sample collection, transport and processing for bacterial identification. • Describe the morphology with the focuses being the pathogenicity, symptoms, identification and	**National and global developmental needs**

			in collection and transport of samples and its biosafety guidelines for bacterial identification. • To teach various cultivation methods, pathogenesis and clinical features of bacteria affecting humans. • To provide the ability to characterize, isolate and identify different Medically important bacteria.	treatment for different bacteria. • Analyse and create an awareness on bacterial diseases and classification for diagnosing Gram positive bacteria and spore formers. • Evaluate the implications of Mycobacterial diseases and drug resistance in the society. • Detect the etiology and virulence factors of Gram negative bacterial diseases, interpreting the laboratory results after following standard operating procedures.	
8	MEDICAL VIROLOGY	MB802	• To make the students to understand the role of viruses in major diseases. • To provide the knowledge on general characters and classification of viruses. • To teach the structure, cultivation and various strategies of Virus replication. • To impart knowledge regarding the diagnostics, clinical aspects and related implications of human viral diseases and emerging viral infections. • To describe the growth behaviour differences between normal cells and cells transformed by DNA and RNA	• Recognize characters of different types of viruses. • Compare the complex interaction between viruses and host cells. • Analyze and teach newer emerging viral infections including the viral mutant forms for emerging. • Outline the basics and essential concepts of Virology. • Evaluate and discuss the structure, classification, pathogenesis, replication, purification and disease control. • Discuss viral vaccines and create awareness about the new emerging threats of viral diseases and modern approaches of virus control.	**National and global developmental needs**

			viruses.		
9	MEDICAL MYCOLOGY AND PARASITOLOGY	MB803	• To illustrate the basics of medically important Fungi and Parasites. • To provide in-depth knowledge on Superficial and Systemic fungi. • Demonstrate the importance of Opportunistic infections caused by fungi. • To study general aspects of Pathogenicity, Clinical Syndrome, Laboratory diagnosis, Treatment and Preventive measures for Fungal and Parasitic diseases. • To explain the role of Protozoans and Helminths as infectious agents.	• Identify, Classify and Cultivate medically important fungi and parasites. • Evaluate and analyze the role of superficial and systemic fungi. • Predict the importance of fungi causing opportunistic infections in immunocompromised individuals. • Assess the role of Protozoans and Helminthes in anthroponotic and zoonotic infections. • Apply diagnostic techniques to identify, isolate and interpret fungal and parasitic infections. • Creating awareness on appropriate preventive and chemotherapeutic measures.	**National and global developmental needs**
10	ELECTIVE - PHARMACEUTICAL MICROBIOLOGY	MB804A	• To illustrate the Principles of Pharmaceutical Microbiology. • To understand the basics of Pharmaceutical Microbiology and important microorganism playing role pharmaceutically. • To understand different products of microbial origin playing key role in Pharmaceutical applications.	• Understanding and explaining the role of microbes in Pharma industries in both positive and negative aspects. • Administering antibiotics and determine Antibiotics resistance for advanced Drug delivery system. • Analyzing and determining drug formulation regarding to guidelines and regulations.	**Global developmental needs**

			• To understand role of Secondary metabolites in Pharmaceutical industry. • To understand good practices and regulation involved in utilizing microbial product for pharmaceutical application	• Examining microbial contamination during pharmaceuticals formulations and production. • Advice good laboratory practices for better understanding. • Formulate regulations for utilizing microbial product in pharmaceutical applications.	
11	ELECTIVE - BIOINFORMATICS	MB804B	• To explain basics and uses of internet and biological databases. • To provide an overview of various bioinformatics tools, databases available and sequence analysis. • To provide knowledge on database concept, management, retrieval along with utilization in gene and protein analysis. • To demonstrate the use of tools for parsing and retrieving sequences and structures from appropriate databases and predicting genes. • To impart in-depth knowledge on deducing protein structures, analyse the expression of proteins, genes and to study variations.	• Effectively use internet in biological database searching, communicating biological data by depositing, storing and retrieving sequences and structures. • Analyse and identify genes and proteins from a set of sequences using appropriate Bioinformatic tools. • Apply the evolutionary relatedness in predicting structure, function of biomolecules, metabolism and to Perform In silico Drug designing. • Demonstrate and evaluate the protein and nucleotide interaction through Bioinformatics tools. • Deduce the structure of proteins, gene expressions. • Justify the variations thus applying Bioinformatics in several fields for benefit of the society.	**Global developmental needs**

12	RESEARCH METHODOLOGY	MB901	• To learn about research designs, ethics in scientific research, data collection and analysis of scientific data using software. • To analyze the Art of Report and Scientific writing. • To study the basic Statistics methods used for Life science research. • To gain the knowledge on Laboratory animals and its maintenance. • To provide insights on importance of scientific communication, ethical issues in research, plagiarism and IPR.	• Provides knowledge to collect Research paper from different Web sources. • Demonstrate the importance of Scientific communication, Ethical issues in research. • Identify appropriate methods for Analysis of variance and learn few Statistical packages • Provides knowledge about the maintenance and ethics related to Laboratory animals. • Evaluate the students about reading the different ongoing research in area of Microbiology. • Creating an awareness on Plagiarism and IPR.	**National and global developmental needs**
13	BIOINOCULANT TECHNOLOGY AND PLANT PATHOLOGY	MB902	• To study about the Production, Formulation, Method of application and Quality control of Bioinoculants. • To create an awareness on Soil microorganisms in Agriculture. • To understand the role of Nitrogen fixers, Phosphate solubilizers, AM fungi and Algal biofertilizers. • To give knowledge on Plant pathogen interaction and its control. • To learn the ability of	• Acquire knowledge on Bioinoculant technology. • Gives the knowledge to the students about Natural organic farming. • Explains the details of Production, Formulation, Method of application and Quality control of Bioinoculants. • Analyzing the diseases causing ability of microorganisms in plants and its control measures. • Developing different methods for the Pest control using microbes.	**National and global developmental needs**

			Biopesticides and Biocontrol agents in Plant growth.	• Recommending the factors for good Soil quality and Agricultural output through sustainable Microbiological applications.	
14	ENVIRONMENTAL MICROBIOLOGY	MB904	• To describe the distribution and enumeration of air microflora and categorize the air borne diseases. • To discuss the Terrestrial ecosystem and Aquatic ecosystem. • To give an overview about role of microorganisms for the cycle of Carbon, Nitrogen, Phosphorus and Sulphur in the nature. • To illustrate the process of Solid waste treatment and Sewage water treatment, and determine the role of microorganisms in water pollution and water quality. • To gain knowledge about Bioremediation mechanisms provided by microbes.	• Assess the role and importance of microorganisms in Atmosphere, Hydrosphere and Pedosphere. • Understanding the role of microorganism in recycling Soil nutrients through Biogeochemical cycles. • Provides a detailed knowledge on Solid waste and Waste water treatment technologies. • Create an awareness to students with current research in environmental microbiology. • Point out the general principles and subject knowledge in the field of Environmental Microbiology. • Gain knowledge about Bioremediation and Biodegradation of complex plant polymers, sustaining and improving plant growth through improving nutrient availability.	**Global developmental needs**
15	ELECTIVE: MICROBIAL REMEDIATION	MB905A	• To motivate against environmental pollution. • To find solution for pollution using microbes. • To study the remediation	• Developing basic skills Environmental microbiology and Microbial remediation of wastes. • Finding solution for various pollution related problems.	**Global developmental needs**

			process by plants, fungi, plants and algae. • To develop knowledge about the environmental risk assessment and remediation. • To gain knowledge on role of microorganisms in their environment.	• Understand and explain the microbial metabolism of environmental contaminants. • Describing the principle of remediation process by various aspects. • Determining the Scientific problem related to pollution and remediation process will be explained. • Analyzing the scientific problem related to pollution and remediation process.	
16	ELECTIVE: VERMITECHNOLOGY	MB905B	• To study about the properties of soil and microbial composting. • To classify and compare the characteristics of earthworm species and waste materials needed for Vermicomposting. • To describe the process and benefits of Vermicomposting. • To understand the biology of Earthworms and its role in Vermicomposting. • To learn the ability of Earthworms in Organic farming and Solid waste reclamation.	• Provide the knowledge to the students about Organic farming through Composting and Vermicomposting. • Compare the difference between Microbial composting and Vermicomposting. • Observe the Biology of Earthworms and its role in Vermicomposting process. • Finding the details of Earthworms and its role in Solid waste reclamation. • Categorize the types of Earthworms and feed needed for Vermicomposting. • Develop various methods of Vermicomposting and its benefits to soil and plants.	**Local and global developmental needs**

17	ELECTIVE – MICROBIAL NANOTECHNOLOGY	MB905C	• To assess types of nanoparticles for various medical research to find out the solution of human diseases. • To overcome the disadvantages of nanoparticle application. • To Physical and chemical properties of nanoparticles give idea about the biological process. • To apply the nanoparticle research in human health sector for their healthy society. • To motivate the researchers to carry the better advanced research on this field.	• Arrange the historical events in the field of Nanotechnology and its development. • Provide knowledge on synthesis of Nanoparticles and its vast applications. • Evaluate and characterize the methods for nanoparticles to know about its physical and chemical properties. • Analyze the Physical and chemical properties of nanoparticles for its Bioactivity. • Motivate the researchers to carry the better advanced research on this field. • Collect a better knowledge about targeting drug delivery by nanoparticles	**Global developmental needs**
18	FOOD MICROBIOLOGY	MB1001	• To distinguish the intrinsic and extrinsic factors of growth of microbes in food and illustrate the various food preservation techniques. • To describe the causes of spoilage of different types of food and plan the methods for detecting the causative microbes of food spoilage. • To obtain a good understanding of food microbiology and	• Understand the principles of microorganisms during various food-processing and preservation steps. • Apply the role of microorganisms, various preservation techniques, and assess the growth factors of food pathogens in food industry. • Evaluate the food contamination and spoilage, detect food pathogens based on physical, chemical and immunological methods.	**Regional and global developmental needs**

			become qualified as microbiologist in food industries. • To detect and interpret the food borne infections, intoxications and prevent food borne outbreaks. • To implement quality control and represent the standards in food production.	• Adapt an appropriate preservative technique for food. • Identify the interactions between microorganisms and the food environment, and factors influencing their growth and survival. • Plan hygiene and sanitation protocol, apply Hazard analysis, Food laws and standards for good quality in food production.	
19	INDUSTRIAL MICROBIOLOGY	MB1002	• To impart theoretical knowledge of role of microbes in Industrial production of different bioproducts. • To describe the industrial Fermentation processes. • To explain the Construction, Design and Operation of Fermentor. • To encompass the use of Industrially important microorganisms in the manufacture of food or industrial products. • To study the use of microorganisms for the production of Antibiotics, Vaccines, Organic acids, Organic solvents, Amino acids, Vitamins and Industrial	• Describe different fermentation techniques, bioreactor design, inoculum development for industrial fermentations, Microbial growth and product formation kinetics. • Media formulation and sterilization, isolation, preservation and improvement of industrially important microorganisms. • Assimilate knowledge on basics and different stages in Industrial fermentation process. • Evaluate theoretical knowledge on design, construction and working of different types of fermenters and medium formulation on an industrial scale. • Plan industrial production of microbial products and stages in	**National and global developmental needs**

			enzymes.	downstream process. • Understanding the Industrial production of Antibiotics, Vaccines, Organic acids, Organic solvents, Amino acids, Vitamins and Industrial enzymes.	
20	ELECTIVE: MICROBIAL BIOTECHNOLOGY	MB1003A	• To learn the basic tools in Microbial Biotechnology. • To study the various Immobilization techniques. • To understand the various concepts of Recombinant DNA Technology and Microbial products. • To understand the production of Microbial Biotechnology products. • To emphasize on IPR issues and need for knowledge in patents in Biotechnology.	• Describe about different metabolites like antibiotics, organic acids, enzymes, drugs, vitamins, therapeutic peptides and pharmaceutical products, biopesticides and biofertilizers of microbial origin. • Analyze theoretical concepts of Biotechnology and their applications in Genetic engineering and Microbiology. • Assimilate knowledge on basics and different stages in Microbial fermentation process. • Evaluate the concept of Recombinant technology with special emphasis in microbial system. • Creates an awareness on the Intellectual property rights and patenting of Biotechnological processes. • Understanding the various concepts of Recombinant DNA Technology and Microbial products.	**Global developmental needs**

21	ELECTIVE: MICROALGAL TECHNOLOGY	MB1003B	• To learn the basic tools in Microbial Biotechnology. • To learn about classification, characteristics of microalgae. • To formulate algal cultures and importance of culture collections. • To learn Upstream and Downstream techniques of microalgae. • To analyze the benefits of Microalgae for this universe.	• Understanding the benefits of Algae to environment. • Formulate algal cultures and importance of culture collections. • Describe commercial production of fuels and microbial enzymes. • Apply knowledge on Basic cultivation technology of microalgal cultivation technique. • Develop techniques on removal of heavy metals from contaminated water using microalgae. • Focus the idea about Bioremediation using microalgae.	**Regional, National and global developmental needs**
22	ELECTIVE: PROBIOTIC MICROBIOLOGY	MB1003C	• To acquire the knowledge and utilization of Probiotics and Prebiotics in our daily life. • To develop the Entrepreneurial Skill production and assessment of Probiotic microbes. • To list out the Commercial probiotic strains. • To explain the definition and types of Probiotics. • To characterize the limitation and dosage of Probiotics	• Understand the basic knowledge of Gastrointestinal Ecosystem. • Learn the Gastrointestinal microbiota and regulation of the Immune system. • Develop the Entrepreneurial Skill production and assessment of Probiotic microbes. • Knowledge about the Genetically modified probiotics. • Evaluate the In vitro assessment of probiotic microbes. • Analyze and explore the Genetic tools used for the identification of adaptation and probiotic factors.	**Global developmental needs**

23	SSP: COMPREHENSIVE MICROBIOLOGY	MB1005SP1	• To understand the overall concept of all fields of Microbiology. • To provide knowledge about basic and advanced concepts in Microbiology. • To compare the characteristics of various categories of microorganisms. • To train the student for their Competitive exams (NET) like ARS/ASRB/CSIR. • To motivate the students to participate in Microbiology Competitive exams.	• Gain knowledge about the overall concepts of Microbiology. • Describe the basic and advanced concepts in Microbiology. • Compare the characteristics of various categories of microorganisms. • Focus the role of microorganisms in food, agriculture, environment and industrial sectors. • Understand and evaluate the role of microorganisms in various Competitive exams. • Help student to score and qualify in the NET exam which will be conducted by ARS/ASRB/CSIR.	**National and Global developmental needs**