

DEPARTMENT OF MICROBIOLOGY
MARKAZ ARTS AND SCIENCE COLLEGE-ATHAVANAD

PROGRAMME AND COURSE OUTCOME

PROGRAMME OUTCOMES (POS)

PO1 Acquire knowledge about the fundamental principles and scientific theories related to various scientific phenomena in day-to-day life.

PO2 To develop communication skills and get expertise in scientific writing.

PO3 Acquire the skills in handling scientific instruments, planning and performing in laboratory experiments. Equip them with the skills to think creatively and draw logical inferences from the scientific experiments to draw the objective conclusions or provide new solutions to the problems. To make them Capable of working effectively in diverse teams in both classroom, laboratory and in industry and field-based situations.

PO4 To get an awareness of the impact of science on the environment and society.

PROGRAMME SPECIFIC OUTCOMES (PSOS)

PSO1 Gain integrated knowledge on different aspects of microbiology, biochemistry, biostatistics and computer applications bioinformatics and emerging worldwide microbiological technologies, issues, and perspectives.

PSO2 Acquire skills specific to microbiology and allied fields for converting information to knowledge through hypothesis, design, execution and analysis.

PSO3 Analysis of scientific issues across the spectrum of related disciplines.

PSO4 Enable the students to improve the quality of human lives in relation to the environment with the knowledge in microbiology.

PSO5 Capacity to develop, employ and integrate technical and professional skills as a member of a team upholding the essence of collaboration, cooperation, ethics and integrity.

CORE COURSE
MICROBIOLOGY

SEMESTER I

MBG1B01. GENERAL MICROBIOLOGY

Course Objectives:

The course contents are designed to gain knowledge about the history of microbiology, eukaryotes and prokaryotes, ultrastructure of bacteria, microscopy and sterilization concepts. The learner will acquire basic knowledge about the microbial world.

Course Outcome

CO1 Sketch the historical events in the developments of Microbiology as a discipline emphasizing the contributions of the scientists.

CO2 Compare the difference between the basic cell types viz, Eukaryote, Prokaryote, Virus, Actinomycetes and Archaeobacteria.

CO3 Describe the ultra structure of a bacterial cell helping to study the further biochemical and physiological reactions inside the cell.

CO4 Discuss various microscopes and compare the different types of light and electron Microscope.

CO5 Explain the various staining techniques and to distinguish their application in Microbiology.

CO6 Discuss the sterilization procedures and to implement it to maintain a hygienic environment .

SEMESTER II

MBG2B02. MICROBIAL PHYSIOLOGY AND TAXONOMY

Course Objectives:

The objective of this course is to enhance and develop knowledge on microbial growth, culture media, modes of reproduction in bacteria and microbial taxonomy. Course Outcomes

CO1 Discuss the environmental and nutritional factors affecting the microbial growth and classify them according to these.

CO2 Describe the mechanism of nutrient transportation across the bacterial membranes.

CO3 Explain the preparation of various cultural media and to distinguish them for microbial cultivation.

CO4 Differentiate various cultural methods and preservation techniques

CO5 Illustrate the reproduction systems and the growth phases of bacteria and bacteriophages CO6 Examine various methods for estimation of microbial cells.

CO7 Analyze the taxonomy of microorganisms through the comparative study of various criteria used and classify them into corresponding groups.

SEMESTER III

MBG3B03. ENVIRONMENTAL AND SANITATION MICROBIOLOGY

Course Objectives:

This course aims to communicate the students with basic principles of environmental and sanitation microbiology. Learner acquires basic understanding of air, water and soil microbiology, solid waste management and xenobiotic metabolism.

Course Outcomes

CO1 Describe the organisms in air with their sources and distribution

CO2 Explain the methods of waste water treatment, air sampling , solid waste management, bioremediation and bioleaching

CO3 Discuss the microbial distribution in aquatic environment with special emphasis on factors affecting them

CO4 Compare the water purification procedures and the tests for the microbiological examination of water

CO5 Explain air borne and water borne diseases with their mode of transmission

CO6 Discuss the concept of xenobiotics and related environmental problems

SEMESTER IV

MBG4B04. SOIL AND AGRICULTURAL MICROBIOLOGY

Course Objectives:

This course prepares the student to address pressing environmental challenges by developing a fundamental understanding of the microbial communities and microbial processes in soil. It provides a brief exploration of plant pathogens and biofertilizers.

Course Outcomes:

CO1 Recall different types of soils and soil properties

CO2 Distinguish the different groups of microorganisms present in soil and t factors affecting their growth.

CO3 Describe the concept of ecosystem and its components and concept of biogeochemical cycles and N, S and P cycles.

CO4 Differentiate different types of biological interactions such as microbe-microbe, plant-microbe and animal-microbe

CO5 Explain the symptoms, disease cycle and control measures of different bacterial, viral and fungal diseases of plants

CO6 Discuss the potential of different microorganisms in agriculture as biofertilizers and biopesticides.

MBG4B05(P). MICROBIOLOGY PRACTICAL I

Course Objectives:

Learner acquires basic skills in aseptic techniques, usage of laboratory instruments, microscopy, different staining techniques, microbial cultivation and enumeration techniques.

Course Outcomes

CO1 Familiarize with parts of a microscope and apply light Microscopy in microbiological studies

CO2 Apply the skill of the staining for microscopic visualization

CO3 Acquaint with common methods of sterilization and to apply the sterilization procedures in a microbiology laboratory and similar places where hygiene has to be maintained.

CO4 Prepare different types of media for the cultivation of microorganisms in a microbiological lab.

CO5 Determine the effect of various factors influencing the growth of microorganisms

CO6 Demonstrate techniques for isolation and enumeration of microbes from various

SEMESTER V MBG5B06. INDUSTRIAL MICROBIOLOGY

Course Objectives:

Learner will Understand the basic concepts of fermentation, fermenter and design, media formulation, sterilization methods and process control parameters in a fermentation process. Imparting Knowledge on isolation, screening, strain development, fermentation and recovery of a product and intellectual property rights.

Course Outcomes

CO1 Describe basic concepts of a fermentation process with various types

CO2 Discuss the media formulations and their significance in fermentation process.

CO3 Explain different methods for screening, isolation, improvement of strain, upstream processing and downstream processing of industrially important microorganisms and products.

CO4 Compare various techniques used for the recovery of fermentation products.

CO5 Demonstrate industrial production of microbial metabolites. CO6 Discuss different intellectual property rights related to microbial products.

MBG5B07. FOOD AND DAIRY MICROBIOLOGY

Course Objectives:

The learner will get acquainted with the beneficial as well as harmful role of microorganisms associated with food and the significant applications of microbes in the food industry. Course Outcomes:

CO1 Memorize the types and importance of microbes that exist in different food items and understand different parameters affecting their growth in food.

CO2 Explain major methods to detect microbes in food, with special importance to contaminants

CO3 Illustrate the physical and chemical properties of milk and types of microorganisms present in milk.

CO4 Differentiate different methods used for the microbiological examination of milk.

CO5 Acquire in-depth knowledge about microbial production of fermented dairy and non-dairy food products and understand the health benefits of SCP, probiotics and prebiotics

CO6 Gain an insight to the microbial spoilage of different kinds of foods

CO7 Discuss major food borne diseases caused by different groups of microorganisms

CO8 Explain preservation of food by various physical and chemical methods

CO9 Discuss the concept of quality control in food, regulatory practices and policies.

MBG5B08. IMMUNOLOGY

Course Objectives:

Demonstrate an understanding on the history of immunology and structural organization of the human immune system. To understand the salient features of antigen antibody reaction, hybridoma technology etc. and its applications. To understand Tumor Immunology and help the students to understand its immunoprophylaxis and immunotherapy including its molecular approach.

Course Outcomes

CO1 Explain the biological functions of various immune cells and organs

CO2 Recognize the cellular coordination in the generation of immune responses

CO3 Illustrate the types, structure and basic features of antigen and antibody.

CO4 Demonstrate the significance of MHC, C system and immunological tolerance.

CO5 Classify antigen-antibody reactions involved in diagnosis of infections.

CO6 Describe the types and mechanisms of hypersensitivity, autoimmunity and graft rejection reactions

CO7 Discuss the causes, molecular mechanisms, immunological responses and treatment options of tumor development.

MBG5B09. MEDICAL MICROBIOLOGY I

Course Objectives:

To impart knowledge of the basic principles of microbial infection. Apart from the mechanism of pathogenesis, morphological, cultural, biochemical, epidemiological and laboratory diagnosis of various bacterial infections also will be studied.

Course Outcomes:

CO1 Explain the concept of infection, its types, sources and the mode of transmission of various diseases.

CO2 Discuss the methods for collection and transportation of clinical samples.

CO3 Compare the morphology, cultural and biochemical characteristics, pathogenesis, laboratory diagnosis, treatment and prophylaxis of various bacterial diseases

SEMESTER VI

MBG6B10. GENETICS AND GENETIC ENGINEERING

Course Objectives:

The learner gets an opportunity to analyze the molecular concepts of cell cycle and its regulation, recombinant DNA technology & other socio-economically relevant molecular technologies. To give a basic understanding on the scope and importance of genetics by imbibing the principles of hereditary genetic transmission and interactions of genes with the environment.

Course Outcomes:

CO1 Summarize the mendelian and non mendelian concepts inheritance

CO2 Explain the concepts of linkage, crossing over and recombination

CO3 Illustrate the cell cycle events and its regulation mechanisms in eukaryotes

CO4 Demonstrate the recombination frequency as a tool of gene mapping in eukaryotes and gene transfer techniques as a tool in prokaryotes.

CO5 Describe the pathways of cell cycle and their regulation strategies adopted by eukaryotic cells.

CO6 Discuss the molecular mechanisms behind the programmed cell death and the inter-relation of death pathway with the cell cycle and immune response.

CO7 Explain the principle behind rDNA technology, DNA sequencing, PCR and their applications in biological sciences.

CO8 Discuss the development of GMOs and its potential risks and benefits on the environment CO9 Critical & ethical analysis of application r DNA technology in our society.

MBG6B11. MEDICAL MICROBIOLOGY II

Course Objectives:

The learner acquires knowledge on various viral, fungal and protozoal disease and immune-prophylaxis. Develop a brief understanding of antibiotics and their classification.

Course Outcomes:

CO1 Discuss the important viral diseases including emerging viral diseases, with special emphasis on symptoms, pathogenesis, transmission and prophylaxis.

CO2 Analyze symptoms, pathogenesis, transmission, prophylaxis and control of important fungal diseases of humans including emerging fungal diseases

CO3 Explain important protozoan diseases of humans such as malaria , amoebiasis and helminth infections and infections caused by flagellates

CO4 Compare different types of vaccines and their routes of administration

CO5 Distinguish antibiotics classes, their mode of action and mechanism of antibiotic resistance

MBG6B12 (P). MICROBIOLOGY PRACTICAL II

4 Course Objectives:

Learner develops skills in biochemical, microscopic and physiological characterization of bacteria and serological studies.

Course Outcomes:

CO1 Apply the biochemical, microscopic and physiological properties of bacteria for the identification of unknown bacteria or clinically relevant bacteria in a patient sample.

CO2 Report variations observed in the blood cell count majorly for clinical or diagnostic purpose

CO3 Perform various serological techniques routinely executed in clinical laboratories

MBG6B13 (P). MICROBIOLOGY PRACTICAL III

Course Objectives:

The learner acquires skill in - Isolation and estimation of DNA and RNA, Study on gene transfer mechanisms and isolation of plasmids, Study various molecular techniques etc.

Course Outcomes:

CO1 Apply the knowledge of the learner for the preparation of various solutions and reagents in laboratories with their specific features.

CO2 To demonstrate various stages of mitosis in onion root tip

CO3 Execute the extraction of DNA and RNA and confirm by performing electrophoresis.

CO4 Estimate the amount DNA and RNA in a solution

CO5 Demonstrate the gene transfer experiments like conjugation and transformation

CO6 Perform procedure for induction of beta galactosidase enzyme by means of artificial transformation.

CO7 Demonstrate the Restriction digestion reaction of various enzymes widely employed in rDNA technology.

MBG6B14 (P). MICROBIOLOGY PRACTICAL IV

Course Objectives:

● To acquire knowledge on various growth patterns, culturing methods and different quantification techniques of microorganisms. ● Develop skills in isolation, screening and strain improvement of industrially important organisms for product development, and their product recovery processes.

Course Outcomes:

CO1 Perform isolation and screening of industrially important microorganisms from soil

CO2 Demonstrate the different fermentation processes-citric acid production, alcohol production and wine production

CO3 Identify sterilization problems with suspended solids in media

CO4 Compare various cell disruption techniques

CO5 Perform cell disruption and salting out

CO6 Perform enrichment of coir pith degraders, pellicle formation, and penicillin assay

CO7 Analyze the aerobic mesophilic count of milk and microbial flora of fermented milk

CO8 Evaluate the microbiological quality of milk by Methylene Blue Reductase test

MBG6B15 (E2). MOLECULAR BIOLOGY

Course Objectives:

Understand the properties, structure and function of genes in living organisms at the molecular level. Have a conceptual knowledge about DNA as a genetic material, enzymology and replication strategies. Understand the molecular mechanisms of mutations, gene expression and gene regulation.

Course Outcomes:

CO1 Demonstrate the structure, function and other basic features of DNA and RNA

CO2 Analyze the organization of genetic material by means of proteins and topological properties.

CO3 Conceptualize the theme of central dogma of molecular biology by discussing the events, enzymes and mechanisms of replication, transcription and translation

CO4 Illustrate the gene expression regulation mechanisms in prokaryotes by means of lac and trp operons

COMPLEMENTARY COURSE: MICROBIOLOGY

BSc. BIOCHEMISTRY

SEMESTER 1

MBG1C01. GENERAL MICROBIOLOGY

Course Objectives:

To develop an understanding on the basic concepts of microbiology including ultrastructure of bacteria, principles of microscopy, sterilization techniques etc.

Course outcomes

CO1 Summarize the historical developments including contributions of scientists.

CO2 Illustrate the external and internal structures of bacterial cell and archaebacterial cell membrane.

CO3 Analyze various microscopic techniques.

CO4 Explain the mechanism of important staining techniques in Microbiology.

CO5 Illustrate physical and chemical disinfection techniques with additional focus on aseptic methods and disinfectant testing

SEMESTER II

MBG2C02. APPLIED MICROBIOLOGY

Course Objectives:

Lerner develop knowledge on the principles of microbial growth, culture media and growth and survival of microbes in air and water.

Course outcome:

CO1 Demonstrate the cultural, metabolic and physiologic characteristics of microorganisms

CO2 Describe the different bacteriological culture media.

CO3 Explain the cultivation of aerobes and anaerobes and different culture preservation strategies.

CO4 Discuss the microbiology of water, air and air borne diseases

CO5 Illustrate different water purification strategies, sewage treatment methods, disinfection techniques.

CO6 Analyze the techniques for water potability and BOD

SEMESTER III

MBG3C03 FOOD AND INDUSTRIAL MICROBIOLOGY

Course Objectives:

The learner acquire understanding on importance of microbes and their applications in food microbiology and industrial microbiology

Course outcome:

CO1 Discuss the important microorganisms in food spoilage and fermentation

CO2 Compare the techniques for food preservation

CO3 Demonstrate the concept of fermentation and enlist its different types.

CO4 Explain the production of commercial products.

CO5 Describe steroid biotransformation and downstream processing

SEMESTER IV MBG4C04. IMMUNOLOGY AND MEDICAL MICROBIOLOGY

Course Objectives:

Impart general awareness on basic concepts of immunology, bacterial, viral and fungal diseases.

Course outcome:

CO1 Discuss the basic concepts of immune system, antigens and antibodies.

CO2 Explain the basics of Infection.

CO3 Illustrate the pathogenesis, diagnosis and treatment of major bacterial pathogens.

CO4 Illustrate the pathogenesis, diagnosis and treatment of common and emerging viral diseases.

CO5 Explain various fungal and protozoan diseases