Mahatma Phule Shikshan Sanstha's

Karmaveer Bhaurao Patil College, Urun-Islampur

Department of Microbiology

B.Sc. I

1. DSC-I Introduction to Microbiology

- Acquired knowledge and understanding of the microbiology concepts as applicable to diverse areas such as medical, industrial, environment, genetics, agriculture, food and others.
- Study different methods in microbiology.
- Experiment with microbial growth dynamics

2. DSC –II Basic techniques in microbiology

- Demonstrate key practical skills/competencies in working with microbes for study and use in the laboratory as well as outside, including the use of good microbiological practices

- Study the structure, classification and general characteristics of bacteria and viruses.
- Classify the prokaryotic and eukaryotic cell and define functions of each and every cell organelle.

Practical Course Sem - I

- To understand the basic techniques in microbiology laboratory.
- To study the working principle, handling and use of compound microscope for the study of microorganism.
- To understand the working principle and application various equipments in microbiology laboratory

3. DSC – III : Bacteriology

- Competent enough to use microbiology knowledge and skills to analyze problems involving microbes, articulate these with peers/ team members/ other stake holders, and undertake remedial measures/studies etc.

- Describe cell biology with special reference to cell organization of prokaryotic and eukaryotic cells. Structural and functional capitalization of cell mitochondria, chloroplast, lysozymes, Golgi bodies, plasma membrane and cytoskeleton, cell wall and nucleus, cell cycle and cell division, chromosome and genetic information storage.

4. DSC – IV Applied microbiology

- Developed a broader perspective of the discipline of Microbiology to enable him to identify challenging societal problems and plan his professional career to develop innovative solutions for such problems.

- Interpret protein evolution, convergent and divergent trees and illustrate Protein turnover
- Describe vitamins as coenzymes and cofactors, sources, requirements, functions and deficiency symptoms of water soluble vitamins, structure and biochemical role.

• Practical Course Sem - II

- To understand the basic laboratory experiment to isolate and cultivate
- To study various biochemical test to differentiate bacteria.

B.Sc. II

1. MIC- 301-MJTH-5 Microbial Physiology & Metabolism

- Demonstrate the metabolic processes through which the energy is produced and utilized.

2. MIC- 302-MJTH-6 Bioinstrumentation and industrial microbiology

- Explain the principles and applications of paper and thin-layer chromatography.
- Describe the working and uses of electrophoresis techniques (agarose gel and PAGE).
- Understand the principles and functions of colorimeters and lyophilization.
- Define fermentation and classify its types with examples of primary and secondary metabolites.
- Identify key parts of a fermenter and factors affecting fermentation processes.
- Outline media components used in fermentation and methods of microbial screening.

Practical course – Sem –III

- Demonstrate differential staining techniques such as spore, flagella, and nucleus staining.

- Evaluate the effect of environmental factors (temperature, pH, heavy metals, salt) on microbial growth.
- Perform primary screening techniques to identify antibiotic and amylase-producing microorganisms.
- Separate and identify amino acids using paper chromatography.
- Monitor microbial growth patterns using optical density measurement.
- Interpret diauxic growth curves of E. coli under changing nutrient conditions.

3. MIC- 401-MJTH-7 Microbial Genetics & Molecular Biology

- Explain the structure and organization of genome in the cell.
- Illustrate characterization of DNA using different techniques.
- Explain various types of Mutation.
- Compare and contrast the basic DNA replication/DNA recombination/ DNA repair process.
- Illustrate basics of transcription process and transcription regulations.

4. MIC- 402-MJTH-8 Basics in Medical Microbiology & Immunology

- Students will define progress of disease caused by bacteria, fungi, viruses and protozoa
- Ability to understand story of disease cycle
- Capacity to evaluate epidemiology of disease, to apply control measures
- Capacity to analyze various specimens and apply various molecular methods for pathogen identification
- Students will define immune system, identify role of organ system in development of immune response against pathogens.

Practical course – Sem –IV

- Prepare various specialized microbiological media for cultivation and biochemical testing of microorganisms.

- Perform key biochemical tests (e.g., gelatin hydrolysis, urea hydrolysis, amino acid deamination) to identify bacterial metabolic activities.

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- Assess the effects of physical and chemical agents such as UV light and antibiotics on bacterial growth.

- Isolate and identify pathogenic bacteria (e.g., Salmonella, Proteus) from clinical samples using standard microbiological techniques.
- Determine human blood groups (ABO and Rh) accurately through agglutination testing.
- Conduct serological diagnostic tests such as the Widal slide test for typhoid diagnosis.
- Interpret experimental results and correlate them with microbial physiology and medical microbiology concepts.

B.Sc. III

1. DSE- E 49 Virology

- Study the structure, classification and general characteristics of bacteria and viruses.

2. DSE E 50 Immunology

- Capacity to build understanding of fundamentals and anatomy of immune system.
- Ability to apply principles of antigen-antibody interaction for diagnosis of diseases.
- Capacity to assess role of antigen processing and presentation for activation of cell mediated immunity
- Determine the efficacy of vaccine to prevent infectious diseases in population

3. DSE E 51 Food & Industrial Microbiology

- Study contamination, Preservation and Spoilage of different kinds of foods
- Study food poisoning and food borne infections
- Study the dairy microbiology contamination
- preservation and spoilage of different dairy products
- Study the Microbiological quality control of different food products

4. DSE E 52 Agricultural Microbiology

- Students will understand basic microbial ecological principle.

1. DSE F 49 Microbial Genetics

- Basic concepts of bacterial genome.
- Study of Mutations
  Methods of isolation and detection of mutants.

- Study of genetic complementation and Extrachromosomal inheritance.
- Concept of Genetic engineering and application.

2. DSE F 50 Microbial Biochemistry

- Study of Enzymes(properties &mechanism of action)
- Study of Enzyme kinetics and Regulation of enzyme synthesis.
- Concept of Extraction & purification of enzymes.
- Basic concepts of metabolic pathway
- Biosynthesis of RNA, DNA, Protein

3. DSE F 51 Environmental Microbiology

- General characteristics of waste
  Biological safety in laboratory and pharmaceutical industries.
- Concept of Sewage Microbiology
  Understand Environmental monitoring.
- Characteristics and treatment of waste generated.
- Concept of bioleaching.

4. DSE F 52 Medical Microbiology

- Students will define progress of disease caused by bacteria, fungi, viruses and protozoa
- Ability to understand story of disease cycle
- Capacity to evaluate epidemiology of disease, to apply control measures
- Capacity to analyze various specimens and apply various molecular methods for pathogen identification
- Determine efficacy of chemotherapeutic agent and understanding the mechanism of action.

Practical Course

- Be able to perform techniques in immunology, virology, food microbiology independently.
- Be able to perform techniques in environmental microbiology, bioassay, BOD/COD estimation.
- Able to perform isolation of DNA and its separation by electrophoresis
- Able to produce citric acid amylase and its estimation by different methods.