Course Outcomes (COs): Microbiology

B. Sc. Microbiology

Semester I

Fundamental of Microbiology

Course Outcomes (COs):

After completion of the course, students will be able to –

CO1: Understanding the History of Microbiology: Gain knowledge on Historical perspectives of Microbiology.

CO2: Microscopy Techniques: understand the concepts of Microscopy and get acquainted to various microscopic methods.

Semester II

Microbial techniques

Course Outcomes (COs):

After successful completion of this course, students are expected to:

CO1: Define and explain the key concepts of sterilization and disinfection, including types of agents, spectrum of activity, mode of action, and applications.

CO2: Apply pure culture techniques to isolate, enumerate, and cultivate microorganisms, using a variety of culture media and methods.

CO3: Perform and interpret common staining procedures for the microscopic observation of Microorganisms.

CO3: Taxonomy and Classification: Understand the concept of taxonomy, familiarize with classification systems and characteristics of bacteria used for classification.

CO4: General Characteristics of Microorganisms: Know general features of various kinds of microorganisms

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Semester III

Bacterial Cytology and Basic Biochemistry

Course Outcomes (COs):

After completion of the course, students will be able to –

CO1:Understand procaryotic cell structure

CO2:Study procaryotic cytoplasmic inclusions

CO3:Understand cell-to-cell interaction

CO4:Difference between pro and eucaryotic cell structure

CO5:Understand the structure, properties and significance of macromolecules

Immunology

Course Outcomes (COs):

After completion of the course, students will be able to –

CO1: Define and classify immune system components antibodies, and vaccines and explain the functions of physiological barriers, normal flora, and lymphoid organs.

CO2:Differentiate cellular and humoral immunity, describe antibody structure and function, and explain various vaccine.

CO3:Analyse antigenicity factors (size, chemical nature, enzyme susceptibility, foreignness, specificity)

CO4:Compare primary and secondary immune responses.

CO5:Explain antigen-antibody reaction mechanisms and the significance of immunological reactions.

CO6:Describe monoclonal antibody.

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Semester IV

Environmental Biology

Course Outcomes (COs):

After completion of the course, students will be able to –

CO1:Gain knowledgeon therole and infections caused by microbes in air

CO2:Obtain detailed information on aquatic ecosystems and Assimilateknowledgeon Water-bornediseases.

CO3:Getdetailed knowledgeof Wastewater treatmentand itsdifferent methods.

CO4:Basicunderstandingofdifferenttypes ofmicrobespresentinthe environmentand their uses.

CO5:Acquireknowledgeon Biodegradation, ofxenobiotic compoundsandUnderstandBiomagnification and Bioremediation.

Medicinal Microbiology

Course Outcomes (COs):

After completion of the course, students will be able to –

CO1:Apply Koch's postulates to analyze the etiology of microbial diseases.

CO2:Comprehensively describe the representative bacterial disease w.r.t. morphology, classification, pathogenesis, laboratory diagnosis, and treatment.

CO3:Analyze the virological characteristics, pathogenesis, and clinical management of viral diseases.

CO4:Explain the characteristics, pathogenesis, and diagnostic approaches for fungal, protozoal, and rickettsial diseases, focusing on representative species.

CO5:Compare and contrast the epidemiological and prophylactic strategies for the prevention and control of bacterial, viral, fungal, protozoal, and rickettsial infections.

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Semester V

Enzymology and Metabolism

Course Outcomes (COs):

After successful completion of this course, students will be able to:

CO1: Explain the structure, classification, and catalytic mechanisms of enzymes.

CO2: Understand enzyme kinetics, factors affecting enzyme activity, and methods for enzyme regulation.

CO3: Demonstrate knowledge of enzyme inhibition, coenzymes, and isoenzymes and their biological significance.

CO4: Describe various metabolic pathways of carbohydrates, lipids, and proteins, including their interrelationships.

CO5: Interpret the role of enzymes in energy metabolism — glycolysis, TCA cycle, oxidative phosphorylation, and photosynthesis.

CO6: Apply concepts of enzymology and metabolism in industrial, medical, and environmental microbiology.

Microbial genetics

Course Outcomes (COs):

After successful completion of this course, students will be able to:

CO1: Understand the structure, organization, and replication of genetic material in microorganisms.

CO2: Explain the molecular basis of gene expression and regulation in prokaryotes.

CO3: Describe genetic recombination mechanisms such as transformation, transduction, and conjugation.

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CO4: Understand the concept of mutations, mutagenic agents, and DNA repair mechanisms.

CO5: Demonstrate the use of microbial genetics in strain improvement and biotechnology.

CO6: Correlate genetic principles with microbial evolution, adaptation, and diversity.

Semester VI

Molecular Biology and genetic engineering

Course Outcomes (COs):

After successful completion of this course, students will be able to:

CO1: Explain the structure and organization of nucleic acids and chromosomes in prokaryotes and eukaryotes.

CO2: Describe the mechanisms of DNA replication, transcription, and translation.

CO3: Understand the regulation of gene expression in prokaryotes and eukaryotes.

CO4: Explain the principles and tools of genetic engineering—restriction enzymes, vectors, cloning, and recombinant DNA technology.

CO5: Demonstrate knowledge of PCR, blotting techniques, sequencing, and gene libraries.

CO6: Discuss applications of genetic engineering in medicine, agriculture, and industry.

CO7: Evaluate ethical, safety, and social issues associated with recombinant DNA research and biotechnology.

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Industrial Microbiology

Course Outcomes (COs):

After successful completion of this course, students will be able to:

CO1: Explain the scope and importance of industrial microbiology and its role in bioprocess technology.

CO2: Understand the design and operation of fermenters and parameters influencing microbial growth and product formation.

CO3: Describe the production processes for primary and secondary metabolites (e.g., alcohol, antibiotics, enzymes, organic acids).

CO4: Explain downstream processing and product recovery techniques.

CO5: Understand the role of microorganisms in food, dairy, and pharmaceutical industries.

CO6: Demonstrate awareness of strain improvement, inoculum development, and process optimization.

CO7: Evaluate industrial biosafety measures, quality control, and environmental regulations.

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