SYLLABUS (CBCS) FOR M.Sc. II. Microbiology
(w. e. from June, 2023)
Academic Year 2023-2024

Class: M. Sc. II (Semester- III)
Paper Code: **PSMB231**
Paper: I
Title of Paper: Immunology
Credit: 4
No. of lectures: 60

Course Outcome:

CO1. Explain the mechanisms of immune response regulation to prevent autoimmunity and excessive immune reactions.
CO2. Understand the roles of regulatory T cells and cytokines in immune regulation.
CO3. Describe the role of the immune system in recognizing and eliminating cancer cells.
CO4. Understand immunotherapeutic approaches for cancer treatment
CO5. Develop critical thinking skills to analyze immunological data and solve problems related to immune responses.
CO6. Effectively communicate immunological concepts through written and/or oral presentations

SYLLABUS (CBCS) FOR M.Sc. II. Microbiology
(w. e. from June, 2023)
Academic Year 2023-2024

Class: M. Sc. II (Semester- III)
Paper Code: **PSMB232**
Paper: II
Title of Paper: Molecular Biology I
Credit: 4
No. of lectures: 60

Course outcome:

CO1. Students will showcase an extensive grasp of operons and the diverse regulatory mechanisms controlling gene expression in both prokaryotic and eukaryotic systems.
CO2. Students will understand the functional importance of riboswitches in gene regulation, along with comprehending how sigma factors respond to phage infections across varied bacterial hosts.
CO3. Students will attain a thorough comprehension of the intricate molecular processes involved in the processing of mRNA, rRNA, and tRNA, encompassing splicing, modifications, and maturation.
CO4. Students will grasp the functions and mechanisms of non-coding RNAs, including their active involvement in RNA interference pathways and their impact on gene silencing.
CO5. Students will be able to explain the distinct roles of activators and repressors in controlling gene expression.
CO6. They will analyze and describe the processes involved in altering chromatin structure and accessibility, leading to changes in gene expression.
CO7. Students will explain the mechanisms of DNA methylation and genomic imprinting.

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Academic Year 2023-2024

Class: M. Sc. II (Semester- III)
Paper Code: **PSMB233**
Paper: III
Title of Paper: Industrial waste water treatment
Credit: 4
No. of lectures: 60

Course Outcome:

CO1. Able to define the key terms and concepts related to industrial wastewater treatment.
CO2. Summarize the significance of industrial wastewater treatment for environmental protection.
CO3. Students be able to determine basic wastewater parameters, such as pH, turbidity, and suspended solids.
CO4. Interpret wastewater characterization data to assess pollution levels and develop treatment strategies.
CO5. Describe the operating principles of physical treatment processes.
CO6. Design a preliminary physical treatment system for a specific industrial wastewater.
CO7. Analyse and interpret data from a biological treatment system, including COD and BOD removal efficiency.

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Class: M. Sc.II (Semester- III)
Paper code: PSMB 234 (A)
Paper: IV (A)
Title of Paper: Biophysical Techniques
Credit: 4
No. of lectures: 60

Course Outcome:

CO1. Students will develop the capability to comprehend molecular structure determination.
CO2. Students will understand the core principles of biology, chemistry, and physics understanding how these disciplines interconnect with biology systems
CO3. Students will proficiently conduct laboratory procedures while adhering to safe practices
CO4. Students will analyze primary literature critically within the field.
CO5. Students will efficiently use databases, computational tools, and various online resources.
CO6. Students will demonstrate awareness of issues in the practice of science.
CO7. Demonstrates a solid understanding of biophysical concepts.

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Class: M. Sc. II (Semester- III)
Paper Code: **PSMB234 (B)**
Paper: IV (B)
Title of Paper: Developmental Biology
Credit: 4
No. of lectures: 60

Course Outcome:
Students who successfully complete the course will be able to

CO1. Name, describe and order the main stages of development common to most multicellular organisms.
CO2. Describe the main anatomical changes that occur during development.
CO3. Identify the cellular behaviours that lead to morphological change during development.
CO4. Describe the hierarchy of gene activation that occurs in early *Drosophila* development.
CO5. Understand how gene activation plays a role in differentiation and development.
CO6. Able to explore how environmental factors influence embryonic development
CO7. Address ethical issues related to developmental biology research, including controversies surrounding stem cell research and genetic manipulation.

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Class: M. Sc. II (Semester- III)
Paper Code: **PSMB235**
Paper: V
Title of Paper: Practical Course: Practical course based on Immunology, Pharmaceutical Microbiology and Industrial waste water treatment
Credit: 4
No. of lectures: 60

Course Outcome

CO1. Students be able to determine basic wastewater parameters, such as pH, turbidity,and suspended solids.
CO2. Interpret wastewater characterization data to assess pollution levels and develop treatment strategies..
CO3. CO7. Analyse and interpret data from a biological treatment system, including COD and BOD removal efficiency.
CO4. Describe the factors influencing the rate of single diffusion and how these factors contribute to the overall process.
CO5. Analyze real-world examples where single diffusion plays a crucial role, such as in biological membranes, chemical reactions, or material science.
CO6. Critically evaluate experimental methods used to study single diffusion and interpret experimental results.

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Class: M. Sc. II (Semester- III)
Paper Code: **PSMB236**
Paper: VI
Title of Paper: Practical Course: Practical course based on Molecular Biology and Microbial Technology
Credit: 4
No. of lectures: 60

Course outcome:
After completing this course Students should able to:

CO1. Develop the ability to critically analyze and describe the impact of diverse gel concentrations on the effectiveness and stability of bioconversions employing immobilized cells, providing insights into how different gel compositions affect the process's efficiency and stability.

CO2. Acquire the capability to assess and interpret the effects of varying cell concentrations in immobilized systems on the pace and productivity of bioconversion processes, aiming to identify the optimal cell density for maximizing conversion rates and yields.

CO3. Attain a comprehensive understanding of biosorption mechanisms, particularly concerning the utilization of deceased biomass for the absorption or removal of dyes from solutions, allowing for a clear grasp of the underlying principles and applications in environmental remediation.

CO4. Develop proficiency in implementing the Plackett-Burman experimental design to optimize media components for laboratory-scale production, specifically targeting increased yields of exopolysaccharides, showcasing adeptness in experimental design and optimization techniques.

CO5. Attain expertise in employing precise techniques for isolating and extracting plasmid DNA from bacterial cells, aiming for high purity and yield, thereby demonstrating competence in molecular biology laboratory skills.

CO6. Understand and apply the process of DNA transformation, enabling bacterial cells to uptake foreign DNA and express specific genes, showcasing proficiency in genetic manipulation techniques.

CO7. Acquire the ability to analyze gene sequences, identify functional elements, and determine potential functions and regulatory elements, leading to comprehensive gene annotation, showcasing advanced bioinformatics and molecular biology skills.

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Class	: M. Sc. II (Semester- III)
Paper Code	: SD23
Title of Paper	: Skill Development: Spectroscopic Techniques
Credit	: 2
No. of lectures	: 30

Course Outcome:

CO1. Understand the Principles: Students will be able to explain the fundamental principles of UV-Visible spectroscopy, including the interaction of electromagnetic radiation with matter, molecular transitions, and the Beer-Lambert Law.

CO2. Gain proficiency in operating UV-Visible spectrophotometers, understanding the components, and calibrating the instrument for accurate measurements.

CO3. Develop the ability to perform quantitative analysis using UV-Visible spectroscopy, including the determination of concentration and molar absorptivity.

CO4. Interpret UV-Visible spectra to identify functional groups, electronic transitions, and chemical properties of various compounds.

CO5. Acquire skills in developing experimental methods for specific applications using UV-Visible spectroscopy, such as kinetics studies, reaction monitoring, and quality control.

CO6. Learn to troubleshoot common issues associated with UV-Visible spectrophotometers and understand routine maintenance procedures to ensure reliable and accurate results.

CO7. Understand the fundamental principles of Atomic Absorption Spectroscopy, including the theory of atomic absorption, energy levels, and the role of hollow cathode lamps.

CO8. Gain proficiency in operating AAS instruments, handling sample introduction systems, and optimizing instrumental parameters for different elements.

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(w. e. from June, 2023)
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Class: M. Sc. II (Semester- IV)
Paper Code: PSMB241
Paper: I
Title of Paper: Pharmaceutical Microbiology
Credit: 4
No. of lectures: 60

Course Outcome:

CO1. In addition to drug development students will also understand the concepts of drug discovery
CO2. They will be able to know pharmacokinetics and pharmacodynamics.
CO3. Proficiency in various drug screening methods, including high-throughput screening, virtual screening, and biochemical assays.
CO4. They will be able to know medicinal chemistry principles to design and optimize drug candidates.
CO5. An understanding of the pharmacological aspects of drug development, including mechanisms of action, pharmacokinetics, and pharmacodynamics.
CO6. Knowledge of safety assessment procedures and understanding of potential toxicity issues associated with drug candidates.
CO7. Proficiency in developing drug formulations and delivery systems.
CO8. Awareness of the regulatory pathways for drug approval, as well as ethical considerations in drug development.

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Class: M. Sc. II (Semester- IV)
Paper Code: **PSMB242**
Paper: II
Title of Paper: Molecular biology II
Credit: 4
No. of lectures: 60

Course outcome:

CO1. Students will gain extensive knowledge encompassing a variety of gene cloning techniques, comprising the preparation of gene and genome libraries, cDNA libraries, PCR cloning, and alternative methodologies.

CO2. Students will demonstrate comprehension of techniques involved in manipulating large DNA fragments (YAC, BAC, HAC) and gene transfer methods utilized for introducing foreign DNA into host cells.

CO3. Students will explore and grasp the process of synthesizing diverse commercial products (amino acids, ascorbic acid, antibiotics, peptide antibodies, biopolymers) utilizing recombinant DNA technology.

CO4. Students will comprehend the process of bioremediation, encompassing the degradation of xenobiotics and the engineering of pathways for degradation within genetically modified organisms.

CO5. Students will understand the utilization of starch and cellulose for producing fructose, alcohol, and silage by employing genetically modified organisms.

CO6. Students will critically evaluate and discuss the social and ethical considerations associated with genetically modified organisms.

CO7. Students will explore the diverse applications of GMOs in medicine, encompassing disease prevention, early detection, therapies, as well as their agricultural uses. They will analyze the advantages, disadvantages, and instances of transgenic plants yielding beneficial molecules.

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Academic Year 2023-2024

Class: M. Sc. II (Semester- IV)
Paper Code: **PSMB243**
Paper: III
Title of Paper: Microbial Technology
Credit: 4
No. of lectures: 60

Course Outcome:

CO1. Students will learn about the different types of fermentation processes, equipment used and microbial process involved.
CO2. Students will gain knowledge of significance and activities of microorganisms.
CO3. Comprehensive understanding of the different designs of bioreactors and process variables.
CO4. Understand the fundamental principles of microbial technology, including microbial physiology, genetics, and metabolism.
CO5. Identify and classify different types of microorganisms and understand their roles in various industrial processes.
CO6. Demonstrate proficiency in techniques used for microbial isolation, cultivation, and maintenance in laboratory settings.
CO7. Apply knowledge of microbial technology to solve practical problems and design biotechnological solutions.

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Class: M. Sc. II (Semester- IV)
Paper Code: **PSMB244 (A)**
Paper: IV (A)
Title of Paper: Medical Microbiology
Credit: 4
No. of lectures: 60

Course Outcome:

CO1. Identify microorganisms associated with human diseases, understand their epidemiology and modes of transmission.
CO2. Understand the principles and techniques used in the laboratory diagnosis of infectious diseases, including specimen collection, culture, identification, and antimicrobial susceptibility testing.
CO3. Analyze and interpret clinical microbiology laboratory results, including microbial growth patterns, biochemical tests, and molecular diagnostic methods.
CO4. Understand the principles of microbial pathogenesis, including mechanisms of virulence and host-pathogen interactions.
CO5. Explain the mechanisms of action and resistance of antimicrobial agents, and apply knowledge to guide appropriate antimicrobial therapy.
CO6. Students will able to learnmultidrug resistance in bacterial pathogens
CO7. Develop critical thinking skills in the analysis of scientific literature related to medical microbiology.

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Class: M. Sc. II (Semester- IV)
Paper Code: **PSMB244 (B)**
Paper: IV (B)
Title of Paper: Mathematics for Biological Science
Credit: 4
No. of lectures: 60

Course Outcome:

By the conclusion of this course, the students clearly -

CO1. Have developed basic knowledge of mathematics as applied to biological phenomenon.
CO2. Have developed basic knowledge of linear function.
CO3. Have developed basic knowledge of exponential function.
CO4. Have developed basic knowledge of power function.

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Class: M. Sc. II (Semester- IV)
Paper Code: **PSMB245**
Paper: V
Title of Paper: Dissertation I
Credit: 4
No. of lectures: 60

Course Outcome:

CO1. Understand the research process, including the formulation of research questions, hypotheses, and objectives.
CO2. Identify appropriate research designs and methods based on the research questions and objectives.
CO3. Critically evaluate and select relevant literature for conducting a comprehensive literature review.
CO4. Develop research proposals that outline the research design, methodology, and ethical considerations.
CO5. Apply various data collection techniques, such as surveys, interviews, experiments, and observations.
CO6. Analyze and interpret quantitative and qualitative data using appropriate statistical and analytical methods.
CO7. Effectively communicate research findings through written reports and oral presentations.
CO8. Demonstrate ethical conduct in research by adhering to guidelines for responsible research practices. Critique and evaluate research studies published in academic journals, identifying strengths and limitations.
CO9. Develop a research mindset and understand the importance of continuous learning in the field of research.
CO10. Students will able to Understand philosophy and ethics of research
CO11. Students should be able to write research proposal.

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Class: M. Sc. II (Semester- IV)
Paper Code: **PSMB246**
Paper: VI
Title of Paper: Dissertation II
Credit: 4
No. of lectures: 60

Course Outcome:

CO1. Understand the research process, including the formulation of research questions, hypotheses, and objectives.
CO2. Identify appropriate research designs and methods based on the research questions and objectives.
CO3. Critically evaluate and select relevant literature for conducting a comprehensive literature review.
CO4. Develop research proposals that outline the research design, methodology, and ethical considerations.
CO5. Apply various data collection techniques, such as surveys, interviews, experiments, and observations.
CO6. Analyze and interpret quantitative and qualitative data using appropriate statistical and analytical methods.
CO7. Effectively communicate research findings through written reports and oral presentations.
CO8. Demonstrate ethical conduct in research by adhering to guidelines for responsible research practices.Critique and evaluate research studies published in academic journals, identifying strengths and limitations.
CO9. Develop a research mindset and understand the importance of continuous learning in the field of research.
CO10. Students will able to Understand philosophy and ethics of research
CO11. Students should be able to write research proposal.

SYLLABUS (CBCS) FOR M.Sc. II. Microbiology
(w. e. from June, 2023)
Academic Year 2023-24

Class: M. Sc. II (Semester- IV)
Paper Code: SD24
Title of Paper: Skill Development II
Credit: 2
No. of lectures: 30

Course Outcome:

CO1. Understanding of the importance of calibration and the ability to calibrate instruments Accurately.
CO2. Ability to evaluate the accuracy, precision, and reliability of measurement systems.
CO3. Familiarity with the ethical and safety considerations associated with instrumentation practices.
CO4. Awareness of the latest advancements and emerging trends in instrumentation technology.
CO5. The student should be able to apply the knowledge regarding various separation techniques while purifying a biomolecule.
CO6. The student should be able to apply the knowledge regarding various analytical techniques while analysing purified biomolecule.

SYLLABUS (CBCS) FOR M.Sc. I. Microbiology (2019 Pattern)
(w. e. from June, 2019)
Academic Year 2019-2020

Class	: M. Sc. I (Semester- I)
Paper Code	: MICRO4101
Paper	: I
Title of Paper	: Microbial Systematics and Diversity
Credit	: 4
No. of lectures	: 60

Course Outcome:

CO1. Students will be able to understand the principles and methods behind studying and identifying cultured and uncultured microorganisms.
CO2. Introduce the concepts of application and research in Microbiology.
CO3. Students will be able to apply knowledge of the standard rules of classification systems to categorise microorganisms.
CO4. Students will be able to understand the basic microbial structure and study the comparative characteristics of prokaryotes and eukaryotes.
CO5. Students will be able to explain the dynamic and ever developing nature of the field of microbial taxonomy and systematic.
CO6. Students will be able to understand the structural similarities and differences among various physiological groups of bacteria, archaea.
CO7. Students will be able to explain general bacteriology and microbial aspects pertinent to bacteria, fungi and algae.

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Academic Year 2019-2020

Class	: M. Sc. I (Semester- I)
Paper Code	: MICRO4102
Paper	: II
Title of Paper	: Quantitative Biology
Credit	: 4
No. of lectures	: 60

Course outcome:

Knowledge Acquisition:

CO1. Students should able to demonstrate a comprehensive understanding of fundamental statistical concepts and principles applicable to biological and health sciences.

CO2. Students should able to describe and explain various methods of data collection techniques used in biostatistics.

CO3. Students should able to describe and explain various methods of study designs, and sampling techniques used in biostatistics.

Data Analysis and Interpretation:

CO4. Students should able to apply appropriate statistical techniques to analyze biological and health-related data sets effectively.

CO5. Students should able to interpret statistical results, drawing meaningful conclusions and insights relevant to biological and health contexts.

Critical Thinking and Problem-Solving:

CO6. Students should able to critically evaluate the validity and reliability of statistical methods used in research studies within the field of biostatistics.

Communication and Presentation Skills:

CO7. Students should able to effectively communicate statistical findings to diverse audiences, including non-statistical professionals, using clear and concise language, visual aids, and appropriate documentation.

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Academic Year 2019-2020

Class	: M. Sc. I (Semester- I)
Paper Code	: MICRO4103
Paper	: III
Title of Paper	: Biochemistry
Credit	: 4
No. of lectures	: 60

Course Outcome:

CO1. Demonstrate a comprehensive understanding of the structure, function, and properties of biomolecules, including proteins, carbohydrates, lipids, and nucleic acids.

CO2. Apply knowledge of biochemical principles to analyze and interpret experimental data related to biological molecules and processes.

CO3. Evaluate the applications of biochemistry in various fields, such as drug discovery, biotechnology, and genetic engineering.

CO4. Students will be able to demonstrate an understanding of fundamental biochemical principles.

CO5. Students will be able to develop in- depth understanding of the area of biochemistry to choose for the research purpose.

CO6. Inculcate a healthy attitude to be a lifelong learner.

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Academic Year 2019-2020

Class	: M. Sc. I (Semester- I)
Paper Code	: MICRO4104
Paper	: IV
Title of Paper	: Cell Biology
Credit	: 4
No. of lectures	: 60

Course outcome

CO1. Student able to identify and describe the structure of eukaryotic and prokaryotic cells.
CO2. Student able to understand the functions of different cellular organelles.
CO3. Understand the cell cycle and its regulation.
CO4. Understand how cells respond to external signals and environmental cues.
CO5. Explore the diversity of cell types and their specialized functions in different tissues and organisms.
CO6. Apply knowledge to solve problems related to cellular processes and functions.
CO7. Understand how cell biology intersects with other fields, such as genetics, biochemistry, and physiology.

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Academic Year 2019-2020

Class	: M. Sc. I (Semester- I)
Paper Code	: MICRO4105
Paper	: V
Title of Paper	: Practical Course: Microbial Systematics
Credit	: 4
No. of lectures	: 60

Course Outcome:

CO1. Enrich students' knowledge and train them in the pure microbial sciences
CO2. Introduce the concepts of application and research in Microbiology
CO3. Students will be able to demonstrate theory and practical skills in microscopy and their handling techniques and staining procedures
CO4. Students will be able learn microbial techniques for isolation of pure cultures of bacteria, fungi and algae
CO5. Students will be able to learn aseptic techniques and be able to perform routine culture handling tasks safely and effectively
CO6. Students will comprehend the various methods for identification of unknown microorganisms
CO7. Students will recognise the scope of microbiology in all spheres of life and industrial sector ways to classify the living system.

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Academic Year 2019-2020

Class	: M. Sc. I (Semester- I)
Paper Code	: MICRO4106
Paper	: VI
Title of Paper	: Practical Course: Cell biology and Biochemistry
Credit	: 4
No. of lectures	: 60

Course Outcome:

CO1. Understand and apply ethical considerations related to the use of biomolecules in research and analysis
CO2. Differentiate between various chromatographic techniques and their applications.
CO3. Proficiency in TLC Techniques:
CO4. Understand the selection of appropriate stationary and mobile phases for biomolecule separation.
CO5. Apply appropriate methods for estimating the concentration of specific biomolecules in a given sample.
CO6. Understand the validation processes for biomolecule estimation methods.

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Academic Year 2019-2020

Class	: M. Sc. I (Semester- II)
Paper Code	: MICRO4201
Paper	: I
Title of Paper	: Virology
Credit	: 4
No. of lectures	: 60

Course Outcome:

CO1. Understand basic structures of viruses
CO2. Student will understand principles of virus pathogenesis.
CO3. Understand basic knowledge of virus cultivation and detection methods.
CO4. Over all understanding about bacteriophages therapy for control bacterial diseases.
CO5. Students will understand viral replication strategies and compare replication mechanism used by viruses.
CO6. Understand different types of vaccines and antiviral agents.
CO7. To comprehend and appreciate the major and varried laboratory techniques and research approaches employed in the field of virology.

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Academic Year 2019-2020

Class	: M. Sc. I (Semester- II)
Paper Code	: MICRO4202
Paper	: II
Title of Paper	: Instrumentation
Credit	: 4
No. of lectures	: 60

Course Outcome:

CO1. Gain a fundamental understanding of the principles of instrumentation, including sensors, transducers, signal conditioning, and measurement techniques.

CO2. Learn about various measurement devices used in instrumentation, such as pressure gauges, temperature sensors, flow meters, and level detectors.

CO3. Develop the ability to design instrumentation systems for specific applications, considering factors such as accuracy, precision, and reliability.

CO4. Gain practical, hands-on experience with instrumentation devices and systems through laboratory exercises, projects, or internships.

CO5. Understand the role of instrumentation in control systems and learn about feedback control mechanisms.

CO6. Gain knowledge of safety standards and regulations related to instrumentation, ensuring that instrumentation systems comply with industry and safety guidelines.

CO7. Develop skills in troubleshooting instrumentation systems and performing routine maintenance to ensure optimal performance.

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Academic Year 2019-2020

Class	: M. Sc. I (Semester- II)
Paper Code	: MICRO4203
Paper	: III
Title of Paper	: Metabolism
Credit	: 4
No. of lectures	: 60

Course Outcomes

CO1. Students should demonstrate a thorough understanding of major metabolic pathways, including glycolysis, the citric acid cycle, oxidative phosphorylation, photosynthesis, and various biosynthetic pathways.

CO2. Students should be able to explain the principles of enzyme kinetics and describe how enzymes are regulated in metabolic pathways.

CO3. Understand how cells generate and transfer energy through ATP synthesis and utilization.

CO4. Demonstrate the ability to integrate different metabolic processes and understand how they are interconnected within the cell.

CO5. Gain practical skills in using biochemical techniques to study metabolic processes in the laboratory.

CO6. Apply knowledge of metabolism to real-world scenarios, demonstrating the ability to relate theoretical concepts to practical situations

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Academic Year 2019-2020

Class	: M. Sc. I (Semester- II)
Paper Code	: MICRO4204
Paper	: IV
Title of Paper	: Evolution and Ecology
Credit	: 4
No. of lectures	: 60

Course Outcome:

CO1. Understand how the major principles of evolution and ecology and to determine the functioning of all life on earth.

CO2. Students will be able to learn the main lines of life's origin and evolution on earth, including the evolution of man.

CO3. Students will be able to acquire knowledge and understanding of the processes of evolution, including natural selection, adaptation and speciation.

CO4. Students will be able to understand how selection pressure arises in ecological interaction and competition between individual and species.

CO5. Students will be able to do simple arithmetic problems and calculations in population dynamics using spreadsheets.

CO6. Understand how biological knowledge is developed, and apply this framework to critically engage with new biological scenarios.

CO7. Students will be able to gain knowledge of key concepts, theories in ecology, life history, population dynamics, and of evolution.

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Academic Year 2019-2020

Class	: M. Sc. I (Semester- II)
Paper Code	: MICRO4205
Paper	: V
Title of Paper	: Practical Course: Biophysics & Virology
Credit	: 4
No. of lectures	: 60

Course Outcome:

CO1. Students will apply their knowledge regarding to qualitative and quantitative determination of bacteriophage in laboratory.
CO2. Students will understand different virus titration technique in laboratory.
CO3. Students will understand interpretation of Ramachandran plots for study of confirmation of protein.
CO4. Students will get master's in Calibration of analytical instruments- colorimeter, spectrophotometer.
CO5. Student will know the Biological synthesis of nanoparticles and their characterization in laboratory level.
CO6. Student will understand protein electrophoresis by Native PAGE and SDS PAGE.
CO7. Students will get over all knowledge of gel filtration chromatography.

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(w. e. from June, 2019)
Academic Year 2019-2020

Class	: M. Sc. I (Semester- II)
Paper Code	: MICRO4206
Paper	: VI
Title of Paper	: Practical Course: Enzymology & Microbial Metabolism
Credit	: 4
No. of lectures	: 60

Course Outcome:

CO1. Demonstrate knowledge of enzyme kinetics, including concepts such as Michaelis-Menten kinetics and enzyme inhibition.

CO2. Calculate and interpret kinetic parameters like Vmax, Km, and Kcat.

CO3. Understand the implications of enzyme research in fields like medicine, biochemistry, and biotechnology.

CO4. Develop critical thinking skills to analyze experimental data related to enzyme activity.

CO5. Learn and apply laboratory techniques for the quantitative and qualitative detection of IAA.

CO6. Explore the diversity of siderophores produced by different microorganisms.

SYLLABUS (CBCS as per NEP 2020) FOR M.Sc. I. Microbiology
(w. e. from June, 2023)

Name of the Programme	**: M.Sc. Microbiology**
Program Code	**: PSMI**
Class	**: M.Sc. I**
Semester	**: I**
Course Type	**: Major Mandatory**
Course Name	**: Microbial Technology**
Course Code	**: MI-502-MJM**
No. of Lectures	**: 60**
No. of Credits	**: 04**

Course Outcome:

CO1. A comprehensive understanding of varied bioreactor designs and the variables within the process.

CO2. Understand the fundamental principles of microbial technology, including microbial physiology, genetics, and metabolism.

CO3. Identify and classify different types of microorganisms, understanding their roles in various industrial processes.

CO4. Demonstrate proficiency in employing techniques for the isolation, cultivation, and maintenance of microorganisms in laboratory settings.

CO5. Apply knowledge of microbial technology to tackle practical challenges and devise solutions in the field of biotechnology.

CO6. Analyze and interpret data obtained from microbial experiments to draw valid conclusions.

CO7. Evaluate the ethical considerations and societal impacts of microbial technology in various sectors, including healthcare, agriculture, and environmental remediation.

SYLLABUS (CBCS as per NEP 2020) FOR M.Sc. I. Microbiology
(w. e. from June, 2023)

Name of the Programme	**: M.Sc. Microbiology**
Program Code	**: PSMI**
Class	**: M.Sc. I**
Semester	**: I**
Course Type	**: Major Mandatory**
Course Name	**: Instrumentation**
Course Code	**: MI-501-MJM**
No. of Lectures	**: 60**
No. of Credits	**: 04**

Course Outcome:

CO1. Ability to explain the fundamental principles and concepts of instrumentation and their applications in different fields.

CO2. Knowledge of different types of instruments, their functions, and their appropriate use in specific measurement and control tasks.

CO3. Understanding of the importance of calibration and the ability to calibrate instruments accurately.

CO4. Ability to evaluate the accuracy, precision, and reliability of measurement systems.

CO5. Familiarity with the ethical and safety considerations associated with instrumentation practices.

CO6. Awareness of the latest advancements and emerging trends in instrumentation technology.

CO7. The student should be able to apply the knowledge regarding various separation techniques while purifying a biomolecule.

CO8. The student should be able to apply the knowledge regarding various analytical techniques while analysing purified biomolecule.

SYLLABUS (CBCS as per NEP 2020) FOR M.Sc. I. Microbiology
(w. e. from June, 2023)

Name of the Programme	**: M.Sc. Microbiology**
Program Code	**: PSMI**
Class	**: M.Sc. I**
Semester	**: I**
Course Type	**: Major Mandatory**
Course Name	**: Practical Course I**
Course Code	**: MI-503-MJM**
No. of Lectures	**: 60**
No. of Credits	**: 02**

Course Outcomes:

CO1. Demonstrate proficiency in the operation of various instruments, such as spectrophotometers, chromatographs.

CO2. Understand the principles and mechanisms behind the operation of different types of instruments

CO3. Perform instrument calibration procedures accurately and effectively, ensuring reliable and accurate measurements.

CO4. Collect and analyze data using appropriate techniques and software for data acquisition and analysis.

CO5. Troubleshoot common issues and problems that may arise during instrument operation and propose appropriate solutions.

CO6. Interpret and critically evaluate instrument-generated data and results.Apply quality control and assurance measures to ensure the accuracy and precision of instrument readings and measurements.

CO7. Demonstrate safe laboratory practices and adhere to ethical guidelines in instrument handling, maintenance, and disposal.

SYLLABUS (CBCS as per NEP 2020) FOR M.Sc. I. Microbiology
(w. e. from June, 2023)

Name of the Programme	**: M.Sc. Microbiology**
Program Code	**: PSMI**
Class	**: M.Sc. I**
Semester	**: I**
Course Type	**: Major Mandatory**
Course Name	**: Practical Course II**
Course Code	**: MI-504-MJM**
No. of Lectures	**: 60**
No. of Credits	**: 02**

Course Outcomes:

CO1. Explain the principles and significance of microbial immobilization in biotechnology.
CO2. Understand the different methods and materials used for microbial immobilization.
CO3. Describe the factors affecting immobilization efficiency and stability.
CO4. Explain the mechanisms and applications of exopolysaccharide production by microorganisms.
CO5. Understand the downstream processing techniques for the recovery and purification of organic acids.
CO6. Demonstrate proficiency in immobilizing microorganisms using different immobilization techniques.
CO7. Analyze and quantify exopolysaccharides using appropriate laboratory techniques.

SYLLABUS (CBCS as per NEP 2020) FOR M.Sc. I. Microbiology
(w. e. from June, 2023)

Name of the Programme	**: M.Sc. Microbiology**
Program Code	**: PSMI**
Class	**: M.Sc. I**
Semester	**: I**
Course Type	**: Major Elective**
Course Name	**: Biochemistry**
Course Code	**: MI-511-MJE(A)**
No. of Lectures	**: 60**
No. of Credits	**: 04**

Course Outcome:

CO1. Demonstrate a comprehensive understanding of the structure, function, and properties of biomolecules, including proteins, carbohydrates, lipids, and nucleic acids.
CO2. Apply knowledge of biochemical principles to analyze and interpret experimental data related to biological molecules and processes.
CO3. Evaluate the applications of biochemistry in various fields, such as drug discovery, biotechnology, and genetic engineering.
CO4. Students will be able to demonstrate an understanding of fundamental biochemical principles.
CO5. Students will be able to develop in- depth understanding of the area of biochemistry to choose for the research purpose.
CO6. inculcate a healthy attitude to be a lifelong learner,
CO7. Acquire problem-solving skills in the context of biochemical processes and pathways.

SYLLABUS (CBCS as per NEP 2020) FOR M.Sc. I. Microbiology
(w. e. from June, 2023)

Name of the Programme	**: M.Sc. Microbiology**
Program Code	**: PSMI**
Class	**: M.Sc. I**
Semester	**: I**
Course Type	**: Major Elective**
Course Name	**: Ecology**
Course Code	**: MI-511-MJE(B)**
No. of Lectures	**: 60**
No. of Credits	**: 04**

Course Outcome:

CO1. Students will be able to define and explain key ecological terms and concepts.

CO2. Students will understand the principles of population dynamics and how populations interact within communities.

CO3. Students will recognize the importance of biodiversity and understand the threats to biodiversity conservation.

CO4. Students will be able to evaluate the impact of human activities on ecosystems, such as pollution, habitat destruction, and climate change.

CO5. Understand the fundamental principles and concepts of ecology, including population dynamics, community interactions, and ecosystem processes.

CO6. Describe the different levels of ecological organization, from individuals to populations, communities, and ecosystems, and understand the interrelationships between these levels.

CO7. Apply ecological principles and concepts to analyze and evaluate real-world ecological issues, such as habitat fragmentation, climate change, and species conservation.

SYLLABUS (CBCS as per NEP 2020) FOR M.Sc. I. Microbiology
(w. e. from June, 2023)

Name of the Programme	**: M.Sc. Microbiology**
Program Code	**: PSMI**
Class	**: M.Sc. I**
Semester	**: I**
Course Type	**: Major Elective**
Course Name	**: Medical Microbiology**
Course Code	**: MI-511-MJE(C)**
No. of Lectures	**: 60**
No. of Credits	**: 04**

Course Outcome:

CO1. Identify microorganisms associated with human diseases, understand their epidemiology and modes of transmission.

CO2. Understand the principles and techniques used in the laboratory diagnosis of infectious diseases, including specimen collection, culture, identification, and antimicrobial susceptibility testing.

CO3. Analyze and interpret clinical microbiology laboratory results, including microbial growth patterns, biochemical tests, and molecular diagnostic methods.

CO4. Understand the principles of microbial pathogenesis, including mechanisms of virulence and host-pathogen interactions.

CO5. Explain the mechanisms of action and resistance of antimicrobial agents, and apply knowledge to guide appropriate antimicrobial therapy.

CO6. Students will able to learn multidrug resistance in bacterial pathogens.

SYLLABUS (CBCS as per NEP 2020) FOR M.Sc. I. Microbiology
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Name of the Programme	**: M.Sc. Microbiology**
Program Code	**: PSMI**
Class	**: M.Sc. I**
Semester	**: I**
Course Type	**: RM**
Course Name	**: Research Methodology**
Course Code	**: MI-521-RM**
No. of Lectures	**: 60**
No. of Credits	**: 04**

Course Outcomes:

1. Understand the research process, including the formulation of research questions, hypotheses, and objectives.
2. Identify appropriate research designs and methods based on the research questions and objectives.
3. Critically evaluate and select relevant literature for conducting a comprehensive literature review.
4. Develop research proposals that outline the research design, methodology, and ethical Considerations.
5. Apply various data collection techniques, such as surveys, interviews, experiments, and observations.
6. Analyze and interpret quantitative and qualitative data using appropriate statistical and analytical methods.
7. Effectively communicate research findings through written reports and oral presentations.
8. Demonstrate ethical conduct in research by adhering to guidelines for responsible research practices.Critique and evaluate research studies published in academic journals, identifying strengths and limitations.
9. Develop a research mindset and understand the importance of continuous learning in the field of research.
10. Students will able to Understand philosophy and ethics of research

SYLLABUS (CBCS as per NEP 2020) FOR M.Sc. I. Microbiology
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Name of the Programme	**: M.Sc. Microbiology**
Program Code	**: PSMI**
Class	**: M.Sc. I**
Semester	**: II**
Course Type	**: Major Mandatory theory**
Course Name	**: Pharmaceutical Microbiology**
Course Code	**: MIB-551-MJM**
No. of Lectures	**: 60**
No. of Credits	**: 04**

Course Outcome:

CO1. Students will also understand the concepts of drug discovery
CO2. They will be able to know pharmacokinetics and pharmacodynamics.
CO3. Proficiency in various drug screening methods, including high-throughput screening, virtual screening, and biochemical assays.
CO4. They will be able to know medicinal chemistry principles to design and optimize drug candidates.
CO5. An understanding of the pharmacological aspects of drug development, including mechanisms of action, pharmacokinetics, and pharmacodynamics.
CO6. Knowledge of safety assessment procedures and understanding of potential toxicity issues associated with drug candidates.
CO7. Proficiency in developing drug formulations and delivery systems.
CO8. Awareness of the regulatory pathways for drug approval, as well as ethical considerations in drug development.

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Name of the Programme	**: M.Sc. Microbiology**
Program Code	**: PSMI**
Class	**: M.Sc. I**
Semester	**: II**
Course Type	**: Major Mandatory Theory**
Course Name	**: Industrial Wastewater Treatment**
Course Code	**: MIB-552-MJM**
No. of Lectures	**: 60**
No. of Credits	**: 04**

Course Outcome:

CO1. Able to define the key terms and concepts related to industrial wastewater treatment.
CO2. Summarize the significance of industrial wastewater treatment for environmental protection.
CO3. Students be able to determine basic wastewater parameters, such as pH, turbidity, and suspended solids.
CO4. Interpret wastewater characterization data to assess pollution levels and develop treatment strategies.
CO5. Describe the operating principles of physical treatment processes.
CO6. Design a preliminary physical treatment system for a specific industrial wastewater.
CO7. Analyse and interpret data from a biological treatment system, including COD and BOD removal efficiency.

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Name of the Programme	**: M.Sc. Microbiology**
Program Code	**: PSMI**
Class	**: M.Sc. I**
Semester	**: II**
Course Type	**: Major Mandatory Practical**
Course Name	**: Practical Course III**
Course Code	**: MIB-553-MJM**
No. of Lectures	**: 60**
No. of Credits	**: 02**

Course Outcome:

CO1. Understand the clinical significance of susceptibility results and how they influence patient treatment and management.

CO2. Implement quality control measures to ensure the accuracy and reliability of susceptibility testing results.

CO3. Gain knowledge about the different mechanisms of antibiotic resistance in bacteria and how they affect treatment decisions.

CO4. Learn how to interpret susceptibility test results and use them to guide antibiotic therapy, including understanding clinical breakpoints.

CO5. Mastering various sterility testing techniques, such as membrane filtration, direct inoculation, and isolator technology, as well as the associated procedures, aseptic techniques, and validation requirements

CO6. Gain knowledge about the different mechanisms of antibiotic resistance in fungi and how they affect treatment decisions.

CO7. Understand the clinical significance of susceptibility results and how they influence assay

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Name of the Programme	**: M.Sc. Microbiology**
Program Code	**: PSMI**
Class	**: M.Sc. I**
Semester	**: II**
Course Type	**: Major Mandatory Practical**
Course Name	**: Practical Course IV**
Course Code	**: MIB-554-MJM**
No. of Lectures	**: 60**
No. of Credits	**: 02**

Course Outcome:

CO1. Able to define the key terms and concepts related to industrial wastewater treatment.
CO2. Summarize the significance of industrial wastewater treatment for environmental protection.
CO3. Students be able to determine basic wastewater parameters, such as pH, turbidity, and suspended solids.
CO4. Interpret wastewater characterization data to assess pollution levels and develop treatment strategies.
CO5. Understand biological treatment system
CO6. Analyze and interpret data from a biological treatment system, including COD and BOD removal efficiency.
CO7. Students can examine sustainability principles in wastewater treatment, including energy efficiency and minimizing the carbon footprint.

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Name of the Programme	**: M.Sc. Microbiology**
Program Code	**: PSMI**
Class	**: M.Sc. I**
Semester	**: II**
Course Type	**: Major Elective Theory**
Course Name	**: Virology**
Course Code	**: MIB-561-MJE(A)**
No. of Lectures	**: 60**
No. of Credits	**: 04**

Course Outcome:

CO1. Understand basic structures of viruses
CO2. Student will understand principles of virus pathogenesis
CO3. Understand basic knowledge of virus cultivation and detection methods
CO4. Overall understanding about bacteriophages therapy for control bacterial diseases
CO5. Students will understand viral replication strategies and compare replication mechanism used by viruses
CO6. Understand different types of vaccines and antiviral agents
CO7. To comprehend and appreciate the major and varied laboratory techniques and researchapproaches employed in the field of virology

SYLLABUS (CBCS as per NEP 2020) FOR M.Sc. I. Microbiology
(w. e. from June, 2023)

Name of the Programme	**: M.Sc. Microbiology**
Program Code	**: PSMI**
Class	**: M.Sc. I**
Semester	**: II**
Course Type	**: Major Elective Theory**
Course Name	**: Biophysical Techniques**
Course Code	**: MIB-561-MJE(B)**
No. of Lectures	**: 60**
No. of Credits	**: 04**

Course Outcome:

CO1. Students will be able to learn molecular structure determination.
CO2. Student will able to understand core concept of Biology, Chemistry and physics and how they are interconnecting with biophysical system.
CO3. Students will function successfully in the laboratory and use safe laboratory practices.
CO4. Students will critically evaluate primary literature in the discipline.
CO5. Students will use databases, computational tools and other online resources effectively.
CO6. Students will use demonstrate awareness of issues in the practice of science.
CO7. Demonstrates excellent understanding of the biophysical concepts.

SYLLABUS (CBCS as per NEP 2020) FOR M.Sc. I. Microbiology
(w. e. from June, 2023)

Name of the Programme	**: M.Sc. Microbiology**
Program Code	**: PSMI**
Class	**: M.Sc. I**
Semester	**: II**
Course Type	**: Major Elective Theory**
Course Name	**: Developmental Biology**
Course Code	**: MIB-561-MJE(C)**
No. of Lectures	**: 60**
No. of Credits	**: 04**

Course Outcome: Students who successfully complete the course will be able to

CO1. Name, describe and order the main stages of development common to most multicellular organisms.

CO2. Describe the main anatomical changes that occur during development.

CO3. Identify the cellular behaviours that lead to morphological change during development.

CO4. Describe the hierarchy of gene activation that occurs in early *Drosophila* development.

CO5. Understand how gene activation plays a role in differentiation and development.

SYLLABUS (CBCS) FOR M.Sc. I. Microbiology (2022 Pattern)
(w. e. from June, 2022)
Academic Year 2022-2023

Class: M. Sc. I (Semester- I)
Paper Code: **PSMB111**
Paper: I
Title of Paper: Microbial Systematics and Diversity
Credit: 4
No. of lectures: 60

Course Outcome:

CO1. Acquire basic skills on bioinformatics tools to study the taxonomy.
CO2. Introduce the concepts of application and research in Microbiology.
CO3. Students will be able to estimate total number of species.
CO4. Students will gain knowledge of species divergence and would be able to measure microbial diversity.
CO5. Students will be able known Bergey's Manuals and use it for classification of prokaryotes.
CO6. Students will gain knowledge of 16S rRNA gene sequencing and its importance in identifying bacteria.
CO7. Students will be able to acquire knowledge to identify Culture by Next generation Sequencing.

SYLLABUS (CBCS) FOR M.Sc. I. Microbiology (2022 Pattern)
(w. e. from June, 2022)
Academic Year 2022-2023

Class: M. Sc. I (Semester- I)
Paper Code: **PSMB112**
Paper: II
Title of Paper: Quantitative Biology
Credit: 4
No. of lectures: 60

Course outcome:
After completing this course Students should able to:

CO1. Attain a comprehensive grasp of fundamental statistical concepts and principles relevant to the biological and health sciences.
CO2. Describe and elucidate various techniques employed in biostatistics for collecting data.
CO3. Describe and explicate various study design methods and sampling techniques utilized in biostatistics.
CO4. Apply suitable statistical techniques proficiently to analyze datasets pertaining to biological and health-related information.
CO5. Interpret statistical outcomes adeptly, extracting meaningful conclusions and insights pertinent to biological and health-related contexts.
CO6. Exercise critical evaluation skills to assess the credibility and dependability of statistical methodologies utilized in biostatistics research studies.
CO7. Communicate statistical findings effectively to diverse audiences, including non-statistical professionals, employing clear, concise language, visual aids, and appropriate documentation.

SYLLABUS (CBCS) FOR M.Sc. I. Microbiology (2022 Pattern)
(w. e. from June, 2022)
Academic Year 2022-2023

Class: M. Sc. I (Semester- I)
Paper Code: **PSMB113**
Paper: III
Title of Paper: Biochemistry
Credit: 4
No. of lectures: 60

Course Outcome:

CO1.Demonstrate a comprehensive understanding of the structure, function, and properties of biomolecules, including proteins, carbohydrates, lipids, and nucleic acids.

CO2.Apply knowledge of biochemical principles to analyze and interpret experimental data related to biological molecules and processes.

CO3.Evaluate the applications of biochemistry in various fields, such as drug discovery, biotechnology, and genetic engineering.

CO4.Students will be able to demonstrate an understanding of fundamental biochemical principles.

CO5.Students will be able to develop in- depth understanding of the area of biochemistry to choose for the research purpose.

CO6.inculcate a healthy attitude to be a lifelong learner,

SYLLABUS (CBCS) FOR M.Sc. I. Microbiology (2022 Pattern)
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Academic Year 2022-2023

Class: M. Sc. I (Semester- I)
Paper Code: **PSMB114**
Paper: IV
Title of Paper: Cell Biology
Credit: 4
No. of lectures: 60

Course outcome

CO1. Student able to identify and describe the structure of eukaryotic and prokaryotic cells.
CO2. Student able to understand the functions of different cellular organelles.
CO3. Understand the cell cycle and its regulation.
CO4. Understand how cells respond to external signals and environmental cues.
CO5. Explore the diversity of cell types and their specialized functions in different tissues and organisms.
CO6. Apply knowledge to solve problems related to cellular processes and functions.
CO7. Understand how cell biology intersects with other fields, such as genetics, biochemistry, and physiology.

SYLLABUS (CBCS) FOR M.Sc. I. Microbiology (2022 Pattern)
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Academic Year 2022-2023

Class: M. Sc. I (Semester- I)
Paper Code: **PSMB115**
Paper: V
Title of Paper: Practical Course: Microbial Systematics
Credit: 4
No. of lectures: 60

Course Outcome:

CO1. Students will learn different isolation techniques used for isolation of organisms from their natural habitat.
CO2. Draws the student's attention to the Universe of Microbial diversity, with focused studies of the contributions that specific microorganism makes to the universe.
CO3. Students will train in Isolation of bacteria and characterize it upto genus level.
CO4. Students will train in isolation of extremophiles and characterize it upto genus level.
CO5. Students will train in isolating and characterizing different fungi.
CO6. Acquire basic skills in 16SrRNA gene sequence analysis using BLAST and preparation of phylogenetic tree.
CO7. It provides a practical guide to microbial diversity from phylogenetic perspective in which students learn evolutionary relationship.

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Class: M. Sc. I (Semester- I)
Paper Code: **PSMB116**
Paper: VI
Title of Paper: Practical Course: Cell biology and Biochemistry
Credit: 4
No. of lectures: 60

Course Outcome:

CO1. Understand and apply ethical considerations related to the use of biomolecules in research and analysis
CO2. Differentiate between various chromatographic techniques and their applications.
CO3. Proficiency in TLC Techniques:
CO4. Understand the selection of appropriate stationary and mobile phases for biomolecule separation.
CO5. Apply appropriate methods for estimating the concentration of specific biomolecules in a given sample.
CO6. Understand the validation processes for biomolecule estimation methods.

SYLLABUS (CBCS) FOR M.Sc. I. Microbiology (2022 Pattern)
(w. e. from June, 2022)
Academic Year 2022-2023

Class: M. Sc. I (Semester- II)
Paper Code: **PSMB121**
Paper: I
Title of Paper: Virology
Credit: 4
No. of lectures: 60

Course Outcome:

CO1. The fundamental structures of viruses.
CO2. Gain insight into the principles of virus pathogenesis.
CO3. Acquire basic knowledge of virus cultivation and detection methods.
CO4. Develop a comprehensive understanding of bacteriophage therapy for controlling bacterial diseases.
CO5. Explore viral replication strategies and compare the mechanisms used by different viruses.
CO6. Comprehend various types of vaccines and antiviral agents.
CO7. Appreciate the diverse laboratory techniques and research approaches employed in the field of virology.

SYLLABUS (CBCS) FOR M.Sc. I. Microbiology (2022 Pattern)
(w. e. from June, 2022)
Academic Year 2022-2023

Class: M. Sc. I (Semester- II)
Paper Code: **PSMB122**
Paper: II
Title of Paper: Instrumentation
Credit: 4
No. of lectures: 60

Course Outcome:

CO1. Gain a foundational grasp of instrumentation principles, encompassing sensors, transducers, signal conditioning, and measurement techniques.
CO2. Acquire knowledge about diverse measurement devices utilized in instrumentation, including pressure gauges, temperature sensors, flow meters, and level detectors.
CO3. Develop the proficiency to engineer instrumentation systems tailored to specific applications, taking into account factors like accuracy, precision, and reliability.
CO4. Acquire practical, hands-on experience with instrumentation devices and systems through participation in laboratory exercises, projects, or internships.
CO5. Comprehend the role of instrumentation in control systems and grasp the intricacies of feedback control mechanisms.
CO6. Attain knowledge of safety standards and regulations pertinent to instrumentation, ensuring adherence to industry and safety guidelines.
CO7. Cultivate skills in troubleshooting instrumentation systems and performing routine maintenance to uphold optimal performance.

SYLLABUS (CBCS) FOR M.Sc. I. Microbiology (2022 Pattern)
(w. e. from June, 2022)
Academic Year 2022-2023

Class: M. Sc. I (Semester- II)
Paper Code: **PSMB123**
Paper: III
Title of Paper: Metabolism
Credit: 4
No. of lectures: 60

Course Outcomes

CO1. Students should demonstrate a thorough understanding of major metabolic pathways, including glycolysis, the citric acid cycle, oxidative phosphorylation, photosynthesis, and various biosynthetic pathways.
CO2. Students should be able to explain the principles of enzyme kinetics and describe how enzymes are regulated in metabolic pathways.
CO3. Understand how cells generate and transfer energy through ATP synthesis and utilization.
CO4. Demonstrate the ability to integrate different metabolic processes and understand how they are interconnected within the cell.
CO5. Gain practical skills in using biochemical techniques to study metabolic processes in the laboratory.
CO6. Apply knowledge of metabolism to real-world scenarios, demonstrating the ability to relate theoretical concepts to practical situations.

SYLLABUS (CBCS) FOR M.Sc. I. Microbiology (2022 Pattern)
(w. e. from June, 2022)
Academic Year 2022-2023

Class: M. Sc. I (Semester- II)

Paper Code: **PSMB124**

Paper: IV

Title of Paper: Evolution and Ecology

Credit: 4

No. of lectures: 60

Course Outcome:

CO1. Students will be equipped to understand the evolutionary background and its importance.

CO2. Demonstrate an understanding of the basic concepts of evolution and ecology.

CO3. Students will acquire a theoretical understanding of population and community ecology to apply in the current issues in ecology.

CO4. Students will be able to understand evolutionary concepts and theories.

CO5. Students will acquire knowledge about the evolutionary history of earth - living and nonliving.

CO6. Students will be able to explain the characteristics, dynamics, and growth of population.

CO7. Students will be able to gain knowledge about the relationship of the evolution of various species and the environment they live in.

SYLLABUS (CBCS) FOR M.Sc. I. Microbiology
(w. e. from June, 2022)
Academic Year 2022-2023

Class: M. Sc. I (Semester- II)
Paper Code: **PSMB125**
Paper: V
Title of Paper: Practical Course: Biophysics & Virology
Credit: 4
No. of lectures: 60

Course Outcome:

CO1. Students will apply their knowledge regarding to cultivation of viruses in laboratory
CO2. Students will understand different virus titration technique in laboratory
CO3. Students will get master's in Calibration of analytical instruments- colorimeter, spectrophotometer
CO4. Student will know the Biological synthesis of nanoparticles and their characterization in laboratory level
CO5. Student will get basic knowledge regarding to Agarose gel electrophoresis
CO6. Student will understand protein electrophoresis by Native PAGE and SDS PAGE
CO7. Students will get over all knowledge of gel filtration chromatography

SYLLABUS (CBCS) FOR M.Sc. I. Microbiology
(w. e. from June, 2022)
Academic Year 2022-2023

Class: M. Sc. I (Semester- II)

Paper Code: **PSMB126**

Paper: VI

Title of Paper: Practical Course: Enzymology & Microbial Metabolism

Credit: 4

No. of lectures: 60

Course Outcome

CO1. Demonstrate knowledge of enzyme kinetics, including concepts such as Michaelis-Menten kinetics and enzyme inhibition.

CO2. Calculate and interpret kinetic parameters like Vmax, Km, and Kcat.

CO3. Understand the implications of enzyme research in fields like medicine, biochemistry, and biotechnology.

CO4. Develop critical thinking skills to analyze experimental data related to enzyme activity.

CO5. Learn and apply laboratory techniques for the quantitative and qualitative detection of IAA.

CO6. Explore the diversity of siderophores produced by different microorganisms.

SYLLABUS (CBCS) FOR M.Sc. I. Microbiology
(w. e. from June, 2022)
Academic Year 2022-2023

Class: M. Sc. I (Semester- II)

Paper Code: CC40

Title of Paper: **Certificate Course in Research Methodology**

Credit: 2

No. of lectures: 30

Course outcome:

CO1. Students will demonstrate comprehension of the fundamental philosophical principles and paradigms that form the basis of diverse research methodologies.

CO2. Students will demonstrate the capacity to distinguish and classify different research publication types, understanding their structures and content.

CO3. Students will cultivate proficiency in employing online referencing tools to accurately generate citations and bibliographies.

CO4. Students will comprehend plagiarism concepts and implement strategies to prevent its occurrence in academic and research writing.

CO5. Students will gain introductory knowledge of statistical software, specifically emphasizing R software.

CO6. Students will develop skills in constructing compelling titles and creating concise yet informative abstracts for research papers or proposed projects.

CO7. Students will exhibit proficiency in composing various sections of a research paper, encompassing materials and methods, results, discussion, conclusion, etc., adhering to academic writing conventions.