

M.SC. MICROBIOLOGY

PROGRAM OUTCOMES

PO1: To train the students in basic and advanced areas of Microbiology, focusing on the recent trends of the discipline with Particular emphasis on the practical aspects.

PO2: To stimulate scholarly progression and intellectual development of the programme grooming the students on par with excellence.

PO3: To promote talent and personality development boosting self-confidence and self-reliance in the student to achieve their goals

PO4: To infuse the latest advances in Microbiology by organizing Conferences, Symposia, Workshops and Webinars.

PO5: To instil moral values of professional ethics in students guiding them to be responsible individuals for a better society.

PROGRAM SPECIFIC OUTCOMES

On completion of program students will be specifically able to

PSO1: Prepare and view specimens for examination using light microscopy

PSO2: Use pure culture and selective techniques to isolate microorganisms. Identify microorganisms (media-based, molecular and serological).

PSO3. Estimate the number of microorganisms in a sample by suitable enumeration technique

PSO4: Use appropriate microbiological and molecular lab equipment and methods.

PSO5: Practice safe microbiology, using appropriate protective, biosafety and emergency procedures.

PSO6: Document and report on experimental protocols, results and conclusions.

Course Outcomes

CO1: Students gain familiarity in various microbiological methods and analytical techniques enabling them to pursue higher education.

CO2: Students' laboratory training will empower them to enrol in research institutions and pharmaceutical industries as career.

CO3: Students cultivate knowledge of the leading edge in a chosen specialized area of Microbiology, based on research experience from a master's project and international literature.

CO4: Students acquire deep insights of a repertoire of microorganisms, their metabolism and industrial applications.

CO5: The Master's degree in Microbiology will address the increasing need for skilled scientific manpower with an understanding of global research applications in the field of basic and applied Microbiology

Course Specific outcomes

CSO1: Students develop the ability to independently carry out multidisciplinary research and communicate to a reputed scientific journal for publication.

CSO2: Students acknowledge health, safety and environmental (HSE) issues in handling and understanding the hazardous chemicals and biological materials.

CSO3: Students can compete in National level competitive exams such as UGC-CSIR NET-JRF or GATE or APSET.

CSO4: Students establish collaboration with various food and pharma industries enhancing student job opportunities

CSO5: Students relieved from the campus are renowned for their abled theoretical and technical skills

CSO6: Student from the campus emerge with positive attitude to face the challenges in the society

I SEMESTER MB 101: GENERAL MICROBIOLOGY

Course Outcomes

CO1: Acquiring Knowledge on Landmark discoveries and contributions in Microbiology

CO2: Developing insights into the microbial techniques of sterilization and preservation

CO3: Familiarising with general characters of prokaryotic and Eukaryotic cellular organization

CO4: Understanding growth media characteristics and measurement methods

CO5: Enlisting the economically important microorganisms

Programme Specific Outcomes

PSO1: Understanding the classification of living organisms

PSO2: Able to understand the Preservation and Maintenance of Microbial cultures

PSO3: Perception of theoretical knowledge on bacterial growth measurements

PSO4: Distinguishing the Ultra structure and characterization of bacterial groups

PSO5: Comprehending the life cycle of prokaryotic (Eubacteria, Archaea, Cyanobacteria) and microscopic Eukaryotic organisms (Algae, Fungi and protozoans).

Learning Outcomes

LO1: Deep insights into the various trends of basic and applied Microbiology

LO2: Emphasizing the discoveries and contributions in the field of Microbiology

LO3: Understanding of basic cellular organisation, morphology, Classification, Pathogenesis and economic importance of various groups of microorganisms

LO4: Comprehending the various methods for identification. isolation, sterilization and cultivation of microorganisms.

LO5: Acquaintance on study of microbial diversity using systematic approaches

MB 102: VIROLOGY

Course Outcomes

- CO1: Gaining Knowledge on history, general characters of viruses and their evolution
- CO2: Characterizing different families of viruses with suitable type study
- CO3: Differentiating the plant and animal viruses and their cultivation methods
- CO4: Perceiving the virus-vector relationships
- CO5: Developing insights into sanitation, vector control and immunization control

Programme Specific Outcomes

- PSO1: Understanding the classification of viruses
- PSO2: Emphasizing biological and biochemical properties of viruses
- PSO3: Comprehending the bacteriophages and other Phages and their replication strategies
- PSO4: Gaining insights into the structure and complexity of viral genomes
- PSO5: Able to gain knowledge on techniques employed for detection of viruses

Learning Outcomes

- LO1: Developing insights on some plant and animal diseases caused by different viruses
- LO2: Understanding the modes of viral transmission.
- LO3: Characterising different types of viruses and their prevention and control methods
- LO4: Grasping the importance of Interferons, their induction and therapeutic applications
- LO5: Comprehending the complex interaction between viruses and host cells

MB 103: BIOMOLECULES

Course Outcomes

- CO1: Overviewing the classification of major biomolecules- carbohydrates, lipids, proteins etc
- CO2: Developing insights into classification, chemical properties and functions of lipids
- CO3: Gaining conceptual knowledge of proteins and their structural classifications
- CO4: Perceiving the chemistry of sterols and steroids
- CO5: Understanding the structure, composition, types and functions of Nucleic acids

Programme Specific Outcomes

- PSO1: Comprehending the structure and classification of biomolecules
- PSO2: Providing the core and specialized knowledge of phospholipids, Glycoproteins, etc.
- PSO3: Understanding the methods for isolation, characterization and purification of proteins
- PSO4: Grasping the Physico-chemical properties and characterization of fats and oils
- PSO5: Emphasizing mineral metabolism in detail

Learning Outcomes

- LO1: Able to gain theoretical knowledge on the characterisation of biomolecules
- LO2: Understanding the formation of peptide bond- concept of Ramachandran plot.
- LO3: Gaining knowledge on vitamins, their classification and biological significance
- LO4: Emphasizing the methods for isolation, characterization and sequencing of proteins
- LO5: In depth perception of mechanisms of biological oxidations and Mineral metabolisms

MB 104: ANALYTICAL TECHNIQUES

Course Outcomes

- CO1: Introducing the basic concepts of qualitative and quantitative analysis of a given sample.
- CO2: Deciphering the working of phase, fluorescent and electron microscopes
- CO3: Studying various spectroscopic techniques and their applications
- CO4: Perceiving the Laws of absorption and radiation
- CO5: Comprehending the principle and workings of radio isotopic tracers

Programme Specific Outcomes

- PSO1: Understanding the various types and applications of microscopes
- PSO2: Comprehending the principles of chromatography
- PSO3: Studying the concept of separation science and its applications
- PSO4: Developing theoretical knowledge on electrophoresis and centrifugation techniques
- PSO5: Emphasizing the advantages and disadvantages of radioisotopes

Learning Outcomes

- LO1: Understanding the principle and applications of basic and advanced microscopy
- LO2: Technical expertise of fixing of specimens and methods of sample preparations
- LO3: Defining the fundamentals of spectroscopic analysis of biomolecules
- LO4: Deep understanding of Principles, types and applications of Centrifugation
- LO5: Emphasizing the concepts of radiochemical analysis and their applications

MBP 105: MICROBIOLOGICAL METHODS & VIROLOGY

Course Outcomes

- CO1: Providing technical expertise in handling and culturing microorganisms
- CO2: Perceiving the microbial growth kinetics
- CO3: Delivering hands-on experience on various Microscopic and Biochemical methods
- CO4: Acquiring training on the general equipment's used in microbiology laboratory
- CO5: Identifying and characterising the unknown microorganisms

Programme Specific Outcomes

- PSO1: Understanding the different morphological and biochemical characteristics of microbes
- PSO2: Enlisting the various growth adjuvants and media compositions
- PSO3: Enumerating the bacteria quantitatively through viable counts
- PSO4: Developing the capability to handle microbial cultures under laboratory conditions
- PSO5: Training in cultivation of viral, fungal and bacterial cultures under aseptic conditions

Learning Outcomes

- LO1: Hands on experience in basic techniques of Isolation, culturing, plating and sterilization.
- LO2: Comprehend the major spectrophotometric and titrimetric approaches of biosamples
- LO3: Basic understanding of cultivation of viruses and their growth characteristics
- LO4: Maintenance and preservation of bacterial and fungal specimens under aseptic conditions
- LO5: Understanding the working of different equipment's used in microbiological laboratories

MBP 106: ANALYTICAL TECHNIQUES

Course Outcomes

- CO1: Understanding the microbial growth kinetics and determination of kinetic parameters
- CO2: Making students well versed with analytical approaches to quantify major biomolecules

- CO3: Training the students in handling the instruments used in laboratory with relative ease
CO4: Providing technical expertise on titrimetric and colorimetric approaches
CO5: Preparing stock solutions with ease and precision

Programme Specific Outcomes

- PSO1: Delivering the hands-on experience of various enzymatic assays
PSO2: Developing insights into the different physiological phenomena of enzymes
PSO3: Deep training in chromatographic techniques
PSO4: Skilled training in sample preparation, spectroscopic and quantitative analysis
PSO5: Working on qualitative and quantitative analysis of samples with relative ease

Learning Outcome

- LO1: Understanding the basic principles of Microscopy and their applications
LO2: Comprehending the chromatographic techniques such as PC, TLC, etc.
LO3: Quantitative and qualitative estimations of proteins, sugars, lipids, fats, oils, etc.
LO4: Calculation of molarity, molality and normality in stock solution preparations
LO5: Determining the molecular weight of enzymes / proteins by electrophoretic methods

II SEMESTER

MB 201: MICROBIAL PHYSIOLOGY & METABOLISM

Course Outcomes

- CO1: Understanding the intricacies of microbial metabolism, growth and energy generation
CO2: Acquainting with the pathways of catabolic and anabolic reactions
CO3: Developing insights into amino acids metabolism
CO4: Emphasizing various fermentation pathways, microbial communication and energetics
CO5: Enumerating the utilization of secondary metabolites

Programme Specific Outcomes

- PSO1: Developing insights into microbial communities and their adaptations
PSO2: Distinguishing microorganisms based on nutrition
PSO3: Understanding fermentation, aerobic and anaerobic pathways for energy generation
PSO4: Emphasizing on the catabolism of purine and pyrimidines
PSO5: Developing insights into the microbial metabolism of hydrocarbons

Learning outcomes

- LO1 : Enlisting microbial communities based on their nutritional and energy requirements
LO2: Deep insights into the biology of nitrogen fixation
LO3: Acquainting with the concepts of microbial cross-talk.
LO4: Perception of biosynthesis of amino acids and their regulation
LO5: Understanding the utilization of secondary metabolites

MB 202: CELL BIOLOGY & ENZYMOLOGY

Course Outcomes

- CO1: Specifying the significance of cellular organelles and their biogenesis.
CO2: Perceiving the Physico-chemical properties of bacteria
CO3: Signifying the cellular permeability and transport process
CO4: Developing insights into the mechanism of signal transduction
CO5: Understanding the laws of thermodynamics

Programme Specific Outcomes

PSO1: Gain knowledge on cellular organisation and transport mechanisms

PSO2: Perceiving the concepts of entropy, enthalpy and free energy changes

PSO3: Emphasizing oxidative phosphorylation and theories of ATP generation

PSO4: Analysing the importance of mathematical and statistical methods required for the description, interpretation of enzymatic phenomena and processes

PSO5: To integrate the practical aspects of enzymology with the kinetic theories providing a mechanistic overview of enzyme activity and regulation in cells

Learning Outcomes

LO1: Understanding the biological and biochemical aspects of photosynthesis and respiration

LO2: Perception of basic knowledge of enzyme kinetics, the parameters of the enzymatic reaction and mechanisms of action of enzymes and inhibitors.

LO3: Developing insights into the knowledge on the structure of enzymes and their active sites

LO4: Emphasizing the basic concepts, terms and techniques used in enzymology

LO5: Deep learning of signal transduction and signalling pathways with receptor protein

MB 203: MOLECULAR & MICROBIAL GENETICS

Course Outcomes

- CO1: Studying the genetic organization of prokaryotes and eukaryotes at a molecular level
- CO2: Perceiving the fine structural analysis of Gene
- CO3: Enumerating the biological significance of plasmids and their properties
- CO4: Gaining insights into transposable elements in yeast and *Drosophila*
- CO5: Developing insights into the mechanisms of mutations and their importance in evolution

Programme Specific Outcomes

- PSO1: Emphasizing the Prokaryotic and Eukaryotic genomes and their organisations
- PSO2: Understanding the microbial inheritance and lateral gene transfer mechanisms
- PSO3: Enumerating model organisms such as *E. coli*, *Yeast* and *Drosophila*
- PSO4: Acquiring knowledge on molecular markers in DNA Polymorphisms
- PSO5: Obtaining insights on mutations and various mutagens causing mutations

Learning Outcomes

- LO1: Developing insights into the fine structure of genes and multigene families
- LO2: Perception of recombination mechanisms at molecular level
- LO3: Deep understanding of the Site directed mutagenesis
- LO4: Understanding the tetrad analysis and mapping of genes
- LO5: Emphasizing the recombination in viruses and their exploitation as genetic tools

MB 204: IMMUNOLOGY

Course Outcomes

- CO1: Providing an overview of immune system, antigen- antibody structure and interactions.
- CO2: Developing a better understanding of innate and adaptive immunity.
- CO3 Theoretical knowledge on autoimmune disorders and hypersensitivity reaction
- CO4: Emphasizing MHC and its role in immune response.
- CO5: Enlisting the significance of vaccines in disease control and prevention

Programme Specific Outcomes

- PSO1: Integrating the knowledge of immunology with health sciences
- PSO2: Understanding the principle and applications of serological techniques
- PSO3: Developing insights into Immune response to infectious diseases
- PSO4: Comprehending the classification and properties of antigens and antibodies
- PSO5: Emphasizing the applications of monoclonal antibodies in biomedical research

Learning Outcomes

- LO1: Understanding the Immunogenicity, adaptive and Innate immunity
- LO2: Deep insights into antigenic-antibody interactions, Histocompatibility and autoimmunity
- LO3: Perception of Hybridoma technology and its significance
- LO4: Gain theoretical knowledge of Immunological tolerance and Immunosuppression.
- LO5: Developing theoretical approach towards the immunological techniques

MBP 205: ENZYMOLOGY AND IMMUNOLOGY

Course Outcomes

- CO1: Imparting knowledge on basic production, isolation and purification methods of enzymes
- CO2: Developing theoretical understanding about enzyme kinetics
- CO3: Hands on experience on serological techniques reflecting antigen-antibody interactions
- CO4: Acquiring technical expertise in handling immunological kits
- CO5: Perceiving practical insights into gel casting, serum preparations and blot techniques

Programme Specific Outcomes

- PSO1: Understanding the effects of substrate and enzyme concentration on enzyme activity
- PSO2: Providing technical expertise to basic immunological techniques
- PSO3: Training in handling DNA and Protein gel loading and band analysis
- PSO4: Technical expertise in quantification and purification of enzymes from bio samples
- PSO5: Performing blood grouping and determining Rh factor with precision

Learning Outcomes

- LO1: Understanding the mode of action of enzymes and their kinetics
- LO2: Acquainting with immunological approaches that encompass detection and understanding of antigen-antibody interactions
- LO3: Technically trained to determine and quantify the presence/absence of antigens and antibodies in biological samples
- LO4: Hands on experience on gel casting (SDS-PAGE) and electroblotting techniques
- LO5: Well versed with calorimetric and spectroscopic analysis

MBP 206: MICROBIAL PHYSIOLOGY AND GENETICS

Course Outcomes

- CO1: Understanding the microbial growth kinetics
- CO2: Providing basic insights of microbial genetic manipulations
- CO3: Training the students in handling and manipulating the microbial samples
- CO4: Making students well versed with analytical approaches to quantify major biomolecules
- CO5: Acquiring technical expertise in handling microbial genetics kits

Programme Specific Outcomes

- PSO1: Developing deep insights into different physiological phenomenon's
- PSO2: Trained to handle microbial genetic modification strategies
- PSO3: Providing hands on experience in banding and karyotyping
- PSO4: Hands on experience in handling chemical mutagens
- PSO5: Overall practical understanding of DNA repair mechanisms

Course Structure

1. Estimation of proteins by Biuret method and Folin Ciocalteu method.
2. Estimation of DNA by Diphenyl amine method.
3. Estimation of RNA by Orcinol method
4. Estimation of Inorganic and organic phosphates by Fiske-SubbaRow method.
5. Estimation of Ammonical nitrogen and nitrates.
6. Strain improvement using chemical mutagens.
7. Isolation of mutants using EMS.
8. UV Survival curve of *E.coli*. or any other bacteria.
9. Study of the repair mechanism for the damage caused by UV radiation.
- 10 Find the effectiveness of disinfectants by Phenol coefficient test.
11. Demonstration of Ames test.

12. Protoplast preparation and regeneration.
13. Chromosome isolation, banding and karyotyping.
14. Bacterial conjugation

Learning Outcome

- LO1: Developing capability to quantify proteins and nucleic acids
LO2: Perceiving insights to perform different gene transfer methods in microbes
LO3: Handling of the general equipment's used in microbiology laboratory with ease
LO4: Comprehending the major spectrophotometric approaches in quantification of biosamples
LO5: Expertized in titrimetric and calorimetric analysis.

III SEMESTER

MB 301: MOLECULAR BIOLOGY

Course Outcomes

- CO1: Understanding the organisation of genetic material and their hereditary patterns
CO2: Perceiving the concepts of central dogma and the deciphering of genetic code
CO3: Enumerating the steps involved in transcription and translational mechanisms
CO4: Gaining insights into catabolite repression mechanism
CO5: Distinguishing different modes of gene regulation and their expressions

Programme Specific Outcomes

- PSO1: Emphasizing the mechanisms of replication, transcriptional and translational processes
PSO2: Understanding the biology of cancer and tumours
PSO3: Enumerating the various enzymes and their importance in replication
PSO4: Deep learning of gene regulation at the levels of transcription and translation
PSO5: Perceiving the importance of Regulatory genes, structural genes and repressors

Learning Outcomes

- LO1: Understanding the importance of DNA and RNA that govern inheritance patterns
LO2: Emphasizing the role of RNA in decoding and protein synthesis
LO3: Insights into the mode of action of antibiotics on protein synthesis
LO4: Perception of post transcriptional and post translational modifications
LO5: Acquiring critical knowledge on telomerase replication, Intron splicing and protein channelling

MB 302: MEDICAL MICROBIOLOGY

Course Outcomes

- CO1: Acquiring basic knowledge of host- microbe interactions
- CO2: Understanding diseases and their persistence in populations
- CO3: Perceiving the biology of vectors and their role in disease transmission
- CO4: Enlisting diseases of public significance, their prevention and control.
- CO6: Gaining insights into Epidemiological studies, Herd immunity and Notifiable diseases

Programme Specific Outcomes

- PSO1: Enumerating the diseases caused by Bacteria, Fungi, Protozoa, Helminths and Viruses
- PSO2: Understanding the pathogenesis of medically significant diseases
- PSO3: Emphasizing the importance of etiology of diseases
- PSO4: Identifying the portals of entry and exit in disease transmission
- PSO5: Developing insights into Sexually transmitted diseases

Learning Outcomes

- LO1: Deep understanding of the microbial flora existing in humans
- LO2: Gaining theoretical knowledge of most common medically significant organisms and the infections caused by them
- LO3: Enumerating the methods and vehicles of disease transmission
- LO4: Understanding the disease cycles and their out breaks
- LO5: Systematic knowledge on the pathogenesis and laboratory diagnosis of diseases
- LO6: Distinguishing nosocomial and zoonotic diseases with specific type studies

MB 303: BIostatistics & BIOINFORMATICS

Course Outcomes

- CO1: Imparting basic knowledge of biostatistics and tools employed for quantitative analysis
- CO2: Gaining in depth knowledge on principles of Probability
- CO3: Understanding the concepts of genomics, proteomics and transcriptomics
- CO4: Developing modules predicting the protein secondary structure
- CO5: Emphasizing the ability to modify gene and protein structures in simulated systems

Programme Specific Outcomes

- PSO1: Providing an overview of various bioinformatics tools, databases and sequence analysis
- PSO2: Gaining practice on statistical problems on mean, median, mode, standard deviation
- PSO3: Developing the concepts of World Wide Web and internet
- PSO4: Insights into peptide finger printing and fragment assembly
- PSO5: Understanding the molecular dynamics in protein structure prediction

Learning Outcomes

- LO1: Insights into statistical approaches such as ANOVA, F-test, T -tests and Chi square tests.
- LO2: Developing an overview on searching and alignment of biological databases
- LO3: Understanding the genome annotation and algorithms of gene prediction
- LO4: Construction of phylogenetic trees using clustering methods
- LO5: Perception of 3D models of protein structure predictions

MB 304: MOLECULAR BIOTECHNOLOGY

Course Outcomes

- CO1: Enumerating the versatile tools and techniques employed in r DNA technology
- CO2: Familiarizing with the cloning strategies and gene expression analysis
- CO3: Enlisting the enzymes and their functions constituting genetic tool kit
- CO4: Developing basic insights into nanotechnology, their synthesis and applications
- CO5: Emphasizing on nucleic acid probe technology and their applications

Programme Specific Outcomes

- PSO1: Gaining insights into the techniques of rDNA technology
- PSO2: Perception of the expression of cloned genes in prokaryotic and eukaryotic host systems
- PSO3: Understanding the screening of recombinants as well the expression of cloned genes
- PSO4: Emphasizing the structural and functional analysis of recombinants
- PSO5: Developing acumen into the synthesis of nanoparticles and therapeutic importance

Learning Outcomes

- LO1: Developing sound knowledge on procedural repertoire and strategies in gene cloning
- LO2: Enumerating the applications of genetic engineering in basic and applied biology
- LO3: Computing the applications of nanomedicine in cancer biology
- LO4: Understanding the genetically inherited disorders and gene therapy
- LO5: Acquiring deep insights into DNA and protein microarray techniques

MBP 305: MOLECULAR BIOLOGY & MOLECULAR BIOTECHNOLOGY

Course Outcomes

- CO1: Understanding the various techniques of recombinant DNA technology
- CO2: Learning the isolation of genomic and plasmid DNA
- CO3: Acquiring skilled expertise in handling molecular biology kits
- CO4: Synthesizing silver nanoparticles and characterizing spectroscopically
- CO5: Carrying out antimicrobial activity of green synthesized AgNPs

Programme Specific Outcomes

- PSO1: Developing laboratory skilled knowledge in molecular biology experiments
- PSO2: Trained hands-on experience in PCR and blotting techniques
- PSO3: Understanding the practical difficulties in managing laboratory reagents
- PSO4: Practical handling of PCR and its trouble shooting technical expertise
- PSO5: Handling the instruments in the lab with ease

Learning Outcomes

- LO1: Developing practical experience in extraction of DNA/RNA
- LO2: Hands on experience in restriction digestion, gel electrophoresis and gel elutions

- LO3: Gaining skilled knowledge in performing Transformation and bacteriophage titration
LO4: Synthesizing nanoparticles and executing their antimicrobial properties
LO5: Working on problems related to DNA/RNA and their characterization

MBP 306: MEDICAL MICROBIOLOGY, BIostatISTICS AND BIOinformatics

Course Outcomes

- CO1: Demonstrating culture dependent studies of microbes and their disease manifestations
CO2: Acquiring technical expertise in handling diagnostic kits
CO3: Providing hands-on experience to basic serological techniques
CO4: Imparting knowledge in basic tools and algorithms used in bioinformatics
CO5: Understanding Protein data bases and genome sequence analysis

Programme Specific Outcomes

- PSO1: Performing microbial isolation and biochemical characterization of biological samples
PSO2: Distinguishing the microorganisms by biochemical and cultural characterization
PSO3: Learning methods for antimicrobial susceptibility testing
PSO4: Skilled training in gene clustering and protein modelling
PSO5: Developing in-silico practice in handling bioinformatics tools

Learning Outcomes

- LO1: Technical expertise in isolation and identification of microbes from biological fluids
LO2: Hands on experience on serological diagnosis of HIV and Hepatitis
LO3: Practical knowledge on blood profiling protocols
LO4: Demonstrating the In silico analysis for genome annotation and gene prediction
LO6: Working on problems related to measures of central tendency, t-test and chi square test

IV SEMESTER

MB 401: FERMENTATION TECHNOLOGY & INDUSTRIAL MICROBIOLOGY

Course Outcomes

- CO1: Imparting knowledge on the exploitation of microbes in Fermentation technology
CO2: Emphasizing the steps involved in downstream processing
CO3: Enumerating the role of micro-organism in production of organic acids, alcohols, wine, vinegar, enzymes, vitamins, antibiotics, amino-acids and steroids.
CO4: Gaining deep insights into biofilms, biosurfactants, biofuels and bioleaching agents
CO5: Developing knowledge on the design of digesters and their applications

Programme Specific Outcomes

- PSO1: Understanding the design of bioreactors and media formulations in fermentation technology
PSO2: Developing new Standard operating procedures for enhanced production and product recovery
PSO3: Perceiving the steps involved in the industrial production of antibiotics
PSO4: Insights into thermophilic and methanogenic archaeobacteria in oil fields instituting Petroleum Microbiology
PSO5: Enlisting the industrially important microbial products

Learning Outcomes

LO1: Understanding the industrial production and purification of organic acids, alcohols, wine and vinegar

LO2: Learning microbial growth and product formation kinetics in fermentation technology

LO3: Developing techniques of sterilization, isolation, preservation and improvement of industrially important micro-organisms

LO4: Perception of microorganism's role in biotransformation and leaching mechanisms

LO5: Emphasizing the exploitation of microbes in biogas and biofuels production as small-scale industry

MB 402: ENVIRONMENTAL MICROBIOLOGY

Course Outcomes

CO1: Providing basic understanding of microbial diversity in the environment

CO2: Developing insights into concept and components of ecosystem

CO3: Perceiving microbial interactions with chemical pollutants in the environment

CO4: Gaining deep insights into soil microbiology, aquatic and aero microbiology

CO5: Enumerating the effects of chemical pollutants in the environment

Programme Specific Outcomes

PSO1: Understanding the intricacies of the ecosystem

PSO2: Emphasizing the microbiology of Air and water

PSO3: Acquiring familiarity on Environmental impact assessment studies

PSO4: Gaining theoretical knowledge in microbial waste management and recycling

PSO5: Developing cognizance in biomagnification, biofouling and Bioremediation processes.

Learning Outcomes

LO1: Understanding biological spectrum at levels of organization & realm of ecology

LO2: Perception of Energy transfer efficiencies between trophic levels

LO3: Insights into kinetic principles of Prey predator relationship.

LO4: Theoretical knowledge on Air sampling and air sanitation

LO5: Enumerating the role of microbes in degradation of oil spills, pesticides and detergents.

MB 403: FOOD MICROBIOLOGY & AGRICULTURAL MICROBIOLOGY

Course Outcomes

CO1: Providing the basics to the general principles of food microbiology

CO2: Developing insights towards types of microbial spoilage of foods

CO3: Enumerating the microbes as Probiotics, Prebiotics and Synbiotics

CO4: Comprehending the role of Microorganisms in biogeochemical cycles.

CO5: Acquiring theoretical knowledge on the mode of action of biofertilizers and biopesticides

Programme Specific Outcomes

PSO1: Understanding the epidemiology of food borne microorganisms of public health significance

PSO2: Analysing the significance of microbiological quality control programmes in food production

PSO3: Acquiring insights towards microbial composition and sampling techniques

PSO4: Emphasizing the importance of biofertilizers and biopesticides over chemical methods
PSO5: Enlisting the various microbial groups employed as biocontrol agents

Learning Outcomes

LO1: Understanding food spoilage microorganisms; the microbiology of food preservation and food commodities; fermented and microbial foods

LO2: Developing principles and methods for the microbiological examination and preservation of foods

LO3: Emphasizing the role of microbes in maintaining soil profile and fertility

LO4: Insights into the role of microorganisms in decomposition of cellulose, hemicellulose and lignin's

LO5: Enumerating the various classes of microbes employed as biofertilizers and biocontrol agents

MB 404: PHARMACEUTICAL MICROBIOLOGY

Course Outcomes

CO1: Understanding the classification and mode of action of antibiotics

CO2: Acquiring basic knowledge on the rules and regulations of GMP and GLP

CO3: Emphasizing the types of IPRs and their management

CO4: Gaining insights into microbial testing in pharma industry

CO5: Enumerating the role of microorganisms in the pharmaceutical industry

Programme Specific Outcomes

PSO1: Understanding the use and abuse of antibiotics and drug resistance

PSO2: Enlisting various chemical as possible antimicrobials

PSO3: Enumerating the rules and regulations of WHO, ISO and US FDA

PSO4: Emphasizing the hierarchical tiers of quality management in pharma industry

PSO5: Perceiving the impact of Patenting biotechnological inventions and ELSI

Learning Outcomes

LO1: Enlisting a wide range of chemicals employed as disinfectants, antiseptics and preservatives

LO2: Developing insights into the hierarchical systems of quality control, quality assurance and quality management tiers in pharma industry

LO3: Enumerating the various sterility tests practised in manufacture of sterile and non-sterile medicinal formulations

LO4: Perception of the properties and limitations of patents, trade secrets and copy rights

LO5: Emphasizing the types of microbial spoilage and their preventive measures

MBP 405: INDUSTRIAL MICROBIOLOGY AND ENVIRONMENTAL MICROBIOLOGY

Course Outcomes

CO1: Providing exposure to design and run batch fermentation experiments

CO2: Developing practical knowledge in production of acids and alcohols by fermentation

CO3: Gaining skilled expertise in product recovery

CO4: Estimating DO, COD and BOD of water samples

CO5: Checking water potability with suitable procedures

Programme Specific Outcomes

PSO1: Acquiring skilled training in the quantification of biological samples

PSO2: Gaining expertise in handling fermenters with technical ease

PSO3: Developing new approaches for production and recovery of fermented products

PSO4: Understanding the adverse effects of pesticides on soil microbes

PSO5: Estimating, characterizing and identification of air flora and soil flora

Learning Outcomes

LO1: Hands on experience on preparation of wine by fermentation

LO2: Practical insights on understanding the various parameters in downstream processing

LO3: Developing skills towards advanced fermentation technology

LO4: Technical expertise in air sanitation and environmental monitoring

LO5: Performing qualitative analysis of water samples

MBP 406: FOOD, AGRICULTURAL & PHARMACEUTICAL MICROBIOLOGY

Course Outcomes

CO1: Providing hands on experience on quality food testing

CO2: Developing practical knowledge on microbiological quality testing

CO3: Isolating and characterizing economically important microorganisms

CO4: Acquiring skilled expertise in performing assays of antibiotics and vitamins

CO5: Providing training in the preparation and evaluation of biofertilizers and biopesticides

Programme Specific Outcomes

PSO1: Technical experience on isolation and characterization of microbes isolated from different food sources

PSO2: Gaining procedural acumen into antibiotic sensitivities towards test pathogens

PSO3: Developing practical insights into microbiological assays

PSO4: Designing experiments to produce biofertilizers and biopesticides with better efficiency

PSO5: Extending outsourcing programmes on quality check analysis of food and water

Learning Outcomes

LO1: Developing skilled training in microbiological examination of fresh and canned foods

LO2: Technical expertise in quality testing of milk and milk products

LO3: Determining the microbial sensitivities of drugs on various test organisms

LO4: Acquiring experience in isolation and culturing of *Rhizobium* and *Azotobacter*

LO5: Gaining practical awareness in handling the equipment's in the laboratory.