

Department of Microbiology

Program:

1. Graduate Course: B.Sc.
2. Post Graduate Course: M.Sc.
3. Ph.D.

Graduate Program Outcome:

PO-1: To provide adequate, basic understanding about Microbiology subject among the students. This program will enable students to understand and demonstrate the basics and fundamentals of the subject such as types of microorganisms, their life cycle, diseases caused by pathogens.

PO-2: To apply the knowledge of molecular biology, genetics, instrumentation, Biochemistry and environmental microbiology to derive solutions to various environmental problems.

PO-3: To Demonstrate their theoretical learning into practical skills and to work effectively in team.

PO-4: The students will be able to get a practical skill in isolating and handling pathogenic organisms and their safe disposal.

PO-4: To derive knowledge of industrially important microbes and their applications in various industries, this would enhance their chances of employability.

Programme Specific Outcomes:

Students after completing their graduation would be able to pursue their career in hospitals, pathology labs and quality control section of dairy, pharmaceutical industries etc.

Course Outcome

I Year

Paper I General Microbiology & Basic Techniques

CO-1: The objective of this course is to enable students to understand the history and developments in the field of microbiology.

CO-2: They will learn the different methods of sterilization, plating and staining techniques.

CO-3: They will be able to understand the principles of classification of viruses, fungi, bacteria, algae, protozoa and their economic importance.

CO-4: They will be able to understand the various diseases caused by these organisms their life-cycle, symptoms and methods of prevention.

Paper II Biochemistry & Physiology

CO-1: They will be able to understand the classification and properties of carbohydrates, proteins, lipids and amino acids.

CO-2: They will have knowledge of types, structure, function and replication of DNA.

CO-3: They will be able to understand the properties and classification of enzymes and their kinetics. They will be able to understand various metabolic pathways, photosynthesis and growth of bacteria.

CO-4: Brief account of bacterial growth phases, plasma membrane structure and different transport systems across the membrane.

II Year

Paper I Microbial Physiology and Genetics

CO-1: Students will be able to acquire knowledge about the structure of plasma membrane and transport systems, differentiation and replication of chromosome in bacteria,

CO-2: Basic knowledge about primary and secondary metabolism will be provided.

CO-3: Students will acquire basic knowledge of structure and properties of bacterial plasmids and bacteriophages, their life cycles, genetic recombination and DNA repair.

CO-4: Study of the mechanism of antibiotic resistance and spread of antibiotic resistance, Transposition; Structure of bacterial transposons, types of bacterial transposons.

II Year

Paper II Principles of Bioinstrumentation and Techniques

CO-1: Students will be able to understand the principles and instrumentation of techniques like colorimetry, spectrophotometry, chromatography, centrifugation and microscopy.

CO-2: Discussion of basics of tissue culture techniques, Principal and requirements of animal tissue culture, Decontamination, sterilization and disinfection.

CO-3: Study of fundamentals of Electrophoreses and enzyme purification techniques.

CO-4: Discussion of Radioisotope techniques; nature of radioactivity, detection measurement, counter, safety aspects.

III Year

Paper I Molecular Biology and Genetic engineering

CO-1: Students will understand the history of molecular biology and genetic engineering. They will retain the knowledge of different types of mutation and gene expression in microorganisms.

CO-2: Basics of various plasmids and phage vectors used and their properties, methods of DNA and protein sequencing.

CO-3: Explanation of Enzymes involved in transcription translation, genetic code, regulation of gene expression-transcription, translation and control of gene expression in microbes.

CO-4: study of Restriction and ligation of vector and passenger DNA, transformation of host cells, selection vs. screening of recombinant colonies, analysis of recombinant clones.

III Year

Paper II Environmental and Medical Microbiology

CO-1: Knowledge of air, soil and aquatic microbiology will be disseminated to the students. They will be able to acquire knowledge about types and use of bio fertilizers.

CO-2: Basic concepts of food spoilage and food borne infections and waste water and treatment types will be discussed.

CO-3: Study of Physical and chemical characteristics and micro flora of various soil types, rhizosphere, phyllosphere Brief account of microbial interactions.

CO-4: Discussion of Potability of water, microbial assessment of water quality and brief account of water borne diseases.

CO-5: Knowledge of Xenobiotics, bioaccumulation, biopesticides and deterioration and General concept of industrial microbiology and their applications.

Post Graduate Program Outcome:

PO-1: Students shall be able to understand the basic concepts of various metabolic pathways in microorganisms. They will be proficient in branches of microbiology like industrial, agricultural microbiology, microbial physiology etc. This program would help build knowledge about the current industrial practices in the field of microbiology.

PO-2: This program will enable students to possess the modern molecular, biological and technical knowledge needed to support research activities.

PO-3: It will enable to study the use of living microorganisms in various fields like bioprocess engineering, genetic engineering, Medicine, Agriculture etc.

PO-4: Students will be proficient ethically; will have leadership qualities and skills relevant to the subject.

PO-5: Students will become an excellent researcher or scientist or academician in microbiology field to discover unique products for societal needs.

Programme Specific Outcomes:

PSO-1: The students after completing their post graduation, students would be able to pursue their career in academics, research or in various applied fields like pharmaceutical, clinical microbiology etc. Students would be well versed in the subject and shall have a deep knowledge.

PSO-2: Students will have the confidence and apply their knowledge to work collaboratively on projects of social interest.

PSO-3: To familiarize with the Principles underlying the relevant compounds and their Clinical Importance.

PSO-4: Build Knowledge of Current industrial practice including innovations and Molecular Biological Techniques.

M.Sc.

I Semester

CO-1: Students will be able to acquire knowledge about the structure of plasma membrane and transport systems, replication of chromosome, genetic recombination and DNA repair, molecular organization of membranes, transport of proteins through various cell organelles, cell signalling and organization of chromosomes.

CO-2: They will be able to understand the classification and properties of carbohydrates, proteins, lipids and amino acids. They will have knowledge of types, structure, function and replication of DNA. They will be able to understand the properties and classification of enzymes and their kinetics. Also knowledge about chemistry of porphyrins and structure and biological role of animal hormones will be dealt with.

CO-3: The objective of this course is to enable students to understand the history and developments in the field of microbiology. They will learn the sterilization, plating and staining techniques. They will be able to understand the principles of classification of viruses, fungi, bacteria, algae, protozoa and their economic importance. They will be able to understand the various diseases caused by these organisms and their nutritional types.

CO-4: Students will be able to learn the basic concept of immune system, types of immunoglobulins, concept of antigens, mode of interaction between antibody and antigen, hypersensitive reactions and their types, types of immunodeficiency disorders etc.

II Semester

CO-1: Students will be able to learn and understand the basic concepts of Mendelian principle, Gene mapping methods, Mutation types and their causes, DNA replication, repair and recombination, RNA synthesis and processing, Protein synthesis and processing and Protein targeting.

CO-2: Students will acquire knowledge of laws of thermodynamics, Concept of free energy, Basic concepts of intermediary and Carbohydrate metabolism, Electron transport and oxidation phosphorylation, Nitrogen Assimilation and Biosynthesis of amino acids.

CO-3: Students will be able to understand the principles and instrumentation of colorimetry, spectrophotometry, chromatography, centrifugation, microscopy, tissue culture techniques, electrophoresis, enzyme purification techniques, Radioactivity and different molecular techniques like isolation and purification of RNA and DNA.

CO-4: Students will be introduced to concept of biostatistics, types of biological data, Probability, Statistical errors in hypothesis testing, Correlation, Regression, Introduction to MS-Office software, Word processing, Introduction to Internet and Basics of internet and they will be introduced to Plagiarism and Cyber laws.

III Semester

CO-1: Students will be able to understand the aerobic and anaerobic respiration mechanisms of various microorganisms, fermentation process of glucose and biosynthesis of bacterial structures, microbial photosynthesis and nitrogen metabolism.

CO-2: Students will be able to understand the basics of fermentation biotechnology, fermentation kinetics, types of bio-reactors, their design and instrumentation, industrial production of microbial biomass, scale up, instrumentation, control and applications of biosensors.

CO-3: Students will be able to understand the distribution and ecology of microorganisms, concept and components of different ecosystems- concept of aquatic ecosystems, waste water disposal and reclamation, micro flora of various soil types, composting, biodeterioration, GMO and their impact.

CO-4: Students will be able to understand the existence and microbiology of normal microbial flora of human body, their source of infection for man, classification of pathogenic bacteria, general properties of viruses, virus-host interactions, Human Immuno Deficiency viruses, different aspects of mycology, Human mycotic infections, Basics of parasitology.

IV Semester

CO-1: Techniques of microbial technology and scope of genetic engineering will be the scope of this course. Also, knowledge of techniques like polymerase chain reaction, DNA sequencing, basics of cloning vectors and genomics, cloning strategies, immobilization techniques, microbial screening, selection and strain improvement, role of national and international organization in biotechnology will be provided.

CO-2: Students will be able to understand the fundamentals of synthesis and production of immunoglobulins, monoclonal antibodies, immunodeficiency diseases, Principles of antimicrobial action and resistance of antibiotics, Principles of vaccination, Immunization practices diagnosis of microbial diseases, principles of immunodiagnostics, Antigen-antibody based immune diagnosis, basics of designer antibody.

CO-3: Students will have a knowledge of microbial flora of fresh foods, basics of canning, processing for heat treatment, role of microorganisms in beverages like beer, wine and vinegar, roles of microorganisms in the food industry, food borne outbreak, laboratory testing procedures, prevention measures, food sanitation in manufacture and retail.

CO-4: Knowledge related to structure and characteristic features of the different biofertilizer organisms, biofertilization processes, major biogeochemical cycles and the organisms, biopesticides, microbial diseases of crop plants including bacterial, fungal and viral diseases will be provided to the students.

Department of Biotechnology

Program:

1. Graduate Course: B.Sc.
2. Post Graduate Course: M.Sc.

Graduate Program Outcome:

PO-1: To provide adequate, basic understanding about Biotechnology subject among the students. This program will enable students to understand and demonstrate the basics and fundamentals of the subject.

PO-2: To apply the knowledge of molecular biology, genetics, instrumentation, Biochemistry and environmental microbiology to derive solutions to various environmental problems.

PO-3: To Demonstrate theoretical learning into practical skills and to work effectively in team.

PO-4: The practical in the laboratories will impart knowledge about various instruments and chemicals which will enable the students to get trained and develop skills to work as a team thereby enhancing their leadership qualities.

Programme Specific Outcomes:

PSO-1: This program would enable students to acquire knowledge on the fundamentals of biotechnology and help them to understand the emerging and advanced concepts in life sciences.

PSO-2: Students after completing their graduation would be able to pursue their career in various industries related to biotechnology.

PSO-3: This program being an applied subject will enable students to equip themselves such that they can pursue higher education and go for research in reputed institutes.

PSO-4: To make students competent in the field of biotechnology and inculcate the capability to work in different industries or go for entrepreneurship.

Course Outcome

I Year

Paper I BIOCHEMISTRY, BIOSTATISTICS AND COMPUTERS

CO-1: The objective of this course is to enable students to understand the history and developments in the field of biotechnology. To introduce the classification of Carbohydrates and Lipids.

CO-2: Explanation of Amino acids and Proteins, classification of Enzymes, their mechanism, Immobilization of enzyme and their applications.

CO-3: They will be able to understand the basics of plant and animal hormones, metabolism of carbohydrates, proteins and lipids.

CO-4: The students will have a better understanding of Biostatistics, methods of Collection of data, sampling techniques, Processing and Presentation of data.

CO-5: They will have a understanding of Concept of Hardware and Software, Input and Output Devices and Application of computers in the field of biotechnology.

Paper II CELL BIOLOGY, GENETICS AND MICROBIOLOGY

CO-1: They will be able to understand the concept of Cell theory, Prokaryotic cell structure and Function and ultra structure Eukaryotic cell including Plant cell wall and Plasma membrane.

CO-2: They will have knowledge of different cell organelles, their characters and functions, cell division and programmed cell death.

CO-3: They will have an understanding of Mendel's Laws of Inheritance, Linkage and Crossing over and different types of chromosome variations.

CO-4: Discussion of History, Scope and Development of Microbiology, Basic techniques of Microbial Culture, General features and Economic importance of Fungi, Algae and Protozoa etc.

II Year

Paper I MOLECULAR BIOLOGY & BIOPHYSICS

CO-1: Students will be able to acquire knowledge about Structure, types and replication of DNA and RNA, structure and concept of gene.

CO-2: Basic knowledge of Genetic code, Protein synthesis, mitochondrial genome and Chloroplast genome.

CO-3: Students will acquire basic knowledge of Gene Therapy, Transposable elements, DNA damage and repair and General Concept of Tissue engineering.

CO-4: Study of different techniques like Radioisotopes techniques, Autoradiography, Spectroscopy, Electrophoresis, Centrifugation, Colorimeter, Chromatography, ELISA etc.

II Year

Paper II RECOMBINANT DNA TECHNOLOGY

CO-1: Students will be able to understand the Scope and aim of the Biotechnology, basics of Recombinant DNA Technology, its General concept and Applications.

CO-2: Discussion of basics of different types of Vectors like Animal and Plant vectors, Bacteriophage Vectors and methods to Introduce vectors into appropriate host.

CO-3: Study of PCR Procedure, its steps, Types of PCR and its Applications.

CO-4: Discussion of Monoclonal Antibodies, Genome Project, Apoptosis, Stem cell technology, DNA fingerprinting, Transgenic animals and Plants.

III Year

Paper I GENERAL BIOTECHNOLOGY

CO-1: Students will understand the basic concepts of Plant cell and tissue culture, Application of tissue culture and Concept of cellular differentiation.

CO-2: Basics of Organogenesis, Embryogenesis, Protoplast isolation and fusion, Germplasm storage and Cryopreservation, Anther and Ovary culture.

CO-3: Explanation of environmental biotechnology, Environmental pollution and its type, Control of pollution through biotechnology, Wastewater treatment methods.

CO-4: study of Biofertilizer, Biopesticides, IPR, Global environmental problems like Ozone depletion, Acid rain, Green house effect, Bioreactors and its types.

III Year

Paper II IMMUNOLOGY

CO-1: General Concept, history and Development of Immune system and immunity, Organization of Immune system, Antigen - Antibody and its types.

CO-2: Basic concepts of food spoilage and food borne infections and waste water and treatment types will be discussed.

CO-3: Study of Types of cells involved in immune system, their Basic structure and function, Cytokines, Cell mediated immunity, Interferons, Hypersensitivity.

CO-4: Discussion of Antigen - antibody interactions, Immunohaematology, Blood group system, Rh factor, medical applications of blood grouping.

CO-5: Knowledge of Immunity of infection diseases, monoclonal Antibodies, Autoimmune diseases, Immunodeficient diseases, Cancers, AIDS.

Post Graduate Program Outcome:

PO-1: Students shall be able to understand the basic concepts of biotechnology and will be proficient in branches like molecular and cell biology, bioinformatics, nano biotechnology, proteomics and genomics etc.

PO-2: This program will enable students to possess the modern molecular, biological and technical knowledge needed to support research activities.

PO-3: Students will be able to use living organisms and manipulate them for societal benefit by using techniques like genetic engineering, bioprocess engineering which would result in all different types of Bio products.

PO-4: Students will be proficient ethically; will have leadership qualities and skills relevant to the subject.

PO-5: Students will become an excellent researcher or scientist or academician in biotechnology field to discover unique products for societal needs.

Programme Specific Outcomes:

PSO-1: After completion of their post graduation, students would be well versed with various modern molecular biological techniques like chromatography, SDS-PAGE, Agarose Gel Electrophoresis, PCR etc.

PSO-2: Students after completing their graduation would be able to pursue their career in various industries

PSO-3: Students would be able to recognize the importance of copyright acts, patents, ethical issues etc which would help students to nurture their management skills.

PSO-4: Students will be able to demonstrate their ability to apply biotechnological research strategies to solve the global environmental problems.

M.Sc.

I Semester

CO-1: Students will be able to acquire knowledge about Cell Theory, Cellular organelles, Transport of nutrients, Cell Cycle, Apoptosis, Biology of cancer, Chromosome: Structure, types, Biosynthesis of proteins in Eukaryotic cell, Development in Drosophila and Arabidopsis.

CO-2: They will be able to understand the concepts of Mendel's laws of genetics, Gene Types, Fine structure of gene, Regulation of gene expression in Prokaryotes and Eukaryotes, Mutation Types, Extrachromosomal inheritance, Inheritance pattern, Bacterial Genetic system, Genetic system of Yeast and Neurospora.

CO-3: The objective of this course is to enable students to understand the concept of Microbial Evolution, Prokaryotic cells: Structure and function, Microbial Growth, Metabolic Diversity among Microorganisms like Archae, bacteria, viruses etc.

CO-4: Students will be able to learn the basic concept of Principles of thermodynamics, Analytical techniques in biochemistry and biophysics, classification and separation of proteins, lipids, nucleic acids etc.

II Semester

CO-1: Students will be able to learn and understand the basic concepts of Measures of central tendency, Simple linear regression and correlation, .Tests of significance, Introduction to digital computers, Flow charts and programming techniques.

CO-2: Students will acquire knowledge of Molecular Biology, DNA Replication, Transcription, Prokaryotic and Eukaryotic translation, Protein Localization, Oncogenes and Tumor Suppressor Genes, Molecular Mapping of genome.

CO-3: Students will be able to understand the principles Introduction to cell and tissue culture, Organogenesis, Organogenesis, Germplasm conservation, Metabolic Engineering and Industrial Products, Molecular Markers.

CO-4: Students will be introduced to Macromolecules and supra molecules assemblies, Protein - protein and protein - ligand interactions, Enzyme catalysis, Ribozymes and Catalytic antibodies, Nucleic acid hybridization

III Semester

CO-1: Students will be able to understand the applications of Genetic Engineering, Nucleic acid purification, Gene cloning vectors, Cloning interacting genes, Processing of recombinant Proteins, Gene therapy.

CO-2: Students will be able to understand the Organization and structure of lymphoid organs, Cells of immune system, Antigen — antibody interactions, Hypersensitivity, Autoimmunity, Hybridoma Technology and Monoclonal antibodies.

CO-3: Students will be able to understand the concept of Bioprocess Engineering, Media for industrial fermentation, Types of fermentation processes, downstream processing, whole cell Immobilization and their industrial applications.

CO-4: study of Basic concepts of Environmental Pollution, Water pollution and its control, Treatment schemes for waste waters, GMO and their Impact, Biopesticides in integrated pest management.

IV Semester

CO-1: Scope of Bioinformatics, Biological database, Bioinformatics software tools, Nanobiotechnology.

CO-2: Students will be able to understand the Principles and application of various instrumentation like Centrifugation, Chromatography, and Principle & Application of microscopy, Principles and application of Cytophotometry, DNA sequence.

CO-3: Students will have a knowledge of Animal cell Structure and organization, Application of animal cell culture, Scaling up of animal cell culture, Ethical Issues in Biotechnology, Gene Manipulation & Research, experiments in Animal & Human, Animal Rights, Protection of Biodiversing.

CO-4: Knowledge related to Genomics in medicine, Methods of gene sequencing, Proteomics, Future of proteomics, and Analysis of protein structure, Protein-Protein interactions, and Protein databases.

