

**INTEGRAL UNIVERSITY
DEPARTMENT OF BIOSCIENCES
PROGRAMME: M.Sc. MICROBIOLOGY**

Microbiology is a broad discipline and students have a wide range of options for the study of microbiology including: microbial physiology, microbial genetics, microbial ecology, pathogenesis, immunology, virology, parasitology, epidemiology, evolution and diversity. Microbiology is a laboratory-based science, and as such, our curriculum supports laboratory components in most of the courses taught in the program.

PROGRAM SPECIFIC OUTCOMES (PSO):

PROGRAM SPECIFIC OUTCOMES (PSO)	Description
PSO 1	Understand the basic concepts, significance and essence of Microbiology discipline.
PSO 2	Demonstrate critical thinking and deeper understanding on pure fields of science.
PSO 3	Effectively communicate scientific ideas both orally and in writing
PSO 4	Appreciate new areas of scientific research through exposure to such fields.
PSO 5	Design and perform experiments, analyze data, relate to scientific theories and conceive potential technological applications.
PSO 6	Demonstrate ability for collaborative research and scientific communication through projects, internship and on-site training.
PSO 7	Conceive the ways and means to address various social, economic, environmental, human rights and other critical issues faced by humanity at the local, national and global levels.
PSO 8	Demonstrate skills required for higher education, professional development and employability

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)	Description
PEO1	To provide in-depth knowledge about core areas of biosciences such as biotechnology, biochemistry and microbiology.
PEO 2	To make students competent in the field of biosciences and allied areas by providing them hands on experience in basic tools and techniques.
PEO 3	To instill the ability for research and entrepreneurship in the students along with strong ethics and communication skills.
PEO 4	To inculcate, facilitate, motivate and promote knowledge and

	technical skills in core areas of biological sciences including advanced tools and techniques like genomics, proteomics and transcriptomics to young aspirants.
PEO 5	To equip and motivate the students to pursue higher education and research in reputed institutes at national and international level in the field of science.
PEO 6	To develop trained human resource in the field of advanced translational research.
PEO 7	To provide students with an understanding of the role of science in societal development.
PEO 8	To develop graduates with a strong professional ethics and moral duties that will positively affect their profession, community, society and Nation at large.

PROGRAM OUTCOMES (PO):

PROGRAM OUTCOMES (PO)	Description
PO 1	The program empowers research-based in-depth study of Microbiology.
PO 2	It equips the students to work independently in laboratory, analyze and apprehend the scientific articles, present scientific topics and research results in spoken and written forms, both.
PO 3	It allows having a thorough perceivence and competency in microbiology in addition to a broad-based integrative standing of basic biological concepts.
PO 4	It endows the understanding of research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
PO 5	Apply ethical principles and commit to professional ethics, responsibilities, and norms of the biological sciences practice.
PO 6	Empower the students to acquire technological cross-examination by connecting disciplinary and interdisciplinary aspects.
PO 7	Inculcate the importance of Bioethics, IPR, entrepreneurship, communication and management skills to usher next generation of Indian industrialists and researchers.

PROGRAMME: M.Sc. MICROBIOLOGY FIRST YEAR

COURSE: GENERAL MICROBIOLOGY

COURSE CODE BS441

COURSE OBJECTIVES: The course aims to provide students with an understanding of general microbiology, contribution of microbiology to human life for various daily needs. The knowledge is used in health care for prevention of diseases, diagnosis, sterilization methods and drug production. Further, the knowledge is also extended into food production, production of alcohol, in agriculture, leather industry, etc

Course Outcomes (CO):

After completion of the course, a student will be able to achieve

these outcomes

Course Outcome (CO)	Description
CO 1	Get an idea about the historical events in microbiology
CO 2	Understand the diversity in microbiology
CO 3	Know the scope of Microbiology
CO 4	Understand the taxonomic classification of microorganisms
CO 5	Know the general characteristics of Bacteria, fungi, algae and viruses
CO 6	Preparation and use of culture media, Pure culture and cultural characteristics & preservation methods of microbes
CO 7	Get an idea about the various methods of microbial control
CO 8	Growth phases – kinetics, asynchronous, synchronous, batch and continuous culture.

COURSE: BIOPHYSICAL METHODS

COURSE CODE BS442

COURSE OBJECTIVES: The objectives of this course are to provide the Students with the understanding of various analytical techniques used in biotechnology based research and industry. The course will acquaint the Students with the various instruments, their configuration and principle of working, operating procedures, data generation and its analysis.

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	Apply basic principles of different analytical techniques in analytical work. Concept of electromagnetic radiation, absorption spectrum, Beer's law and Lamberts law
CO 2	Use spectroscopy, microscopy, centrifugation, electrophoretic techniques and radioactivity in biotechnological applications
CO 3	Demonstrate principle and working of various instruments
CO 4	Use various techniques for solving industrial and research problem

COURSE: BIOMOLECULES

COURSE CODE BS443

COURSE OBJECTIVES: The course aims to provide students with an understanding of biomolecules, the basic building blocks of living organisms, focusing on their structural underpinnings, unique properties, biological roles and functions and inter relations. Emphasis will be on the association between structure and function of various biomolecules at a chemical level with a biological perspective.

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	Basic knowledge of structure and functions of major bio-molecules will make the students to understand and implement the acquired knowledge in future.
CO 2	Introduced to the structure, properties and roles of carbohydrates, lipids and nucleic acids.
CO 3	Aware of the importance of amino acids and vitamins in biological systems.

COURSE: MICROBIAL CYTOLOGY & GENETICS

COURSE CODE BS444

- **COURSE OBJECTIVES:** To give students a proper understanding of prokaryotic and eukaryotic cell organization.
- To develop in students the understanding about mechanism and regulation of eukaryotic cell cycle and signal transduction.
- To explain students about various methods of gene transfer in bacteria.

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	The cell organization in prokaryotes: structure and synthesis of bacterial cell wall and other cell organelles or structures present in bacteria. Importance of antibiotics, their mode of action and development of antibiotic resistance.
CO 2	The cell organization in eukaryotes: structure, function and protein transport of membrane, structure and functions of other cell organelles, cytoskeleton, genetic organization and concept of protein targeting.
CO 3	Cell division in eukaryotes i.e. Mitosis and Meiosis. Cell cycle and its regulation. Mechanism and pathways of cell proliferation and apoptosis.
CO 4	Basics of signal transduction. Role of second messengers and protein kinases in signal transduction. Mechanism of Quorum sensing. Production and application of Biofilms.
CO 5	Various methods of gene transfer in bacteria and their mechanism: Transduction, Transformation and Conjugation. Transposons present in prokaryotes and their mechanism of transposition. Types and role of Retrotransposons.

COURSE: SOIL AND AGRICULTURAL MICROBIOLOGY

COURSE CODE BS445

COURSE OBJECTIVES: This paper of microbiology and biochemistry of soil is designed with the objective to provide general introduction of soil and in depth information on soil microbial diversity and the role of microorganisms in biogeochemical cycling of elements like C,N,P and trace elements and soil fertility

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	The importance of physical, chemical and biological properties of soil.
CO 2	Role of microorganisms in biogeochemical cycling.
CO 3	Microbiology and physiology of degradation of native and organic matter and Nitrogen fixation.
CO 4	The mechanism of plant growth promotion.
CO 5	Production, application and use of microbes as biofertilizers.

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COURSE: GENERAL MICROBIOLOGY & BIOCHEMISTRY LAB

COURSE CODE BS446

COURSE OBJECTIVES: This course has been designed to provide the students a practical hand on various biochemical assays that are being used on regular basis in the biochemistry labs i.e. tests for carbohydrates, proteins, amino acids, cholesterol, DNA and RNA. In addition, student will also perform microbiology experiments i.e. detection of gram positive and negative bacteria, preparation on culture media sterilization and growth pattern in bacteria etc.

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	Instruments used in microbiology, sterilization techniques etc.
CO 2	Gram staining, culture media preparation and antibiotic susceptibility test.
CO 3	At the end of each biochemical estimation method students will be able to qualitatively and quantitatively determine the level of various test macromolecules in a given sample.
CO 4	Students will also be able to perform comparative estimations of same sample via using different assays i.e. estimation of proteins by Molish's Test, Fehling's Test and Benedict's Test etc.
CO 5	Students will also be able to determine the sensitivity of each method used for single test macromolecule so that the test molecules present in a very low amount can also be estimated using the most sensitive method.

COURSE: MICROBIAL METABOLISM

COURSE CODE BS451

COURSE OBJECTIVES: This course enables the students to provide basic knowledge about catabolism, anabolism, regulation of metabolism and pathway analysis. It also gives understanding of how enzymes and metabolites in living system work to produce energy and synthesizing different biomolecules. The course also extend comprehensive knowledge about biochemical pathways involved in intermediary metabolism of carbohydrate, protein, lipid and nucleic acid.

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	Characteristic of Enzymes, enzyme inhibition and kinetics
CO 2	Carbohydrate metabolism, significance of glycolysis and ETC, untreated diabetes
CO 3	Lipid metabolism and production of ketone bodies
CO 4	Protein metabolism, role of urea cycle and errors of protein metabolism
CO 5	Biosynthesis and degradation of purine and pyrimidine
CO 6	Microbial degradation of Xenobiotics and Fermentation: Special pathways for primary attack on organic compounds by microorganisms,
CO 7	Nitrogen metabolism: Biological nitrogen fixation: nitrogenase enzymes, structure and properties, Physiology and biochemistry of nitrogen fixation,
CO 8	Utilization of various nitrogen sources (ammonia, urea, nitrate, amino acids) by bacteria

COURSE: BIOINFORMATICS AND BIOSTATISTICS

COURSE CODE MT412

COURSE OBJECTIVES: Available from Maths department

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	Basics knowledge of computers, input and output devices, storage devices and different operating systems
CO 2	Different Biological data file formats and Search engines
CO 3	Biological databases Primary nucleotide sequence and Primary Protein sequence databases. Secondary databases, Microbiology databases
CO 4	Sequence analysis like Pair wise Sequence Alignment, Sequence similarity search programs and Substitution matrices.
CO 5	Protein structure prediction: Homology modeling, Primer Designing, Multi dimensional protein identification technology – identification using database.
CO 6	Basics knowledge of computers, input and output devices, storage devices and different operating systems

COURSE: MOLECULAR BIOLOGY

COURSE CODE BS452

COURSE OBJECTIVES: To develop in students the understanding about advanced techniques used in molecular biology and biotechnology and their application.

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	Experiments to prove DNA is a genetic material Concept of gene, pseudogene, cryptic gene and split gene
CO 2	DNA replication and regulation in prokaryotes and eukaryotes
CO 3	Transcription in eukaryotes
CO 4	Translation in prokaryotes and eukaryotes
CO 5	Post translation and transcriptional mechanism
CO 6	Gene expression in prokaryotes using Lap operon and in Eukaryotes by Trp operon.

COURSE: INDUSTRIAL MICROBIOLOGY & FERMENTATION TECHNOLOGY

COURSE CODE BS453

COURSE OBJECTIVES: Industrial microbiology & fermentation contains improved biochemical or physiological fermentation are mainly carried out by fungi and bacteria on large scale to produce commercial products. The main objective of industrial fermentation is to produce highest quality and quantity of particles produce by combining.

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	Microbes involved in fermentation.
CO 2	The basics of fermentation technology.
CO 3	General design of fermenter, media and the process of fermentation.
CO 4	Optimization of fermentation process.
CO 5	Use of microbes for production of important industrial products.
CO 6	The basic knowledge of intellectual property rights specially patents.

COURSE: MICROBIAL DIVERSITY

COURSE CODE BS454

COURSE OBJECTIVES:

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	Microbial ecology – concepts of Niche, habitat, ecosystem etc.
CO 2	Concept related to extremophilic microbes and archea
CO 3	Significance of microbes in biodegradation and biodeterioration
CO 4	Application of biofertilizers and their significance Anoxygenic photosynthetic microbes, Oxygenic photosynthetic microbes and the Role of blue green algae (BGA) in agriculture
CO 5	Methanogenic Archeobacteria, General characteristics. Bioluminescent and nitrogenfixing
CO 6	Bacteria, Magnetotactic bacteria Microorganisms in prospecting of oils Extremophiles

COURSE: MYCOLOGY & PLANT MICROBE INTERACTIONS

COURSE CODE BS455

COURSE OBJECTIVES: To understand about the fungi lichen and interaction of microbes to plant. To understand different plant diseases caused by fungi.

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	Fungi: Historical account; General characters of fungi, Nutritional types of fungi, Genetic variation in fungi and Sex hormones in fungi.
CO 2	General classification of fungi.
CO 3	Economic importance of fungi, Biology and physiology of lichen thallus and economic importance of lichens. Insect fungus association. Role of saprotrophs in ecosystems.
CO 4	Plant Microbe interaction, Interaction in Rhizosphere and phyllosphere. Biofertilizers and biopesticides.
CO 5	Classification of plant diseases. Factors influencing infection, colonization and development of symptoms. Defense mechanism in host.
CO 6	Plant Diseases: Epidemiology, symptoms, etiology, perennation and control different diseases.

COURSE: ENZYMOLOGY & ENZYME KINETICS

COURSE CODE BS412

COURSE OBJECTIVES: This course has been designed to teach the student majoring in science all the major aspects of the study of enzymes. The course focuses on the theories of enzyme kinetics, the mechanisms of enzyme catalysis, and immobilization of enzyme

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	To understand the general properties of enzymes and their nomenclature
CO 2	To understand the theories of enzyme kinetics and the mechanisms of enzyme catalysis and enzyme inhibition
CO 3	To understand the multisubstrate enzyme kinetics and enzyme Immobilization

COURSE: APPLIED MICROBIOLOGY AND BIOINFORMATICS LAB

COURSE CODE BS456

COURSE OBJECTIVES:

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	Measurement of bacterial growth/growth curve. Effect of physical and chemical factors on the growth of bacteria: temperature, pH, and salts.
CO 2	Enumeration of phyllosphere/rhizosphere microbial flora and Enumeration/Isolation of PSB/PSF
CO 3	Detection of extracellular microbial enzyme and antibiotic sensitivity and/or toxicity test using bacterial system
CO 4	Determination of MIC values by different methods
CO 5	Microbiological examination of milk and milk products and Microbiological quality testing of milk (MBRT test)
CO 6	Microbial examination of industrial waste water/sewage.
CO 7	Basics of computers file creation, copying, moving & deleting in DOS & Windows.
CO 8	Biological databases – GENBANK, EMBL, Swissprot – Protein Data Bank.
CO 9	Different types of sequence analysis queries in BLAST and FASTA. (Homology search)
CO 10	Multiple sequence alignments (Clustal) and Phylogenetic Analysis. (Phylip or Clustal)

COURSE: EDUCATIONAL/ INDUSTRIAL TOUR

COURSE CODE BS419

COURSE OBJECTIVES: The main objective of this course is to provide the students an exposure to various research activities in the country and acquaint the student with state of the art technique/instruments used in various research institutions and industries of national repute.

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes:

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Develop understanding of state of the art technique/instruments used in various reputed research institutions.
CO2	Develop understanding of state of the art technique/instruments used in various reputed research institutions. and industries
CO3	Prepare a tour report.

PROGRAMME: M.Sc. MICROBIOLOGY SECOND YEAR

COURSE: MEDICAL MICROBIOLOGY

COURSE CODE BS541

COURSE OBJECTIVES: To introduce basic principles and application relevance of **clinical** disease. It covers all biology of bacteria, viruses and other pathogens related with infectious diseases in humans.

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	Gain information about the concepts of medical microbiology and gain knowledge on medically important micro-organisms.
CO 2	Gain knowledge of morphology, cultural characteristics, biochemical tests, epidemiology, laboratory diagnosis etc of bacterial pathogens.
CO 3	Gain knowledge on Water borne infections caused by bacteria, Nosocomial infections
CO 4	Gain knowledge on various chemotherapeutic agents and their mode of action including alternatives of antibiotics and Alternative and Complimentary medicine.

COURSE: FUNDAMENTALS OF INFECTION AND IMMUNITY

COURSE CODE BS542

COURSE OBJECTIVES:

The objective of the course is to apprise the students about components associated with immune system and molecular mechanism of their working. The course also deals with implications of deregulation of basic regulatory networks that lead to immune system related disorders. The students will be able to describe the roles of the immune system in both maintaining health and contributing to disease.

Course outcomes (CO): After completion of the course, a student will be able to achieve these outcomes.

COURSE OUTCOME (CO)	DESCRIPTION
CO1	The student will learn the fundamental principles of immune response including molecular, biochemical and cellular basis of immune homeostasis.
CO2	The course will aid in understanding various aspects of immunological response and how its triggered and regulated.
CO3	The student will learn and understand the rationale behind various assays used in immunodiagnosis of diseases and will be able to transfer knowledge of immunology in clinical perspective.
CO4	The course will aid in understanding the principles of Graft rejection, Auto immunity and Antibody based therapy.
CO5	The student will develop the capacity for problem-solving about immune responsiveness, knowledge of the pathogenesis of diseases and designing of immunology based interventions for effective treatment.

COURSE: RECOMBINANT DNA TECHNOLOGY

COURSE CODE BS543

COURSE OBJECTIVES: The objectives of this course are to:

1. Develop the understanding of Genetic Manipulations.
2. Introduce the concepts of different Enzymes, concept of Transformation, Gene Cloning and its expression.
3. Introduce students with the concepts of Transgenic plants, animal, GMOs creation.

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Learn about different enzymes used in genetic engineering for DNA manipulations
CO2	To study different vectors and their characteristics
CO3	Transformation methods and their use in Genetic Engineering.
CO4	Determine the selection parameters of r-DNA, creation of different gene libraries. Using genetic engineering for mutagenesis, gene silencing, and amplification of DNA, DNA Sequencing

COURSE: VIROLOGY & BIOSAFETY

COURSE CODE BS544

COURSE OBJECTIVES:

This course is designed to introduce the structure of viruses, provide knowledge on fundamentals of virology; Develop understanding of infection processes at the molecular level; introduce a concept of biosafety against infection or genetic modification.

Course Outcomes: Upon successful completion of this course the student will be able to understand basic concepts in the field of Virology. Successful completion of the course will enable the student to:

Course Outcome (CO)	Description
CO 1	Know how viruses are classified
CO 2	Understand the architecture of viruses and their genomes
CO 3	Know the methods used in studying viruses
CO 4	describe the basic steps in virus replication and disease
CO 5	Discern the basic replication strategies of viruses, virus gene expression, modes of replication and transmission, the interaction of viruses with cells and prevention of virus infections and evolution of viruses.
CO 6	Comprehend the intricate interaction between viruses and host immune cells and pathogenesis of virus-induced diseases, the detection, treatment
CO 7	Assess the proper use of biological containment, and be introduced to safely conduct research
CO 8	Identify the role of the Biosafety Professional in Biomedical Research Laboratories

COURSE: FOOD & DAIRY MICROBIOLOGY

COURSE CODE BS545

COURSE OBJECTIVES: (ii) To provide knowledge of microorganisms (pro-technological, probiotic, pathogens and spoilage) associated with **foods** and their origin and role; Knowledge of the factors that determine the presence, growth and survival of microorganisms in **food**.

(ii) To gain knowledge about fermentation techniques used in **dairy** industry, role of microorganisms in fermentation and to gain skills to control fermentation process.

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	Learn about fundamentals of food microbiology.
CO 2	Gain insight on spoilage of foods by microbes, microbial food poisoning
CO 3	Understand the process of fermentation of milk and other food items
CO 4	Assessment of food quality in reference to microbial contamination

COURSE: RDT AND IMMUNOLOGY LAB

COURSE CODE BS546

COURSE OBJECTIVES:

The lab is designed to train the students to use the immunology and molecular biology techniques for advanced genetic engineering practicals.

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	Capable of performing chromatography techniques: Paper/Column/TLC
CO 2	Isolation of plasmid DNA. visualization of DNA on gels and size analysis of isolated DNA by Agarose gel electrophoresis. Preparation of competent <i>E. coli</i> cells and transformation of plasmid DNA to the <i>E. coli</i> cells, Amplification of DNA (using PCR demonstration) and restriction digestion.
CO 3	Capable of preparing Competent cells, transformation.
CO 4	Capable of separating proteins by SDS – PAGE and native gel and using Blotting
CO 5	Techniques like Southern/ Northern Blot for applications in various sectors of Microbiology.
CO 6	Capable of identifying sensitivity of antigen & antibody by double Immunodiffusion: Ouchterlony's Method, performing Immunoelectrophoresis and Enzyme Linked Immunosorbent Assay (ELISA)
CO 7	Determination of blood Group, Total WBC count and Total RBC count

COURSE: ENVIRONMENTAL MICROBIOLOGY

COURSE CODE BS551

COURSE OBJECTIVES: To know and understand the role of microbes in biogeochemical processes in different ecosystems. The students will learn the basic **microbiological** principles, the methods in **microbial ecology** and their theoretical and practical use.

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	Understand the concepts related to aquatic microbiology.
CO 2	Gain knowledge on environmental pollution, bioremediation and role of microbes in
CO 3	Understand the basics of soil microbiology and xenobiotics.
CO 4	Gain knowledge on biodeterioration and microbial waste treatment methods.

COURSE: COMMERCIAL & APPLIED MICROBIOLOGY

COURSE CODE BS552

COURSE OBJECTIVES: Applied Microbiology course aims to impart the knowledge of basic principles of Microbiology and their applications to humankind.

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	Learn about the biotechnological application of microalgae.
CO 2	Learn about the production and significance of biofertilizers
CO 3	Gain knowledge of Microbial genomics and proteomics.
CO 4	Acquire knowledge on production of single cell protein and its merits and demerits.
CO 5	Learn application of microbes in antibiotics, acids, alcohol, vitamins production in industry

COURSE: PHARMACEUTICAL BIOTECHNOLOGY

COURSE CODE BS553

COURSE OBJECTIVES: This course enables the students to learn the various aspects of pharmaceutical sciences. In this course, students get exposed to the insights into various therapeutic strategies against infectious and non-infectious diseases i.e. via monoclonal antibodies (mABs), peptide based therapeutics, liposome/emulsion-based drug delivery systems, PEG-conjugates-based drug delivery and various factors affecting the drug delivery, its release, and absorption

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	Explain the principle of mABs generation, their mode of action, and their application in targeting various diseases.
CO 2	Formulate the therapeutic proteins and peptides, their encapsulation with other macromolecules and their implication in drug delivery.
CO 3	Prepare lipid-based drug delivery systems as well as PEG-conjugates for fast drug delivery and release inside the body.
CO 4	Develop the strategies of new drug discovery.
CO 5	Apply the knowledge of pharmaceutical manufacturing in the production of biopharmaceuticals.

COURSE: SEMINAR

COURSE CODE BS514

COURSE OBJECTIVES:The students will be able to summarise the existing data related to a specific topic in the form of a report.

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes

Course Outcome (CO)	Description
CO 1	The students will be able to summarize the recent research in the form of review.
CO 2	The students will be able to deliver power point presentations on an assigned topic.

COURSE: PROJECT WORK

COURSE CODE BS515

COURSE OBJECTIVES:The main objective of this course is to acquaint the student with various techniques used in contemporary research in microbiology/biotechnology that will be useful in successful completion of their project work in the fourth semester.

Course Outcomes (CO): After completion of the course, a student will be able to achieve these outcomes:

Course Outcome (CO)	Description
CO 1	To develop synopsis of a defined research problem.
CO 2	To conduct the bench work.
CO 3	To prepare the research report and its oral demonstrations.