# COURSE OUTCOMES (COs)

## HUMAN ANATOMY AND PHYSIOLOGY

### CO 1: Understanding of Structures of the Human Body

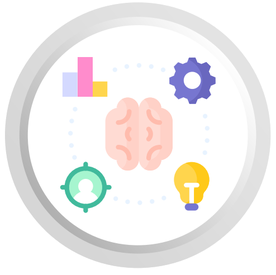
Students will demonstrate knowledge of the structures of the human body, including systems, organs, tissues, and cells, and their relationships to each other

### CO 2: Functions of the Various Parts of the Human Body

Students will explain the functions of the various organ systems and how they work together to maintain homeostasis and overall health

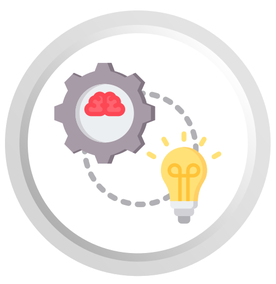
### CO 3: Analyzing Integration of Systems

Students will analyze how different body systems interact and support one another, illustrating the interdependence of physiological processes



### CO 4: Application of Concepts

Students will apply anatomical and physiological concepts to real-world scenarios, including disease processes, pharmacological interventions, and clinical practices etc.

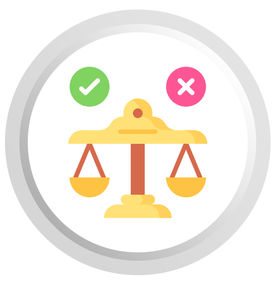


### CO 5: Laboratory Skills

Students will develop practical skills in anatomy and physiology through hands-on laboratory experiences, including microscopy, and physiological testing

### CO 6: Communication Skills

Students will effectively communicate anatomical and physiological information in multidisciplinary teams, using appropriate terminology, in both written and oral formats



### CO 7: Ethical Practices

Students will recognize and adhere to ethical practices in the practice areas relevant to human anatomy and physiology, including human dignity and rights etc.

# COURSE OUTCOMES (COs)

## PHARMACEUTICAL ANALYSIS & INSTRUMENTAL METHODS OF ANALYSIS

### CO 1: Analytical Techniques Proficiency
Students will demonstrate proficiency in various analytical techniques used in the pharmaceutical industry, including chromatography, spectroscopy, and titrimetry

### CO 2: Regulatory Compliance
Students will understand regulatory guidelines relevant to analytical method development, validation of analytical methods etc. ensuring compliance with quality standards

### CO 3: Research and Development Insight
Students will gain insights into the role of pharmaceutical analysis in research and development, including stability testing, formulation development, clinical research, etc.

### CO 4: Data Interpretation
Students will analyze and interpret data obtained from analytical methods, applying statistical tools to ensure accuracy and reliability in results

### CO 5: Application of Concepts
Students will apply their understanding relevant to regulatory guidelines (e.g., ICH, FDA) in the development and validation of analytical methods, ensuring compliance with quality standards

### CO 6: Method Development
Students will develop, optimize, and validate analytical methods for the qualitative and quantitative analysis of pharmaceutical compounds

### CO 7: Instrumentation Skills
Students will operate and troubleshoot modern analytical instruments, understanding their principles, functionalities, and applications in pharmaceutical analysis

### CO 8: Problem-Solving Abilities
Students will demonstrate critical thinking and problem-solving skills by addressing analytical challenges and proposing appropriate solutions in pharmaceutical analysis

### CO 9: Ethical Practices
Students will recognize and adhere to ethical practices in pharmaceutical analysis, including data integrity, reproducibility, etc.

# COURSE OUTCOMES (COs)

## PHARMACEUTICS

### CO 1: Knowledge of Pharmaceutical Formulations
Students will demonstrate a comprehensive understanding of the principles of drug formulations

### CO 2: Manufacturing Processes
Students will understand manufacturing processes of traditional and advanced pharmaceutical dosage forms, including tablets, capsules, injectables, topicals, inhalations etc.

### CO 3: Regulatory Compliance
Students will understand and apply regulatory requirements for the approval of pharmaceutical products, including documentation and submission processes

### CO 4: Analyzing Integration of Systems
Students will analyze how material attributes and process parameters affect the performance of drug product

### CO 5: Application of Concepts
Students will apply pharmaceutics, biopharmaceutics concepts to real-world scenarios, in designing and developing pharmaceutical products (solid, liquid, semi-solid, and sterile etc.)

### CO 6: Quality Control and Assurance
Students will evaluate the quality of pharmaceutical products through appropriate quality control tests and understand the principles of Good Manufacturing Practices (GMP)

### CO 7: Stability Studies
Students will conduct stability studies and interpret data to assess the shelf life and storage conditions of pharmaceutical formulations

### CO 8: Communication Skills
Students will effectively communicate information, using appropriate terminology in multidisciplinary teams, in both written and oral formats

### CO 9: Ethical Practices
Students will recognize and adhere to ethical standards in pharmaceutics is foundational to maintaining public trust, ensuring patient safety, and promoting health

# COURSE OUTCOMES (COs)

## PHARMACEUTICAL INORGANIC CHEMISTRY

### CO 1: Fundamental Knowledge
Students will demonstrate an understanding of the basic principles of inorganic chemistry, including the properties, reactions, and applications of inorganic compounds in pharmaceuticals

### CO 2: Regulatory Guidelines
Students will understand the regulatory requirements and guidelines governing the use of inorganic compounds in pharmaceuticals, including safety and efficacy considerations

### CO 3: Metal-Based Drugs
Students will analyze the role of metal as drugs, including their mechanisms of action, therapeutic applications, and potential side effects

### CO 4: Environmental and Health Impacts
Students will assess the environmental and health impacts of inorganic pharmaceutical substances, emphasizing the importance of sustainable practices in drug development

### CO 5: Application of Concepts
Students will apply concepts in inorganic chemistry to real-world scenarios, in designing and developing pharmaceutical products

### CO 6: Quality Control
Students will evaluate the quality and purity of inorganic pharmaceutical substances through appropriate analytical techniques and quality control measures

### CO 7: Synthesis Techniques
Students will acquire skills in the synthesis and characterization of pharmaceuticals involving inorganic material

### CO 8: Ethical Practices
Students will recognize and adhere to ethical standards in research and practices related to inorganic pharmaceuticals, ensuring responsible conduct in scientific inquiry

# COURSE OUTCOMES (COs)

## COMMUNICATION SKILLS

### CO 1: Verbal Communication
Students will demonstrate effective verbal communication skills, including clear articulation, appropriate tone, and persuasive speaking in various contexts

### CO 2: Non-Verbal Communication
Students will understand and utilize non-verbal communication cues, such as body language, facial expressions, and gestures, to enhance interpersonal interactions

### CO 3: Professional Communication
Students will analyze how communication skills can foster productive interactions, whether in professional settings, academic environments, or personal relationships

### CO 4: Application of Concepts in Conflict Resolution
Students will apply strategies for conflict resolution and negotiation, facilitating constructive discussions and resolving differences in a professional manner

### CO 5: Written Communication
Students will produce clear, concise, and well-structured written documents, including emails, reports, and presentations, adhering to appropriate formats and styles

### CO 6: Active Listening
Students will develop active listening skills, enabling them to engage in meaningful dialogues, understand diverse perspectives, and provide constructive feedback

### CO 7: Interpersonal Skills
Students will demonstrate effective interpersonal skills, fostering collaboration and positive relationships in both professional and academic settings

### CO 8: Presentation Skills
Students will create and deliver engaging presentations using visual aids and effective storytelling techniques, tailoring content to diverse audiences

### CO 9: Cross-Cultural Communication
Students will recognize the importance of cultural awareness and sensitivity in communication, adapting their approaches to effectively interact with individuals from diverse backgrounds

### CO 10: Ethical Practices
Students will recognize and adhere to ethical communication practices contributing to more respectful, effective, and meaningful interactions

# COURSE OUTCOMES (COs)

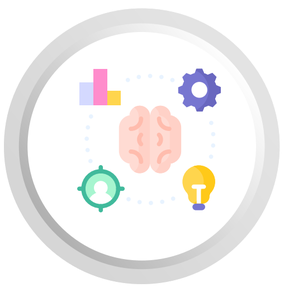
## REMEDIAL MATHS

### CO 1: Understanding of Fundamental Concepts

Students will demonstrate a solid understanding of basic mathematical concepts, including arithmetic, algebra, and geometry, necessary for further studies in mathematics and related fields

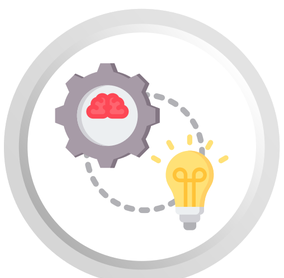
### CO 2: Data Interpretation

Students will analyze and interpret data using basic statistical concepts, including measures of central tendency and dispersion, as well as representing data visually through charts and graphs



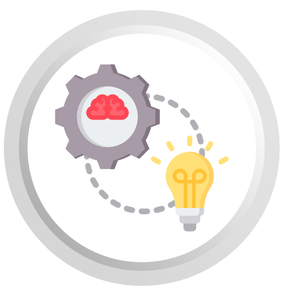
### CO 3: Application of Concepts

Students will apply concepts in mathematics to real-world scenarios, including but not limited to dosage calculations, pharmacokinetics, statistical analysis, pharmacoeconomics etc.



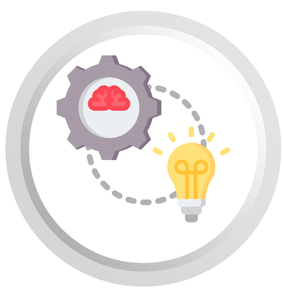
### CO 4: Algebraic Proficiency

Students will solve linear equations, inequalities, and quadratic equations, demonstrating proficiency in algebraic manipulation and reasoning



### CO 5: Function Understanding

Students will identify, evaluate, and graph different types of functions (linear, quadratic, and exponential) and understand their properties and applications



### CO 6: Problem-Solving Skills

Students will develop critical thinking and problem-solving skills by applying mathematical concepts to solve real-world problems

### CO 7: Mathematical Communication

Students will communicate mathematical ideas clearly and effectively in multidisciplinary teams, using appropriate terminology and notation in both written and oral formats

# COURSE OUTCOMES (COs)

## REMEDIAL BIOLOGY

### CO 1: Knowledge of Fundamental Concepts

Students will demonstrate an understanding of fundamental biological concepts, including cell structure and function, genetics, evolution, and ecological principles

### CO 2: Understanding of Cellular Biology

Students will explain the structure and function of cells, including the processes of cellular respiration and photosynthesis, and their importance in living organisms

### CO 3: Genetics Principles

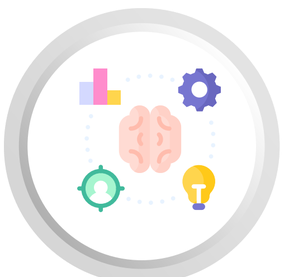
Students will understand basic genetic principles, including Mendelian inheritance, genetic variation, and the role of DNA in heredity

### CO 4: Diversity of Life

Students will explore the diversity of life forms, recognizing the characteristics that distinguish different domains and kingdoms of organisms

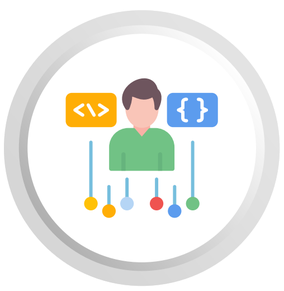
### CO 5: Ecology and Environment

Students will analyze ecological relationships and the impact of environmental factors on living organisms, emphasizing the importance of biodiversity and conservation



### CO 6: Health and Human Biology

Students will apply biological concepts to human health, including understanding body systems, nutrition, and the effects of diseases



### CO 7: Communication Skills

Students will effectively communicate biological data, using appropriate terminology, in multidisciplinary teams for project development, research and project execution

# COURSE OUTCOMES (COs)

## PHARMACEUTICAL ORGANIC CHEMISTRY

### CO 1: Understanding of Organic Compounds

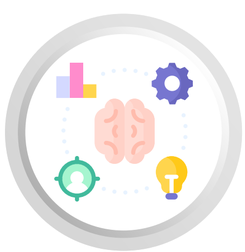
Students will demonstrate a comprehensive understanding of the structure, properties, and the role of organic chemistry in the development of new pharmaceuticals

### CO 2: Mechanisms of Reactions

Students will explain the mechanisms of organic reactions commonly used in drug development

### CO 3: Spectroscopic Analysis

Students will analyze and interpret data from spectroscopic techniques (NMR, IR, MS, UV-Vis) to identify organic compounds



### CO 4: Synthesis Techniques

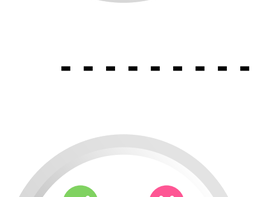
Students will apply various synthetic methods for the preparation of pharmaceutical compounds, including multi-step synthesis and the use of different reagents and catalysts

### CO 5: Safety and Environmental Considerations

Students will recognize and implement safety and environmental regulations related to the handling of organic chemicals in a laboratory setting

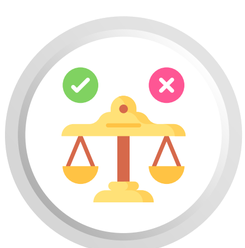
### CO 6: Laboratory Skills

Students will conduct literature reviews and apply scientific methodology to propose and conduct experiments related to organic synthesis



### CO 7: Communication Skills

Students will effectively communicate organic chemistry information, using appropriate terminology, in multidisciplinary teams for project development, research and project execution



### CO 8: Ethical Practices

Students will recognize and adhere to ethical practices in the areas relevant to organic chemistry, including integrity in research, safety practices, environmental responsibility, and respect for intellectual property etc.

# COURSE OUTCOMES (COs)

## BIOCHEMISTRY

### CO 1: Fundamental Principles
Students will demonstrate an understanding of the fundamental principles of biochemistry, including the structure and function of biomolecules such as proteins, carbohydrates, lipids, and nucleic acids

### CO 2: Molecular Genetics
Students will explain the principles of molecular genetics, including DNA replication, transcription, translation, and the role of genes in regulating biochemical pathways

### CO 3: Biochemical Techniques
Students will demonstrate proficiency in laboratory techniques used in biochemistry for analyzing biomolecules

### CO 4: Signalling Pathways
Students will describe cellular signalling pathways and how they influence cellular responses, emphasizing the role of hormones and second messengers

### CO 5: Enzyme Function and Kinetics
Students will understand the mechanisms of enzyme action, factors affecting enzyme activity, and apply enzyme kinetics to analyze reaction rates

### CO 6: Metabolic Pathways
Students will analyze and describe key metabolic pathways, including glycolysis, Krebs cycle, and oxidative phosphorylation, and their regulation within the cell

### CO 7: Clinical Applications
Students will apply biochemical principles to understand disease mechanisms, diagnostics, and therapeutic approaches in clinical biochemistry

### CO 8: Technical Skills
Students will develop practical skills in biochemistry through hands-on laboratory experiences, including but not limited to diagnosing diseases, genomics, proteomics, molecular biology, bioinformatics etc.

### CO 9: Critical Thinking and Problem Solving
Students will develop critical thinking and problem-solving skills by analyzing biochemical data and applying concepts to real-world biological problems

# COURSE OUTCOMES (COs)

## PATHOPHYSIOLOGY

### CO 1: Understanding Disease Mechanisms
Students will demonstrate an understanding of the underlying mechanisms of diseases, including the pathogenesis of various disorders at cellular and systemic levels

### CO 2: Clinical Manifestations
Students will identify and explain the clinical manifestations of common diseases, including signs and symptoms, and how they relate to underlying pathophysiological processes

### CO 3: Disease Classification
Students will classify diseases based on etiology (causes), pathogenesis (development), and clinical presentation, including infectious, autoimmune, metabolic, and neoplastic disorders

### CO 4: Impact on Homeostasis
Students will discuss how diseases disrupt homeostasis and the physiological responses of the body to restore balance

### CO 5: Therapeutic Implications
Students will understand the implications of pathophysiological knowledge for therapeutic interventions, including pharmacological and non-pharmacological treatments

### CO 6: Systemic Pathophysiology
Students will analyze the pathophysiological changes in specific organ systems, such as the cardiovascular, respiratory, gastrointestinal, and nervous systems

### CO 7: Laboratory Findings
Students will interpret laboratory and diagnostic findings in the context of pathophysiology, correlating them with disease progress and clinical outcomes

### CO 8: Application of Concepts
Students will apply concepts in pathophysiology to real-world scenarios, including progress of disease, clinical manifestations, clinical outcomes o treatment etc.

### CO 9: Critical Thinking and Application
Students will develop critical thinking and problem-solving skills by analyzing case studies and applying pathophysiological concepts to clinical scenarios

# COURSE OUTCOMES (COs)

## COMPUTER APPLICATIONS IN PHARMACY

### CO 1: Understanding Fundamentals of Computers
Students will demonstrate an understanding of the fundamentals of computers and their applications in pharmaceutical sector

### CO 2: Proficiency in Using Software Tools
Students will demonstrate proficiency in using various software applications relevant to pharmacy practice, including pharmacy management systems, electronic health records (EHR), and drug databases

### CO 3: Pharmacy Automation
Students will understand the principles and applications of pharmacy automation technologies, including automated dispensing systems and robotics, to enhance efficiency and accuracy in medication management

### CO 4: Analyzing Integration of Computers in Health System
Students will analyze and explore the role of health informatics in improving patient care and pharmacy practice, including telepharmacy and mobile health applications

### CO 5: Application of Concepts
Students will apply concepts in computer science to real-world scenarios, including but not limited to drug discovery and drug product development, clinical research, and pharmacy practice

### CO 6: Data Management Skills
Students will develop skills in managing pharmaceutical data, including data entry, retrieval, and analysis, ensuring accuracy and compliance with regulatory standards

### CO 7: Drug Information Retrieval
Students will effectively utilize online resources and databases to retrieve drug information, interpret clinical guidelines, and provide evidence-based recommendations

### CO 8: Communication and Collaboration
Students will demonstrate effective communication skills through presentations and reports on computer applications in pharmacy, fostering collaboration among healthcare professionals

### CO 9: Ethical Practices
Students will recognize and adhere to ethical practices in the practice areas relevant to computer science, essential to ensure the protection of patient rights, data integrity, and the delivery of high-quality care

# COURSE OUTCOMES (COs)

## ENVIRONMENTAL SCIENCES

### CO 1: Understanding Ecosystems

Students will demonstrate an understanding of the structure and function of various ecosystems, including biotic and abiotic components and their interactions

### CO 2: Environmental Policies and Regulations

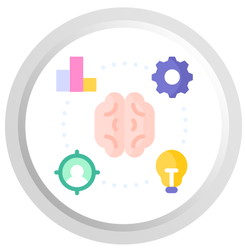
Students will understand the key environmental laws, policies, and regulations that govern environmental protection and management at local, national, and international levels

### CO 3: Environmental Issues

Students will analyze major environmental issues such as climate change, pollution, biodiversity loss, and resource depletion, understanding their causes and effects on ecosystems and human health

### CO 4: Sustainable Practices

Students will evaluate sustainable practices and technologies that contribute to environmental conservation and resource management, promoting sustainability in local and global contexts



### CO 5: Application of Concepts

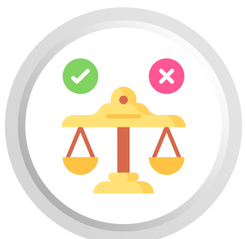
Students will apply concepts in environmental sciences to real-world scenarios, including but not limited to depilating natural resources, climate change, environmental conservation etc.

### CO 6: Technical Skills

Students will develop practical skills in environmental sciences through independent project, including to deal with depilating natural resources, etc.

### CO 7: Communication and Collaboration

Students will effectively communicate environmental concepts and findings through written reports, presentations, and discussions, tailored to diverse audiences



### CO 8: Ethical Practices

Students will recognize and adhere to ethical practices in environmental sciences to protect ecosystems and promote social equity for current and future generations

# COURSE OUTCOMES (COs)

## PHYSICAL PHARMACEUTICS

### CO 1: Fundamental Principles

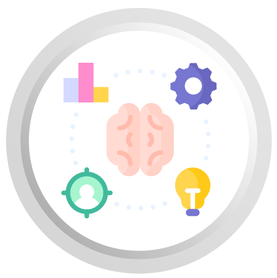
Students will demonstrate an understanding of the fundamental principles of physical pharmaceutics governing the formulation and stability of pharmaceutical products

### CO 2: Quality Control and Testing

Students will understand and implement quality control measures and testing methodologies to assess the physical properties and performance of drug substances, excipients and pharmaceutical products

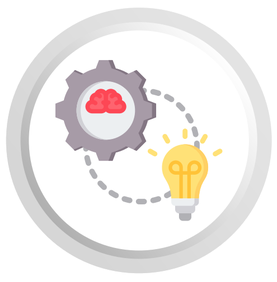
### CO 3: Drug Solubility and Stability

Students will analyze factors affecting drug solubility and stability, and applying this knowledge to design and evaluate various pharmaceutical dosage forms



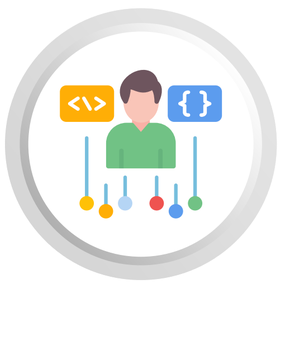
### CO 4: Application of Concepts to Formulation Development

Students will apply principles of physical pharmaceutics to develop, optimize, and characterize pharmaceutical formulations, including solid, liquid, and semi-solid dosage forms



### CO 5: Technical Skills

Students will develop practical skills in physical pharmaceutics through hands-on laboratory experiences, including micromeritics, rheology, solubility, dissolution, drug release etc.



### CO 6: Communication and Collaboration

Students will effectively communicate preformulation, formulation concepts, experimental findings, and analytical results in both written and oral formats, promoting teamwork in multidisciplinary settings

### CO 7: Ethical Practices

Students will recognize and adhere to ethical practices in the practice areas relevant to physical pharmaceutics, including but not limited to data integrity

# COURSE OUTCOMES (COs)

## PHARMACEUTICAL MICROBIOLOGY

### CO 1: Classification and Characteristics of Microorganisms

Students will demonstrate an understanding of the classification, structure, and characteristics of microorganisms, including bacteria, fungi, viruses, and protozoa

### CO 2: Pharmaceutical Applications of Microbiology

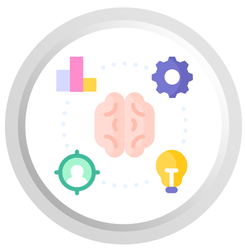
Students will understand the role of microorganisms in pharmaceuticals, including the production of antibiotics, vaccines, and biopharmaceuticals, as well as their implications for drug development

### CO 3: Regulatory Standards and Guidelines

Students will comprehend key regulatory frameworks and guidelines governing microbial testing and quality assurance in the pharmaceutical industry, including those from agencies like the FDA and WHO

### CO 4: Microbial Contamination and Control

Students will analyze sources and mechanisms of microbial contamination in pharmaceutical products and evaluate methods for their control, including aseptic techniques and sterilization processes



### CO 5: Quality Control and Assurance

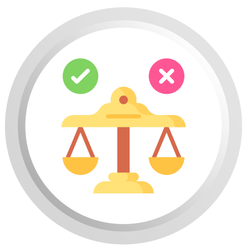
Students will apply principles of microbiological quality control to ensure the safety and efficacy of pharmaceutical products, including sterility testing and microbial limit tests

### CO 6: Technical Skills

Students will develop practical skills in pharmaceutical microbiology through hands-on laboratory experiences, including aseptic transfers, microscopy, sterilization, microbiological assays etc.

### CO 7: Communication and Collaboration

Students will effectively communicate microbiological concepts and findings through written reports and presentations, fostering collaboration within interdisciplinary teams



### CO 8: Ethical Practices

Students will recognize and adhere to ethical practices in the practice areas relevant to pharmaceutical microbiology, including ethical treatment of biological samples, biosafety and biosecurity, antibiotics stewardship etc.

# COURSE OUTCOMES (COs)

## PHARMACEUTICAL ENGINEERING

### CO 1: Fundamental Principles

Students will demonstrate a solid understanding of the basic principles of engineering as applied to pharmaceutical processes, including thermodynamics, fluid mechanics, mass transfer, heat transfer etc.

### CO 2: Regulatory Compliance and Good Manufacturing Practices (GMP)

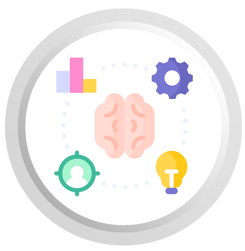
Students will understand the regulatory landscape governing pharmaceutical manufacturing and will be able to apply GMP principles to ensure product safety and quality

### CO 3: Emerging Technologies in Pharmaceutical Engineering

Students will explore emerging technologies in pharmaceutical engineering, such as continuous manufacturing, nanotechnology, and biopharmaceutical production, and assess their implications for the industry

### CO 4: Pharmaceutical Process Design

Students will analyze and design pharmaceutical unit operations, including milling, drying, mixing, granulation, compression, coating etc. ensuring efficiency and compliance with the standards



### CO 5: Application of Concepts

Students will apply pharmaceutical engineering concepts to real-world scenarios, in manufacturing drug substances, biologics and pharmaceutical products

### CO 6: Technical Skills

Students will develop practical skills crucial for effective and efficient production of high-quality pharmaceutical products, ensuring that products are safe, effective, and compliant with regulatory standards

### CO 7: Interdisciplinary Collaboration and Communication

Students will effectively communicate engineering concepts and findings to diverse audiences, and work collaboratively within multidisciplinary teams to solve complex pharmaceutical engineering problems

### CO 8: Ethical Practices

Students will recognize and adhere to ethical practices in the areas mostly relevant to data generation, storage, retrieval and data integrity