

BE Pharmaceutical Engineering

The Bachelor of Engineering in Pharmaceutical Engineering is a comprehensive four-year interdisciplinary undergraduate program that integrates core principles of pharmaceutical sciences with the analytical and problem-solving framework of engineering. This programme is designed to meet the evolving demands of the pharmaceutical, biotechnology, and healthcare industries. The curriculum combines in-depth knowledge of drug development, pharmaceutical technology, and process systems with essential engineering disciplines. Students enrolled in this program will gain a strong foundation in drug formulation and delivery systems, bioprocess engineering, pharmaceutical manufacturing (GMP), regulatory science, and quality assurance, while also being exposed to emerging technologies such as artificial intelligence (AI), machine learning, medical instrumentation, computational modelling, and pharmaceutical data analytics. Laboratory courses, industrial training, and project-based learning ensure that students develop practical, hands-on experience with state-of-the-art tools and instruments used in modern pharmaceutical and biopharmaceutical industries.

Program Educational Objectives:

Graduates will be able to:

- ✓ **Demonstrate Professional Competence** in designing and optimizing pharmaceutical and biopharmaceutical processes and products.
- ✓ **Integrate Advanced Technologies** such as automation, AI, and data science in pharmaceutical manufacturing and process control.
- ✓ **Engage in Innovation and Research** in advanced therapeutics and processes.
- ✓ **Ensure Quality and Regulatory Compliance** aligned with global standards, GMP, and regulatory frameworks.

Student Outcomes:

Graduates will be able to:

- ✓ Apply **engineering, scientific, and pharmaceutical knowledge** to solve complex problems related to products/processes.
- ✓ Use **modern tools** (simulation, automation, data analytics) effectively.
- ✓ Conduct **research and investigations** using experimental and analytical methods.
- ✓ Develop and scale-up **pharmaceutical products** (small molecules and biologics).
- ✓ Implement **Industry 4.0 technologies** in process and quality systems.
- ✓ Incorporate **sustainability and environmental considerations** in pharmaceutical processes.
- ✓ Apply **project management and financial principles** in industrial and research settings.

Program Details:

Duration: 4 Years (8 semesters)

Key Core Courses/Subjects:

- ✓ Fundamental understanding of Physiology and Pharmacology
- ✓ Drug design, synthesis and analysis (Pharmaceutical Chemistry)
- ✓ Drug Delivery & Formulation aspects (Pharmaceutics)
- ✓ Design, Development and manufacturing of Biologics (Antibodies, Vaccines, etc)
- ✓ Chemical Process Calculations
- ✓ Foundation of Data Structure and Algorithms
- ✓ Artificial Intelligence
- ✓ Medical Device Instrumentation

Key Elective Courses/Subjects (not limited to):

- ✓ Scale up and Technology transfer
- ✓ Pharmaceutical Regulatory Science
- ✓ Pharmaceutical Quality System and GMP
- ✓ Kinetics and Reactor Design
- ✓ Modelling and Simulation in Chemical Engineering
- ✓ Machine Learning
- ✓ Data Science for Healthcare
- ✓ Mechanisms & Robotics
- ✓ Mechatronics and Automation
- ✓ Microfluidics and its Applications
- ✓ Biomedical Signal Processing,
- ✓ Signals and Systems, Digital Image Processing, Digital Signal Processing