

# Co-op Program

## BIOTECHNOLOGICAL ENGINEERING



This undergraduate program delivers comprehensive training in process engineering by integrating traditional engineering principles and methods with the life sciences, and from the very beginning promotes the application of concepts of biology and chemistry. Besides acquiring technical, scientific and administrative skills, students study industry standards, regulations and good practices, learn experimental techniques, as well as focus on the conception, design, operation and optimization of processes, units, equipment and tools. Moreover, biotechnical engineers are able to design and scale up, if needed, industrial bioprocesses using living organisms or the products they synthesize, all in view of sustainable development.

The multidisciplinary nature of this program and the diversity of its applications guarantee the versatility and quality of its future biotechnological engineers. Such solid training, both comprehensive and specialized, opens the door to numerous employment opportunities for Biotechnological Engineering graduates, including industrial companies, consulting firms and research centers.

## WHAT OUR STUDENTS CAN DO FOR YOU

### Design

- Programming (Excel, MATLAB)
- Design and sizing of equipment
- Design of control systems
- Process optimization
- Mass and energy balance

### Environment / Health & Safety

- Biological treatment of wastewater and sludge
- Management of hazardous materials
- Environmental compliance monitoring

### Production

- Operate bioreactors
- Sampling and operational monitoring
- Process analysis and continuous improvement
- Investigate and resolve production issues
- Energy efficiency and performance of equipment
- Validation of processes and equipment qualification

### Management

- Plan, organize, supervise, control and follow up projects
- Search for providers, call for tenders and bid follow-up
- Feasibility study
- Economic evaluation and calculation of processes

### Research and Development

- Good laboratory practice (GLP) and sterile workplace
- Microorganisms and DNA manipulation
- Process simulation
- Pilot plant operation
- Isolation, purification, characterization and formulation of bioproducts
- Installation of test benches
- Testing and data acquisition
- Analysis and interpretation of results
- Prepare and present technical papers



## KNOWLEDGE AND SKILLS

Term	Description
S-1	<b>Introduction to biotechnological engineering</b> Systemic vision of process engineering; biochemistry; organic chemistry; health, safety and risk management in engineering; computing environment; communication in engineering; teamwork; integration project I.
S-2	<b>Fundamentals and analytical techniques</b> Mass and energy balance; linear algebra; differential and integral calculus; formulate, analyze and interpret mathematical models; eukaryotic biology, microbiology; biotechnological analysis techniques; integration project II (lab).
S-3	<b>Fluid transport and exchange</b> Transfers in a process; differential equations; momentum, energy and mass transfer; designing, drafting and reading technical drawings; thermodynamics; physiology of prokaryotes; genetics and molecular biology.
S-4	<b>Basic unit design</b> Optimization of the production capacity of bioorganisms; development and application of genetic modification protocols; advanced exchange phenomena; unit operation.
S-5	<b>Operation and control of bioreactors</b> Reaction and kinetic systems in biotechnology; process control; biosecurity; good manufacturing practices; immunotechnology; economic analysis in engineering.
S-6	<b>Industrial biotechnological process design</b> Isolation and purification; materials and biomaterials; unit operations lab, pilot units; cell culture.
S-7	<b>Integration of process design skills – 1</b> Integrate all aspects related to the implementation, modification and operation of a large-scale biotechnological industrial installation; process simulation; environmental aspects of process engineering.
S-8	<b>Integration of process design skills – 2</b> Integrate all aspects related to the implementation, modification and operation of a large-scale biotechnological industrial installation; sustainable development; engineer's rights.

## ORGANIZATION OF STUDY (S) AND WORK TERM (W)

1st year			2nd year			3rd year			4th year			5th year
FALL	WIN	SUM	FALL	WIN	SUM	FALL	WIN	SUM	FALL	WIN	SUM	FALL
S-1	S-2	W-1	S-3	W-2	S-4	W-3	S-5	W-4	S-6	W-5	S-7	S-8