

Objective of the Master's Degree Program in Chemical Engineering and Professional Competencies

Program Objective:

The aim of the program is to train chemical engineers in line with the needs of the economy and labor market. Graduates will be capable of developing, modeling, designing, operating, managing, and maintaining chemical and chemical technology systems and processes. They will be able to develop chemical technologies, procedures, and new materials, apply technological processes in an energy-efficient and environmentally conscious manner, perform leadership and organizational tasks, carry out research, development, design, and innovation activities in the field, and participate in and manage engineering projects at national and international levels. Graduates are prepared to continue their studies in doctoral programs.

Professional Competencies of the Chemical Engineer

a) Knowledge

- Understands the mathematical, scientific (chemical, physical), and technical theories and practices related to chemical engineering.
- Has comprehensive knowledge of the properties and application areas of key materials used and produced in the chemical industry and chemical technologies.
- Knows the possibilities and typical methods for developing new materials and procedures.
- Understands the principles, methods, and practices related to the sustainability, safety, and environmental impact of chemical and industrial systems, as well as workplace health and health promotion.
- Knows the rules of technical documentation in the field.
- Is familiar with quality management methods typically used in the chemical industry.
- Understands business economics, organizational tools and methods related to management, and the basic legal framework necessary for professional practice.
- Possesses knowledge in measurement theory, measurement techniques, analytics, and material testing related to chemical engineering and chemical technologies.
- Is familiar with information and communication technologies relevant to chemical engineering.
- Understands the tools and methods of computer modeling and simulation in chemical engineering.
- Knows the methods for designing and evaluating experiments.
- Understands the principles and methods of integrating and linking technological processes.
- Is familiar with the latest results and approaches in technological development.
- Has knowledge of modern synthetic methods, especially green chemistry and catalytic processes.

Depending on the chosen specialization, the graduate may also:

- Have comprehensive knowledge in the analysis, modeling, and design of chemical and chemical technology systems.
- Understand the control of chemical and chemical technology processes and systems.
- Be familiar with the main operations and technologies of one or more industries related to the field.
- Possess analytical and structural testing methods necessary for research, development, and operation of procedures and technologies.
- Have comprehensive knowledge in materials science and material technology.

- Understand and apply the principles and methods of quality assurance in chemical and chemical technology systems.

b) Skills

- Creatively applies theoretical and practical knowledge in mathematics and science related to chemical engineering to solve tasks.
- Possesses manual skills necessary for high-level research and development activities.
- Able to perform, evaluate, and document analyses and material tests used in chemical engineering and chemical technologies, and if needed, improve or introduce new testing methods.
- Processes, organizes, and analyzes information collected during the operation of chemical and chemical technology processes, and draws conclusions.
- Contributes original ideas and results to enrich the knowledge base of chemical engineering and chemistry.
- Integrates knowledge in the development, management, and design of chemical processes, equipment, and systems, and in related research.
- Plans and manages the use of technical, economic, environmental, and human resources in chemical industry systems.
- Applies and develops procedures, models, and IT tools used in the design, organization, and operation of chemical and chemical technology systems and processes.
- Ensures quality assurance, measurement, and process control in chemical and chemical technology systems.
- Is prepared to manage chemical and technological activities in the chemical industry and other fields, and to lead teamwork.
- Capable of creative problem-solving and flexible handling of complex tasks, and committed to lifelong learning with openness and value-based thinking.
- Operates technological systems safely and health-consciously, recognizes potential health impacts, and applies preventive measures.

c) Attitude

- Strives to enforce and promote sustainability, safety, environmental protection, and energy efficiency.
- Aims to independently or collaboratively plan and execute tasks at a high professional level.
- Works with a systems-oriented and process-oriented mindset, applying a complex approach.
- Investigates and strives to achieve research, development, and innovation goals, committed to enriching the field with new scientific and technical knowledge.
- Continuously seeks to improve knowledge and skills.
- Open to professional training aligned with career goals.
- Dedicated to high-quality work and promotes this mindset among colleagues.
- As a leader, makes important decisions after understanding the opinions and arguments of team members.

d) Autonomy and Responsibility

- Acts independently and proactively in solving professional problems.
- Takes responsibility for sustainability and environmental protection.

- Makes decisions with appropriate autonomy, consulting with representatives of other (not only technical) fields when necessary, and assumes responsibility for those decisions.
- In decision-making, considers safety, environmental protection, quality assurance, consumer protection, and product liability.
- Applies and respects the principle of equal access.
- Enforces occupational safety, health promotion, technical, economic, and legal regulations, and engineering ethics in professional and leadership activities.
- Strives to support the professional development of colleagues and subordinates.
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