

Objective of the Bachelor's Degree Program in Materials Engineering and Professional Competencies

Program Objective:

The aim of the program is to train materials engineers who are familiar with the fundamental types of structural materials (metals, ceramics, polymers, and composites), capable of interpreting and controlling processes occurring in such materials, examining and modifying the structure and properties of materials during various technological processes, managing and organizing material production processes with a systems approach, and ensuring the quality of materials produced by these technologies. Graduates are prepared to continue their studies at the master's level.

Professional Competencies to be Acquired

a) Knowledge

- Understands the basic physico-chemical processes in material systems and their (basic-level) mathematical descriptions, with particular emphasis on the laws of thermodynamics and kinetics.
- Has broad knowledge of the atomic, micro-, and macrostructure of solid materials, the fundamental methods for structural analysis, and the operating principles of basic instruments, as well as the processes that lead to the formation of structures.
- Has detailed knowledge of the operating principles of machines and equipment used in material production.
- Understands the basic technologies for producing and forming metals and alloys (plastic deformation and casting).
- Knows the basic technologies of heat treatment and surface treatment.
- Understands the basic technologies for producing ceramics (including glass and binders) and composite materials.
- Knows the basic technologies for producing and processing polymers.
- Possesses systematic knowledge of the energy characteristics of technologies in the field, expectations for energy efficiency, and possibilities for ensuring the required energy supply.
- Has basic knowledge of occupational safety, fire protection, and technical safety requirements related to the field, as well as relevant environmental protection regulations.
- Has a general understanding of related fields such as environmental protection, quality assurance, information technology, law, and economics, including their boundaries and requirements.
- Is familiar with the specific learning, knowledge acquisition, and data collection methods of materials engineering, their ethical limitations, and problem-solving techniques.

b) Skills

- Able to apply design-related calculation and modeling principles and methods for products and technologies.
- Capable of interpreting and characterizing the structure and operation of mechanical system components, and the design and interconnection of system elements.

- Applies technical regulations related to the operation of manufacturing systems, principles of machine and equipment setup and operation, and economic correlations.
- Directs and supervises specialized technological production processes, considering elements of quality assurance and control.
- Capable of diagnosing failures and selecting appropriate corrective actions.
- Understands and applies environmental, occupational, and safety requirements specific to the field, and can modify processes accordingly.
- Able to comply with legal and economic expectations relevant to the field.
- Understands and uses professional literature in both Hungarian and foreign languages, in online and printed formats.
- Considering potential specializations, is capable of quality control of work phases in material technologies and quality management of sub-tasks, as well as determining the properties of various products.
- Able to assess and reduce environmental impact related to material production.
- Able to assess and rationalize energy consumption related to material production.
- Capable of solving occupational safety tasks.
- Able to apply the principle of equal access.

c) Attitude

- Strives for continuous self-education in materials engineering aligned with professional goals.
- Aims to solve tasks and make leadership decisions by understanding and cooperating with colleagues.
- Possesses perseverance and tolerance for monotony in practical activities.
- Approaches the development of technologies and procedures creatively.
- Strives to apply environmentally conscious technologies and protect the built and natural environment.
- Aims to use energy- and material-efficient processes and technologies

d) Autonomy and Responsibility

- Under the guidance of a workplace supervisor, directs the work of assigned personnel and supervises the operation of machines and equipment.
- Determines the properties of various products, checks the quality of work phases characteristic of the technology, and performs quality management of sub-tasks.
- Assesses environmental impact related to production and strives to reduce it.
- Assesses and rationalizes energy consumption related to material production.
- Performs occupational safety tasks.
- Evaluates the efficiency, effectiveness, and safety of subordinates' work.
- Pays attention to promoting the professional development of subordinates and supports their efforts.
- Ensures the application of the principle of equal access.
- Supports colleagues in their professional development and career advancement.