

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

Program Objective:

The aim of the program is to train metallurgical engineers who, based on their scientific, technical, and economic knowledge with a metallurgical focus, are capable of preparing and enriching ores mined from the Earth's crust and metal-containing waste through physical and chemical processes. They can design and modernize procedures for the economical and environmentally conscious extraction and purification of metals, alloys, and their compounds, as well as technologies for producing products from metallic materials through casting, plastic deformation, and heat treatment. They are also able to design the necessary equipment, operate it at a high technological level, and carry out and coordinate research and development tasks in the field of metallurgical engineering. Graduates are prepared to continue their studies in doctoral programs.

Professional Competencies to be Acquired

a) Knowledge

- Possesses detailed knowledge of scientific and technical theories and practical procedures related to the profession of metallurgical engineering and metallurgical technologies.
- Has appropriate manual skills.
- Has in-depth knowledge of the key properties and application areas of metals, alloys, and metal matrix composites relevant to their specialization.
- Is thoroughly familiar with the rules of technical documentation.
- Has general knowledge of organizational tools and methods related to management.
- Has general knowledge of the legal regulations necessary for professional practice.
- Possesses knowledge of measurement techniques and measurement theory relevant to the field.
- Has basic knowledge of information and communication technologies related to professional activities.
- Has comprehensive knowledge of modern metallurgical technologies.

b) Skills

- **Able to formulate** problems related to the field in mathematical terms and solve the resulting equations (or systems of equations) analytically or numerically.
- Processes and organizes information gathered from chemical and physical phenomena occurring during the operation of metallurgical technologies, models the processes, and draws conclusions.
- Solves tasks related to quality assurance, measurement techniques, and process control in metallurgical systems and related technologies.
- Designs complex systems based on a systems-oriented and process-oriented way of thinking.

- Based on the relationships between various metals, alloys, and metal matrix composites, determines their composition, structure, and properties, and selects and operates the necessary instruments.
- Conducts laboratory tests, processes and evaluates measurement results, and documents findings.
- Operates machines and equipment characteristic of their specialization.
- Applies metallurgical technological procedures relevant to their specialization.
- Strives to enrich the knowledge base of the field with original ideas through self-education.
- Plans and manages the use of necessary technical, economic, environmental, and human resources.
- Forms well-founded engineering opinions on issues related to metallurgical technologies and is able to communicate their views both in Hungarian and in foreign languages.

c) Attitude

- Strives to apply the latest results of their field to support their own professional development.
- Committed to enforcing sustainability and energy efficiency requirements.
- Aims to independently or collaboratively plan and execute tasks at a high professional level.
- Performs work with a complex approach based on systems-oriented and process-oriented thinking.
- Investigates the possibilities of setting research, development, and innovation goals and strives to achieve them.
- Open to professional further training that supports self-improvement and self-development.
- Dedicated to high-quality work and aims to promote this mindset among colleagues.

d) Autonomy and Responsibility

- Acts independently and proactively in solving professional problems.
- Takes responsibility for sustainability and environmental awareness.
- Makes decisions independently and responsibly, consulting with representatives of other fields (especially legal, economic, energy, and environmental), and assumes responsibility for those decisions.
- In decision-making, considers and applies principles of environmental protection, quality assurance, consumer protection, product liability, equal access, workplace health and safety, technical, economic and legal regulations, and engineering ethics.