

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

Program Objective:

The aim of the program is to train engineers who are capable of producing nanostructures, analyzing their structure and properties, and exploring the impact of production technologies on these characteristics. Based on this, they are able to optimize production technologies in an energy-efficient and environmentally conscious manner, operate them economically, and systematically perform organizational and management tasks related to the field. They are also prepared to carry out, coordinate, and lead nanotechnology-focused research and development projects at national and international levels. A nanostructure is defined as a structure in which at least one subunit (phase) has at least one dimension smaller than 100 nm. Graduates of the program are prepared to continue their studies in doctoral programs.

Professional Competencies of the Nanotechnology Engineer

a) Knowledge

- Has detailed knowledge of the requirements for the properties of nanostructured materials and their application areas.
- Possesses in-depth understanding of the scientific and technical theories and practical procedures related to the properties, production, and application of nanostructured materials.
- Has appropriate manual skills.
- Is thoroughly familiar with the rules of technical documentation.
- Has general knowledge of organizational tools and methods related to management.
- Has general knowledge of legal regulations necessary for professional practice.
- Possesses knowledge of measurement theory and techniques relevant to the field.
- Has basic knowledge of information and communication technologies related to professional activities.
- Has comprehensive knowledge of modern materials science and chemical 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 production of nanostructured materials, models the processes, and draws conclusions.
- Solves quality assurance, measurement, and process control tasks in the production of nanostructured materials.
- Designs complex systems based on a systems-oriented and process-oriented way of thinking.
- Based on the relationships between different elements/material types, determines the composition, structure, and properties of nanostructured materials, and selects and operates the necessary instruments.
- Conducts laboratory tests, processes and evaluates measurement results, and documents findings.
- Operates machines and equipment characteristic of the field.
- Applies technological procedures typical of the field.
- Plans and manages the use of technical, economic, environmental, and human resources.
- Forms well-founded engineering opinions on issues related to the structure, properties, and production technologies of nanostructured materials, and communicates these opinions in both Hungarian and foreign languages.

c) Attitude

- Strives to apply the latest results of the field to support their own professional development.
- Aims to enrich the knowledge base of the field with original ideas through self-education.
- Committed to enforcing sustainability and energy efficiency requirements.
- Strives 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.