Metallurgical engineering

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Faculty	Faculty of Materials Science and Technology
Type of study	Follow-up Master
Language of instruction	English
Code of the programme	N0715A270010
Regular period of the study	2 years
Cost	50,000 CZK per semester
Coordinating department	Department of Metallurgical Technologies
Coordinator	doc. Ing. Pavlína Pustějovská, Ph.D.
Keywords	foundry, bulk forming, iron and steel production

About study programme

The study program is aimed at educating specialists for modern metallurgy and engineering. Initially, basic common theoretical courses are taught, suitably complemented by courses in, for example, materials science, management and quality management. The study program also covers the subjects of iron and steel production, foundry and bulk forming. The study program is characterized by the close interconnection of the pedagogical process with the often unique experimental basis and the use of computer technology in process modeling.

Graduate's employment

Typical graduate jobs include: technologist, researcher, manager, project manager, computer engineer, qualified reseller.
• specialists in the field of iron and steel technology (including its liquid processing and casting) in various metallurgical plants as technologists, plant managers or managers;
• specialists in the field of technology of casting of metallic materials into permanent and non-permanent molds (foundries of steel, cast iron and non-ferrous metals, foundries of gravity, pressure and centrifugal casting of castings) in the positions of technologists, plant managers or managers;
• specialists in companies supplying materials and equipment to foundry operations;
• specialists in the field of metal forming in various metallurgical and engineering companies (hot and cold rolling mills, forging shops including die mills, drawing plants, press shops, etc.) in the positions of technologists, plant managers or managers;
• specialists in companies involved in the distribution or further processing of metallurgical products.

Study aims

Main goals:
• Acquisition of basic theoretical knowledge that will enable a sufficiently well-founded approach to the issue of technical subjects from three technological areas - iron and steel production, foundry and bulk forming.
• Acquisition of relevant expertise and skills in the theoretical and technological aspects of the three areas of metallurgical engineering with an emphasis on their thematic interconnection.
• Training of an engineer as a metallurgical specialist, technologist, researcher, etc., capable of managing the above-mentioned areas technically and managerially, including methods of quality management.
• Acquisition of general competences corresponding to the Master's degree - soft skills, language skills, presentation of results, etc.

Specific goals:
• Understand the theoretical and technological nature of the processes of metallurgical processes, formulate physico-chemical processes in the production of pig iron and steel, characterize the processes occurring during refining and the patterns of casting,

crystallization and solidification of steel.
• Understand the principle of cast parts production using foundry methods, characterize processes occurring at the form-metal interface, characterize processes occurring during casting, crystallization and solidification of castings from iron alloys and non-ferrous metals using experimental methods, computer modeling and operational applications.
• Understand the advantages of a comprehensive approach to studying the deformation behavior of materials in the coordination of forming, material sciences, computer and automation, etc., preferably in a combination of experimental methods, computer modeling and operational applications.
• To learn to use theoretical and practical knowledge for individual technological aggregates associated with the production of iron and steel, including the application of knowledge and results obtained using modern laboratory equipment together with the processes of physical or numerical modeling.
• To learn how to design a suitable casting process based on theoretical and practical knowledge, including the use of new and progressive methods and materials, in order to achieve maximum performance of castings with minimal economic and environmental burden.
• To learn the thought processes and methods leading to the effective utilization of the structural potential of both traditional and newly developed metallic materials in order to achieve precisely defined or extremely outstanding mechanical properties of the bulk formed products.

Graduate's knowledge

• Demonstrates in an appropriate extent and detail the knowledge of iron and steel production technology, foundry technology and the technology of forming ferrous and non-ferrous metals at the latest level and knows their principles.
• Based on the choice of study subjects and the topic of the thesis demonstrates a deeper knowledge of theoretical principles related to the technology of iron and steel production, foundry technology, or technology of bulk forming of metallic materials.
• Controls statistical data processing methods to an appropriate extent and is able to use advanced modeling methods in the field of steel production technology, foundry technology or forming technology at an advanced level.
• Demonstrates basic knowledge of technical materials, non-ferrous metal production, thermal processes in industrial furnaces, methods of planning and quality improvement, and management economics.

Graduate's skills

• Is able to independently solve tasks in the field of modern technologies of iron and steel production or foundry technology or materials forming.
• Is able to broaden the use of modern methods of theoretical and experimental research in the field of iron and steel production, foundry technology or materials forming.
• In solving individual tasks he / she is able to use methods of statistical analysis, modern physical and computer modeling methods and basic principles of managerial economy.

Graduate's general competence

The graduate has sufficient soft skills, is linguistically equipped with knowledge of at least one foreign language at B1-B2 level according to the Common European Framework of Reference, is ready for teamwork, etc.

Professions

- Research and development specialist
- Foundry technologist
- Technologist-metallurg
- Process management specialist

- RαD engineer in the field of materials science
- Forming technology manager
- Materials production technologist
- Metallurgical operation technologist
- Research team leader
- Production manager

Hard skills

- Tests of formability of metallic materials
- Knowledge of technology of steel and ferroalloys production in electric arc and induction furnaces
- Design of technological processes of production
- Knowledge of the influence of forming on the properties and structure of a material
- Knowledge of casting technology
- Optimization of the course of metallurgical processes in steel production and casting
- Optimization of refining processes in the production of molten metals using SW ANSYS Fluent
- Knowledge of steel production technology in converters
- Methods and tools of quality management
- Optimization of the steel casting process using SW ProCAST and QuikCAST
- SW Simufact Forming
- Reading technical documentation
- Creation of technical reports
- SW Simulink - Fluids
- Procedures for production of pressure castings
- Knowledge of the basics of business economics
- Knowledge of materials
- Knowledge of technological processes
- Evaluation of deformation behaviour of metallic materials
- Simulation of forming processes using PC programmes
- Orientation in the production and modifications of metallic materials
- Orientation in properties and use of molding materials
- Knowledge of metallurgical processes in metal production
- Orientation in the processing of materials and input raw materials
- MAGMASoft simulation programme
- Presentation and defense of work results
- Knowledge of production documentation of casting
- Orientation in modelling of volume forming processes
- Assessment of formability of materials

Study curriculum

- form Full-time (en)