Thermal engineering and fuels in industry

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Faculty	Faculty of Materials Science and Technology
Type of study	Doctoral
Language of instruction	English
Code of the programme	P0713D070002
Regular period of the study	4 years
Coordinating department	Department of Thermal Engineering
Coordinator	prof. Ing. Vlastimil Matějka, Ph.D.

About study programme

The aim of the doctoral study program "Thermal Engineering and Fuels in Industry" is the scientific education of professionals who are able to creatively solve scientific research problems in the field of thermal engineering, energy, fuel chemistry, ceramic materials especially for high temperatures and material and energy utilization of waste. . The graduate is able to independently identify and formulate a scientific problem, design and develop a method of solution and implement theoretical, experimental, computational or simulation activities aimed at solving the problem. Graduates of the field are ready to develop and design new technologies and thermal-technical and energy equipment, as well as to increase the technical level of existing ones, especially with regard to increasing productivity, saving fuels and energy while minimizing environmental impact.

Graduate's employment

Graduates of the doctoral study program "Thermal Engineering and Fuels in Industry" have an extremely promising and wide application on the labor market, which stems from the lack of qualified professionals in the field of thermal engineering, energy, fuel chemistry, industrial ceramics and waste utilization. research and academic, as well as in the industrial sphere at the level of research, development, design, production and management. Graduates are prepared to develop and design new laboratory and production technologies and thermal engineering equipment, as well as to increase the technical level of existing ones, especially with regard to fuel and energy savings while minimizing environmental impact.
Graduates of doctoral studies can find employment as scientific, research and pedagogical staff at universities and research institutions. They will also find employment as experts in the state administration, as technicians, managers and developers in manufacturing companies, especially in the energy industry, heating industry, ceramics and chemical industry, petrochemistry and in plants focused on energy and material utilization of waste.
Professions:
scientist and researcher,
pedagogical worker,
expert in state administration,
technician, manager, developer, computer scientist, designer,
employee in the research and development department of industrial enterprises,
thermal engineer and energetics in companies and institutions,
leading technologist in the ceramic industry and in fuel production,
chief technologist for waste processing and energy utilization

Study aims

The aim of the study is the scientific education of experts who will be able to solve scientific research problems in the field of thermal engineering, energy, fuel chemistry, ceramic materials and waste utilization. The goal is achieved by leading to the systematic acquisition, deepening and application of current theoretical and practical knowledge in the field studied and the development of the

creative talent of the personality of the researcher.

Graduate's knowledge

Students of the doctoral study program will acquire theoretical knowledge by studying appropriately selected subjects, whose offer covers the issues of thermal engineering and energy, industrial ceramics, fuel chemistry, environmental impact and also includes general subjects such as numerical mathematics and statistics. The doctoral student deepens special theoretical and professional knowledge related to the solved project by independent study of literature and consultations with teachers. The graduate becomes an expert with a broad interdisciplinary perspective, who understands theories and modern research methods in the field studied.

Graduate's skills

The graduate is able to formulate a problem, design and apply research methodology in order to expand knowledge in the field, increase the technical level of thermal and energy technologies and equipment, develop new types of fuels and materials for use especially at high temperatures and seek new ways to use waste and alternative energy sources. . Students are guided to develop creative thinking in the research process, starting with a theoretical analysis of the problem and ending with the design or innovation of laboratory procedures or production technologies and equipment. Graduates manage the implementation of laboratory and operational experiments, evaluation of measured data, learn to create and solve a mathematical formulation of the problem, create and use a physical or numerical model and verify it. The graduate is able to use measuring and analytical instruments and specialized software in the field of study.

Graduate's general competence

vzdělávání)
The graduate is able to independently identify and formulate a scientific problem, design and develop a method of solution and implement the necessary theoretical, experimental or mathematical simulation activities to solve the problem. Part of the graduate's basic competencies is the ability to critically assess published scientific information, the ability to present procedures and results in writing and orally to the professional public and internationally, including in the world language, and further deepen their theoretical and practical knowledge in the field in which solves the doctoral project.

Professions

- Power engineering investment specialist
- Power engineering project manager
- Power engineering design engineer
- Power engineering auditor
- Power engineering researcher

Hard skills

- Applications of the basics of thermodynamics in power engineering and thermal engineering
- Heat sharing and mass transfer
- Knowledge of ceramic materials for energy processes
- Knowledge of properties of the gaseous, liquid, and solid fuels
- Knowledge of binary and ternary equilibrium phase diagrams
- MS Excel application for thermal calculations
- Knowledge of the effects of thermal processes on the environment
- Orientation in the field of the heating industry, boiler issues, and heat distribution
- Application of mathematical methods in energy and thermal engineering
- Knowledge of the structure of ceramic materials
- Application of non-destructive tests using active thermography

- Orientation in the field of refractory materials and their applications
- Orientation in the field of thermal energy equipment
- Knowledge in the field of thermodynamics of ceramic systems
- Determination of efficiency of thermal and energy equipment
- Knowledge of calculations and design of heat exchangers
- Ability to design refractory structures and linings
- Knowledge in the field of interchangeability of gaseous fuels
- Orientation in the field of use of secondary energy sources
- Basics of programming in SW Matlab
- Renewable energy sources
- Knowledge of properties and applications of materials for energetics
- Application of natural sciences in energy and thermal engineering
- Knowledge of creating energy balances and standardization of energy consumption

Study curriculum

- form Full-time (en)