

# General information

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## GENERAL INFORMATION ABOUT THE DOCTORAL PROGRAMME

**The doctoral programme Materials Science and Engineering** lasts for 3 years (6 semesters) and comprises 180 ECTS under the European Credit Transfer System (ECTS). Within the programme, there are three fields of study:

- Materials,
- Metallurgy and
- Mining and Geotechnology.

**Professional title** awarded is doctor of science (PhD).

Performance of the programme is managed by the Programme Board established by representatives of three faculties:

- Faculty of Natural Sciences – programme applicant
- Faculty of Chemistry and Chemical Technology
- Faculty of Mathematics and Physics.

## Programme goals and general competencies

Materials have been anchored into our lives since ancient times and have accelerated the progress of mankind. This progress was marked by the development of traditional materials, starting with mining and exploitation of raw materials by mining engineering (geotechnology), then transformed into standard materials (metallurgy and chemical engineering) and further advanced into modern functional materials that represent an important base for the development of numerous industrial branches in this period of globalisation. Advancements in telecommunications, informatics and technology as well as in the field of energy, medicine, and space technology have introduced new materials with various and up to now unimaginable properties. The ability to make, process and use modern materials is a precondition for entering the competitive market scene and essential for greater economic exploitation of natural resources and protection of the global environment. At the University of Ljubljana, materials science has been taught at several faculties since the disintegration of the former Faculty of Natural Sciences and Technology in 1995. To combine the advantages of the many years of scientific development in natural sciences and engineering activities, the Department of Materials and Metallurgy introduced the undergraduate study programme of materials in 1995. In 2008, the programme was renewed and harmonised with the Bologna directives and accredited as Materials Engineering. Simultaneously, certain materials were also taught in BSc and Engineering programmes at FKKT and FMF. Materials, primarily their applications, can also be found in the programmes of some other faculties, e.g. Faculty of Mechanical Engineering, Faculty of Electrical Engineering, Faculty of Computer and Information Engineering and Faculty of Civil Engineering as well as in some research institutes, e.g. Jožef Stefan Institute, Institute of Chemistry, Institute of Materials and Technology, etc. The science in this field is primarily focused on natural sciences, and it is classified as a science of inanimate nature. The knowledge and new findings are transferred via process

technologies into processes of making materials and further on into manufacturing industrial products. The content of the proposed study programme refers to understanding the nature of materials and characterisation of their properties, which means it is an interdisciplinary chain of geo-matter, chemistry, solid matter physics, physical metallurgy and application-oriented process engineering. This knowledge is further upgraded to include developing new materials, processing scrap material and degradation of wastes and their environmentally safe disposal. The main emphasis is placed on understanding, discovering and developing properties of materials, thus opening up long-term perspectives for modern economic production and human life. PhD studies place special emphasis on analysis and synthesis of new materials, introduction of mathematical and statistical methods and methods of artificial intelligence in simulation and modelling of physical and chemical processes to predict properties of materials and to control process technologies in a manufacturing process. Materials are a decisive parameter of technical and industrial progress. The proposed PhD study programme can provide good knowledge and skills for future professionals and cater to the needs in Slovenia while also remaining open to foreign universities.

The basic objective of the PhD programme in Materials Science and Engineering is to qualify professionals to seek employment in research institutions in the areas of natural sciences and engineering, primarily in development, manufacturing and application of standard and modern functional materials, as well as in administrative services or to continue their careers in academic institutions.

After completing the programme, students will acquire the following general competencies and skills:

- Ability of critical analysis, evaluation and synthesis of new and complex ideas;
- Ability of communication in their expert field with colleagues, larger professional groups and the wider public;
- Ability to promote scientific and technological advancements at an academic and application level in knowledge-based society.