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Study programme "Material Science and Nanotechnologies"

Main attributes

Title	Material Science and Nanotechnologies
Identification code	WMM0
Education classification code	45526
Level and type	Academic Master (Second Cycle) Studies
Higher education study field	Physic, Materials Science, Mathematics and Statistics
Head of the study field	Juris Blūms
Department responsible	Faculty of Natural Sciences and Technology
Head of the study programme	Dmitrijs Stepanovs
Professional classification code	
The type of study programme	Full time
Language	Latvian, English
Accreditation	13.09.2023 - 14.09.2029; Accreditation certificate No 2023/28-A
Volume (credit points)	120.0
Duration of studies (years)	Full time studies - 2,0
Degree or/and qualification to be obtained	Master degree of engineering science in material science and nanotechnologies
Qualification level to be obtained	The 7th level of European Qualifications Framework (EQF) and Latvian Qualifications Framework (LQF)
Programme prerequisites	Bachelor degree of engineering science in materials science or chemical technology or bachelor degree of natural sciences in chemistry or physics, or biology, or comparable education

Description

Abstract	This networking-based study programme, which involves academia, high-tech industry, and governmental and non-governmental organizations, prepares leaders for future challenges in material science and nanotechnology. The study programme focused on the development of new materials and the use of modern technologies offers the acquisition of higher level technical education based on skills and competencies. In parallel with in-depth theoretical knowledge, the acquisition of practical skills is promoted not only in academic institutions, but also in high-tech manufacturing companies, governmental and non-governmental organizations in Latvia and abroad. The programme provides specialization in entrepreneurship and innovation to develop managerial skills for the high-technology industry in collaboration with RTU Riga Business School. The study programme includes general study courses on modelling and calculation of physical processes of materials, creation of innovative products and technologies, courses dedicated to specific materials, their properties and applications, as well as internship in high-tech company. Graduates of the study programme will be able to work as high level experts and engineers or managers in a high-tech manufacturing companies engaged in materials processing and process modelling, development of new materials and technologies, product design, testing, certification and quality laboratories, as well as participate in innovative product development by founding a start-up company.
Aim	The aim of the study programme is to prepare progressively thinking, new technology and knowledge-oriented, highly qualified specialists and managers in materials science and high value-added technologies, including nanotechnologies, as well as for further doctoral studies.
Tasks	The tasks of the study programme are: - to ensure competitive academic master's level education in the European Higher Education Area in accordance with the Bologna recommendations, preparing students for work in leading engineering and managerial positions, to develop skills of scientific research work, technology transfer, innovation and to promote their use; - to provide students with in-depth knowledge and expertise in material science and nanotechnologies and develop competencies not only to solve conventional everyday problems, but also tackle technically and challenging innovative problems both in accordance with labour market requirements and future industry development trends; - to gain expertise in biomaterials, polymer, inorganic, and smart materials, as well as ecodesign and life cycle analysis; - to develop the student's skills in identifying problems, formulating goals and solving them, finding an opportunity to use both laboratory-wide infrastructure and industrial equipment in cooperation with the manufacturer; - to develop entrepreneurial and managerial skills for high-tech companies and to enhance high value-added production and productivity; - to stimulate the interest of students and graduates in doctoral studies, lifelong learning, as well as academic and industrial excellence.

Learning outcomes	The graduate of the study programme: - shows expanded and specialized knowledge and understanding of the fundamental issues, as well as the most current discoveries and development trends of materials science and nanotechnology; - is familiar with the methods of industrial production processes and technology transfer, processing of results, analysis and interpretation, as well as modelling of physical processes of materials, understanding their essence and areas of application; - is able to lead high-tech industrial companies and promote technology transfer and productivity; - is able to reasonably choose, plan and independently use methods and equipment for material development, characterization, as well as processing, analysis and modelling of results; - is able to summarize, compare and reasonably discuss the obtained results of research and/or production process in scientific works or technical instructions, reports and present these results to both industry specialists and the general public; - is able to propose and develop innovative scientific and market-oriented projects in accordance with the project calls, market requirements and available resources, as well as is able to perform technical expertise of the manufacturer's products, - is able to critically evaluate and substantiate the importance of the introduction of modern materials and innovative technological solutions in research and production processes; - is able to competently explain and substantiate the use of technical means, modelling approaches and results processing and analysis methods to solve technical problems of manufacturers' products, as well as to develop modern materials and technologies to meet market demands in competitive conditions.
Final/state examination procedure, assessment	The assessment system of the study results is based on RTU Regulations on the assessment of learning outcomes. The assessment methods for each study course are defined by the responsible academic staff. Assessment of each study course is carried out according to 10 grade scale or in the case of a test as pass/fail. The fulfilment of the study programme ends with the State Examination, organized as a public defence of Master Thesis at the meeting of Final Examination Committee (FEC). This includes also examination of theoretical knowledge, scientific background and practical competences. The FEC consists of at least 3 persons, including head of structural unit implementing the study programme and representative from the high-tech industry. The FEC is approved by the Dean of the Faculty. The student''s knowledge, skills and competences are evaluated collegially by the FEC on a 10-grade scale, based on the author's presentation, the quality of answers to questions related to the developed work, the most important fundamental and branch/sub-branch theoretical study courses, and reviewer's notes, as well as considering the evaluation of the supervisor and reviewer.
Description of the future employment	The graduate of the study programme can be employed in any field related to the development of new materials and modelling of properties for the creation of various innovative products according to consumer needs, selection of appropriate materials for technologically, ecologically and economically sustainable composite products, natural and synthetic materials. A materials scientist manages the development of new materials, manages the processes of material processing, monitors quality assurance, and convinces investors about the most promising investment opportunities in the development of innovative products. In turn, a specialist in nanotechnology is competent to work in high-tech companies on the development of new high value-added nanomaterials and their conformity assessment for innovative applications in energy, electronics, medical technology, transport, as well as other sectors of national economy. Thus, the field of work of both a material scientist and a nanotechnology specialist include innovative product development companies, new product development laboratories, product conformity assessment and quality control laboratories, and material technical expertise and certification centres.
Special enrollment requirements	English language proficiency is equivalent to at least CEFR B2 level.
Opportunity to continue studies	After successful completion of the study programme, it is possible to continue studies in doctoral study programmes in Latvia and abroad, including RTU doctoral study programme "Chemistry, Materials Science and Engineering".

Courses

No	Code	Name	Credit points
A		**Compulsory Study Courses**	**54.0**
A.1		**Study courses on the current achievements in the field**	**24.0**
1	DA4203	Materials and Technologies	18.0
2	BM0769	Modeling and Simulation of Physical Processes	6.0
A.2		**Field-Specific Theoretical Basic and IT Study Courses**	**30.0**
1	DA4204	Biomaterials	6.0
2	DA4205	Polymer Materials	6.0
3	DA4206	Inorganic Materials	3.0
4	DA4207	Smart Materials	6.0
5	DA5209	Ecodesign and Life Cycle Analysis	9.0
B		**Compulsory Elective Study Courses**	**18.0**
B1		**Field-Specific Study Courses**	**18.0**
1	BS0062	Financial and Managerial Accounting	6.0
2	BS0060	Human Resource Management	6.0
3	BS0061	Managerial Statistics	6.0
4	BS0063	Strategic Management	6.0
5	BS0058	Managerial Economics	6.0
6	BS0064	Financial Management	6.0
7	BS0059	Marketing Management	6.0
8	BS0070	Behavior and Organizational Concepts for Management	6.0
9	BS0071	Management Information Systems	6.0
C		**Free Elective Study Courses**	**12.0**
D		**Practical Placement**	**6.0**
1	DA4202	Internship in Material Science and Nanotechnologies	6.0
E		**Final Examination**	**30.0**
1	DA4201	Master Thesis	30.0