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Study programme "Materials Engineering"

Main attributes

Title	Materials Engineering
Identification code	WBN0
Education classification code	43526
Level and type	Academic Bachelor Study
Higher education study field	Physic, Materials Science, Mathematics and Statistic
Head of the study field	Juris Blūms
Department responsible	Faculty of Material Science and Applied Chemistry
Head of the study programme	Remo Merijs-Meri
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 - 3,0
Degree or/and qualification to be obtained	Bachelor degree of engineering science in materials engineering / –
Qualification level to be obtained	The 6th level of European Qualifications Framework (EQF) and Latvian Qualifications Framework (LQF)
Programme prerequisites	Secondary education

Description

Abstract	The multidisciplinary study programme is the only study programme of this type in Latvia. The study programme ensures mastering of basic knowledge necessary for the development of novel materials, application of innovative technologies and use of advanced programming tools for improvement of efficiency of products and technologies by acquiring the set of obligatory study courses. In the framework of compulsory elective study course of professional specialization, it is possible to acquire specific knowledge, necessary for development of both, new value-added materials required by power engineering, biomedicine, electronics, building and construction as well as other export-capable branches of Latvian natural economy, and sustainable preservation of Latvian material cultural heritage. The study programme has received an excellent evaluation during the accreditation. In the framework of the module of compulsory elective study courses, the student has a possibility to design the individual study profile of professional specialization or to choose one of the provided study profiles of specialization in biomaterials, polymer materials and composites, inorganic materials or conservation and restoration. The study programme offers to develop communication, cooperation, creativity, problem-solving, planning, organization, and leadership skills by acquiring study courses developing communication and organization competences. For strengthening practical skills in the framework of the study programme, it is necessary to do an internship as well as to work out bachelor's thesis, by finding solution for topical problem in the field of materials processing defined by manufacturer or development of new future material by using advanced technologies and materials characterization methods.
Aim	The aim of the study programme is to prepare progressively thinking, oriented to the introduction of new technologies and knowledge, highly qualified, responsible professionals in the field of materials science and engineering with comprehensive theoretical knowledge, practical work skills and competencies suitable for both master's studies and career development in the fields significant for the national economy, including the development of exportable innovative solutions in the fields of biomaterials, inorganic materials, polymer materials and composites, as well as in the fields focused on conservation and restoration of national cultural heritage.
Tasks	General tasks of the study programme are: - to ensure competitive academic bachelor's level education in the European Higher Education Area in accordance with the Bologna recommendations, preparing students for responsible positions in production, consulting, product quality control, development of new products; - to provide students with scientifically based broad profile knowledge in certain fields of materials science and engineering, to develop critical thinking, to develop expert skills and improve competencies in solving real everyday problems both in accordance with labour market requirements in tight conditions of competitiveness and in accordance with future industry development trends; - 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 promote knowledge transfer and develop the student's skills in the reasoned presentation of real material development problems and their solutions both to professionals in the field and to society in general; - to stimulate the interest of students and graduates in the expansion of the knowledge horizon, professional development and studies in master's study programmes.

Learning outcomes	The graduate of the study programme: - is able to demonstrate comprehensive theoretical knowledge of materials science and engineering basics, as well as specialized knowledge and understanding of fundamental issues, current discoveries and development trends in certain fields of materials science and engineering, understanding their nature and significance in an interdisciplinary context; - is familiar with the methods of industrial production processes and scientific research planning, implementation, processing of results, analysis and interpretation, as well as programming, modelling of physical processes of materials, understanding their nature and areas of application; - is able to practically apply knowledge of fundamental issues, current discoveries and development trends of certain fields of materials science and engineering; - is able to reasonably choose, plan and independently use methods and equipment for obtaining, processing and characterizing materials and products, as well as methods for processing, analysis and modelling of results; - is able to summarize, compare and discuss at the level of his/her competence the results of the research and/or production process in scientific works or technical instructions, reports etc and present these results to both industry professionals and the general public; - is able to participate in the implementation of innovative scientific and producer-oriented projects in accordance with the project call, market requirements and available resources; - is able to perform quality control and technical expertise of the manufacturer's products; - is able to critically evaluate the importance of the introduction of modern materials and innovative technological solutions in research and production processes; - is able to explain at the level of his / her competence the technical means, programming and modelling approach, the use of results processing and analysis methods for solving technical problems of manufacturers' products.
Final/state examination procedure, assessment	Assessment of study results at RTU takes place in accordance with the Regulations for Assessment of Study Results. Specific evaluation criteria for each study course are determined by the responsible lecturer. The evaluation of each study course is determined on a 10-point scale or in case of a test with passed/failed. The level of acquisition of the study programme, which is not lower than 4 (almost average), is considered to be positive. Acquisition of the study programme concludes with a final examination, a part of which is the public defence of the bachelor's thesis in an open meeting of the final examination commission (FEC), which simultaneously also tests knowledge in the most important study courses of fundamental, theoretical and specialized sciences in accordance with the Regulations on final examinations at Riga Technical University. The student's knowledge, skills and competence are assessed by FEC in a closed session on the basis of the author's report, the quality of answers to questions related to the developed work, the most important fundamental and branch/sub-branch theoretical study courses, and the reviewer's notes, as well as evaluation of the scientific supervisor and reviewer.
Description of the future employment	The acquired knowledge will allow the graduates of the study programme to develop a career in the fields of: - management, testing and quality assurance of new products/materials as well as an approbation of innovative production processes for use in biomedical and healthcare sectors, by demonstrating competence and understanding of the biological system, its interaction with biomaterials, expertise in modern and environmentally friendly technologies as well as new sustainable technologies; - designing of Latvia's cultural heritage conservation strategy, by demonstrating knowledge of chemical and physical causes of aging (destruction) of materials, evaluation of changes in chemical composition and structure of organic and inorganic materials and products in natural environment, use of artefact material testing and identification methods, management of the bases of conservation and restoration of artefacts of a specific group of materials; - vitreous coatings and their technologies, inorganic thin films, sol-gel coatings and their technologies, construction silicates and their production technologies, thus, on the one hand, ensuring the demand of the Latvian manufacturing sector in this area, but on the other hand, creating preconditions for graduates to gain experience in working with future production technologies (including nanotechnologies), which are currently implemented only at the laboratory level; - basic life cycle principles for materials and products, choice of materials and technologies, product design aspects, material ageing aspects and knowledge of recycling technologies, polymer fibre materials and their technology management for use in exportable sectors such as mechanical engineering/transport, construction products, medical equipment, agriculture, packaging. It is expected that the specialists prepared by the study programme will have competitive knowledge, skills and competencies in order to satisfy not only the requirements of the Latvian labour market but also the international demand criteria for material science and engineering specialists.
Special enrollment requirements	English language proficiency equivalent to at least CEFR B2 level.
Opportunity to continue studies	Graduating the study programme, it is possible to continue studies in master's study programmes in Latvia and abroad, for example, in RTU academic master's study programme "Chemistry and Chemical Technology" and "Materials Science and Nanotechnologies".

Courses

No	Code	Name	Credit points
A		**Compulsory Study Courses**	**80.0**
1	KPI769	Introduction to Materials Science	2.0
2	KVK742	General Chemistry	4.0
3	KVK746	Chemistry for Material Scientists	3.0
4	KVT775	Introduction to Unit Operation of Chemical Engineering	6.0
5	KFO704	Physics	8.0
6	DIM710	Mathematics	9.0
7	DMS212	Probability Theory and Mathematical Statistics	2.0
8	DIM212	Supplementary Mathematics (for materials science)	2.0
9	RTR708	Introduction to the Programming Language MATLAB	2.0
10	BTG701	Fundamentals of Graphics Communication	2.0
11	KPI776	Programming in Materials Science	2.0
12	KFM700	Structure and Properties of Materials	3.0
13	KPI770	Material Surface Processes	3.0
14	KPI772	Organic Materials and Technology	3.0
15	KST780	Inorganic Materials and Technology	3.0
16	KPI766	Composite Materials and Technology	4.0
17	KPI771	Materials Research Methods	4.0
18	KPI780	Material Selection, Ageing and Recycling	6.0
19	KST783	Management of Materials and Processes	4.0
20	SDD701	Innovative Product Development and Entrepreneurship	4.0
21	KOS743	Information Literacy in Chemistry and Materials Science	2.0
22	VAS038	Environment and Climate Roadmap	1.0
23	ICA301	Civil Defence	1.0
B		**Compulsory Elective Study Courses**	**20.0**
B1		**Field-Specific Study Courses**	**15.0**
		Biomaterials	*15.0*
1	KVT779	Biomaterials Chemistry and Technology	6.0
2	KVT777	Anatomy and Physiology	3.0
3	KVT778	Methods for Materials Analysis	4.0
4	KVT776	Design of the Experiments and Experimental Data Processing	2.0
		Conservation and Restoration	*15.0*
1	KPI779	Introduction to Cultural Heritage Preservation	2.0
2	KPI731	Textiles Dry and Wet Cleaning, and Maintenance	2.0
3	KPI767	Ageing of Materials	2.0
4	KPI782	Paper Ageing and Conservation	2.0
5	KPI781	Pigments and Paints	3.0
6	KPI762	Colour Science	3.0
7	KST785	Basics of Stone Material Conservation	3.0
8	KPI777	Metals and Alloys	3.0
		Inorganic materials	*15.0*
1	KST778	Technologies and Use of Glass-like Materials	3.0
2	KST784	Ceramic Materials, Their Production Technologies and Use	3.0
3	KST781	Binders for Construction	3.0
4	KST744	Introduction to Nanomaterial Technologies	3.0
5	KST786	Experimental Research Methods for Silicate Materials and Nanomaterials	3.0
		Polymer materials and composites	*1.0*
1	KPI783	Polymer Composites and Blends	3.0
2	KPI784	Polymer Adhesives	3.0
3	KPI785	Polymer Paint and Varnish Coatings	3.0
4	KPI775	Biopolymers and Sustainable Polymers	3.0
5	KPI307	Fibre Materials	3.0
6	KPI786	Recycling of Polymer Materials	3.0
7	KPI773	Basics of Additive Technologies and 3D Printing	3.0
8	KPI791	Organisation of Research Work	3.0
9	KPI774	Additives for Polymer Materials	3.0
10	KPI778	Advanced Polymer Materials	3.0
B2		**Humanities and Social Sciences Study Courses**	**5.0**

1	HVD153	The Terminology Minimum in English	3.0
2	HSP377	General Sociology	2.0
3	HSP375	Sociology of Management	2.0
4	HSP376	Sociology of Personalities and Small Groups	2.0
5	IUV101	Fundamentals of Law	2.0
6	IVZ756	Startup Entrepreneurship	2.0
C		**Free Elective Study Courses**	**4.0**
D		**Practical Placement**	**6.0**
1	ĶVT783	Internship in Biomaterials	6.0
2	ĶPI787	Internship in Polymer Materials and Composites	6.0
3	ĶST788	Internship in Inorganic and Nanomaterial Technologies	6.0
4	ĶPI789	Internship in Conservation and Restoration of Materials	6.0
E		**Final Examination**	**10.0**
1	ĶVT782	Bachelor Thesis	10.0
2	ĶPI788	Bachelor Thesis	10.0
3	ĶST787	Bachelor Thesis	10.0
4	MFB001	Bachelor Thesis	10.0
5	ĶNĶ001	Bachelor Thesis	10.0