APPLICATION

Study field "Chemistry, Chemistry Technologies, and Biotechnology" for assessment

Study field	*Chemistry, Chemistry Technologies, and Biotechnology*
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Self-evaluation report

Study field "Chemistry, Chemistry Technologies, and Biotechnology"

Riga Technical University

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1. Information on the Higher Education Institution/College

1.1. Basic information on the higher education institution/ college and its strategic development fields,.

Riga Technical University was founded in 1862 as Riga Polytechnic, later Riga Polytechnic Institute, and is the oldest technical university in the Baltic States. Following the restoration of the Republic of Latvia in March 1990, Riga Polytechnic Institute was renamed Riga Technical University (RTU). Over years RTU has become the leading centre of higher engineering education and science in Latvia, obtained a positive assessment of international experts and has been accredited by the Supreme Education Council of the Republic of Latvia.

RTU values include sustainable development, quality, openness and cooperation, creativity, academic freedom, motivation to explore and discover.

At the beginning of academic year 2021/2022, an academic and scientific staff of 1,193 people work at nine faculties of RTU (Faculty of Architecture; Faculty of Civil Engineering; Faculty of Computer Science and Information Technology; Faculty of E-Learning Technologies and Humanities; Faculty of Electronics and Telecommunications; Faculty of Electrical and Environmental Engineering; Faculty of Engineering Economics and Management; Faculty of Mechanical Engineering, Transport and Aeronautics; Faculty of Materials Science and Applied Chemistry) and four RTU Study and Science Centres in Cēsis, Liepaja, Ventspils and Daugavpils carrying out high-quality academic activities and scientific research at a contemporary level. RTU is the second largest university in the Republic of Latvia in terms of student number and has educated and trained more than 160,000 graduates in total.

RTU carries out active study and research work, acquiring new partners worldwide, working together on project implementation, student exchange and the development of joint study programmes. Active development of a student campus is underway in Ķīpsala, where new faculty buildings are being built, while those built during earlier years are getting a new look, modern content and design.

Many research and scientific projects are being carried out in cooperation with RTU partners, which result in both new patents and successful business activities. RTU successfully develops cooperation to strengthen its role in the development of higher engineering education in the world and in the development of Latvia.

RTU has defined its mission – we are building a competitive, educated, innovative and creative future, the vision – an internationally competitive, dynamic and modern university of science and technology.

Accredited RTU study fields and number of study programmes in May 2022:

Study field	**Number of study programmes**
Architecture and Construction	20
Economics	3

Study field	Number of study programmes
Energy, Electrical Engineering and Electrical Technologies	15
Physics, Materials Science, Mathematics and Statistics	9
Internal Security and Civil Defence	6
Information Technology, Computer Engineering, Electronics, Telecommunications, Computer Control and Computer Science	38
Chemistry, Chemical Technology and Biotechnology*	10
Mechanics and Metalworking, Thermal Energy, Thermal Engineering and Mechanical Engineering	28
Manufacture and Processing	6
Translation	2
Management, Administration, Real Estate Management	21
Environment Protection	6
Total:	**164**

* Five study programmes are not subject to re-accreditation.

Bachelor study programme "Chemistry" and Master study programme "Chemistry" are closed. Bachelor study programme "Chemistry technology" and Doctoral study programme "Chemistry" will be closed by 31 December 2023, because the last students will graduate at academic year 2022./2023. Master study programme "Chemistry technology" already has no active students therefore it will be closed by 31 december 2023.

The offer of RTU study programmes is in compliance with the forecasts with regard to the needs of the labour market in both Europe and Latvia in the coming decade. The RTU study programme offer ensures education and training of the specialists in information and communication technologies (ICT), engineering, management and humanities, for which a significant shortage in the labour market is predicted.

In recent years, the number of foreign students studying to obtain a degree or qualification in Latvia has increased. In addition, international student mobility growth is projected to continue also in the future. In academic year 2019/2020, there were by 25% more foreign students studying at RTU in comparison with academic year 2018/2019. Taking into account the above mentioned, RTU has great opportunities to further increase the number of foreign students. It also provides an appropriate offer of RTU study programmes in English – 16 Bachelor study programmes, 27 Master study programmes, and 13 Doctoral study programmes, moreover, this list is updated from year to year.

Dynamics of the number of students in the RTU during the evaluation period:

Academic year	Total number of students
2013./2014.	14,452
2014./2015.	14,797
2015./2016.	14,997
2016./2017.	14,672
2017./2018.	14,322
2018./2019.	14,383
2019./2020.	14,006
2020./2021.	13,237 *

* In May 2022, 13,372 students studied at RTU – 9,719 studied at undergraduate study programmes, 3,128 studied at graduate Master degree programmes and 525 – at the Doctoral study programmes.

The guiding principle of RTU Strategy for 2021–2025 is the proactive link between the activity of the university and the needs of the national economy, focus on high quality and effectiveness. The basis for the activity of RTU is the study process built on science, innovation and in cooperation with the industry, which ensures preparation of specialists required by the Latvian national economy, thus serving as a foundation for sustainable growth of Latvia. The RTU's strategy for the new programming period is a consecutive continuation is the previous strategy of the university for 2014-2020. It has been developed in compliance with the objectives and priorities defined in Latvian development planning documents.

According to the National Development Plan for 2021-2027 of Latvia, fundamental changes are planned in the near future in four directions – Equal Rights, Quality of Life, Knowledge Society, and Responsible Latvia, in the achievement of which a high-quality study process, excellent research, as well as sustainable innovation and commercialization activities play an important role, which are important elements in RTU's vision to become an internationally competitive, dynamic and modern university of science and technology.

Keynote of the RTU Strategy: High quality and effectiveness – proactive link between the activity of RTU and the needs of the national economy. RTU is one of the leading science and technology universities of the Baltic and Nordic region, which is acting based on a study systems built on research, innovation and cooperation with the industry. RTU prepares European and global-level engineers – leaders: developers of new technologies.

In order to implement RTU's vision to become an internationally competitive, dynamic and modern university of science and technology, RTU's strategy defines four main objectives for the next programming period, three of which are related to the implementation of basic university functions: excellent science, quality studies and sustainable valorisation. The fourth, institutional excellence, is related to the university support function and the development of internal governance in the six areas: digitalisation, sustainable development, effective financial and administrative action, internationalisation, communication and cooperation, human resources development. For all the objectives identified in the strategy define specific tasks to be performed and result indicators to

make it possible to follow the implementation of the strategy so that RTU can realise its vision.

The implementation of the RTU Strategy is approved by a decision of the RTU Senate. Following the approval of the Strategy, RTU Rector once a year ensures definition of the annual RTU aims and tasks with clear performance indicators set at the level of each RTU unit. RTU Strategy is implemented, and the results achieved are analysed annually with regard to the defined tasks.

RTU Strategy is published at https://www.rtu.lv/en/university/strategy.

1.2. Description of the management structure of the higher education institution/ college, the main institutions involved in the decision-making process, their composition (percentage depending on the position, for instance, the academic staff, administrative staff members, students), and the powers of these institutions.

The structure and administration of RTU are established in compliance with the University vision, mission and objectives and taking into account the specifics of the University management. The administrative structure is based on a decentralized decision-making process and obligations arising from the Law on the Higher Education Institutions, the Constitution of RTU, resolutions of RTU Senate, the orders issued by the Rector, as well as other RTU documents. The functions of various organizational units have been approved in their regulations approved by the Senate.

On 16 August 2021, the amending laws to the Law on Higher Education Institutions entered into force, which envisages changes in the internal management model and the procedure for electing rector, as well as defines a new typology of higher education institutions, setting specific eligibility criteria for each type. According to the new typology, RTU corresponds to the status of a university of science. Changes in the Law on Higher Education Institutions are one of the most important steps to create a modern, effectively managed higher education system in Latvia, based on science and research, oriented towards excellence, being internationally competitive and stimulating the country's economic development.

In view of this, during 2021/2022 academic year RTU is undergoing an intensive change process. On 31 August 2021, the new regulations of the RTU Senate were approved, on 20 September 2021 the new RTU Senate was elected. The RTU’s Council was established in March 2022, a new Constitutional Assembly and a new Constitution must be developed and adopted by summer of 2022. From the management point of view, the changes included in the amendments to the law concern the election process of a rector, the appointment/ dismissal of deans, the establishment / reorganization of structural units based on the proposal of the rector which now will be decided by RTU Council.

The council of the higher education institution is a collegial highest decision-making body responsible for the sustainable development, strategic and financial supervision of the university, but the senate will be responsible for the development of university’s studies and scientific processes. The council must also ensure the operation of the state higher education institution in accordance with the goals set in its development strategy. The RTU Council consists of five representatives nominated by the RTU Senate, five external representatives of society or industry, who are not professionally related to the university, but whose presence allows the university to respond more flexibly to external changes and expand its strategic vision. The election of external representatives takes place in accordance with the regulations approved by the Cabinet, which ensures the transparency and political neutrality of the process. The council also has a

representative nominated by the President of Latvia, thus facilitating strategical focus of the university according to development goals of the state.

Overall, RTU management can be divided into three levels: university level, administration level and faculty level.

At the University level, there is the Constitutional Assembly (200 representatives – 120 academic personnel representatives (60% of the total number), 40 student representatives (20% of the total number) and 40 general staff representatives (20% of the total number). The Assembly includes all 35 members of the RTU Senate, the other 165 members are elected by the central administration, faculties, and institutes that are not part of the faculties, study and science centres and the students' self-government in the amount to ensure proportional representation. The conditions for the formation of the Assembly are defined in Part II of the RTU Constitution – see the file of Annex 01 of the list of Internal regulations).

There are 35 senators in the Senate, of which 27 are representatives of the academic staff (not less than 75% of the representatives, including at least 14 professors or associate professors – not less than 50% of the total number of senators), seven students (not less than 20% of the total number of senators) and the Rector is a member of the Senate in accordance with the position. The conditions for the election of the representatives of the Senate are defined in the attached Article 7 of the Regulation of the Senate of RTU – see the file of Annex 02 of the list of Internal regulations).

RTU Scientific Council, which consists of Deputy Deans in for research, Vice-Rector for Research, Deputy Vice-Rector for Research; and representatives of doctoral students; the Rector, Vice-Rector for Academic Affairs, Vice- Rector for Strategic Development, Vice-Rector for Finance, and the Chair of the Senate also have the rights of membership of the Council.

At the level of administration, the operational management of the university is exercised by the Rector, whereas the Board of the Rector plays an advisory role in the adoption of such decisions, with the participation of the Rector, Chair of the Senate, Vice-Rectors, Administrative Director, Deputy Rector for Digital Transformation, Deputy Rector for International Academic Cooperation and Studies, Director of the Legal Department, Director of Infrastructure Development Department, President of the Student Parliament; the Deans Council comprising the Rector, Deans, directors of studies and research centres, Director of Riga Business School, Chair of the Senate, Vice-Rectors, Deputy Rector for International Academic Cooperation and Studies, Director of Infrastructure Development Department, President of the Student Parliament; operational management meetings uniting the Rector, Administrative Director, Deputy Vice-Rector for Research in Scientific Work, the heads of administrative departments (department directors, unit managers). At the faculty level, the highest decision-making bodies are faculty councils whose composition depends on the size of the faculty.

External partners and stakeholders are involved in the University management through the RTU Advisory Board (27 members). It provides an opportunity to receive independent opinion on important issues and possible solutions from various perspectives. Each faculty also has its own Advisory Board, which provides its own vision for improving the supply of study programmes in line with sectoral needs and market trends.

Each faculty also has its own student self-government, while RTU Student Parliament coordinates faculty student self-governments. Students are represented in all RTU decision-making bodies and can therefore participate in the University strategic decision-making.

The Rector, Vice-Rector for Research, Vice-Rector for Academic Affairs, Vice-Rector for Finance and Vice-Rector for Strategic Development are the senior officials of RTU. The Rector implements the general administrative management of RTU and represents RTU without a specific mandate. The

Rector is elected by the Constitutional Assembly for a period of five years for no more than two consecutive terms for the same person. The Rector is elected, approved in office and removed from office pursuant to the regulatory enactments governing higher education institutions.

The operational management of RTU is exercised independently, in accordance with the delegation of the Rector, by the Vice-Rector for Research, Vice-Rector for Academic Affairs, Vice-Rector for Strategic Development and Vice-Rector for Finance. The Senate elects the Vice-Rector for Research, Vice- Rector for Academic Affairs, Vice-Rector for Strategic Development and Vice-Rector for Finance based on the recommendation of the Rector for the term of office of the Rector. The Rector may also delegate certain functions to other RTU officials and, on the basis of the Rector's proposal; other Vice-Rector positions may be created by a Senate decision.

The Vice-Rector for Research supervises and is responsible for Doctoral study programmes and research work, including support to young researchers, research infrastructure, research funding, applied research, intellectual property protection, RTU scientific publications and scientific conferences. The Vice-Rector for Academic Affairs supervises and is responsible for the study process at the Bachelor, Master, first and second-level professional study programmes, further education, including training programs, security and quality assurance in studies, credit points, determination of academic staff positions and workload, as well as the selection and admission of students. The Vice-Rector for Strategic Development is responsible for the development strategy and its successful implementation, supervises the implementation of projects important for the development of RTU, and represents the interests of RTU in interaction with public authorities, partners and the public. The Vice-Rector for Finance is responsible for the financial management processes of RTU and for allocating and planning financial resources to ensure the functioning of RTU and implementation of the development strategy.

The accounting, study administration, science administration and human resources administration at the university are centralized. Other administrative processes, such as procurement and project management, are centralized to the extent necessary to avoid institutional risks. At the same time, a decentralized management system has been provided at a high level at RTU, with a certain degree of autonomy for each academic unit. This means they have their own budget and self-governing structure, which allows defining and meeting the objectives of the organizational unit. This approach motivates the heads of departments to be proactive, to plan the development of the unit, and to apply for funding.

RTU governance structure information is published at
https://www.rtu.lv/en/university/structure-and-administration.

1.3. Description of the mechanism for the implementation of the quality policy and the procedures for the assurance of the quality of higher education. Description of the stakeholders involved in the development and improvement of the quality assurance system and their role in these processes.

The RTU has established an internal quality management system that respects the standards of Part 1 of the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG).

RTU internal quality management system works in line with the “Excellence approach” (approved on 30 January 2017 at the meeting of the RTU Senate, Minutes No 606), as well as the “RTU Quality

Policy" (approved by the Senate on 25 September 2017, Minutes No 612).

The Quality Policy is focused on the implementation of the RTU mission and the achievement of the strategic objectives. The Quality Policy lays out the framework and pathways for development and improvements of the RTU Strategy, research, study process and organization. The University Quality Policy is aligned with the European Association for Quality Assurance in Higher Education (ENQA) standards and guidelines. The RTU Excellence Approach and quality policy are mutually integrated documents which require RTU to use the quality model of the European Foundation for Quality Management (EFQM).

The EFQM quality model assumes cooperation with student representatives, partners, professional associations, student organizations, other higher education institutions, businesses and organizations. RTU maintains an open dialogue to explore the needs of the parties involved and to respond appropriately by developing feedback to day-to-day and long-term cooperation.

By establishing links with the parties involved, the administration of RTU contributes to the development of excellence and ensures the clarity, unity, building of the work environment and diversity management of the objectives to be achieved.

RTU staff participates in quality assurance by providing suggestions and feedback to improve the RTU quality system. The heads of the RTU departments are responsible for carrying out internal quality assurance procedures and processes in their departments.

Based on the results of regular student and graduate surveys, improvements in the quality of the study process are being planned.

Cooperation with partners, suppliers and other stakeholders takes place in accordance with the RTU Strategy, establishing appropriate cooperation networks and identifying appropriate policies, activities and processes for effective cooperation aimed at ensuring the quality of the RTU and acquisition of feedback. To ensure the topicality and continuous development of existing study programmes and before the introduction of new study programmes the interests of all stakeholders in modern and interdisciplinary technology education are considered.

External stakeholders (public authorities, cooperation partners, representatives of the public) assess the study process and its results in State Examinations, practical placements (internships) and accreditation, and contribute to improving the content and quality of study programmes.

More on this point is set out in Section 2.1.1.

RTU Excellence Approach is published at https://www.rtu.lv/en/university/strategy/rtu-excellence-approach.

RTU Quality Policy in Latvian is published at https://www.rtu.lv/lv/universitate/dokumenti/kvalitates-politika (The English translation is in the file of Appendix 03 of the List Internal regulations).

1.4. Fill in the table on the compliance of the internal quality assurance system of the higher education institution/ college with the provisions of Section 5, Paragraph 2(1) of the Law on Higher Education Institutions by providing a justification for the given statement. In addition, it is also possible to refer to the respective chapter of the Self-Assessment Report, where the provided information serves as justification.

1.	The higher education institution/ college has established a policy and procedures for assuring the quality of higher education.	In line with the quality model introduced by RTU, process analysis and improvement are ongoing. Performance indicators and the results of the assessment of various surveys are analysed. The quality report data are compiled after the end of the academic year. Annual agreements on the target study process performance indicators are signed with the faculties; the quality is assessed by analysing the achievement of the defined objectives relative to the plan. For more details, see the 5th row of this table.
2.	A mechanism for the creation and internal approval of the study programmes of the higher education institution/ college, as well as the supervision of their performance and periodic inspection thereof, has been developed.	The development of study programmes takes place in accordance with the "Procedure for the application, elaboration and amendment of the study programmes" (approved at the Meeting of RTU Senate on 26 April 2021, Minutes No 649). The departments and institutes implementing the study process, Faculty Councils, the Office of Vice-Rector for Academic Affairs, the Student Parliament and the Senate are involved in ensuring the internal study quality of RTU. These institutions carry out comprehensive assessment of the new study fields and study programmes, the changes to the study fields and programs and the annual reports of the improvement of the study fields. At RTU, the operation of the internal quality assurance mechanism takes place at the level of the Rectorate, faculties, study fields and study programmes. At the level of the Rectorate, the internal study quality control of RTU is carried out by the Office of Vice-Rector for Academic Affairs. The Study Department performs: (1) the maintenance and control of the Study Programme Register, which involves control of the conformity of the study curriculum to the aims, tasks and learning outcomes of the study programme, as well as the control of changes; (2) maintenance and control of the Study Course Register, which involves control of the conformity of study course descriptions with the learning outcomes, as well as quality control of study course descriptions; (3) periodical student polling at the University level.

3.	The criteria, conditions, and procedures for the evaluation of students' results, which enable reassurance of the achievement of the intended learning outcomes, have been developed and made public.	The evaluation of learning outcomes takes place in accordance with the "Regulation on the Assessment of Learning Outcomes" (approved at the Meeting of RTU Senate on 29 May 2017, Minutes No 610) and "Regulation on Final Examinations at RTU" (approved at the Meeting of RTU Senate on 26 April 2021, Minutes No 649). Regulation on the Assessment of Learning Outcomes states that the process of evaluating study results includes formative and summative evaluation and regulates summative assessment for evaluation of the achieved study results in RTU study courses. This regulation determines the procedure for summative evaluation of study results achieved in RTU study courses. Regulation defines different types of assessments, rating scales, assessment planning and procedure, determination of the final rating, procedures for appeals, academic debt settling and how to improve academic performance. The procedure for evaluating the study results achieved at the end of the study programme are determined by the Regulations on Final Examinations, which regulates the procedure for organization and conduct of final examinations, general requirements for study graduation papers, final theses (graduation papers), as well as the procedure of development and presentation of study final theses graduation papers. Detailed requirements for study graduation papers final theses, methodological guidelines for development of study graduation papers final theses and the procedure of presentation, pursuant to the present Regulations, is developed by the unit in charge for the implementation of the relevant study program and approved by the relevant Faculty Council. This Regulations apply to studies of all types and levels, except for Doctoral studies.

4.	Internal procedures and mechanisms for assuring the qualifications of the academic staff and the work quality have been developed.	In order to ensure the qualification and performance quality of academic staff, professional advancement needs are regularly assessed when evaluating the results. Professional advancement training modules are developed by collecting information from: (1) academic staff surveys on professional advancement needs once in two years; (2) analysis of student polling results; (3) cooperation with student self-governments; (4) world trends and good practices of other Latvian universities in the field of professional advancement of academic staff; (5) information provided by academic staff on professional advancement topics of interest; (6) proposals from the heads of academic units for professional advancement of academic staff. The Centre for Academic Excellence (CAE), a teaching and learning centre, was set up at the end of 2018; its aim is to develop a strategy for the professional advancement of academic staff, including in line with Article 16 of Cabinet Regulations No. 569. Other tasks of CAE are detailed in Section 3.5. Academic units organize regular or one-time professional advancement activities having assessed the need for professional training of academic staff. The units assess whether it is more appropriate to participate in a particular event for certain representatives of academic staff, all members of the unit or to invite also members from other units.

5.	The higher education institution/ college ensures the collection and analysis of the information on the study achievements of the students, employment of the graduates, satisfaction of the students with the study programme, efficiency of the work of the academic staff, the study funds available, and the disbursements thereof, as well as the key performance indicators of the higher education institution/ college.	Student expectations and satisfaction with the curriculum and study process are identified in sequential and planned surveys at all stages of study. Student surveys are organized in accordance with the Regulations on “Student Polling for Assessment of the Study Process” (approved by the resolution of RTU Vice-Rector for Academic Affairs No 02000-1.1-e/8 as of 1 February 2021). The aim of polling is to clarify the adaptation of first year students to the university system and the satisfaction of all students with the study process, lectures, and practical classes after each semester, the satisfaction of students with the services offered by the University, and the overall satisfaction of graduates with the study programme. The results of the surveys are available to academic staff, heads of organizational units and students in a summarized form. The survey results also directly summarize the effectiveness of academic staff's work, as students also have the opportunity to add their comments to surveys on teaching staff's work abilities and professionalism. The analysis of student success information is the responsibility of the specific unit implementing the study programme. Information regarding the success of students within the scope of study courses and the weighted average mark in general shall be available in the RTU Study Management system. Annually, the State Revenue Service provides information on employment of RTU graduates. The Total Quality Management System of RTU analyses performance results of the study process, comparing the characteristics of the study programmes, including the resulting performance indicators related to the study process in the overall EFQM quality model of RTU. At the beginning of September of each year, a faculty Activity Plan on study process indicators is drawn up: (1) number of students; (2) number of graduates; (3) number of graduates who complete their studies on time; (4) number of students expelled from University; (5) number of foreign students; (6) average age of elected academic staff; (7) number of study programmes implemented in English; (8) average indicator of the evaluation of faculty academic staff; (9) number of persons with a scientific degree elected to academic positions (%); (10) number of foreign guest lecturers. The established Faculty Study Activity Plans for the following year are drawn up by Faculty Deans, together with Deputy Deans for Academic Affairs and institute directors; they are approved by the Rector of RTU. RTU administration meets with representatives of faculties to evaluate the faculty activity plans on study process indicators, evaluating the progress in the previous academic year and defining the indicators to be achieved in the next two academic years. These indicators are used to monitor study process performance of the faculty. These indicators and other aspects influence the amount of performance-based funding allocated to the faculty and contribute to the achievement of the objectives set forward in the RTU Strategy. The study process funds are administered in accordance with methodologies approved by the Senate or as stipulated by the Vice-Rector for Finance. Principles of the methodologies motivate the heads of departments to be proactive, to plan the development of the unit, and to apply for funding. These methodologies are described in more detail in section 2.3.1. of the self-assessment report.

6.	The higher education institution/ college shall ensure continuous improvement, development, and efficient performance of the study field whilst implementing their quality assurance systems.	At the level of the faculty and study field, internal quality is ensured by the Faculty Council, the Study field Committee and Directors of the study field, Directors of the study programmes, administration of the institutes and chairs implementing study programmes. Within the framework of the study programme, internal quality is ensured by the program director and by the academic staff implementing the program. Internal quality control at the level of the study programme is carried out by the administration of the relevant institute or chair. In order to ensure continuous development of the study programmes, RTU Study field Committees monitor academic activities in the relevant study field and are responsible for the curriculum and quality of the study programmes within the study field, including the accreditation of the study field. Inclusion of employer representatives in the Study field Committee is a mandatory requirement. Study field Committee acts in accordance with the “Regulation of the Study field Committee” (approved by the Resolution of RTU Senate Meeting on 26 April 2021, Minutes No 649). The basic tasks of the Study field Committee are: (1) to analyse the situation in the labour market and make suggestions for the development of new study programmes as well as for the closure of the outdated study programmes; (2) to carry out expert assessment of the curriculum and quality of the study programmes, assess their compliance with the defined objectives and compliance with the research area represented and labour market requirements; (3) to organize and monitor the accreditation of the study field and the licensing of study programmes; (4) to analyse the assessment and recommendations made by external experts and organize elimination of identified shortcomings; (5) to carry out an analysis of the study field self-assessment report as well as the annual reports on study field development activities; (6) in order to achieve strategic objectives of the University, to assess the proposed changes to study programmes with a view to increasing the quality of all study programmes included in the study fields; (7) to analyse the results of student, graduate and employee surveys and organize elimination of identified shortcomings, as well as organize additional surveys.

2.1. Management of the Study Field

2.1.1. Aims of the study field and their compliance with the scope of activities of the higher education institution/ college, the strategic development fields, as well as the development needs of the society and the national economy. The assessment of the interrelation of the study field and the study programmes included in it.

The study field “Chemistry, Chemical Technologies and Biotechnology” includes five study programmes: academic bachelor study programmes “Chemistry and Chemical Technology”, “Biotechnology and Bioengineering”, academic master study programme “Chemistry and Chemical Technology”, second level professional higher education study programme “Industrial Pharmacy” and doctoral study programme “Chemistry, Materials Science and Engineering”. The aim of the study field is to provide the Latvian economy with comprehensively trained specialists in chemistry, chemical technology, biotechnology, pharmacy, and materials science to be able to work at various public and private sector institutions, as well as to promote graduates entering the labor market

and stimulate business or research, engaging in job creation and maintenance. The goals of the study field are clearly defined and achievable. The study field and the corresponding study programmes correspond to the strategic development areas of the university, the needs and development tendencies of the society, and the national economy. The management structure of the study field and the corresponding study programmes is oriented toward the development of the study field. Decision-making process is efficient, and the support provided by the administrative and technical staff ensures all the needs of the study programmes corresponding to the study field. Being aware of the role of RTU in shaping the future of Latvia and the growth of the Baltic Sea region, the priorities of the European Union and the guidelines of the sector regulatory directives, as well as national and regional level education and innovation policy planning documents have been observed in the development of the study programmes.

The strategy of the study field is to promote the mutual coordination of the study programmes to be implemented within the field, emphasizing the orientation towards the jointly achieved result — quality education in the fields of chemistry, materials science, and technologies. The long-term plans of the study field include working on the development of joint international study programmes and modules and attracting foreign students and lecturers.

The study field combines academic and professional study programmes, which provide an opportunity to acquire theoretical and practical knowledge, skills and competencies in the fields of natural sciences and engineering, chemistry and chemical technologies and other related fields. This provides an understanding of the interplay between technical, social, and economic factors in building a sustainable industry. These principles are in line with the long-term interests of the Republic of Latvia and the strategic guidelines of RTU.

The activities of the study field promote the implementation of the keynote of the Strategy of Riga Technical University for 2021 – 2025: High quality and efficiency – proactive integration of RTU activities with the needs of the national economy. RTU is one of the leading universities of science and technology in the Baltics and Nordic Region that adopts the education system based on research, innovation and cooperation with the industry as the foundation of its activities. RTU educates and trains engineers competitive on the European and global scale – leaders, developers of new technologies.

All study programmes in the study field have been developed during the reporting period and are mainly implemented by two faculties of RTU - the Faculty of Material Science and Applied Chemistry (FMSAC) and the Faculty of Civil Engineering (FCE) in cooperation with the University of Latvia (UL) and Riga Stradiņš University. The core of the study field consists of chemistry and chemical technology study programmes at all three levels of education — the academic bachelor study programme "Chemistry and Chemical Technology", the academic master study programme "Chemistry and Chemical Technology" and the interdisciplinary academic doctoral study programme "Chemistry, Materials Science and Engineering". These study programmes provide graduates with a set of knowledge and competencies in the basic fields of chemistry and chemical technology at all levels of education. The study programmes are based on the previous RTU FMSAC study programmes — academic bachelor study programmes "Chemistry" and "Chemical Technology", academic master study programmes "Applied Chemistry" and "Chemical Technology", academic doctoral study programmes "Chemistry", "Chemical Technology" and "Materials Science", reviewing their content and compliance with modern requirements, and consolidating academic and infrastructural resources.

The study field also includes two joint study programmes implemented jointly with other Latvian universities. One of them is the academic bachelor study programme "Biotechnology and Bioengineering", which is joint with the University of Latvia. This study programme is one of the

areas of smart specialization in Latvia "Biomedicine, Medical Technologies, Biopharmaceuticals and Biotechnology". RTU academic bachelor or master study programmes "Chemistry and Chemical Technology" and UL academic bachelor and master study programmes "Biology" cover the aspect of biotechnology only as a small part of one of the specializations.

The second study programme is the second level professional higher education study programme "Industrial Pharmacy", which is joint with Riga Stradiņš University. The study programme “Industrial Pharmacy” synergistically complements the specialization area “Chemistry and Technology of Biologically Active Compounds” implemented by RTU. The development of pharmaceuticals includes the development of medicines and the production of substances, which are mainly covered within the study programme “Chemistry and Chemical Technology”, as well as their pharmacological research, GMP documentation and market introduction, which are studied in depth within the study programme “Industrial Pharmacy”.

The study programmes are unique for the Latvian education market, as they are the only study programmes that educate and train engineering specialists in chemistry and its sub-fields.

The aim of the **academic bachelor study programme "Chemistry and Chemical Technology"** is to provide graduates of the study programme with the necessary basic knowledge and skills to work at chemical companies or laboratories. Graduates of the study programme are able to ensure the course of chemical processes and product acquisition, know and manage chemical technology processes and equipment, are aware of the risks of chemical processes to the environment and people, and are able to provide protection measures within industry or laboratory, know quality control methods, and are able to use industry equipment. The study programme not only provides an insight into the basic issues of chemistry and chemical technology but also offers specialization in one of its subfields. As a result, the graduate of the study programme is a highly qualified employee in the chosen field and can successfully start a professional career, quickly integrating into the production and laboratory processes. In Latvia, chemical production is developing rapidly in various areas and is mainly focused on the development of innovative products. There is a growing demand for well-trained specialists who are able to apply skills in several fields of chemistry in their work. No other higher education institution in Latvia offers the opportunity to study chemical technology and its relation to the basic fields of chemistry. Tallinn University of Technology implements the study programme "Environmental, Energy and Chemical Technologies". This study programme covers a wider range of areas and is more focused on the training of engineering personnel. Kaunas University of Technology has a similar study program, but they do not provide such in-depth theoretical education in the chosen specialization.

The academic bachelor study programme "Biotechnology and Bioengineering" is the first joint RTU study programme with the UL, which combines natural sciences with engineering sciences. The study programme was established in 2020 and the first 25 students started their studies in the autumn of 2020. The aim of the study programme is to prepare highly qualified specialists and scientists who can compete in both the local and international labour market in various fields of biotechnology and bioengineering. Students are provided with the opportunity to acquire basic theoretical and practical study courses in biology, mathematics, physics, and chemistry. Graduates will also gain knowledge in specialized fields, such as molecular biology, analysis of biological data, bioreactors and their principles of operation, cell culture. To ensure the quality of the study programme, common quality principles have been established in the study programme implemented jointly with partner universities, regular quality monitoring, mutual exchange of information between lecturers, student questionnaires and regular meetings with study programme managers at RTU and UL. If compared to similar study programmes at the University of Tartu and Vytautas Magnus University, the specialization in the UL / RTU study programme takes place simultaneously in biotechnology and bioengineering. In the study

programme of the University of Tartu, one of the specialization directions must be chosen, moreover, bioengineering and biotechnology have their own specialization direction. In the study programme of Vytautas Magnus University, specialization takes place mainly in the field of biotechnology.

The second level professional higher education study programme “Industrial Pharmacy” is unique in Latvia. No other Latvian higher education institution offers any programme where one can acquire the skills and competencies necessary for an industrial pharmacist. The study programme aim is to prepare personnel who know and understand the production issues of biologically active substances and can prepare the required documentation for the quality control and distribution of pharmaceutical preparations for Latvian and foreign pharmaceutical companies. In addition, graduates are able to analyse the latest scientific research in the field and apply it to the development of innovation, know the basic stages of pharmaceutical production, and have the skills to prepare the necessary documentation and experiments to incorporate biologically active substances into acceptable forms. As a result of these studies, specialists with the required skills are trained at all stages of the development, production and circulation of biologically active compounds. Similar study programmes are implemented at foreign universities, such as Leiden University, University of Otago, etc. Lithuanian and Estonian universities offer various issues related to pharmaceutical care, such as the Lithuanian University of Health Science "Pharmacy" and the University of Tartu "Clinical Pharmacy", but neither of them gives the industrial pharmacist the competencies specifically required.

The aim of **the academic master study programme "Chemistry and Chemical Technology"** is to provide the Latvian economy with competitive, technologically competent, knowledge-oriented and highly qualified leading employees with academic education in the following sub-sectors: Production Technology and Environmental Aspects, Biomaterials Chemistry and Technology, Chemistry and Technology of Inorganic Materials, Chemistry and Technology of Biologically Active Compounds, Chemistry and Technology of Polymer Materials, Sustainable Chemistry. The study programme also aims to develop students’ research skills for pursuing doctoral studies. The study programme provides an opportunity to comprehensively acquire one of the specializations, gaining detailed knowledge and competencies in its current issues, or to acquire the topics of two specializations, if it is necessary to raise the student's professional level. As a result, the graduate of the study programme is prepared to take a leading position at a chemical manufacturing company, taking responsibility for the management of production and laboratory processes. No other higher education institution in Latvia offers the opportunity to acquire knowledge in such a wide range of chemical technologies and their relation to the aspects of chemical production management and the most important skills in the development of innovative products. Tallinn University of Technology implements the study programme "Environmental Protection and Chemical Technology". This study programme focuses on the organization of production processes with an emphasis on environmental issues. Kaunas University of Technology implements a number of Master’s study programmes related to chemical technology - "Environmental Engineering", "Chemical Engineering", "Industrial Biotechnology", "Food Technology and Innovation", but they do not provide an opportunity to expand students’ knowledge in the related field of the chosen specialization.

The academic doctoral study programme “Chemistry, Materials Science and Engineering” is unique, and no other higher education institution in Latvia offers a similar study programme. The main unique difference between the study programme is its interdisciplinarity in the fields of chemistry, materials science and engineering. The aim of the study programme is to educate and train highly-qualified research and science management specialists who are innovative and competent in the modern trends of both natural sciences and engineering, and who will be

employed at the Latvian and international research institutions or industrial R&D centers. The most important emphasis is on the ability of graduates to carry out research work, the ability to analyse and follow the latest trends in the chosen field, the ability to define and explain their research results in the context of the latest scientific achievements and apply their research results in the development of innovations. In terms of content and structure, Tallinn University of Technology implements the study programme “Chemical and Materials Technology”, but it does not include aspects of the natural sciences and chemistry and does not provide interdisciplinary education. There are no similar study programmes at Vilnius University and Kaunas University of Technology.

For more detailed information on each of the study programmes, see Section 3.

2.1.2. SWOT analysis of the study field with regard to the set aims by providing explanations on how the higher education institution/ college expects to eliminate/ improve weaknesses, prevent threats, and avail themselves of the given opportunities, etc. The assessment of the plan for the development of the study field for the next six years and the procedure of the elaboration thereof. In case there is no development plan elaborated or the aims/ objectives are set for a shorter period of time, information on the elaboration of the plan for the development of the study field for the next assessment period shall be provided.

For the provision of the quality of the study field, the annual report of improvement of the study field was prepared and assessed by an expert assigned by the Vice-Rector for Academic Affairs. The report was approved by the RTU Senate. SWOT analysis was an indispensable part of the report on improvement and it allows demonstrating achievement and identifying problems in a concise manner. This was an important tool for achieving the goals of the study field. The SWOT analysis of the study field is presented below.

Strengths	
Human resources	• Highly qualified academic and scientific staff; • Open environment for professional growth; • Involvement of the Faculty Advisory Board and associations in the process of study programmes development and accreditation.
Study curriculum	• Unique science-based study programs in chemistry and chemical technology in Latvia; • Interaction of the study fields “Chemistry, Chemical Technologies and Biotechnology” and “Physics, Materials Science, Mathematics and Statistics” in the bachelor and master education cycles have led to the development of a unified doctoral study programme “Chemistry, Materials Science and Engineering”; • High quality and unique doctoral study programme; • Consolidation of study programmes; • The curricula of new study programmes are also drawn up in English.

Study process and results	• Traditionally strong areas of scientific research that are actively integrated into the study process; • In the last decade, intersectoral cooperation developed intensively, which resulted in the development of new and modern research fields and study programmes; • The acquired education and knowledge make it easy for graduates to find work in the industry, especially in the polymer and pharmaceutical industries; • Ability to provide the potential workforce to several leading Latvian research institutes; • The development of the industry conditions a high potential for demand for specialists in the future; • The performed lecture digitization process.

Weaknesses	
Human resources	• Lack of an incentive system for instructors to work with foreign students. • Renewal of academic staff
Study curriculum	• Considering the population decrease in the country and, consequently, the decrease in the number of students, it is necessary to continue optimizing the study programmes.
Study process and results	• Unforeseeable government policy in the field of education funding; • Improvement of auditorium equipment for digitization of practical classes, such as installation of permanent equipment in classrooms to ensure the distance learning process; • Objective restrictions on the possibilities of digitization of laboratory works, because not all materials can be digitized; • Academic work covers a small part of the salary compared to the part that is provided by participating in research projects; as a result, there are motivation risks for involvement in the study process.

Opportunities	
Local applicants	• Due to high quality of studies, graduates have an opportunity to find a job in the industry very easily; • Attracting students in cooperation with the secondary schools as part of the students' research work and the Latvian Chemistry Olympiad movement; • An initiative to teach 12th grade pupils for the advanced class “Chemistry II” by the faculty teachers; • Cooperation with the industry in improving the study content; • Cooperation with foreign universities within the framework of Erasmus and EUt + programmes.

Foreign applicants	• Using the Erasmus programme to exchange and attract students; • Foreign students' growing interest in bachelor, master and doctoral study programmes; • Providing study programs to foreign students in English; • Attracting foreign students is a possible solution to compensate for the decline in the number of local students.
Continuing education	• Opportunity to earn additional income.
Graduates	• Maintaining contact with graduates, thus attracting academic staff from abroad.
External environment	• In Latvia, the study programs implemented by RTU are the only programs that provide higher education in chemical technology, materials science, and, in collaboration with other universities, in biotechnology and industrial pharmacy. • Unique scientifically driven study programmes in chemistry and chemical technology in Latvia; • Opportunity to attract students, especially foreign students by offering lower tuition fees.

Threats	
Local applicants	• Decrease in the number of students due to the demographic gap; • Low level of competence of high school graduates in STEM subjects; lack of compulsory secondary school examinations in STEM subjects; • Insufficient number of graduates holding a Master's degree; • The attraction of students is threatened by the relatively low level of salary in the industry, especially for young specialists; • The level of training at the bachelor study programmes is high enough to be able to find a job in a field that does not motivate to continue studying for a master degree; • Doctoral studies are chosen to work abroad.
Foreign applicants	• Legislative restrictions on training foreign students in the same groups as local students, while maintaining a parallel group for a small number of foreign students is not financially viable; • Relatively low recognition of the Latvian state in the international education arena.
Continuing education	• Insufficient number of academic staff members for the development of special training courses; • The specifics of the industry means that employees learn by working, thus not creating the demand for knowledge improvement outside the company; • Difficulties in developing training courses, offering additional knowledge for the specifics of each company.

External environment	• Cooperation with some countries is limited by geopolitical factors; • Lack of students in other countries also hinders international cooperation and exchange opportunities; • Competition in the Baltics for opportunities to attract students at the international level; • Students do not continue their master studies at the faculty, but apply for master study programmes at other universities; • Applicants choose other study programmes at other universities, where a bachelor degree can be obtained in 3 years.

The aims of the study field are coordinated with the FMSAC strategy, which follows the unified RTU Strategy. Given the importance of the industry in the national economy and the diversity of production, as well as the rapid development of the chemical industry, study programs in the field of chemical technology must be continuously improved and updated. The development plan of the study field is closely related to the development of innovative technologies and products in Latvia, the European Union, and the world.

See the Study Field Development Plan of the in Annex.

The development plan has been developed in accordance with the RTU Strategy, which adheres to the goals of national and international development plans, for example, the UN Sustainable Development Goals. The development plan of the study field has been developed in compliance with the guidelines of international educational and professional organizations and coordinated by the FMSAC Advisory Board. Educational institutions and student representatives have been consulted during the development of the plan.

To prevent weaknesses issues of relevance to students and staff are addressed in the study field as a whole and in each study programme separately, according to the topicality and the objectives set. Regular exchanges of experience take place. For example, by clarifying the defined minimum requirements for entry to the programmes of the study field, as well as by setting up the School of Engineering. The RTU Offices of the Vice-Rector for Science and Development carries out regular activities to address gaps in the research and study process.

RTU's competitiveness in Latvia and beyond is being enhanced **to avoid the identified threats**. In order to avoid a decrease in the number of students, the study programme plan is regularly optimised, as well as study courses are updated and improved with the latest developments in the global and local industry. Involvement of young faculty members in international academic and research projects.

To take advantage of the opportunities identified all activities of the study field are organised to strengthen the reputation of the study programmes and to build cooperation with organisations and universities in other countries. The involvement of students and staff in mobility projects, as well as the development of new cooperation contacts, provides opportunities for new research projects and exchanges of experience.

The development perspectives of the study field are related to the provision of high quality, prestigious, internationally recognized study programs that teach to critically perceive and creatively process information, think analytically, develop engineering skills and self-educate throughout the life, training competitive specialists for the international labor market. The study process of the study field relates to scientific research in the field. The development perspectives of the study field follow from the significant role of this branch of the national economy in the

development of the Latvian economy. The development of innovative products to boost the economy is growing in demand in both the manufacturing and service sectors. Therefore, the programs of the study field are planned to include studies that promote innovation and research activities in a wide range through the acquisition of synergistic natural sciences and engineering sciences.

2.1.3. The structure of the management of the study field and the relevant study programmes, and the analysis and assessment of the efficiency thereof, including the assessment of the role of the head of the study field and the heads of the study programmes, their responsibilities, and the cooperation with other heads of the study programmes, as well as the assessment of the support by the administrative and technical staff of the higher education institution/ college provided within the study field.

The study field has 5 study programmes in total and they are led by 3 directors of study programmes. The Study field Committee includes directors of all study programmes, leading teaching staff, representatives of employers and a representative of students (see annex “RTU Study Field Management Structure”).

The structure indicates that the Study Direction Committee shall supervise the activities of the Study Direction, performing an examination of the content and quality of implementation of study programmes of the study direction at the end of each academic year, evaluating their conformity with the objectives of the st udy direction, the requirements of the represented science sector and labour market, as well as taking into account the opinion of graduates and students regarding the quality of programmes. The Study Direction Commite initially takes decisions on different types of issues, which are further approved by faculty councils, while further communicating with the Study Department, which prepares Senate projects (on the basis of decisions of both the Study Direction Committee and Faculty Councils) for examination by the Senate Study Quality and Programms Committee, where RTU Vice-Rector for Academic Affairs also participates and engages in discussion for relevatn issues. Once the Senate Study Quality and Programs Committee has reviewed and approved the project's consideration in the Senate, only then does it advance in to the RTU Senate hearing.

Internal quality control at the faculty and at the level of the study field is ensured by the Vice Dean for Academic Affairs. The quality of the study programme is ensured by the Head of the study programme and the academic staff involved in the implementation of the program, whereas the whole process is controlled by the administration of the responsible institute or department. Once in an academic year the abstracts and curriculum of the study programme, the methodological materials, as well as recent study literature and methodological guidelines for study papers (reports, study papers, internship reports and graduation papers) are reviewed. The academic staff and the administration of the study programme participate in various experience exchange activities, cooperating with the higher education establishments in other countries, participating in the meetings with representatives of relevant institutions and entrepreneurs, as well as discuss the current developments in the field, analysing the results of the students' research papers and projects.

The responsibilities and duties of the Head of the study programme are provided in the job description. The most important of them include: management of study programme development, improvement of the curriculum in compliance with the requirements of the scientific fields or the

sectors of the national economy, implementation of quality assurance, supervision of study plan development, promotion of internationalization, cooperation with RTU Study Department providing the input of data in the Information system, as well as the cooperation with other departments of RTU that are involved in the implementation of the study programme. The administration of the Faculty constantly monitors the compliance of the premises and technical equipment with the modern quality requirements, and appropriate classrooms have been created with the necessary multimedia equipment. Support functions for the development and implementation of study programmes are provided by RTU Study Department. RTU Programs Management and Curriculum Design Unit plays an important role supporting the improvement of the study programme.

RTU has established a rigid system for the management and development of study programmes. Proposals to introduce any changes in the curriculum are made by the Study field Committee based on the recommendations of the academic staff, references from employers, suggestions from student self-government, as well as observing the latest trends in the national economy and the labour market. The Study field Committee requests the Faculty Council to review and approve them. Based on the decision of the Faculty Council, the RTU Senate approves changes in the study field. Amendments in the structure of study programmes are approved by the order of RTU Vice Rector for Academic Affairs. Technical support of the study field is provided by the study programme record keeping as well as RTU IT department. Such cooperation in the implementation of the study programmes within the study field is to be evaluated as efficient and stimulating the development of the study field.

The management of the study field and the corresponding study programmes is ensured by the faculty councils, the study field commission, the director of the study field, as well as the directors of each study programme, management and administration of study programme implementation institutes and departments and student self-government.

The study field is implemented by two structural units - the Faculty of Materials Science and Applied Chemistry (FMSAC) and the Faculty of Civil Engineering (FCE). Joint study programmes are implemented together with the University of Latvia and Rīga Stradiņš University. The study field has 5 study programmes in total and they are led by 3 study programme directors.

At the RTU level, the study programs are implemented in cooperation with six FMSAC institutes and the FCE Institute of Water Systems and Biotechnology (IWSB).

Institutes and their departments provide teaching and methodological work: create and update descriptions of study courses, ensure the teaching of appropriate study courses, supervise and defend graduation works, and perform other activities related to teaching, methodological and scientific work. The teaching staff and technical staff of the study field also cooperate with other structural units of RTU, such as the Department of Engineering Mathematics, the Institute of Technical Physics, the Department of Labor and Civil Protection, the Department of Innovation and Business Management, the Department of Social Sciences, the Department of Special Use Languages, etc.

2.1.4. Description and assessment of the requirements and the system for the admission of students by specifying, inter alia, the regulatory framework of the admission procedures and requirements. The assessment of options for the students to have their study period, professional experience, and the previously acquired formal and non-formal education recognised within the study field by providing specific examples of the application of these procedures.

The admission process and procedure of students' matriculation is stipulated in the RTU Admission Regulations, which are elaborated based on the Law on Higher Education Institutions and Cabinet Regulations No. 846 issued 10 Oct 2006 ''Regulations on Requirements, Criteria and Procedures for Enrolment in Study Programmes'', as well as the specific requirements of study programmes and the industry. The RTU Admission Regulations are approved by the RTU Senate and published on November 1 each year (see the files of Appendix 29-35 of the list of Internal regulations).

Admission requirements are logical, understandable, and linked to the goals defined in the RTU Strategy. Admission system is state-of-the-art, easily accessible, logically structured, and is evolving in line with today's digitalization trends, providing the potential students with the convenient and easy to use application to university registration tool.

Applicants are admitted to full-time and part-time undergraduate programmes based on the results of the Centralized Examinations (CE) in Mathematics, the Latvian language and the Foreign Language, and the final grades in individual subjects obtained in the Secondary Education, and the entry test results. If, in addition to these CEs, the applicant has a CE in Physics or Chemistry, the results of these CEs are taken into account in the ranking calculation.

In order to participate in the competition for the state budget funded seats, the rating in Mathematics CE is calculated as the average value of all Mathematics CE rating sections and must be at least 15 percent. An applicant with a CE in mathematics of less than 15 percent may apply only for a tuition fee. Until year 2022 the CE rating minimal value was set at 12 percent.

To determine the candidate's rank in the competition, each CE rating, calculated as an average of all CE evaluation sections, and each entry test (if any applies) is multiplied by the appropriate weighting factor and the resulting multiplications are added together. Some study programme applicants must pass an entry test, the result of which shall be multiplied by an appropriate weighting factor and summed up in the total calculation of rank.

Persons, who have received secondary education prior to 2009 (including), as well as persons, who have received secondary education abroad, or persons, who were exempted from passing the secondary education state examinations in accordance with the procedure set by regulatory enactments, may be admitted to the study programmes based on their year grades in the secondary education document in the subjects mentioned in the RTU Admission Regulations, which must be successfully passed. Up to 2019, the admission based on the secondary education year grades was attributed to persons who completed secondary education prior to 2004. In general, the RTU Admission Regulations follow the Cabinet Regulations No. 846.

Persons who have completed secondary education and have not passed any of the CEs mentioned in the RTU Admission Regulations or have failed the year grade, shall pass the CE in accordance with the Cabinet Regulations No. 335 "Rules on the content and procedure for centralized examinations".

Persons who have not passed CE in Latvian and who do not meet the requirements of RTU Admission Regulations, shall pass the entrance examination in Latvian as prescribed by RTU. The result is evaluated in percentage.

In compliance with Cabinet Regulations No. 543 adopted on 29 September 2015 “Regulations on Replacement of the Foreign Language Centralized Examination in the General Secondary Education Program by Foreign Language Examinations Conducted by International Testing Institutions”, CE in the foreign language can be replaced with a foreign language examination conducted by an international testing institution the certificate of which must be presented to the RTU Admission

Committee.

The applicants who have acquired a bachelor's degree in a field relevant to the study programme are enrolled to the graduate study programmes. The applicants take part in the competition with a weighted average grade from the Bachelor or professional study programme records. The weighted average grade is calculated as the sum of all the grades received in each study course multiplied by the credit points acquired in the study programme and is divided by the total number of credit points within the study programme. If credit points are not verified, the number is calculated as the multiplication of the grades and contact hours obtained in each study course divided by the total number of contact hours.

Before applying for the doctoral studies, the candidate and the Head of the Doctoral Study Programme must agree upon the possible scientific advisor / consultant and receive his/her written consent. The Doctoral Thesis scientific advisor may be from another scientific establishment; however, the applicant must also choose the scientific advisor / consultant from RTU. Every year, the RTU Senate approves the regulations for the admission of doctoral students for the study year, which set deadlines for the submission of admission documents. The applicants for Doctoral study programmes, can submit application for full-time studies by arriving at the Doctoral Studies Unit, bringing the required documents, within the admission deadlines. Documents necessary for the competition are compiled by RTU Doctoral Studies Unit. After the collection of documents, the Doctoral Studies Unit submits them to the Scientific Committee of the respective Faculty, which draws the Ranking table of the applicants according to the evaluation criteria set by the Faculty Scientific Committee and approved by the order of RTU Vice Rector for Research. The Ranking table is submitted to Admission Committee of doctoral students. The Admission Committee is approved by an order of RTU Vice Rector for Research.

Taking into account the spread of Covid-19 and in order to facilitate the admission process of applicants for studies at RTU, starting from the summer of 2020, the admission process was improved.

There are two ways to apply for the state budget funded seats in undergraduate study programmes:

- Electronically in the Joint Enrolment Undergraduate Study Programme information system, using the e-service portal (https://www.latvija.lv). Given the spread of Covid-19, with the summer 2020 admission, secondary school graduates of the 2019/2020 school year can approve the electronic application remotely without arriving in person. If the secondary education was obtained abroad or until 2019/2020 school year, the applicants must confirm their electronic applications by arriving at the designated locations within the deadlines and presenting the originals of the required documents;
- Arriving at the RTU Admission Committee in person, presenting the originals of the required documents.

To apply for the state budget funded seats in the graduate study programmes RTU undergraduate study programme graduates can submit their applications online on RTU portal ORTUS. Taking into account the spread of Covid-19, with the summer 2020 admission, also graduates of other Latvian state-accredited higher education institutions' undergraduate study programmes can submit applications electronically on the RTU website, or by visiting RTU Admission Committee.

Applicants who do not qualify for the state budget funded seats and applicants who have received their education outside Latvia, as well as in other specific cases, must appear in person at the RTU Admission Committee within the admission deadline, with the required documents.

Taking into account the spread of Covid-19 and in order to improve the RTU admission process and

make it easier for applicants to apply for studies at RTU, it is planned to introduce electronic application also for tuition fee studies with the summer of 2021.

Recognition of previously acquired formal and non-formal education at RTU is carried out in accordance with the "Regulation on the Recognition of the "Courses Completed at Other Universities and RTU Study Programmes" (Resolution of RTU Vice-Rector for Academic Affairs No 02000-1.1/29 as of 4 April 2016) and the "Procedure for Recognition of Competencies Developed Outside Formal Education or From Professional Experience and Learning Outcomes Achieved in Previous Education at Riga Technical University" (approved at the Meeting of RTU Senate on 23 September 2019, Minutes No 632) (available at https://international.rtu.lv/wp-content/uploads/sites/65/2021/02/09.-Procedure_for_Recognition_of_Competencies_Developed_Outside_Formal_Education.pdf and in the file of Appendix 09 of the list of Internal regulations).

RTU Admission Regulations are published at https://www.rtu.lv/lv/studijas/uznemsana/uznemsanas-noteikumi (in Latvian) (for local students) and at http://fsd.rtu.lv/ (for foreign and exchange students).

During the reporting period, the study field has reviewed 8 applications regarding recognition of the study outcomes achieved in prior bachelor's level education. Basically, they were study courses of the study programmes acquired at other Latvian universities at the same level of education.

2.1.5. Assessment of the methods and procedures for the evaluation of students' achievements, as well as the principles of their selection and the analysis of the compliance of the evaluation methods and procedures with the aims of the study programmes and the needs of the students.

Assessment of student learning outcomes is carried out in accordance with the "Regulation on the Assessment of Learning Outcomes" (approved at the Meeting of RTU Senate on 27 May 2017, Minutes No 610), which is available on Studies Regulations page of RTU web page (https://www.rtu.lv/writable/public_files/RTU_studiju_rezultatu_vertesanas_nolikums.pdf (in Latvian)); the English translation is in the file of Appendix 04 of the List of Internal regulations). Summative assessment system is used in appraisal of student achievements, it implies that the final grade is composed of numerous components.

In the course descriptions of the study programme there is a set of relevant knowledge, skills and competences and their evaluation system, defined learning outcomes for the achievement of which credit points are awarded.

Pedagogical methods used in the implementation of study courses, as well as assessment forms and methods are selected by the instructors responsible for the study courses in compliance with course curriculum and specifics of the programme, as well as student needs. A member of academic staff should inform students about particular assessment criteria at the fist lecture/practical class.

The main advantage of the summative assessment system is that the final grade is made up of several components. Therefore, the students may contribute to their final grade working during the semester. Criteria for assessment of the study courses and individual/home tasks are published on ORTUS e-study system beforehand. During semester, the assessment for each home task, test, report, presentation and any other task is ascribed a certain weight in the final grade. Exam grade

may not exceed 50% of the final grade. Academic staff may take into consideration and also assess student attendance. Assessment structure for the study course is determined by the academic staff themselves, abiding the resolution of RTU Senate that the exam grade may not contribute more than 50% to the final grade. Selecting assessment criteria and methods for evaluation of student achievements, specifics of each study programme and learning outcomes are taken into consideration. During the creation of new study courses, both their content and assessment methodology are discussed and approved by the study field committee.

In order to advance professional pedagogical competences of the academic staff, courses and seminars on the newest pedagogical methods are organized regularly. Qualification advancement is provided at both the University and faculty level, organizing academic conferences and methodological seminars. The Centre for Academic Excellence has been established and successfully operates at RTU; it organizes various events aimed at professional advancement of academic personnel at the University level.

(In addition, see the description of each study programme.)

2.1.6. Description and assessment of the academic integrity principles, the mechanisms for compliance with these principles, and the way in which the stakeholders are informed. Specify the plagiarism detection tools used by providing examples of the use of these tools and mechanisms.

Since 2010 all students that gradate from any RTU study programme should upload electronic versions of their graduation papers in ORTUS portal in order to improve the quality of graduation papers, create a bibliographic database of the graduation papers and introduce an automated control system for detecting plagiarism. RTU uses two major plagiarism control tools in the study process:

1. Since 2015 graduation papers of study programmes of the study field have been checked in the joint computerised plagiarism control system (JCPCS), which unites numerous Latvian universities and colleges. RTU uses the system in cooperation with the University of Latvia. This system is used to check graduation papers after their uploading to the ORTUS environment. JCPCS complements and extends plagiarism identification opportunities.
2. Starting from 20 December 2017, RTU has been having TurnitIn®, the world's leading tool for the correction of written papers and combating plagiarism that is used daily by millions of students and academics around the world. TurnitIn® tool is integrated with RTU ORTUS e-study system and provides full service of submitting, correcting, verifying the originality (plagiarism) and return of the submitted papers. TurnitIn® offers two main platforms: a platform that automatically checks for the percentage of non-genuine content (plagiarism) and a platform that allows to electronically correct the submitted papers. This tool is used to check all the electronic versions of graduation papers submitted for defence and further control measures are operatively implemented for potential plagiarism detection.

Graduation papers are checked in both systems in parallel, thus using the advantages of both systems. The developed Doctoral Theses are in a similar way controlled with extreme scrutiny. Since 2005, the Code of Ethics of RTU Students, Academic Personnel and Staff has been effective at RTU (see the file of Appendix 19 of the list of Internal regulations). Academic Integrity Code, approved at the RTU Senate meeting of 29 February 2016. The aim of the Academic Integrity Code is to strengthen academic culture and integrity in the academic environment of RTU, to explain the

concept of academic integrity and related actions, to define main procedures in examination of academic fairness violations (in Latvian available at https://www.rtu.lv/writable/public_files/RTU_rtu_studiju_reglaments_7.1.1.4..pdf, English translation is in the file of Appendix 38 of the list of Internal regulations).

There are procedures defined, how the report on the violation of the student's academic integrity is filled, registered, reviewed, and appealed. Informing and educating students about the aspects of academic integrity takes place both within the study courses and in specially organized seminars.

Both students and academic staff have access to the book “Glossary for Academic Integrity” published by RTU publishing house (available at http://www.academicintegrity.eu/wp/glossary/).

In addition, RTU participates in different initiatives that bring forward and solve academic integrity related issues. RTU is a member and one of the founders of the European Network for Academic Integrity (ENAI), where it is involved in active work sharing experience, keeping updated about academic integrity related issues, and organizing conferences. The Dictionary of Academic Integrity Terms and Guidelines is one of the newest aids that has been developed and published by RTU Press. In the framework of Specific Support Objective (SSO) 8.2.3 of the project “Development of Efficient Management of Riga Technical University”, RTU, in cooperation with the University of Latvia (UL) and Rīga Stradiņš University, develops educational aids, as well as participates in the establishment of the Latvian national academic integrity organization and development of plagiarism control tools.

The organisational units implementing the study programme have developed a control mechanism, i.e., the initial check is performed in the process of interim assessment, which is performed by the work of the Advisory Examination Commission. When the student comes to these examinations, he or she should submit the electronic version of the performed work and the paper is checked in free plagiarism control tools in presence of the student. When students draft their graduation papers, they are instructed about plagiarism and its consequences several times. Methodological materials contain detailed instructions on correct presentation of references. This process allows to reduce plagiarism and highlights faults in the student’s paper, which needs to be rectified. The generally accepted “good practices” show that more attention should be paid to the papers showing 20 percent or more matches. A message is received from the system, when the match level is higher than 20%. The papers are examined, reasons of matches in the text are evaluated and a decision is made whether the student should be allowed to defend his or her thesis.

The structural units implementing the study field study programmes have developed the mechanism of control of semester study assignments and graduation assignments based on the regular evaluation of the stages of performance of assignments a minimum of twice a semester. Every student submits and presents the results of the relevant assignment stage, and participates in a discussion with the professors of the relevant study course of the department or the department management and the leading professors of the study courses during the development process of the graduation paper. This allows following up on the progress of the work and seeing any indications of plagiarism in due time.

As the themes of the graduation papers are unique in all the study programmes of the study field, significant text correspondence level has not been revealed just twice. It should be noted that these cases were not related to the plagiarism of the experimental work, but to the literature review.

2.2. Efficiency of the Internal Quality Assurance System

2.2.1. Assessment of the efficiency of the internal quality assurance system within the study field by specifying the measures undertaken to achieve the aims and outcomes of the study programmes and to ensure continuous improvement, development, and efficient performance of the study field and the relevant study programmes.

RTU operates pursuant to “Constitution of Riga Technical University” (approved by the Law “On the Constitution of Riga Technical University”, the law was adopted in the Saeima on 23 October 2014 (see the file of Appendix 01 of the list of Internal regulations).

In order to efficiently control implementation of RTU Strategy, RTU Strategy Management System has been established, which provides that strategic aims, activities and tasks are cascaded to the level of definite organizational units and their staff.

RTU has an internal quality management system in place in accordance with the RTU Quality Policy updated and approved at the meeting of RTU Senate on 25 September 2017, Minutes No 612 (see: RTU Quality Policy) and the RTU Excellence approach approved at the meeting of RTU Senate on 30 January 2017, Minutes No 606 (see: RTU Excellence Approach). Since the study field is one out of 12 study fields implemented by RTU, and its internal quality system is closely related to RTU Quality Management System.

RTU Quality Policy is aimed at implementation of RTU mission and achievement of strategic aims – scientific research, academic, infrastructure and organizational excellence, and recognizability. The Quality Policy provides the framework for implementation of RTU Strategy, and the paths for development and improvement of research, study process and organization. RTU Quality Policy is reconciled with the ENQA standards and guidelines. RTU Excellence Approach and Quality Policy are reciprocally integrated documents, which determine that RTU employs the EFQM quality model.

Starting with December 2018, RTU has been a member of the European Foundation for Quality Management, having joined the global quality cooperation network.

RTU Excellence Approach (see the figure in file "RTU Excellence Approach") has been elaborated in order to promote purposeful development of the University as an excellent organization, and RTU Constitution, Strategy and Quality Policy are integrated therein; it is based on the Standards and Guidelines for Quality Assurance in European Higher Education Area (ESG) developed by the European Association for Quality Assurance in Higher Education and the basic principles of the EFQM Excellence Model.

The structure of RTU Excellence Approach (see the figure in file "Structure of RTU Excellence Approach") is designed in accordance with the criteria of the EFQM Excellence Model and forms the basis for the maintenance of performance at a high level, a prerequisite for its continuous improvement, as well as for achievement of sustainable results of RTU activities and excellence. Student results are a separate criterion, they are also in part transferred to the main activity results; thus, the quality of the study field is closely related to RTU quality management.

To promote introduction of the model of the EFQM total quality management system, as well as to assist in the compilation of a self-assessment report, a working group was established at RTU on 29 September 2017 (Rector’s order No 01000-1.1/225), which comprised representatives of RTU administration, faculties and Student Parliament (18 in total).

Potential problems were identified and suggestions for improvement of RTU Quality Policy, including improvement of academic quality, were made at the meetings of the working group. In the period of one year, the working group considered compliance to nine criteria of the EFQM model and

analysed 101 sub-criteria, having identified 133 problems in total and having made 146 suggestions. The priority problems were included in RTU Development Plan as tasks set for a definite term to be solved by the respective organizational units. Quality model review report is drawn up with regard to the Quality System, which identifies the areas that should be improved. Performance indicators and results of student polling are integrated in RTU Quality System.

Application of RTU Excellence Approach is based on process-oriented activities and includes clear process flow and their interaction. Striving for excellence, RTU actively works on process planning, definition of its aims and interaction analysis. RTU has developed criteria and methods for ensuring efficient process operation and management. RTU conducts the process analysis and provides recommendations and suggestions on process improvement, which are discussed with process managers and persons responsible for process procedures; later they are approved as performable tasks with a definite completion term. Task creation and control tools inbuilt in the Document System, reports on task performance at the organizational unit level provide the necessary support for achievement of performance indicators of the annual aims and tasks set in RTU Strategy. For example, development of the uniform study programme application structure and assessment criteria is one of the tasks for the process “Provision and Organization of Studies” approved in the system with the completion term set until 31 December 2020; they were developed and approbated on the study programmes developed within SSO 8.2.1 project.

Until 2018, the study programs of the field of study were evaluated and the annual improvement report was prepared, which was discussed, evaluated and approved by the Faculty Council and RTU Senate. The preparation of improvement reports is planned to resume with the acquisition of accreditation.

The departments and institutes, faculty councils, the service of the vice-rector for academic affairs, the service of the vice-rector for development, the student parliament and the RTU Senate are involved in ensuring internal quality of studies at RTU. These institutions comprehensively evaluate the study fields and programmes to be newly created, as well as changes to study fields and programmes, evaluate annual self-assessment reports of study fields. The internal quality assurance mechanism of studies at RTU is functioning at the level of administration, faculties, study fields and study programmes of the university.

Study field Committees at RTU supervise academic activities in the respective study field and are responsible for curriculum of the study programmes within the study field, including accreditation of the study field. Members of student self-government are involved in ensuring the quality of the study field and study programmes implemented therein; they actively participate in the work of the decision-making bodies of the University: RTU Constitutional Assembly, RTU Senate, RTU Senate commissions and faculty councils.

The anonymous survey of the students of the study programmes is performed twice a semester regarding the quality of work of professors and assessment of the study programmes. The survey is performed electronically in the portal ORTUS, the results are received by every member of the academic staff in person and by the director of the study programme. The summary of the results is discussed at the department meetings, at the meetings of the heads of structural units of the FMSAC. The survey of graduates is carried out following every graduation, the survey of employers and graduates of preceding years is carried out once in two years. The results are taken into account in the improvement of the study programmes and discussed at the meetings of departments and the institute. At the defence of graduation papers, there are employers’ representatives who express their opinion regarding the quality of knowledge of the graduates and recommend necessary improvements of the study programmes and processes. DTI employees continuously follow up the compliance of the quality requirements of the premises and technical

equipment, there are special classrooms with necessary means of multimedia technology.

Also, members of the self-government of the students of the faculty who are active in the decision making bodies of the higher education institution: the Academic Meeting of RTU, the RTU Senate, the RTU Senate Commissions and the Faculty Councils, are involved in the provision of the quality of the study field and the study programmes implemented therein.

The above-mentioned set of activities ensures the quality of the study process at a high level, which is confirmed by the high assessment of study quality in student and graduate questionnaires, as well as the assessment of employers of graduates of study programs, as well as the increase in the number and quality of scientific publications, in the creation of which students participated.

2.2.2. Analysis and assessment of the system and the procedures for the development and review of the study programmes by providing specific examples of the review of the study programmes, the aims, and regularity, as well as the stakeholders and their responsibilities. If, during the reporting period, new study programmes have been developed within the study field, describe the procedures of their development (including the process of the approval of study programmes).

Study programme development and revision processes are regulated according to the "Procedure for Application, Elaboration and Amendment of the Study Programmes" (published at RTU_studiju_reglaments_4.6._programmu_izstradasanas_kartiba.pdf (in Latvian); the English translation is in the file of Appendix 06 of the Internal regulations), which in detail specify activity sequence and parties involved, starting with drawing up an application for new study programme elaboration and finishing with study programme closure. Procedures are reconciled with the effective national regulatory enactments pertaining to study programme licensing and amendment.

Revision of the study programme curriculum is the responsibility of the Study field Committee. The responsibilities and activities of the committees are regulated by the “Regulation on the Study field Committee” (approved at the RTU Senate on 26 April 2021, Minutes No 649; published at RTU_studiju_reglaments_4.7._studiju_virziena_komisijas_nolikums.pdf, (in Latvian); the English translation is in the file of Appendix 07 of the Internal regulations).

Expert assessment of the study programme is performed by the Study field Committee, then – by the Faculty Council or the councils of several faculties involved. The expert assessment procedure is finalized by the Study Department. The Study field Committee evaluates the quality of the draft study programme and the compliance of its curriculum to the planned aims and tasks.

The establishment and monitoring of the joint programs included in the direction are carried out in accordance with the quality management systems of the participating universities, which are largely based on legislation and are similar in nature.

The need to revise study programs is analyzed based on the results of student and graduate surveys, and proposals of the involved academic staff or structural units, with the aim of improving and updating the structure and content of the program. Such an analysis is carried out at least once a year. Both the bachelor's level programs and the master's program "Chemistry and chemical technology" were created within the framework of the SAM project (reducing the fragmentation of study programs of Riga Technical University and strengthening the sharing of resources, No. 8.2.1.0/18/A/013). This determined the unified principles of creating the programs described in 3.1.1 of each program.

2.2.3. Description of the procedures and/or systems according to which the students are expected to submit complaints and proposals (except for the surveys to be conducted among the students). Specify whether and how the students have access to the information on the possibilities to submit complaints and proposals and how the outcomes of the examination of the complaints and proposals and the improvements of the study field and the relevant study programmes are communicated by providing the respective examples.

In order to promote continuous improvement of the quality of studies and provide students with the opportunity to submit proposals and complaints on various study-related issues in accordance with the ESG, in the reporting period from 2013 to mid-2019, at RTU, the examination of students' recommendations and complaints was carried out; this was done by involving the structural units to which the applications related, as well as the student self-government of the respective faculty.

A new document was approved in 2019 and now students' complaints and proposals are considered in compliance with "Procedure for Submission and Examination of RTU Students' Proposals and Complaints" (published at https://www.rtu.lv/en/university/proposals-and-complaints and attached in the section "Other Annexes").

The procedure stipulate how RTU students can submit suggestions and complaints concerning the study process and other issues, determine the terms for consideration and reply to applications (if the applicant has provided contact details) and prepare a summary of application statistics.

A total of 43 complaints/proposals have been received between September 2021 and May 2022, none of which were submitted anonymously. Of the submissions, 32 were complaints and problems, and 11 were suggestions across six topics (subject: the number of complaints or problems / the number of proposals):

- Study process: 13 / 6
- Maintenance of infrastructure issues: 1 / 0
- Accommodation related: 3 / 0
- Foreign students' questions: 8 / 1
- Information flow: 2 / 0
- IT issues: 9 / 2

Evaluating the submitted complaints about the study process, six of them are related to the unavailability of lecture schedules in the ORTUS e-learning environment, late posting of information on the final work and/or homework, often no links to connect to a specific lecture in a distance learning format. Four of the complaints and problems are related to the constraints of the Covid-19 pandemic. Complaints have been received that teachers do not attend classes or cancel very shortly before they take place. There are several complaints about specific lecturers and their work, about poor-quality lectures and in cases when several lecturers are involved in the implementation of the study course, there is no consistency about the requirements for students; there are no specific criteria for the final works. Complaints have been received that lectures take longer than indicated in the schedule, as well as students' health problems during the study process and final examinations are not considered. It is not clear to young students what to do next after signing the study agreement. Proposals have been received to organize certain study courses only in a remote format, as well as to be more flexible and to respect the free choice to obtain a vaccination certificate. The proposal is to move to a single remote lecture platform, where calendar-scheduled

lectures can be automatically linked to the person's calendar, making it easier to notice changes when they occur. The opportunity to see the recipients of their course scholarships and their success could increase the competition and motivation of other course students.

The economic sector has received a complaint about the lack of heating and hot water in some faculty. Student hostels have several complaints about poor sound insulation and noise from neighbours at night. International students often disregard ethical and cleanliness standards, leaving unpleasant environment for the rest of the residents.

International students have asked for more support in the study process and provision of information in English, as well as to expand the possibilities of psychological support. A frequent complaint is about the length of time required to complete the documents in order to start studies and stay in Latvia. Complaints have been received that the schedule of lectures is often not available and, especially for the autumn semester, it becomes available delayed. Several complaints have been received about the attitude of teachers – they do not give access to course materials, regularly change the dates of exams and tests, do not indicate connection links to lectures, poor quality and indifferent study process, are often inaccessible and do not respond to students' e-mails. There has also been a complaint that Erasmus+ students do not have another European student on their course when they arrive to the university.

Complaints received about the exchange of information are mainly related to the lack of information at all or very late publication. RTU websites have outdated entries and are no longer relevant.

Five IT issues are related to the correction of the calendar study schedule. Complaints have been received that the newly introduced compulsory student e-mails edu.rtu.lv are not working, problems with accessing MS Office services through the ORTUS system. It is also not possible to access the RTU *cloud*, from which the student cannot receive materials for the study course. Suggestions have been made for creating a more convenient electronic scholarship form to make it easier for the user to transfer information with a copy function. The recommendation is to provide students with access to the Stimul8 programme, which could improve the study process.

The management of the study field continuously supervises the study process, always listens to the students' objections and proposals, as well as follows up to ensure that all the issues are resolved. At the beginning and middle of every semester, the directors of the study programme discuss the study process in the students' groups. The students' objections and questions regarding the organisation and content of the studies are clarified. When objections expressed by students in relation to the study process and its organisation are resolved as described above, written complaints are rare.

An example is the changes made in the previous academic bachelor study programme "Chemical Technology" with regard to three study courses – "Organic Chemistry", "Analytical Chemistry" and "Inorganic Chemistry". The results of the survey showed a growing dissatisfaction of students with the study course content and performance of the lecturer, as well as the non-compliance of the laboratory infrastructure with modern requirements. Even before the reorganization of the study programmes, the responsible lecturers for the study courses "Organic Chemistry" and "Analytical Chemistry" were replaced and the content and structure of the study courses were significantly improved during the development of the new study programme. Also, the infrastructure of teaching labs has been significantly improved (full renovation of space and purchase of new equipment). During the approbation of the study programme, the work on the improvement and adaptation of these courses and other study courses to modern requirements is underway.

2.2.4. Provide information on the mechanism for collecting the statistical data, as developed by the higher education institution/ college. Specify the type of data to be collected, the regularity of collection, and the way the information is used to improve the study field. Describe the mechanism for obtaining and providing feedback, including with regard to the work with the students, graduates, and employers.

RTU Quality Policy provides the framework for implementation of the Strategy, the paths for development and improvement of research, study and organization processes. RTU Quality Policy and implementation thereof employ a fact-based approach – decisions are based on the acquired objective data, information analysis and monitoring.

RTU draws up quality reviews based on the analysis of processes and their results. Quality reviews are drawn up once a year, summarizing the data on performance indicators of RTU administration, core activities and support processes.

28 performance indicators characterizing process quality are set for one of the RTU core activity process "Organization and Management of the Study Process". The data are summarized once a year for the previous academic year by study level and study programme.

Performance indicators characterize the quality of entrant enrolment process, study process planning and the quality of implementation of studies - implementation of the initial admission plan, number of matriculated entrants vs. number of entry applications, number of entry applications with RTU as the first priority vs. all matriculated students, number of graduates vs. total number of students, number of exmatriculated students (except for graduates) vs. total number of students, number of students with academic arrears vs. total number of students, number of students exmatriculated due to academic failure vs. total number of exmatriculated students, number of timely signed learning agreements vs. all signed learning agreements, etc.

Observing the current study programme performance, reachable qualitative or quantitative aims are set for the indicators, when possible, e.g., 65 percent of graduates of RTU undergraduate study programmes continue studies at graduate study programmes.

The data in the quality review that is submitted to RTU administration are analysed by study level, by faculty and study field. Indicators of numerous study programmes are compared with the general average RTU level.

The Study Department organizes further review and data forwarding to the faculties and directors of the study programmes, whereas process managers introduce the necessary improvements. Changes to the approved processes occur in cooperation with quality management specialists.

In addition to performance indicators characterizing study process quality, which are summarized in the review, a study programme quality visualization tool has been created in Power BI environment, which will be used to reflect Bachelor and Master study programme performance in an academic year with the help of radar chart. In the chart, study programme results at each study level will be presented comparatively - in relation to the best performance at the respective level. The tool is envisioned for the directors of the study programmes and faculty administration to facilitate collection of transparent information on each study programme performance considering numerous indicators simultaneously, as well as to rank the programme in relation to the best performance. It will be also possible to compare the programme performance in several academic years. The tool is currently at the development and test phase. Performance indicators of 11 study programmes are planned to summarize in the radar chart: academic staff vs. number of students, academic staff

with scientific degree, ratio of graduates to the number of matriculated students, number of students who continue studies (not exmatriculated), proportion of foreign students, number of outbound mobility students, Bachelor programme graduates who continue studies at RTU, number of matriculated students from the respective Bachelor study programmes, average assessment of the study programmes in student polls, number of study materials published on ORTUS e-study system and applicability thereof, as well as financial revenue generated by study programmes per student. Comparative reviews of the study programmes results will be available to directors of all RTU study programmes. It is planned to develop and improve the tool for collection of statistical data necessary for evaluation of the study programme performance and data visualization within the framework of SSO 8.2.3 project.

In addition, RTU Study Department summarizes and annually submits until 15 October to the Central Statistical Bureau and the Ministry of Education and Science a statistical review "Review of the University, College at the Beginning of Academic Year 20_/20_" (Cabinet Regulations No. 812 of 20 December 2016, Appendix 5 (https://likumi.lv/doc.php?id=287576 (in Latvian)). The Review contains the following information (sources of information and/or RTU employees responsible for data collection are indicated in parentheses).

- Distribution of students by study programme (Study Management System| Reports | University Review at the Beginning of the Academic Year).
- Enrolment results (University Review at the Beginning of the Academic Year).
- Students having obtained a degree or qualification in the academic year (University Review at the Beginning of the Academic Year).
- Distribution of enrolled students by age (University Review at the Beginning of the Academic Year).
- Distribution of students by age (University Review at the Beginning of the Academic Year).
- Distribution of students having obtained a degree or qualification by age (University Review at the Beginning of the Academic Year).
- University staff in the reporting year as of 1 October (Administrative Office);
- Premise floor area (the Unit of Legal Provision in Real Estate Issues).
- University revenues in the previous year (Planning and Economic Analysis Unit).
- Budget expenditure of the University in the previous year (Planning and Economic Analysis Unit).
- Number of students, who reside in student hostels (Study Organization Unit).
- Number of students by the language of instruction.
- Distribution of enrolled students by place of residence (University Review at the Beginning of the Academic Year).
- Number of mobility students in the total number of students (University Review at the Beginning of the Academic Year).
- Number of mobility students in the total number of students who have obtained a degree or qualification (University Review at the Beginning of the Academic Year).
- Own revenue from allocation of the mobility student tuition fees by country in the previous year (International Cooperation and Foreign Students Department).
- Revenue from allocation of foreign financial study grants by country in the previous year (Project Financial Management Unit).
- Revenue from allocation of foreign financial study grants for research by country in the previous year (Project Financial Management Unit).

Summarized statistics on the number of students/graduates are used for the following purposes:

- Improvement of the study field. For example, if at some study programme the annual number of student dropouts is much higher than the number of graduates who obtained

degree/qualification, the causes of such a situation are sought for with scrutiny.
- If at some study programme the number of enrolled students decreases annually, the cause should be identified, and potential programme closure should be considered.
- Allocation of financing (for state budget funded seats).
- Compilation of RTU information materials, press, etc.

In order to analyse study fields and receive feedback, RTU has developed a polling cycle:

- When starting studies at RTU, a survey of students is conducted about expectations from studies, availability of information, admission process. The survey is conducted electronically on the portal ORTUS.
- Each semester, the polling of the students at a study programme is conducted to find out student opinion about instructor's work quality and obtain evaluation of the study programme. Polling is conducted electronically in portal ORTUS, the results are received by each instructor personally and the head of the organizational unit. The summary of the results is summarised at department meetings, at the meeting of the Study field Committee and the meeting of the Faculty Council.
- After each graduation round, polling of the graduates of Bachelor and Master programmes is conducted. The results are taken into consideration in the improvement of the study programmes within a study field and discussed at methodological seminars.
- Annual polling of Doctoral students and Doctoral alumni has been introduced, it is also planned to conduct surveys of Doctoral entrants. The polling on the admission procedure and study process has been launched. The summaries of results are published on portal ORTUS. The results are taken into consideration in the improvement of Doctoral study process and the quality of support provided to doctoral students.
- It is also planned to run regular centralised polling of RTU employers. Polling of employers presently takes place at the end of internship of each student, as well as within the scope of development of study programmes.

From the spring semester of academic year 2020/2021, a mid-semester questionnaire has also been introduced.

The following mechanisms are used to obtain feedback from employers.

RTU Council Convention, composed of representatives of different sectors, advises RTU Senate and Rector on the RTU Development Strategy. It has the right to propose an issue to the Senate and the Constitutional Assembly. The RTU Strategy and its development program are presented in the RTU Council Convention, the decision-making bodies, as well as to cooperation partners, industry associations and leading companies, with feedback and suggestions being incorporated into the RTU documents.

The involvement of stakeholders and the realization of major projects is the responsibility of the Vice-Rector for Strategic Development. He clarifies existing needs, coordinates key priorities and activities, implements recommendations and promotes the sustainable development of the RTU.

Employers, as providers of the internship of RTU students, after completing the practice, prepare online feedback on the knowledge and skills of the student, thereby also assessing the relevance of the knowledge provided by the study programme to the needs of the industry.

Employers' feedback is obtained also from the Council Convention, composed of representatives of different sectors and industry associations, as well as from the assessments provided by employers on the portal prakse.lv (RTU is the most recommended university at https://www.prakse.lv/top for several consecutive years (information available only in Latvian)).

Feedback within study programmes is received through every semester student polling, regulated by the “Regulation on Student Polling for Assessment of the Study Process” (approved by the resolution of RTU Vice-Rector for Academic Affairs No 02000-1.1-e/8 as of 1 February 2021; published at https://www.rtu.lv/writable/public_files/RTU_anketesanas_nolikums.pdf (in Latvian); the English translation is in the file of Appendix 20 of the list of Internal regulations).

Study programme study course abstracts and course programmes, methodological materials, newest educational literature and methodological instructions for study papers (reports, study papers, internship reports and graduation papers) are reviewed once an academic year.

Courses and seminars on latest teaching methods are organised for academic staff, as well as attendance of courses to improve qualification is promoted. Academic staff and heads of study programmes participate in different experience exchange activities cooperating with universities of other countries, meeting representatives of respective institutions and businessmen, as well as discussing among themselves latest developments in the sector, research papers and projects of students by analysing their results.

The Study field Committee analyses recommendations from employers and external experts, which are used as the basis for improvement of the study programmes.

In order to receive feedback from RTU graduates, RTU Alumni Association has been established. It actively operates at the University (http://alumni.rtu.lv/, https://www.facebook.com/RTUAlumni/ (information available only in Latvian)) and runs an online community platform (https://rtuconnect.net/), which aims at developing alumni traditions. In order to ensure the transfer of experience from graduates, the RTU Alumni Association provides mentor training, database maintenance, as well as mentors and mentee matching. The RTU Alumni Association organizes various events, which bring graduates back to the University, allow for networking, cooperation among the graduates and with the University, and integration in University activities. RTU Grand Graduation Ceremony is a major event introduced by the RTU Alumni Association; it gathers the respective year graduates from all nine RTU faculties, academic and general staff, as well as guests.

2.2.5. Specify the websites (e.g., the homepage) on which the information on the study field and the relevant study programmes is published (in all languages in which the study programmes are implemented) by indicating the persons responsible for the compliance of the information available on the website with the information published in the official registers (State Education Information System (VIIS), E-platform).

Detailed information on the study field and the study programmes pertaining to it with the indication of the languages of instruction is available at RTU web page:

1. RTU web page in the section on education opportunities in the Latvian language (https://www.rtu.lv/lv/studijas) (responsible person – I. Bušovska, Head of the Admission Department);
2. RTU web page in the section containing comprehensive information on education opportunities in the English language (https://www.rtu.lv/en/studies) (responsible person – I. Tipāns, Director of the International Cooperation and Foreign Students Department);
3. Interactive web pages dedicated to RTU study fields, study programmes therein, as well as the detailed description of the offered study courses in the Latvian and English languages

(https://stud.rtu.lv/rtu/vaaApp/sprpub and https://stud.rtu.lv/rtu/discpub/list?english=true) (responsible person – G. Alksnis, Head of the Program Management and Curriculum Design Unit);

4. Web page designed for the foreign student target audience on RTU study programmes implemented in English and student mobility opportunities (https://international.rtu.lv, https://apply.rtu.lv) (responsible person – I. Tipāns, Director of the International Cooperation and Foreign Students Department);
5. Higher Education Quality Agency E-platform (responsible person – G. Alksnis, Head of the Program Management and Curriculum Design Unit);
6. State Education Information System (responsible person – I. Pujats, Project Manager of the Information Technology Department).
7. RTU web page section about information on education opportunities and the latest news in the Faculty of Civil Engineering (Faculty of Civil Engineering) (responsible persons – J. Mačāns (Counselor of career) and S. Krasta (Manager of Database)).
8. RTU web page section about information on education opportunities and the latest news in the Faculty of Materials Science and Applied Chemistry (Faculty of Materials Science and Applied Chemistry) (responsible persons – A. Frīdvaldis (User Support Specialist)).

Information on the study programmes of the study field published on the RTU website corresponds to the information available from official registers, provides important information for applicants and students, it is published in all the languages of implementation of the study programme.

2.3. Resources and Provision of the Study Field

2.3.1. Provide information on the system developed by the higher education institution/ college for determining and redistribution of the financial resources required for the implementation of the study field and the relevant study programmes. Provide data on the available funding for the scientific research and/or artistic creation activities, its sources and its use for the development of the study field.

According to the Conceptual Report “Introduction of a New Higher Education Financing Model in Latvia” approved by the Cabinet on 29 June 2015 (http://likumi.lv/ta/id/274944-par-jauna-augstakas-izglitibas-finansesanas-modela-ieviesanu-latvija, in Latvian), Latvia has introduced structural reforms in the sector to ensure the development of an efficient and sustainable higher educational system. A three-pillar funding model has been introduced to reconcile the supply offered by higher education with the needs of Latvia's economic development and labour market, high-quality research-based higher education content and performance management in higher education institutions. The base funding for the provision of the study process is the 1st pillar, performance funding is the 2nd pillar, and development funding is the 3rd pillar.

The first pillar, or base (base funding), is implemented through state budget funded study seats. Determination of the number of state budget funded study seats are regulated by Sections 51 and 52 of the Law on Higher Education Institutions (http://likumi.lv/ta/id/37967-augstskolu-likums#p-50515, in Latvian).

RTU funding from the basic state budget is made up of the study base financing corresponding to

the list of study programmes and the number of students; it is used to cover such expenses as utilities, taxes, infrastructure maintenance (including data for the Student and Graduate Register), purchase of equipment and supplies, staff remuneration, and funding for research activities.

The number of study seats is allocated after discussions with the Ministry of Education and Science. Funding from the state budget is allocated for full-time studies.

The amount of study base funding is determined on the basis of the number of study seats determined by the state at RTU, as well as the state-defined study seat basic expenses and study cost coefficients in the thematic areas of education.

Study cost coefficients for thematic areas of education are indicators that determine the amount of study seat costs in the respective thematic area of education in relation to the basic costs of the study seat.

The cost coefficients for the study programmes in the thematic areas of education for Bachelor and professional study programmes are set by in Appendix 1 of Cabinet Regulations of 12 December 2006 “Procedure for Financing Higher Education Institutions and Colleges from the State Budget” (https://likumi.lv/doc.php?id=149900, in Latvian) (further in the text - the Regulations).

Values of study cost coefficients are 1.5 times higher for Master study programmes and three times higher for Doctoral programs than the study cost coefficients specified in Appendix 1 to the Regulations for the respective thematic area of education.

The amount of the study funding granted to the institution of higher education or college from the state budget for the implementation of Bachelor, professional and Master study programmes is calculated using the following formula:

Fs = Tb x [S(ki x ni) + 1,5 x S(ki x mi)] + Sb x S(ni + mi), where

Fs – the amount of study financing;

Tb – basic costs of the study seat;

ki – coefficient of the study costs in the relevant field of education (Appendix 1 to the Regulations);

ni – the number of study seats for a higher education institution or college at undergraduate and professional study programmes in the relevant thematic area of education;

mi – the number of study seats at the Master study programmes in the relevant thematic area of education;

Sb – study seat social security expenses at undergraduate, professional and Master study programmes (Appendix 2 to the Regulations).

The basic costs of a study seat and the social security expenses of a study seat are determined in accordance with Appendix 2 to the Regulations.

Each year, the Ministry of Education and Science calculates the basic costs of a study seat for the following budget year and, by November 1 of the current year, coordinates the calculations with the Ministry of Finance and those Ministries which have higher educational institutions and colleges subordinated to them.

RTU funding from the state basic budget for the provision of study seats in the respective academic year is distributed in accordance with the decision of RTU Senate “Methodology for the distribution and use of funding for the structural units of RTU in academic year 2020/2021” (see the file of Appendix 16 of the list of Internal regulations; hereinafter – the Methodology). The Methodology is reviewed and revised every year and is subjected to any necessary changes.

RTU has a decentralized budget, and each organizational unit is allocated a separate budget. In a general sense, a budget is a plan of revenues and expenditures for a specific period of time, work, event or function. The revenues and expenditures of RTU shall be administered in accordance with principles approved by the Senate or as stipulated by the Vice-Rector for Finance.

According to the Budget Allocation Methodology, the financing is allocated to the organizational units either according to the financial or budget year or immediately after receiving the financing. The financial or budget year of RTU organizational units is from October to September of the following year, and for this period the financing is calculated and distributed:

- Subsidy or basic budget funding (training of state budget funded students) is divided into monthly limit – 1/12 of the estimated annual funding per month is allocated to the organizational unit;
- Tuition fee funding (training of tuition fee-paying students, including funding paid by students for settling academic arrears) is allocated twice a year (in October and April) as a monthly limit – 1/6 of the estimated funding per semester is allocated to the unit monthly;
- Performance funding (research support funding) is allocated as a monthly limit – 1/12 of the estimated annual funding is allocated to the unit per month;
- Research base funding (research support funding) is allocated as a monthly limit – 1/12 of the estimated annual funding is allocated to the unit per month;
- funding for foreign student fees is distributed four times a year, taking into account that the largest amount of the planned workload is allocated to the structural unit at the beginning of each semester (October and April), the remaining part of funding - at the end of the semester.

Each head of the RTU organizational unit is provided with remote access to operational financial information on the unit's budget, including the envisaged workload and correspondingly allocated funding for the implementation of study programmes and study courses in subsequent periods. Based on this information, the head of the organizational unit plans the work of the unit at the beginning of each financial or budget year, including remuneration issues for academic staff members who are subordinate to the head of the unit, and develops a procurement plan for the following year in compliance with the implementation and development of the study programme or study course, etc.

According to the World Bank research on higher education governance in Latvia, which was conducted in 2017 and 2018, the World Bank concluded that RTU used the opportunities offered by the system-level funding model reform to gradually adjust the internal distribution of decision-making powers by strengthening the position of deans. Prior to the introduction of the second pillar of the state funding model, RTU funding was provided to units below the level of faculties. To address the issue of weak positions of deans, more than half of the new 2nd pillar performance income is used to provide funds to faculties where the dean is the budget holder. First, it opens up new opportunities for faculty-level strategic development. Second, deans now have greater opportunities to ensure the development of faculties, which is their responsibility. Third, since the academic year 2019/2020, deans of the faculties have additional funding from the tuition fees of foreign students.

In the academic year 2020/2021, RTU has made changes in the Methodology to ensure that the basic state budget funding for the provision of study seats is distributed by study programmes and thematic areas of study courses, ensuring precise distribution of funding according to the indicators by which RTU receives the state budget funding. In addition to the seats financed by the state basic budget, the study programme financing also consists of tuition fee revenue from the resources of natural or legal persons, which can be divided into two subgroups:

1. revenue from local fee-paying students;
2. revenue from foreign fee-paying students.

Funding from local fee-paying students is allocated in compliance with the Methodology where, in order to provide greater opportunities for the development of fee-based study programmes, for several academic years, a significant amount of the funding received has been channelled to the head of study programme, who may appropriately use this funding to renew facilities and attract higher-level specialists for the implementation of the study process, etc.

Funding from foreign fee-paying students in a respective academic year is allocated in accordance with the Resolution of RTU Senate On Approval of the "Methodology for Allocation of Funds for Study Process Provision at the International Cooperation and Foreign Students Department" in the Respective Academic Year (see the file of Appendix 41 of the list of Internal regulations; hereinafter – Methodology2). Methodology2 is revised and approved every year taking into account necessary changes.

In the academic year 2019/2020, RTU made significant changes to Methodology2 with an aim to bring it closer to the Methodology governing budget allocation, thus facilitating the work process of the persons responsible for the implementation of the study programmes – both by aligning funding allocation periods and principles. The new Methodology2 provides funding for the structural unit responsible for the implementation of the study programme for its development similarly as in Methodology. However, two new coefficients are introduced in the calculation of study course funding - the correction factor for the number of students and the sustainability coefficient of the study programme, as well as whether foreign students acquire the study course together with local students. The financial surplus, which is formed from the application of both coefficients and the acquisition of joint study courses, is directed to the structural unit responsible for the implementation of the study programme.

Analysing the financing procedure of the study programmes and the study fields at RTU as a whole, it can be seen that the state basic budget and local fee-paying student funding, in the long run, are determined taking into account the basic principles established by the state. In the process of determining the amount of funding, the study cost coefficients of the thematic areas of studies and the values of the study cost coefficients according to the level of the study programme, as well as the number of students at the study programme and the study courses implemented therein are taken into account. As mentioned above, by using study cost coefficients of the thematic areas of studies, it is possible to determine the amount of financing required for the implementation of a particular study programme and study course. In the Methodology for the academic year 2018/2019, RTU Senate approved that in the future the study cost coefficients of the thematic areas of studies would be applied individually to each study course of the study programme, thus ensuring an even more appropriate amount of financing for the implementation of study courses included in the study programmes. In order to implement this system, the Expert Committee was established by order of the Vice-Rector for Academic Affairs, who determined thematic areas of studies for each study course.

RTU has the following thematic areas of studies and the applicable coefficients:

Thematic area of RTU study courses	**RTU coefficient**
Architecture and urban planning	3.5
Aviation transport	4.2

Construction	2.9
Civil engineering and real estate management	1.71
Civil and occupational safety	2.9
Civil defence	4.2
Computing	2.9
Computer training	2.42
Economics	1.4
Electronics and telecommunications	2.9
Power and electrical engineering	2.9
Physics	3.2
Geodetics and cartography, geomatics	2.9
Innovation	2.9
Engineering drawing	2.9
Quality management	2.9
Chemistry and chemical technology	3.2
Applied arts and design	3.5
Mathematics and statistics	2.42
Material sciences	3.2
Medical engineering	2.9
Mechanics, mechanical engineering, construction of machines and mechanisms	2.9
Internal security and customs	4.2
Pedagogy	1.67
Heat engineering, heat, gas and water technology	2.9
Social sciences	1.4

Sports	2.0
Textile technology	2.9
Law	1.4
Transport	2.9
Management and administration	1.4
Languages	3.2
History and philosophy	1.4
Environmental engineering and management	3.2
Logistics	1.8

From the academic year 2019/2020, similar principles are introduced also in Methodology2 and applied to study programmes, where the total number of foreign students in all academic years is greater than or equal to 90. The study programmes with less than 90 foreign students have a support mechanism, which envisages financing from the total funding of the foreign students, in order to ensure an adequate amount of funding for the implementation of the study courses of the study programmes.

In order to ensure the functioning and sustainable development of study programmes, RTU has been improving the Methodology and Methodology2 for each academic year in accordance with changes in the external and internal environment, thus also eliminating possible risks in the implementation process of the study programme or its study courses. The transition process involves all stakeholders, thus ensuring transparency, as well as a transparent decision-making process. The required changes are at first initiated by RTU Vice-Rector for Finance, and additional changes can be initiated by any RTU employee by submitting a request to RTU Vice-Rector for Finance or to the Finance and Budget Committee of RTU Senate. The Finance and Budget Committee of RTU Senate consists of 20 senators (the count might vary) - deans, heads of organizational units of faculties, professors, as well as student representatives, who have voting rights, as well as nine RTU Senate advisors, who are mainly representatives of various administrative units, such as vice-rectors, heads of departments etc. Once the Finance and Budget Committee of RTU Senate has considered and evaluated the proposals, it shall propose amendments to the Methodology or Methodology 2 or develop a new version of the document(s) for the next academic year for approval by the RTU Senate 35 senators. It should be noted that historically changes in the Methodology or Methodology2 have been proposed after performing a thorough analysis, including mitigation of their possible negative impact on the implementation of study programme study courses.

Funds for research activities are allocated from RTU Science Development Fund. For example, they are allocated for the organization of the section “Materials Science and Applied Chemistry” within the RTU International Conference. Regular support has been given to the organization of Paul Walden Symposium. During the above-mentioned events, researchers and students can gain new knowledge, share experience and establish contacts for new research. Also internal grants for research projects of Master students and PhD students are provided from the RTU Science

Development Fund through an open call competition.

Information on the financial resources of RTU study programmes included in the study field "Chemistry, Chemical Technologies and Biotechnology" in the period from 2013 to 2020 is shown in fig. 2.3.1. below. The total funding of the study field in the reporting period from 2013 to 2021 was 6 918 120 EUR. This funding is mainly made up by government subsidies. Less than 3% of the total funding is made by foreign student tuition fees. At the beginning of the reporting period, funding decreased, reaching the lowest level in academic year 2016/2017. Further financial stabilization can be observed.

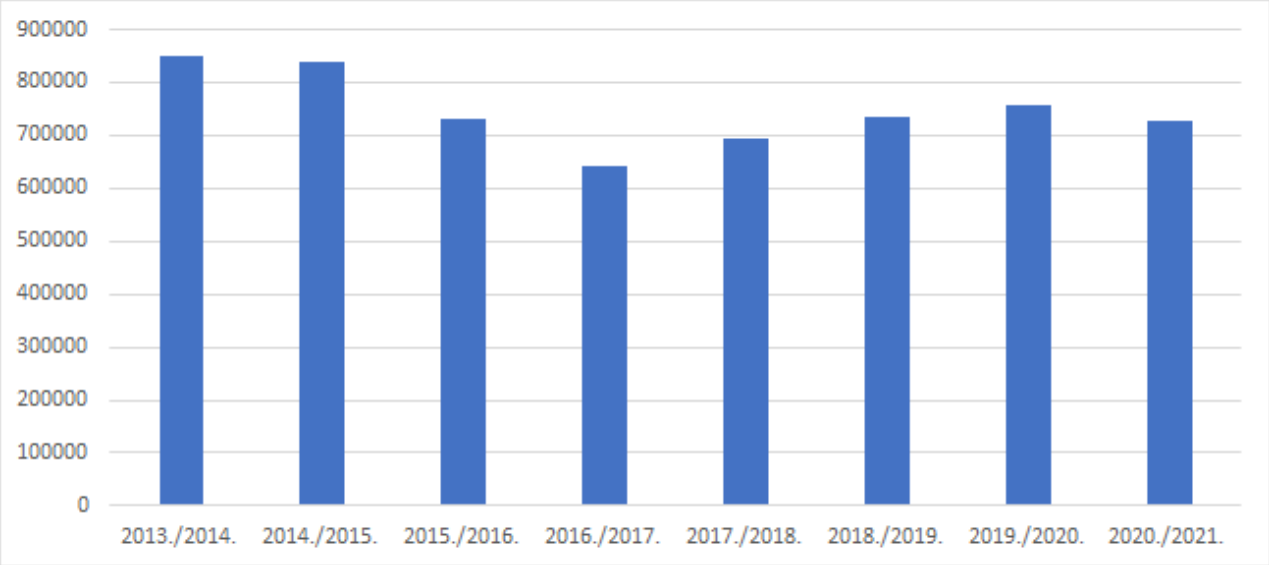


Figure 2.3.1. Information on the financial resources of study field programmes (EUR/acad.year)

Research base funding (base funding provided by the state) is allocated among faculties according to the performance-based output indicators, i.e., number of publications (weighted by impact and citation), money attracted by research projects and industry contracts, and defended Doctoral Theses (considering also the time it takes to complete Doctoral studies). The calculation is made based on the transparent methodology, which was approved by the Scientific Council (the document: "Methodology for Allocation of Research Base Funding to RTU Organizational Units") on 20 November 2018. A decision regarding allocation of the budget among faculty institutes is made within faculties (by the Faculty Councils).

RTU also makes three project calls a year with internal funding. The 1st project call aims at supporting publication activities of young scientists. The 2nd call supports projects where RTU cooperates with industry partners, and this call is aimed at promoting inter-faculty and inter-disciplinary research within six research platforms of RTU. The goal of the 3rd call is to involve graduates in the research process. The regulation documents are usually approved by the Scientific Council of RTU. However, the decisions regarding the selection of particular researchers or projects are made by expert groups organized by the Office of Vice-Rector for Research, on the faculty level or the research platform level (Council of Coordinators of Research Platforms; decision of RTU Senate No. 600 "On Approval of the Regulation of Coordinators' Board of the Research Platform at Riga Technical University" as of 23 May 2016. Projects are administered by the Office of Vice-Rector for Research. The Office also coordinates the administration of the externally funded research projects, e.g., within Horizon 2020 program and other. Research projects funded by the EU Structural Funds are administered by the Office of Vice-Rector for Strategic Development.

The structural units of FMSAC have implemented or implemented eight platform projects - in 2022 the project "Development and comparison of oil intensive extraction method" was started, in 2021 -

the project “Innovative methodology for Al-MMNC microstructure analysis” and “Development of ecological granular sorbent”. 2019 - “Innovative methods for ensuring and controlling the frost resistance of concrete”, in 2018 - “Development of a method for the production of high-efficiency nano-concrete with low U/C ratio”, “Development of innovative frost-resistant concrete using rubber microgranules”, “New derivatization reagent for gas chromatography and based on the development of analytical methods” and “Energy production from food residues”.

The Internal Research Excellence Grant for young scientists is a new initiative, with an aim to attract talented young researchers to RTU and provide funding, which allows establishing new research groups in a prospective research field. Funding for a 3-year period is based on international competition under conditions similar to EC ERC grant, and international call and evaluation performed by external, i.e., foreign well-recognized researchers. The final decision for awarding the grant is made by the Scientific Council of RTU.

RTU Research Support Fund (decision of RTU Senate No. 585 “RTU Regulation of Research Support Fund” as of 15 December 2014) aims at providing financial support for various research related activities, such as support for maintenance of research equipment, protection and licensing of intellectual property, covering of expenses related to the Doctoral study process, publishing of scientific journals, participation and organization of scientific conferences, support to researchers in establishing new laboratories in a prospective research field. The Research Support Fund is an instrument to support research activities, which foster the development of the strategically important research fields. 10 % of the research base funding (state budget funding) is allocated to the Research Support Fund every year. Establishment of seven new laboratories or centres has already been supported by the Fund by June 2020, e.g., RTU High Energy Particle Physics and Accelerator Technology Center (for cooperation with CERN), Biochip Laboratory, Scientific Laboratory of Experimental Mechanics of Materials, Scientific Laboratory of Electromechatronics, Research Center of Communication System Technologies. Research Laboratory of Technologies of Electrical Engineering and Ergonomics. Scientific Council has decided to support on competition basis at least one new prospective research direction every year (decision of RTU Scientific Council No. 04000-3/09 dated 21.09.2020.

In 2018, Andris Šutkas, a researcher at FMSAC, was awarded a Science Excellence Grant of 270,000 euros to implement the project “Improved Nanogenerators for Mechanical Energy Collection”. As a result of the project, new generation piezoelectric and triboelectric nanogenerators have been developed and their synthesis approaches investigated. The project includes not only research and attraction of funding at RTU, but also the formation of a self-financing group or structural unit of researchers and involvement in the study process. The project is successfully completed in 2021 with the strengthening of the research direction and the creation of a new structural unit.

Since 2015, RTU has been awarding doctoral grants to support research related to the doctoral thesis and promote the defence of the Doctoral Thesis in the 4th year of doctoral studies. In total, such grants have been awarded to 74 doctoral students in the study field. The amount of support for one grant per year is 10,000 EUR. Grant recipients are elected to the position of research assistant or researcher.

Also, since 2019, significant funding has been attracted within the framework of the ESF project SSO 8.2.2.0/18/A/017 Rounds 1 and 3 "Strengthening the academic staff of Riga Technical University in the fields of strategic specialization", the supported activities of which include the involvement of PhD students in academic activities within the institution, envisaging employment in accordance with the employment conditions of the elected academic staff, promotion of the development of the Doctoral Thesis and obtaining the first doctoral degree and support in scientific activities. Since 2019, 13 PhD students have been involved in the project, who, in accordance with

the conditions of the project, plan to submit a Doctoral Thesis for the public defence and obtain the first doctoral degree by 31 October 2022. The amount of support for one grant is up to 1,400 EUR per month, which includes the remuneration to the PhD student, as well as the costs of mobility and the purchase of research materials.

Both mentioned grants promote the development and the public defence of PhD students' research projects, as well as the involvement of PhD students in the pedagogical work.

In 2019, RTU also established a grant programme to increase the number of master students who are able to create internationally cited scientific publications and continue their doctoral studies, thus strengthening the development and capacity of RTU research staff. In two years, a total of 11 master students have received such grants. Three of them already continue studies at the doctoral study programmes.

2.3.2. Provide information on the infrastructure and the material and technical provisions required for the implementation of the study field and the relevant study programmes. Specify whether the required provision is available to the higher education institution/ college, available to the students, and the teaching staff.

The construction of RTU Ķīpsala campus began in 1965 with the aim to create a unified study and research centre. The construction process is underway, and it is envisaged to host the majority of university students in Ķīpsala from 2021. After completion of the construction, RTU Ķīpsala campus will become the most modern engineering study centre in the Baltic States.

The issue of sustainable development is taken into account in the construction process of the campus. Recognizing its concern for sustainable development and demonstrating its willingness to engage in the promotion of sustainable development, RTU has joined the Sustainable Development Solutions Network, which seeks to achieve the 17 UN Sustainable Development Goals (SDGs) by 2030. RTU is currently the only organization in the Baltic States that has been admitted to the network.

Through its networking activities, RTU, as a higher education and research institution, has prioritized the achievement of seven UN SDGs that coincide with RTU research platforms. RTU considers the provision of quality education and the promotion of lifelong learning to be its primary goal. RTU also intends to contribute to research and innovation in sustainable and modern water technologies, power systems, infrastructure and urban environment. The University is also committed to promoting the creation and distribution of sustainable products.

RTU buildings are equipped with state-of-the-art climate control equipment, technical solutions that are remotely controlled and provide the opportunity to track energy consumption to make buildings more comfortable for students, academic staff, researchers and guests. One of the results achieved in the development of RTU infrastructure is the participation in the Green Metric Ranking (https://greenmetric.ui.ac.id/rankings/overall-rankings-2021/rtu.lv), which recognizes RTU Ķīpsala campus as the 40th greenest campus in the world and RTU – as the 50th greenest university in the world. In the Baltic region, RTU is a leader in terms of green thinking infrastructure.

To reduce human impact on the environment and climate change, RTU is committed to introducing the concept of Green Ķīpsala at its campus by 2023. To achieve the goal, RTU is improving its infrastructure in compliance with sustainability principles, changing student and staff habits, and using innovative green products and technologies developed by RTU researchers in Ķīpsala campus

infrastructure.

The infrastructure of Ķīpsala campus provides students, staff and guests with all the necessary services and utilities, e.g., it is possible to park a bicycle and a car, quench one's thirst at water drinking points. Developing the infrastructure, care is taken of all groups of people, including people with disabilities: each building has parking lots, easy access to classrooms, laboratories and other facilities, the use of Braille to provide essential information, as well as all sanitary facilities are designed according to the requirements. The association of people with disabilities and their friends APEIRONS (https://www.apeirons.lv/; in Latvian) commends RTU for its achievements in infrastructure related issues for people with disabilities.

In RTU Ķīpsala campus, there are currently 54 classrooms, 187 laboratories, 19 special training rooms, 10 computer classrooms, 12 workshops and several research centres of national importance. The campus also houses a hostel with 950 beds and a special area for people with disabilities.

Foreign students, visiting lecturers and university guests can use the renovated RTU student accommodations (Āzenes 22a, Riga).

Other elements of RTU infrastructure are also available for the needs of students and lecturers - canteens and cafes located in each of the RTU complexes, photocopiers, hostels, RTU sports and recreation centres, swimming pool, etc. RTU premises are equipped with drink and snack vending machines.

Wi-Fi is provided in all classrooms of the campus which allows students to access study materials placed on the RTU study portal ORTUS.

The study process of the study programmes in the study field is mainly organized in the FMSAC premises at 3/7 P.Valdena Street, 3 Pulka Street and in the premises of the Institute of Water Systems and Biotechnology at 6A and 6B Ķīpsala Street. All classrooms intended for the study process are equipped with modern multimedia equipment — a computer with the internet connection, a speaker system, a projector, which allow ensuring a modern learning process. Training laboratories are equipped according to the requirements of a specific study course.

The facade and common use areas of the building at 3/7 P. Valdena Street were renovated and insulated in 2013/2014, investing 8 million EUR in this renovation. The buildings at 6A and 6B Ķīpsalas Street were completely renovated in 2022 and 2021, respectively. All buildings have the infrastructure suitable for both the academic and research process. Every year, funds are invested in the repair and improvement of equipment in the learning and scientific laboratories. Due to the need to implement a distance learning process because of the epidemiological situation, in 2021 the auditorium to provide an interactive online learning process was equipped. To provide a simultaneous opportunity to stream the lecture, record it and interact with the students, the appropriate equipment was purchased (10,000 EUR).

The annex lists the most important equipment used in the study process. These are both the appliances used to fulfill the laboratory assignments within particular study courses and the equipment necessary for the development of the graduation paper and research papers. Some of the equipment is included in the UseScience online database (https://scientificservices.eu/) for wider access. The mentioned database is also used in case the equipment for the development of the graduation or research paper is not available in the organizational units of the faculty. The largest investments in the purchase of equipment in the reporting period were made in 2018-2020, when state-of-the-art equipment was purchased for 9 MEUR. The implementation of the Horizon2020 project "Baltic Biomaterials Center of Excellence" (BBCE) started in 2020, which envisaged investing 3.5 MEUR in equipment and 4 MEUR in the construction of the BBCE building.

In 2022, the reconstruction of the building of the FCE completed, where new classrooms would be arranged for the learning process, including a classroom for the implementation of the study courses in microbiology and biotechnology.

Students and faculty are also provided with access to online scientific databases provided by RTU Scientific Library, including SpringerLink, Web of Science, SCOPUS, WILEY, ScienceDirect, and others. RTU documents are available via the centralized digital ORTUS system (based on Moodle). It also provides modules for academic staff and researchers (Project Management System).

2.3.3. Provide information on the system and procedures for the improvement and purchase of the methodological and informative provision. Description and assessment of the availability of the library and the databases to the students (including in digital environment) and their compliance with the needs of the study field by specifying whether the opening times of the library are appropriate for the students, as well as the number/ area of the premises, their suitability for individual studies and research work, the services provided by the library, the available literature for the implementation of the study field, the databases available for the students in the respective field, the statistical data on their use, the procedures for the replenishment of the library stock, as well as the procedures and possibilities for the subscription to the databases.

Library plays an important role in the provision of methodological guides and educational resources to students. RTU Scientific Library (SL) (https://www.rtu.lv/en/studies/scientific-library) is a library of national importance, which has acquired its status in the process of library accreditation. The SL provides the necessary information to ensure RTU study process and research activities, as well as provides library, bibliographic and information services to RTU students, academic and general staff. The Library holds more than 1.3 million printed documents and e-resources in RTU industry specific databases. The Library stock is located at the Central Library, the Study Material Subscription, the Chemistry Branch, the Transport Branch and Study and Research Centres in Daugavpils, Liepāja, Cēsis and Ventspils.

In 2016, significant investments were made in the development of the SL infrastructure by building additional premises (2240 m^2). The total area of the SL premises is 6393 m^2, of which 3417 m^2 are reader service premises. There are 713 working places for SL users. The SL has four group rooms and six individual booths, a rare book reading room and a conference room. The library is equipped with self-service facilities. The SL is accessible for users with disabilities.

In order to improve the SL activities and to meet the information needs of academic and research staff, the Library Council has been established, which decides on replenishing the library collection with printed publications and subscribing to the necessary databases. The Library Council has approved the Compilation Policy of RTU SL Collection, which sets the basic principles of the collection development in accordance with the areas of RTU academic and research activities.

After the SL receives its funding from RTU, it calculates funding for the information resources for each study programme. The collection is replenished taking into account the recommendations of the heads of the study programme and researchers, in compliance with the allocated funding. By contacting the SL Collection Development Department regarding replenishment of collection, the desired editions can be ordered at the Library website by filling out an order form (https://www.rtu.lv/lv/studijas/biblioteka/pakalpojumi-3 (in Latvian)) or an application form, contacting by phone 67089353, or visiting the Library at 5-105 Paula Valdena Street. The SL offers

a guide, which includes websites of various Latvian and foreign publishing houses and bookstores for searching publications and e-resources.

Database subscription agreements are concluded both directly with the supplier and through the Cultural Information Systems Centre, which is the Latvian national representative for the international non-profit organization Electronic Information for Libraries (EIFL, http://www.eifl.net/). The EIFL Licensing Programme offers libraries of state importance to subscribe to internationally recognized databases at a significantly reduced subscription fee that is not offered to individual subscribers, thus saving the financial resources of libraries.

At the request of the academic staff of the study field “Chemistry, Chemistry Technologies and Biotechnology”, 155 new books were purchased by the SL amounting to 14070 EUR in the period of 2013 – 2021.

- At the request of the academic staff of the study programme “Chemistry”, 62 new books were purchased by the SL amounting to 5539,36 EUR in the period of 2013 - 2021.
- At the request of the academic staff of the study programme “Chemistry technology”, 71 new books were purchased by the SL amounting to 7034,32 EUR in the period of 2013 - 2021.
- At the request of the academic staff of the study programmes “Biotechnology and Bioengineering”, 22 new books were purchased by the SL amounting to 1496,4 EUR in the period of 2013 - 2021.

The purchased books are mainly in English.

Every month, the list of the newly-received literature is published in the SL newly-received literature bulletin ((https://www.rtu.lv/lv/studijas/biblioteka/jaunieguvumi) (in Latvian&English)).

Subscribed databases (https://www.rtu.lv/en/studies/scientific-library/electronic-resources):

- ProQuest Ebook Central Academic Complete, Wiley Online Library, SpringerLink e-books, ACM Digital Library, IEEE Xplore Digital Library, Academic Search Complete EBSCOhost, Applied Science & Technology Source EBSCOhost, Business Source Ultimate EBSCOhost, eBook Academic Collection EBSCOhost, MasterFILE Reference eBook Collection EBSCOhost, MasterFile Premier EBSCOhost, eBook Open Access Collection EBSCOhost, Open Dissertations EBSCOhost.
- The SL also has access to databases funded by the Ministry of Education and Science: ScienceDirect Freedom Collection, SCOPUS (Elsevier), Web of Science (Clarivate).
- Latvian databases: LETA, Letonika, Latvijas standartu datubāze (available only on library premises).

The most appropriate e-resources for the study field "Chemistry, Chemistry Technologies and Biotechnology”:

- **E-books:** Proquest Central Academic Complete, SpringerLink, eBook Academic Collection EBSCOhost, eBook Open Access Collection EBSCOhost, ScienceDirect handbooks (Elsevier).
- **E-journals:** Wiley Online Library, Academic Search Complete EBSCOhost, ScienceDirect Freedom Collection (Elsevier), Applied Science & Technology Source EBSCOhost, IEEE Xplore Digital Library, MasterFile Premier EBSCOhost.

The use of RTU SL databases has been growing since 2016. Number of downloaded full texts in 2021 – 418103.

The SL new premises have made it possible to expand the range of services available to users. Since the opening of the new premises, the number of library visits increased from 103,825 to 691,200. The SL Central Library is open to users from Monday to Friday

(https://www.rtu.lv/writable/public_files/RTU_2_rtu_library.pdf). There is a 24h reading room. At the request of students, during the session in December 2019 and January 2020, five central Library floors with a collection were available to users 24h. During the summer the Central Library is open every working day with reduced opening hours.

The SL information sources are open access resources. Books and periodicals relevant for the study field “Chemistry, Chemistry Technologies and Biotechnology” are located in the main building of the SL (5 Paula Valdena Street) and in the Branch library of Chemistry (3 Paula Valdena Street) in compliance with UDC indexes. The basic indexes for this study field are:

Branch Library of Chemistry (3 Paula Valdena street)

54 Chemistry

542 Practical laboratory chemistry. Preparative and experimental chemistry

543 Analytical chemistry

544 Physical chemistry

546 Inorganic chemistry

547 Organic chemistry

548 Crystallography

549 Mineralogy

60 Biotechnology

61 Medical sciences

615 Pharmacology. Therapeutics. Toxicology

620 Materials testing. Commercial materials

66 Chemical technology. Chemical and related industries

661 Chemicals

662 Explosives. Fuels

663 Industrial microbiology

664 Production and preservation of solid foodstuffs

665 Oils. Fats. Waxes. Adhesives. Gums. Resins

666 Glass industry. Ceramics. Cement and concrete

667 Colour industries

669 Metallurgy

674 Timber and woodworking industry

675 Leather industry

676 Pulp, paper and board industry

677 Textile industry

678 Industries based on macromolecular materials. Rubber industry. Plastics industry

Central Library (5 Paula Valdena street)

54 Chemistry

543 Analytical Chemistry

544 Physical chemistry

546 Inorganic chemistry

547 Organic chemistry

61 Medical sciences

66 Chemical technology. Chemical and related industries

620.1 Materials testing. Defects of materials. Protection of materials

620.2 Commercial materials. Goods. Wares

662 Explosives. Fuels

664 Production and preservation of solid foodstuffs

666 Glass industry. Ceramics. Cement and concrete

669 Metallurgy

67 Various industries, trades and crafts

674 Timber and woodworking industry

677 Textile industry

678 Industries based on macromolecular materials. Rubber industry. Plastics industry

The last copy of the oldest editions that comply with RTU profile is stored in the SL repository. They are always available to users.

The on-duty librarian helps find the necessary resources. More detailed information and consultations are provided by bibliographers (information specialists). The SL has librarians responsible for particular fields of science (https://www.rtu.lv/lv/studijas/biblioteka/nozaru-informacija (in Latvian)).

Searching for SL resources is ensured by the PRIMO Discovery search tool). It allows searching for the information in the library catalogue, subscribed databases, as well as in databases created by the SL. Searching for the information in the Union catalog, one can simultaneously obtain information about the available resources in 13 libraries in Latvia.

Both the electronic catalogue and RTU portal ORTUS can be used to reserve the library resources remotely. Remote access to databases is also provided. Since the introduction of RFID technology, users have been able to use five book-dispensing self-service vending machines and return books to a book-sorting vending machine around the clock.

The SL provides students, academic staff and other interested parties with different types of individual consultations and group training in information literacy (https://www.rtu.lv/lv/studijas/biblioteka/lietotaju-apmacibas (in Latvian)).

Editions that are not available in the SL are delivered through an interlibrary subscription or international subscription. Internet access is provided throughout the SL. The SL provides copying, scanning, printing and binding services, as well as there is a self-service canteen.

2.3.4. Provide a description and assessment of information and communication technology solutions used in the study process (e.g., MOODLE). If the study programmes within the study field are implemented in distance learning, the tools specially adapted for this form of study must also be indicated.

Owing to a high level of digitalization, the available infrastructure and material and technical facilities for the implementation of the study field and corresponding study programmes provide an opportunity to increase the University's competitiveness, improve operational quality and efficiency, as well as to make information available by integrating IT solutions into administrative, academic and research processes of the University and providing administrative and academic staff with modern, reliable, secure and unified IT infrastructure and quality IT services.

The Information Technology Department works in three areas:

1. Creation, development and maintenance of an integrated information system of RTU providing support for administrative, academic and research work of RTU;
2. Provision of high-quality and uninterrupted voice and data communication services throughout the territory under the control of RTU, as well as maintenance of RTU data centres and key network resources;
3. IT service support, incl. providing information on new IT solutions, giving necessary consultation and organizing IT training.

To ensure easy and efficient identification of IT users, an IT user identity management system has been introduced; as a result, each IT user has a unique electronic identity that is valid in all information systems. In addition to the aforementioned, a user session management system is ensured in IT systems, which means that there is no need for IT users to re-authenticate when logging in to RTU information systems. It gives the experience of using a unified integrated information system without having to memorize different identification data and re-enter them, implementing different IT application scenarios.

All IT users are provided access to the centralized portal ORTUS (https://ortus.rtu.lv – screenshots of the interface are attached in "RTU IT sistēmu saskarnes / Screenshots of RTU IT systems"), which functions as a single digital gateway, combining information from all RTU information system components and providing users with an easy-to-use way of accessing the directory of all IT services in one place.

The Centralized Study Management System is used for efficient administration of the study process, which ensures digital provision of the study life cycle, incl. Electronic Register of Study Programmes (its public part is available at https://stud.rtu.lv/rtu/vaaApp/sprpub – screenshots of the interface are attached in "RTU IT sistēmu saskarnes / Screenshots of RTU IT systems"), drawing up learning agreements and enrolment of students in study programmes, Register of Study Courses (its public part is available at https://stud.rtu.lv/rtu/discpub/list?english=true – screenshots of the interface are attached in "RTU IT sistēmu saskarnes / Screenshots of RTU IT systems"), designing student's individual study plans, drawing up orders, implementing study courses and study process, registering grades, recognizing study courses, awarding qualifications, administering payments, hostel information, gathering information to issue diploma supplements, etc. This system is one of the main cornerstones in the administration of RTU study process.

To ensure effective implementation of the study process, Moodle e-learning system is used, where all relevant information is compiled in an automated way (study courses, users, groups, access

rights, etc.). This system ensures student-instructor communication. The academic staff members place various electronic materials, assessment tests, homework assignments, information on a particular study course, etc. in the system. Students can also view their financial information on the ORTUS portal, as well as make request for documents (references, transcripts of records, copies of a learning agreement, etc.). For online distance learning RTU academic staff has options to use *Zoom* or *Microsoft Teams* video conferencing platforms.

Since 2007, more than 130,000 unique study course sites have been generated in the e-learning environment of RTU. Students can access electronic learning resources anytime and anywhere.

Digitization of classrooms and schedules has been carried out to ensure efficient premises management and study planning (https://telpas.rtu.lv (in Latvian); https://nodarbibas.rtu.lv/ – screenshots of the interface are attached in "RTU IT sistēmu saskarnes / Screenshots of RTU IT systems"). Each RTU student and academic staff member can access their schedule, which provides information on the venue, time, instructor, room, title and type of lecture. In addition, for user's convenience purposes, the system greatly facilitates lecture planning and scheduling, as well as optimizes the use and efficiency of premises.

Electronic Staff Management and Record-keeping Systems, which cover the circulation of record-keeping and personnel documents at RTU (https://docs.rtu.lv/ – screenshots of the interface are attached in "RTU IT sistēmu saskarnes / Screenshots of RTU IT systems"), are also used to ensure the efficient administrative work. Electronic document coordination and document e-signing functionality have been introduced, thus reducing print-based document circulation and significantly increasing document circulation speed. Since autumn semester 2019, students have been provided with electronically signed learning agreements. Since 2016, RTU graduates have been receiving electronically signed transcripts of records.

In terms of quality assurance, a digital student survey system is used, with the help of which the quality control of study courses and study programmes is implemented each semester. Based on the results of quality control, regular measures are taken to improve study programmes and the study process, in general.

For the additional convenience of RTU students, academic and general staff members, RTU leases Microsoft Windows and Microsoft Office software, which provides all IT users with access to the latest Microsoft software. RTU students can use the licensed Windows operating system and the Microsoft Office productivity suite provided by RTU for study needs. All IT users have access to Microsoft Office 365 cloud computing platform with one terabyte of storage space available to each user and access to a variety of additional collaboration and productivity tools (Microsoft Teams, SharePoint Online, Forms, OneNote, OneDrive, Outlook, etc.). RTU students, academic and general staff have access to the University's email system.

To support research activities, RTU has developed the Centralized Research Support System, which records all information on publications, patents, commercialization applications, Doctoral Theses, RTU scientific journals, research staff, etc. The system provides access to information according to Open Access principle (https://science.rtu.lv – screenshots of the interface are attached in "RTU IT sistēmu saskarnes / Screenshots of RTU IT systems"). RTU students and academic staff also have centralized access to research software.

RTU has high-speed fibre optic Internet and extensive wireless network infrastructure with over 400 access points, including the international *Eduroam* service. In addition, desk phones and mobile communications are provided for fast and easy communication.

To ensure a stable and secure operation of the information technology infrastructure, continuous monitoring of the IT infrastructure and systems is performed, resulting in proactive incident control.

Data backup is also ensured.

The Information Systems Security Policy has been developed and implemented with the primary goal of ensuring the secure use of RTU information systems by establishing and maintaining a sufficient set of measures to reduce or prevent potential or resulting harm. Implementation of the Information Systems Security Policy envisages security checks, data transmission network monitoring, as well as preventive measures. Regular IT security and personal data protection training is organized for IT users. Automated security incident management and risk management have been implemented. Statistics demonstrate that the number of IT security incidents dropped significantly over the last five years.

The IT User Support Centre provides IT user support, by applying a one-stop approach to process applications based on ITIL guidelines. Since 2007, the IT User Support Centre has processed and resolved more than 160,000 IT user applications.

2.3.5. Provide information on the procedures for attracting and/or employing the teaching staff (including the call for vacancies, employment, election procedure, etc.), and the assessment of their transparency.

The implementation of RTU personnel policy is stipulated in the Human Resources Development Plan, which focuses on three main goals within the professional development of the academic staff: renewal of the academic staff, by promoting academic work of Doctoral students, improvement of the professional competence of the existing academic staff and attraction of foreign academic staff. The action plan sets out, for each goal, the activities and sub-activities to be carried out, defines the results to be achieved, the responsible organizational units and the implementation schedule.

Elections of RTU academic staff are held in accordance with the requirements of the Law on Higher Education Institutions and Cabinet regulations based on the recommendations of the Council of Higher Education, in accordance with the Constitution of RTU and the regulations approved by the Senate “On the Procedure of Electing Professors and Associate Professors” and “On the Procedure Of Electing Assistant Professors, Lecturers and Assistants” (publicly available at https://www.rtu.lv/lv/universitate/vakances-rtu/personalatlases-dokumenti (in Latvian); the English translation is in the file of Appendix 42-43 of the list of Internal regulations), as well as in compliance with other internal laws and regulations.

At the proposal of organizational units, the faculty council or the institute board shall consider and approve a reasoned proposal made by the head of a respective organizational unit for announcement of the competition for vacant academic positions, which expire in the respective academic year. The faculty council or the institute board shall submit the proposal under consideration to the RTU Personnel Department together with the job description and qualification requirements, including the workload (full-time or part-time).

Regarding academic positions for professors and associate professors, where the term of election expires in the respective academic year, periodic evaluation of scientific and pedagogical qualifications is performed in accordance with the Procedure for Election of a Candidate for the Position of Professor or Associate Professor and the Procedure for Assessing the Qualification of an Existing Professor or Associate Professor approved by the RTU Senate meeting on 29 June 2020 (published at https://www.rtu.lv/writable/public_files/RTU_par_profesoru_un_asocieto_profesoru_periodisko_novert

esanu_apstiprinasanu.pdf (in Latvian); the English translation is in the file of Appendix 45 of the list of Internal regulations).

The Personnel Department informs the head of the structural unit of the professor or associate professor about the need to organize the evaluation of the professor or associate professor. The evaluation is performed by the Board of professors of the field in accordance with the Law on Higher Education Institutions, the Regulations of Councils of RTU professors and the Regulations on periodic evaluation of professors and associate professors approved by the RTU Senate. After the evaluation, the Council of the professors of the field submits an opinion on the result of the evaluation to the Rector and the Personnel Department. Taking into account the evaluation of the Board and the procedures and criteria set by the higher education institution, the employment contract with the associate professor or professor may be extended for a definite or indefinite term. If, as a result of the evaluation, the scientific and pedagogical qualification of a professor or associate professor meets the evaluation criteria set by the higher education institution, the employment relationship is continued. If, as a result of the evaluation, the qualification of a professor or associate professor does not meet the evaluation criteria set by the higher education institution:

- the relevant employment contract of the professor or associate professor is terminated;
- the department may decide to announce a new vacancy.

The Personnel Department announces a competition for academic staff positions at RTU website, the *Euraxess* vacancy portal and at least in one mass medium distributed throughout Latvia. The applicant shall personally submit or send by email the signed application documents no later than one month after the date of competition announcement.

The employment relationship shall be established by means of a written employment agreement between the Employer and the Employee at least two working days before the commencement of employment. The employment agreement shall be drawn up in duplicate. One copy shall be kept by the Personnel Department of the Department of Personnel and Working Environment (in accordance with RTU File Nomenclature) and the other shall be issued to the Employee. Prior to entering into the employment agreement, the applicant is acquainted with RTU Rules of Procedure.

Employee's duties are defined in accordance with the Classification of Occupations of the Republic of Latvia and RTU Position Catalogue, Unified Work Remuneration Procedure at RTU (see the file of Annex 44 of the list of Internal regulations), RTU Rules of Procedure and the requirements laid down in the job description, which is an integral part of the employment agreement. Job description shall be presented to and signed by the Employee. Job description shall be drawn up in duplicate; one copy shall be issued to the Employee and the other shall be kept according to RTU Case Nomenclature.

Before taking up the employment, the Applicant shall present an identity document – passport or identity card, the Foreigner shall additionally present a visa or residence permit, as well as a work permit if such a permit is required in accordance with regulatory enactments.

Visiting academic staff shall be employed in compliance with:

- Law on Higher Education Institutions (https://likumi.lv/doc.php?id=37967 (in Latvian));
- Labour Law (https://likumi.lv/ta/id/26019-darba-likums (in Latvian));
- Immigration Law (https://likumi.lv/ta/id/68522-imigracijas-likums (in Latvian));
- Cabinet Regulations No. 568 "Regulations Regarding the Procedure by which a Research Institution Concludes and Terminates Employment Agreements with a Foreign Researcher" as of 21 July 2008 (https://likumi.lv/doc.php?id=178749 (in Latvian));
- Cabinet Regulations No. 225 "Regulations Regarding the Amount of Financial Means

Necessary for a Foreigner and the Determination of the Existence of Financial Means" as of 25 April 2017 (https://likumi.lv/doc.php?id=290808 (in Latvian));

- Cabinet Regulations No. 25 "Implementing Regulations for the First, Second and Third Project Applications Selection Round of Specific Objective 8.2.2 "To Strengthen Academic Staff of Higher Education Institutions in the Areas of Strategic Specialization" of the Operational Programme "Growth and Employment"" as of 9 January 2018 (https://likumi.lv/doc.php?id=296513 (in Latvian));
- RTU internal regulations “Procedure of Involvement and Employment of Visiting Academic Personnel at RTU” as of 26 November 2018 (see the file of Annex 25 of the list of Internal regulations);
- RTU internal regulations "Unified Work Remuneration Procedure at Riga Technical University" as of 27 April 2020 (amendments on 28 September 2020, 21 December 2020, 25 January 2021, 31 January 2022) (see the file of Annex 44 of the list of Internal regulations).

According to the results of the applicant selection competition, the employment agreement with the visiting academic staff is signed within a month, specifying an hourly rate. Job description is also provided, which includes specific job responsibilities (delivering lectures, designing study courses, lecture cycles, supervising study papers, etc.). The workload of the visiting academic staff member may include the provision of face-to-face work (delivering lectures, providing tutorials, conducting seminars, supervising graduation papers, etc.) and remote work if it complements the face-to-face work (video lectures, tutorials, supervision of graduation papers). If the work is to be carried out remotely, face-to-face visits (e.g., tutorials) should be provided at the organizational unit.

The visiting academic staff member shall enter into the employment agreement in compliance with the requirements of the Latvian regulatory enactments. During the term of the employment agreement, all assignable copyrights for the work created by the visiting academic staff member, including curricula, materials, and any other teaching aids developed by the visiting academic staff member, shall pass to the Employer. The visiting academic staff member, upon termination of the employment agreement, shall be obliged to transfer the work created within the framework of the employment agreement, including study materials, to RTU. Before terminating the employment agreement, the visiting academic staff member shall submit to the head of a respective organizational unit the reports and other documents stipulated in the employment agreement.

2.3.6. Specify whether there are common procedures for ensuring the qualification of the academic staff members and the work quality in place and provide the respective assessment thereof. Specify the options for all teaching staff members to improve their qualifications (including the information on the involvement of the teaching staff in different activities, the incentives for their involvement, etc.). Provide the respective examples and specify the way the added value of the possibilities used for the implementation of the study process and the improvement of the study quality is evaluated.

At the end of 2018, the Centre for Academic Excellence (teaching and learning centre) was established at RTU in order to support RTU academic staff (in the areas of pedagogical, intercultural communication and self-development). The main tasks of the Centre for Academic Excellence are as follows:

- to organize various educational events, such as seminars, thematic series of events, guest

lectures, conferences, discussions with the participation of the Latvian and foreign specialists;
- to coordinate experience exchange activities within faculties and other organizational units;
- to inform (including posting to ORTUS) the academic staff about the latest teaching and learning trends that are appropriate for RTU;
- to provide guidance to academic staff on the use of teaching and learning methods, as well as on the assessment of students' knowledge, skills and competence;
- to inform students about learning opportunities, such as platforms, systems, applications, effective methods and forms of learning that can be used both in the study process and individually.

Each semester, a core set of activities is offered taking into account the professional competence and needs of the academic staff, which are identified through a survey, in which the lecturers indicate the most important topics and areas in which they want to improve themselves. Student surveys data and information from student self-governments are also evaluated, to gain some topics which should be improved for lecturers from students' point of view. At the same time, proactive actions are being taken to assess the potential needs of academic staff.

The Centre for Academic Excellence organizes two methodological conferences a year. The conference organized in the autumn semester is dedicated to the modern content of the study courses, while the conference held in spring focuses on modern teaching and learning methods. Materials of all events are available on ORTUS within the study course "Materials of the Centre for Academic Excellence".

After each professional development event, participants complete assessment questionnaires, which enable organizers to improve the range of offered events. In order to promote the development of competences of the academic staff, the student surveys are analysed each semester, as well as discussions with the representatives of faculties, student self-governments and the instructors themselves take place.

Lecturers have the opportunity to improve their English language skills by applying to the courses offered by the RTU Institute of Applied Linguistics or by the RTU Riga Business School, which are organized thanks to SOO 8.2.2 project funding.

With the emergency situation and lecturing switching to the remote mode, the CAE on the ORTUS portal prepared a site “Support in the provision of remote courses”. The site consists of six sections: General Information, Technical Assistance, Pedagogical Assistance, Experience Stories, Distance Exams and Mutual Support. Each section is regularly updated with relevant resources. Lecturers appreciate such a resource, and also suggest what other materials should be included.

Since March 2020, almost 80 webinars have taken place (both organized by CAE and international partners, in which RTU lecturers were invited to participate). Webinars organized by the CAE were recorded, with more than 400 participants participating online, and the recordings were viewed more than 650 times.

Educational events are also organized by the Career Support and Services Unit, providing regular seminars to RTU academic and general staff on the following issues:

- cultural diversity;
- critical thinking;
- youth psychology;
- team management;
- virtual processes and cybersecurity;
- burnout at work, etc.

For participation in seminars, employees receive professional development certificates issued by RTU Department of Further Education.

The themes of seminars and classes are offered taking into account the results of RTU staff surveys, as well as current trends at foreign universities. Information on seminars organized over the years is available at https://www.rtu.lv/lv/studentuserviss/karjeras-centrs-ssc/projekti-un-seminari/seminari-un-vieslekcijas (in Latvian).

RTU IT User Support Centre regularly organizes training on IT systems and the latest technology tools for RTU academic and general staff. Training is organized on the following topics:

- e-learning environment (Moodle) for beginners;
- e-learning environment (Moodle) for advanced users;
- MS Outlook email and calendar;
- Office365 Teams and OneDrive;
- searching in subscribed databases;
- record-keeping systems;
- basic IT security issues working with RTU information systems.

In May each year, the Student Parliament of RTU organizes the contest “Annual Award of the Student Parliament of Riga Technical University”. During the event, RTU staff and members chosen by the students are awarded the honorary titles “Instructor of the Year” and “Student Support of the Year”.

To recognize and appreciate RTU academic staff, since 2018, RTU has been organizing contests “Annual Academic Excellence Awards” and “Young Academic Staff Member of the Year” in cooperation with the foundation “Riga Technical University Development Fund” and Industry Service Partner Ltd. The aim of these events is not only to award the best academic staff members, but also to promote creativity in the academic environment.

Specific Support Objective project 8.2.2 “To strengthen the academic staff of higher education institutions in the areas of strategic specialization” increases the quality and knowledge of the academic staff by providing internships to the academic staff of the study field at companies (16 persons), attracting foreign visiting lecturers (4 persons), as well as involving PhD students in the study process (6 persons). Instructors intensively use the opportunity offered by the project to improve their English language skills, as well as to attend professional development courses. The acquired skills will ensure quality training for foreign students and thus increase the opportunities to attract new foreign students.

Almost every program's academic staff has taken advantage of one of the extensive professional development opportunities. The opportunities for up-skilling used by teaching staff add value to the study process and make a significant contribution to improving the quality of studies. Overall, the contribution made is a long-term process, the evaluation of which takes place in the context of the assessment of the quality of study courses and study programmes.

The effectiveness of the use of measures for the development of academic staff is evaluated by carrying out the regular assessment of the suitability of the academic staff for the position held in accordance with the regulations adopted by the RTU Senate on May 30, 2022 (protocol No. 663) "On the procedure for the election of an applicant for the position of professor or associate professor and the procedure for the appointment of an incumbent professor or associate professor procedures for evaluating the professor's qualifications".

2.3.7. Provide information on the number of the teaching staff members involved in the implementation of the relevant study programmes of the study field, as well as the analysis and assessment of the academic, administrative (if applicable) and research workload.

85 members of the academic staff are involved in the implementation of the study field. Most of them, 81 (95%), has been elected to academic positions at RTU. Industry representatives are involved in the implementation of certain study courses. The professional qualification of the academic staff fully complies with the requirements set for the implementation of the study programs of the study field. 54 (67%) academic staff members that are elected at RTU hold a PhD degree, the rest of the academic staff have a master's degree. 42 members of the academic staff (49%) are elected professors or associate professors (see Fig. 2.3.7.). Currently, 26 professors and 16 associate professors work in the study field, whose main responsibility is the development and improvement of the study process, work with PhD and master students, as well as they have a greater workload in research activities and research projects.

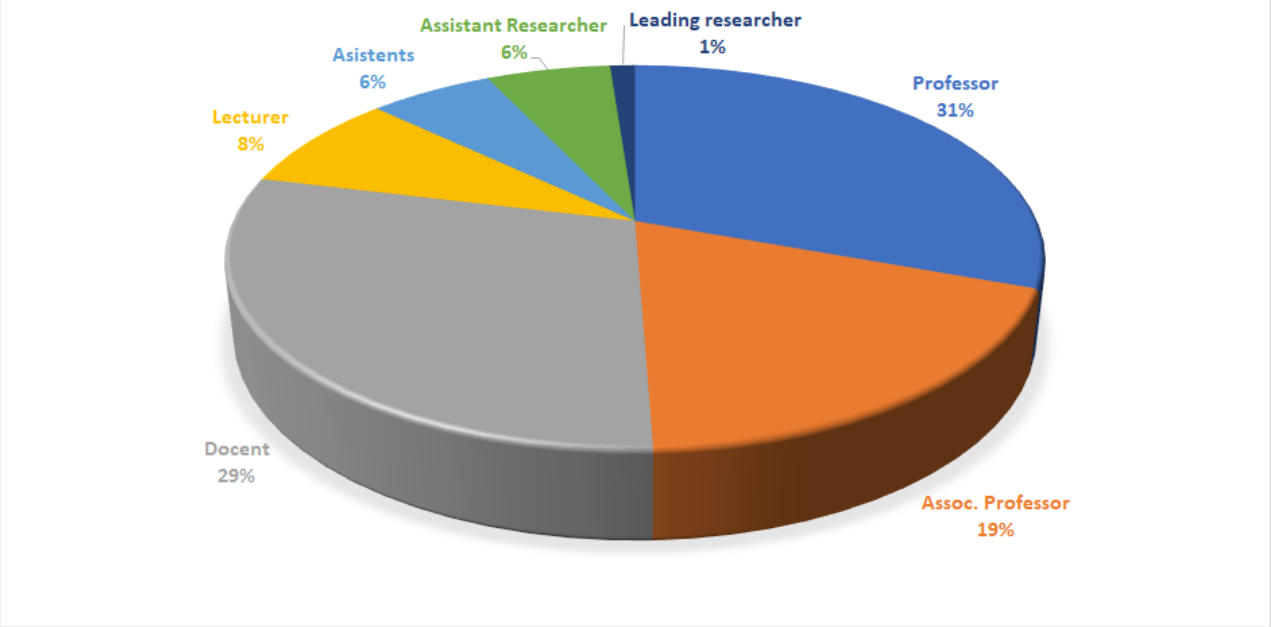


Figure 2.3.7. Distribution of teaching staff by position

The qualification of the academic staff corresponds to the specifics of the study programmes, i.e., the academic staff have obtained a master or PhD degree in the relevant sub-branch of engineering or natural sciences. Most of them hold a PhD degree in the fields and sub-branches of science corresponding to the study field, but depending on the course being taught, there are also representatives of the academic staff with a PhD degree in economics, engineering, pedagogy, social sciences, etc. The average age of the academic staff is around 50 years. Many instructors with a PhD degree are experts of the Latvian Council of Science in the relevant sub-fields of science. Most of the instructors elected to academic positions are also elected to research positions (75%). These indicators are very important for ensuring the quality, sustainability, and succession of the academic staff.

The workload of the academic staff often overlaps with the research workload, as a large proportion of the elected academic staff perform both academic and research work and, in some cases, administrative work. It is especially difficult to separate the workload from the supervision of the Bachelor and Master thesis projects, which, in most cases, is also related to the development of

research papers within a scientific project. The workload of each instructor is determined considering their position, involvement in projects and contract work, involvement in administrative work, as well as professional competencies and experience. At the beginning of the academic year, the planned workload of the academic staff for the next study year is evaluated, and, if necessary, adjustments are made in accordance with the workload of the previous period.

The academic work includes contact hours in classrooms and laboratories, consultations, advising on and reviewing of study and graduation projects, working in examination commissions, methodological work and activities improving the quality of studies, etc.

The administrative work includes management of study programmes and the study field, work in councils, commissions, the Senate, management of structural units and departments, etc.

The research work includes attraction and management of projects, performance of research assignments paid from the development funds or the third party financing, preparation of publications, advising on and reviewing of Ph.D Thesis, work with Ph.D students.

On daily basis the duties of the personnel overlap and all the elected academic staff members have both academic and research load and, in some cases, are also engaged in administrative work.

Qualification of the academic staff in the study field is very high, it is particularly important that the majority of the academic staff members holding the Ph.D degree are leading professors and leading researchers of their field with substantial international experience. Their Hirsch index reaches as high as 38.

According to the needs and specifics of each study course, high-level specialists (guest lecturers) from the industry, state institutions, non-governmental organizations, etc. can be involved in the study process. This also ensures close cooperation with the industry and reduces thematic and developmental divergence. The involvement of the industry representatives varies from year to year. It depends on the course design and the specializations chosen by the students. It should be noted that a large part of the guest lecturers is cooperation partners of RTU, as well as its former graduates.

Guest lecturers from other universities are purposefully attracted to the study courses of the compulsory part of the study programme, which supplements or fully ensures the delivery of these study courses. The involvement of such instructors is carefully assessed, considering the students' ability to participate in the study process in English. For this reason, most of the guest lecturers have participated in the delivery of Master level study courses.

2.3.8. Assessment of the support available for the students, including the support provided during the study process, as well as career and psychological support by specifying the support to be provided to specific student groups (for instance, students from abroad, part-time students, distance-learning students, students with special needs, etc.).

RTU Career Support and Services Department provides students with a wide range of career and psychological support services.

Career development support involves:

For prospective students:

- consultation on study programme selection;
- consultation on study selection and skills profiling;
- career choice seminars within RTU Open Days and upon request.

For current students:

- regular seminars and individual consultations on the development of career management skills, writing CVs and cover letters, job interview process;
- seminars on the development of entrepreneurial skills;
- project "RTU Golden Fund" to honour the best graduates and to promote new opportunities in the labour market;
- student summer camps for the development of career management and social skills and competences;
- online resource https://ekarjera.rtu.lv/ (in Latvian);
- an annual career day aimed at informing students majoring in engineering, natural and social sciences about the best and leading companies in the respective fields and bringing them closer to potential partner companies for undertaking internship and employers.

Psychological support involves:

- individual consultations and support in case of difficulties with studies (time planning, lack of motivation, social anxiety, adaptation difficulties) and individual psychologist consultations on personal issues and difficulties (including crisis intervention).

Seminars and workshops on the following topics:

- adaptation events for first-year students - informative classes within the study course "Introduction to Study Field", seminars on the development of learning and communication skills;
- stress management methods;
- time planning methods; o self-motivation;
- emotion management and development of emotional intelligence;
- public speaking skills.

Support is differentiated by the target groups (https://www.rtu.lv/en/studentservice/career-centre/psychological-support):

- prospective students (secondary school pupils, vocational school graduates, other prospective students): consultations concerning the studies are available, including skills diagnostics.
- first-year students: informative classes within the framework of the study course "Introduction to Study Field"; seminars on the development of learning skills; information letters on career and psychologist support opportunities; individual career and psychologist consultations; and other activities in cooperation with businesses and non-governmental organizations.
- all RTU students: individual career and psychologist consultations, seminars and classes, guest lectures, RTU Career Day.
- foreign students (Erasmus+ mobility and full-time): individual and career support consultations are available in English; wherever possible, seminars and classes are conducted in English, such as seminars on writing CVs and cover letters, time management.
- students with special needs: psychological and career support consultations are provided upon request; physical access to the room; opportunity to come with one's mentor or interpreter.
- graduates: career support consultations are provided if necessary; consultations on writing

CVs and cover letters, job interview process, career opportunities.
- staff: consultations on work and study related issues are provided to RTU academic and general staff members, if necessary.

As a result of pandemic, the offer has become even more accessible, as counselling and also career classes can be offered remotely.

In 2014, the Student Services Centre was opened in Ķīpsala campus. It provides day-to-day support under the supervision of the Career Support and Services Department:

- provides answers to various questions that students may have;
- provides printing, copying and binding services;
- issues identification cards;
- draws up references and transcripts, if necessary.

Further information is available at: https://www.rtu.lv/en/studentservice/student-service

In 2019, work was started on strengthening support for students with disabilities and in 2020 guidelines were issued with recommendations for effective communication and improvement of the study environment for people with disabilities and special needs: https://www.rtu.lv/lv/studentuserviss/par-mums-ssd/noderigi-ssc/noderigi-materiali-1/ka-komunicet-un-nodrosinat-piemerotu-studiju-vidi-personam-ar-invaliditati-un-specialam-vajadzibam (in Latvian).

RTU International Cooperation and Foreign Students Department has academic consultants who consult foreign students on studies and practical issues. Academic consultants keep track of the students' academic performance and attendance, as well as meet students on a regular basis to make sure their studies are successful, both in and outside the classroom. Shortly after the arrival of students, academic seminars are held, which are compulsory for all new students. Academic seminars are held approximately twice a week at the beginning of each semester, in line with the student influx. During these seminars, academic consultants introduce students to RTU internal rules, their responsibilities and rights, academic integrity, and various other practical aspects. In the future, it is planned to divide the students into groups according to the study programmes and to involve the heads of the study programme in the seminars so that the students would get acquainted with the management of the programme in due time. If during the semester a student is observed to face difficulties with the study process (attendance, academic arrears), the student is invited to an individual meeting with his/her academic consultant to discuss the best possible solutions to the problem. Each academic consultant has to arrange meetings with 2-5 students per week. After a month, students are invited to the meeting again to discuss their progress and make sure the situation has improved.

At RTU International Cooperation and Foreign Students Department, students have a contact person for facilitating the immigration process. The contact person organizes immigration seminars and document examination at the beginning of the semester. The Department arranges an appointment for students with the Office of Citizenship and Migration Affairs of the Republic of Latvia and verify the compliance of the submitted documents with the requirements specified in regulatory enactments.

RTU ICFSD foreign student admission team organizes introductory or orientation virtual seminars for foreign students, which take place before the beginning of the academic year / semester and students' arrival in Latvia, to inform students about practical issues related to entry and stay in Latvia (entry requirements, vaccination, self-isolation). , accommodation, etc.)

ICFSD in cooperation with the Student Service provides its students with a career counselor, who explains employment-related issues to students and introduces them to available vacancies, thus

facilitating students to gain work experience and develop their skills and abilities.

2.4. Scientific Research and Artistic Creation

2.4.1. Description and assessment of the fields of scientific research and/or artistic creation in the study field, their compliance with the aims of the higher education institution/ college and the study field, and the development level of scientific research and artistic creation (provide a separate description of the role of the doctoral study programmes, if applicable).

The development of the study programmes within the study field is based on two main aspects — the needs of the Latvian economy/industry and the areas of scientific research. The organizational units implementing the study programmes in the study field closely cooperate with the industry in the development of innovations, as well as apply for and implement scientific projects.

The research work is organized by administrative subunits – institutes:

- Institute of Applied Chemistry,
- Institute of Technology of Organic Chemistry,
- Institute of Polymer Materials,
- Institute of Technical Physics,
- Institute of General Chemical Technology,
- Institute of Materials and Surface Engineering,
- Institute of Water Systems and Biotechnology.

Academic staff implementing the study field performs research in the following fields (SciVal data):

- Materials Science (~24%),
- Engineering, in context of Materials Science and Chemistry (~24%),
- Physics (~23%),
- Chemistry and Chemical Engineering (~13%),
- Others (Biochemistry, Environmental Science, Pharmacology, Biology, Energy, Mathematics, Computer Science) (~16%).

These areas are related to the nationally defined “smart specialization” areas in the Guidelines for Science, Technology Development and Innovation 2014-2020. (1. Knowledge-intensive bioeconomy; 2. Biomedicine, medical technologies, biopharmaceuticals and biotechnologies; 3. Smart materials, technologies and engineering systems).

Study field researchers are involved in several multidisciplinary and interdisciplinary projects, which are implemented at the level of above mentioned institutes:

Institute of General Chemical Engineering [IGCE] and its research centre “RTU Rudolfs Cimdins Riga Biomaterials Innovation and Development Centre” focuses on biomaterials for bone tissue replacement and regeneration, eco material/environmentally friendly material development and research, including the exploration of Latvian natural resources as well as biotechnology and bioreactor design. A strong collaboration with physicians and pathologists in Latvia and abroad is established. The high level research in this domain is further justified by recently awarded HorisonH2020 Teaming 2 BBCE project (>30 MEUR) for which this Institute is the project

coordinator. This will further develop FMSAC as the Baltic regional hub for biomaterials research.

Institute of Technical Physics (ITP) focuses on materials physics: holographic grating spectroscopy, chalcogenide glasses, and electrooptic crystals; investigation of semiconductors under nonequilibrium conditions in nonhomogeneous electric, magnetic and temperature fields; nanostructures formation on a surface of semiconductors by laser radiation; elaboration and investigation of smart polymer nanocomposites; transformation of human and ambient motion and heat energies into usable electric energy. ITP has strong collaboration with physicians in many EU and Asian countries. ITP has established collaboration with CERN (ARIES project). It extensively collaborates with IMSE, IPM, IAC.

Institute of Materials and Surface Engineering [IMSE] runs several multidisciplinary research directions. It develops functional materials for detection, environmental remediation, alternative energy, and conducts research in materials science and nanotechnology of inorganic compounds. This includes photochromic energy saving smart windows, triboelectric nanogenerators, photocatalytic nanoheterostructures, antibacterial coatings, electrochemistry, etc. IMSE develops plasma and chemical preparation methods of oxide, boride, carbide, and nitride nanoparticles or their composites, thin coatings and their processing in fine-grained high-temperature and functional materials for energetics, solid electrolytes, luminescent devices, photocatalysts and catalysts, microelectronics. IMST has experience on technology for commercial production of nanopowders of refractory compounds, investigates also preparation of solid electrolytes and battery elements based on phosphates. IMSE holds also a group of scientists who perform research on calcium phosphates, albeit from a different perspective than IGCE. Their contribution to biomaterials research complements that of IGCE. IMSE also specializes in acquisition, research, and technological solutions of multifunctional nanostructured and ceramic materials (including composite materials) for environmental quality improvement, health protection, alternative energy and sustainable use of Latvian mineral resources. The institute actively performs contract analysis and consults companies working with geopolymer natural resources and construction chemistry. The institute collaborates with extensively ITP and Tartu University.

Institute of Polymer Materials (IPM) focuses mainly on:

1) Tailoring and optimization of boundary processes during development of polymer composite, nanocomposite, and hybrid composite materials.

2) Technological R&D and characterization of bio-based polymer composites / hybrid composites / functional polymer nanocomposites / multi-component hybrid systems with various anisodiametric nanostructured additives;

3) Chemical technology of polymer fibres;

4) Recycling strategy and technological solutions of polymer and composite materials;

IPM has an excellent balance between fundamental and applied research. It is the national centre for polymer testing and runs accredited “Laboratory for Polymer Testing” (ISO/IEC 17025), thus providing extensive consulting for polymer industry.

Institute of Water Systems and Biotechnology (IWSB) was established in 2020 by restructuring the Building Centre. The institute currently combines two research units: Water Research and Environmental Biotechnology Laboratory and Spatial and Regional Development Research Center. The main research areas of WSBI are water and wastewater technologies, treatment quality and efficiency, development and application of molecular and microbiological methods in the analysis of environmental samples, evaluation of disinfection efficiency of various innovative materials, technologies and agents, and environmental treatment and waste reuse using

biotechnological methods.

Institute of Applied Chemistry (IAC) works mainly in two directions, which involve organic and hybrid materials, and chemical and thermochemical transformations:

1) Development of novel organic materials for use in photonic and opto-electronic applications and devices. Several novel materials for holographic applications (collaboration with ITP) have been created. Also novel thin-films-forming luminescent materials have been developed and successfully applied in OLEDs (collaboration with ITOC and external collaboration with Institute of Solid State Physics).

2) Searching for solutions to the problem of rising greenhouse gas emission disrupting the global carbon cycle and leading to the planetary warming. Novel biomass conversion processes to form 1st and 2nd generation biofuel have been developed. These include new heterogeneous catalysts in the transesterification and interesterification process. Improves interesterification processes by eliminating the formation of glycerol as a by-product in biodiesel production. Biomass conversion via catalytic pyrolysis and catalytic hydrothermal or solvothermal liquefaction.

Institute of Technology of Organic Chemistry (ITOC) specializes in fundamental research on organic chemistry, preparative organic synthesis, natural product and medicinal chemistry, pharmaceutical chemistry and pharmaceutical process chemistry R&D. The fundamental organic chemistry research is conducted in fields of carbohydrate, nucleoside, purine chemistry. Medicinal chemistry projects are implemented on semi-synthetic triterpenoids and heterocyclic scaffolds. Technological advancements are achieved by using liquid sulfur dioxide a Lewis acidic and polarizing reaction medium which facilitates transformations involving carbenium ion intermediates. ITOC studies also natural antioxidants for pharmaceutical and cosmeceutical applications, and novel synthetic antioxidants for broad spectrum industrial applications. ITOC has an excellent balance between fundamental and applied research. It develops patent-free synthesis technologies for generic active pharmaceutical ingredients as a contract research. A great portion of the whole industrial income of FMSAC is due to ITOC contracts.

Since 2011, the academic staff have published more than 1000 scientific publications in the above-mentioned fields of science indexed in the international databases. Graduation papers in all education cycles are related to scientific research, as a result of which graduates of the study programmes are often included in the list of authors of publications. PhD and Master students provide invaluable support in the implementation of scientific projects. Both PhD and Master students have been involved in all scientific projects implemented within the study field (FLPP, Horizon2020, ERDF, ESF, etc.). This creates a link and complementarity between the study process and research activities.

There are 6 main foci of research in the study field:

1. Biomaterials research.
2. Inorganic materials (including their physics).
3. Organic chemistry (broadly defined: biologically active compounds, biofuels, catalysts, organic and hybrid functional materials, organic materials for photonics),
4. Polymers & composite materials (including their physics).
5. Water and wastewater treatment technologies.
6. Environmental biotechnology (waste recirculation, green technologies).

2.4.2. The relation between scientific research and/or artistic creation and the study process, including the description and assessment of the use of the outcomes in the study

process.

Scientific research is of special importance in ensuring the study process within the study field. The academic staff of the study field has a close connection with the scientific environment. Students are attracted by the examples used by the academic staff, which are based on the experience gained in the professional environment, and the use of analysis and interpretation of related cases in the study process. The academic staff discuss the latest scientific discoveries and current events in Latvia and the world within the topics of the study courses. Thus, a unique set of knowledge, skills and competencies is created to achieve the learning outcomes. Summarizing and evaluating the involvement of the academic staff in scientific research at the national and international level (in the fields corresponding to the content of the study programme) and the application of the obtained information in the study process, it can be concluded that the professional competence of academic staff fully meets the requirements. For a complete picture of research activities, see the CVs of academic staff and the list of publications in the field of study for the reporting period.

The information mentioned in the previous section attests to the qualification and ability of the academic staff of the study programme to independently improve their knowledge and apply it in the study process. The academic staff members, being also researchers, regularly participate in various conferences and projects, exchange experience with cooperation partners of other universities. This ensures that the content of study courses is regularly updated and is in line with the latest trends.

52% of the academic staff involved in the study field are also experts of the Latvian Council of Science.

The graduation papers of the study field are largely related to the topics of scientific projects run by the faculty, which allow the students to acquire specific knowledge that is not provided within the study courses and get acquainted with the scientific infrastructure and use it properly. Such an approach ensures a high-quality study process with an integrated science component, as well as promotes graduates' understanding of internationally recognized research and sustainable innovation, commercialization and knowledge transfer to the economy. If the results of the graduation paper are reliable and scientifically grounded, the student is given the opportunity to participate in local and international scientific conferences together with the academic staff. In this way, the students gain experience in presenting and communicating scientific research results. PhD students are involved and gain experience in drawing up the applications and reports for scientific projects, thus gaining a perspective of the most important aspects for starting an independent career.

In such a way, the elaboration of graduation paper promotes a high-quality collaborative study process, in which students acquire the knowledge necessary for professional growth and development. Since 2021, it is possible to prepare and defend Master’s Thesis as collection of scientifically unified research publications (Master by publications).

In 2019, Dr. Kristaps Kļaviņš, while working in CeMM, Austria, in cooperation with IGCT received the Marie Curie Individual Fellowship for the project “Metabolites as Immunomodulatory Additives for Biomaterials” and joined FMSAC not only as a research associate, but also as a lecturer in the undergraduate chemistry study course “Analytical chemistry”. This is an example of how the attraction of a scientific project provides study field with new teaching staff.

2.4.3. Description and assessment of the international cooperation in the field of scientific research and/or artistic creation by specifying any joint projects, researches, etc. Specify those study programmes, which benefit from this cooperation. Specify the future plans for the development of international cooperation in the field of scientific research and/or artistic creation.

The academic staff of the study field actively promote international cooperation in scientific research by participating in international scientific activities— taking part in international projects, publishing research results in internationally indexed scientific journals and conference proceedings, participating in international conferences, scientific journal editorial boards and scientific conference program committees, reviewing Doctoral Theses at foreign universities. PhD students of the program have conducted research at foreign universities and research institutes, as well as foreign PhD students and researchers have conducted research at the FMSAC.

In the reporting period, cooperation in the implementation of the scientific research projects was maintained with the following partners:

- Ulster University (project Multifunctional calcium phosphate and biodegradable polymer composites for therapeutic bone tissue engineering),
- Rizzoli Orthopedic Institute (NANOstructured osteochondral scaffold: novel biomimetic triggers for enhanced bone regeneration),
- National Institute of Chemical Physics and Biophysics (project Novel Heteroatom-doped Nanocarbon Catalysts for Fuel Cell and Metal-air Battery Applications),
- Tallinn University of Technology (project Investigation of carbon containing materials and method development for heavy metal removal from water),
- Vilnius Gediminas Technical University, University of Belgrade (project Bioceramic-based scaffolds for bone regeneration and controlled-release local delivery of antimicrobials),
- Mineral and Energy Economy Research Institute of The Polish Academy of Sciences (MEERI), Clausthal University of Technology, Norwegian University of Science and Technology (NTNU), Luleå University of Technology (LTU), Ravarugruppen RMG Ekonomisk Forening (RMK EK) (project International Cooperation for Rational Use of Raw Materials and Circular Economy (COOPMIN)),
- Republican Research and Practical Center for Epidemiology and Microbiology of Belarus (project Synthesis and antiviral activity of semisynthetic derivatives of biorenewable triterpenoids),
- University of Nantes, Université Laval, HTL Biotechnology (projects NANO delivery system for one-shot regenerative therapy of peri-implantitis),
- Marmara University, Tomas Bata University in Zlín, Technion - Israel Institute of Technology (project Bioactive injectable hydrogels for soft tissue regeneration after reconstructive maxillofacial surgeries),
- National Tsing Hua University (project Enabling a Commercially Viable Long Lifespan and High-Efficiency Omni- Friendly OLED Lighting Source with G2 and G3 Emitters),
- Amedeo Avogadro University of Eastern Piedmont, the Italian National Research Council, Queen Mary University of London, AO Research Institute Davos, Trustech S.R.L, the Max Planck Society for the Advancement of Science, REGENHU, EU CORE Consulting, Fluidigm France Sarl, EnginSoft Turkey (projects From pathobiology to synovia on chip: driving rheumatoid arthritis to the precision medicine goal),
- Vilnius University (project Environmentally friendly synthesis of metal-organic frameworks for enzyme encapsulation and energy harvesting),

- University of Oslo, Reykjavik University, Tallinn University of Technology (projects Waste-to-resource: eggshells as a source for next generation biomaterials for bone regeneration),
- Lomonosov Moscow State University, University of Tartu, EMPA, the Swiss Federal Laboratories for Materials Science and Technology (project UV-assisted 3D-printing of Ionic Electroactive Polymer Actuators for Soft Robotics),
- Estonian University of Life Sciences and SINTEF (EEA grant project "New biorefining solutions for lignocellulosic waste valorization",
- Leibniz Institute for Polymer Research Dresden (ERA-NET EU-LAC Health project “Efficient and affordable water treatment technologies to minimize waterborne diseases – Hi-Water)
- KTH Royal Institute of Technology, Tallinn University of Technology, Satakunta University of Applied Sciences (Interreg Central Baltic project “Application of experimental water bodies for pollution control in the Baltic Sea – WATERCHAIN”)
- Bielefeld University, University of Maribor, Technical University of Denmark, University of Patras within the project ITS-THIN (Water separation revolutionized by ultrathin nanomembranes),
- Mendel University in Brno, Glasgow Clyde College within the project “Pilot PoVE”
- University of Mainz within the ERANET Rus Plus project Development of pentacyclic triterpenoid – azole conjugates: from cancer chemopreventive agents and adjuvants in cancer chemotherapy to novel anti-cancer drug candidates
- Kiev university within the project From the theory of azidopurine-tetrazolopurine tautomerism to its applications in medicinal and materials chemistry.
- Vilnius University and National Taiwan University Synthesis of novel (deaza)purine-triazole conjugates and applications of their fluorescent properties

The academic staff of the study field are involved in international cooperation. An ERA Chair project has already been submitted in collaboration with Professor Joan Daniel Prades (University of Barcelona, Spain), which also envisages the participation of a partner in the study process. It is planned to apply in the next period for projects such as MeraNet, ERC, etc., and to move towards research related to the development of sustainable processes and products in cooperation with foreign research institutes.

The involvement of the academic staff in research and international cooperation has a positive impact on the study process as a whole. International cooperation broadens the horizons of the academic staff and allows integrating new findings into the study process. The knowledge, skills and competencies of the academic staff acquired in international cooperation, as well as the experience gained, are used in study courses and graduation papers within study programs of all levels. By developing the existing research areas and international cooperation, it is planned:

- to increase the number of publications in Q1-level scientific journals indexed in the Scopus and Web of Science databases;
- to implement more projects with the involvement of foreign partners;
- to promote the development of publications with foreign co-authors;
- to promote the active participation of instructors in international scientific conferences.

2.4.4. Specify the way how the higher education institution/ college promotes the involvement of the teaching staff in scientific research and/or artistic creation. Provide the description and assessment of the activities carried out by the academic staff in the field of scientific research and/or artistic creation relevant to the study field by providing examples.

It is a requirement of RTU that academic staff are actively involved in research apart from their involvement in the study process. Professors and associate professors are re-evaluated and re-elected every six years. Candidates are obliged to comply with certain criteria in terms of scientific research, i.e., number of publications or patents, supervised Doctoral candidates, etc. (Decision of RTU Senate No. 649 "On approval of the RTU Regulations "On the Procedure for Election of a Candidate for the Position of Professor or Associate Professor and the Procedure for Assessing the Qualification of an Existing Professor or Associate Professor" in a new edition" as of 26 April 2021; Amendments and Additions No. 01000-15.2/67, 30.05.2022. (Minutes 663)). In order to be allowed to supervise Doctoral students, the academic staff have to be approved experts in their fields, which is possible only if criteria regarding the number of publications/patents are met (decision of RTU Senate No. 602 "On Amendments to RTU Regulation on Doctorate" as of 26 September 2016). Approval process for the experts is organized by the Latvian Council of Science. The database of the experts is published on the National Research Information System (NRIS; https://sciencelatvia.lv/#/pub/home).

Every year, the Rector and faculty deans sign agreements by which each faculty undertakes to achieve certain key performance indicators, many of which are based on research output, e.g., the number of publications/patents, obtained research project funding, etc. Achievement of these indicators has an impact on financing received by the faculty from the so-called performance-based funds.

RTU Research Support Fund (decision of RTU Senate No. 585 "RTU Regulation of Research Support Fund" as of 15 December 2014) aims at providing financial support for various research related activities, such as support for maintenance of research equipment, protection and licensing of intellectual property, covering of expenses related to the Doctoral study process, publishing of scientific journals, participation and organization of scientific conferences, support to researchers in establishing new laboratories in a prospective research field. The Research Support Fund is an instrument to support research activities, which foster the development of the strategically important research fields.

Six research platforms in the main strategic research areas of RTU were established in 2013 as an instrument for fostering inter-disciplinary and inter-faculty cooperation of researchers in the areas of importance for industry and society. These platforms are as follows: "Energy and Environment", "Cities and Development", "Information and Communication Technologies", "Transport", "Materials, Processes and Technologies", "Security and Defence. Each platform has a dedicated coordinator, and they comprise the Council of Coordinators responsible for implementing the activities within platforms. The Council is supervised by the Office of Vice-Rector for Research (Decision of RTU Senate No. 600 "On Approval of the Regulation of the Council of Coordinators of Research Platforms at Riga Technical University" as of 23 May 2016). Similar to the faculties, the platforms have the Research Program (Decision of RTU Senate No. 590 "On Authorization to Approve RTU Research Program by RTU Scientific Council" as of 27 May 2015; "Research Program of Technical University 2016–2020"), annual action plan and dedicated funding from the Research Support Fund. Internal project calls within the platforms are organized every year, allocating 90–120 thousand EUR in total to six projects selected on a competitive basis. A mandatory requirement for the projects is a minimum 20% industry co-financing and participation of more than one faculty. In the period of 2016–2020, 16 projects were supported and nearly 300,000 EUR of funding was allocated to the projects. Regular series of seminars and visits to companies are also organized by the research platforms to stimulate networking and cooperation with industry.

Efficiency of these mechanisms can be illustrated by growth of SCOPUS indexed publications in the

period of 2013–2019. The total number of RTU publications increased from approximately 440 publications per year in 2013 to 865 in 2018. Number of SCOPUS publications per researcher (expressed in full-time-equivalent (FTE)) increased from circa 0.9 in 2013 to circa 1.5 publications/FTE per year in 2018 (the data were obtained from Elsevier “SciVal” database on 17 June 2019).

2.4.5. Specify how the involvement of the students in scientific research and/ or applied research and/or artistic creation activities is promoted. Provide the assessment and description of the involvement of the students of all-level study programmes in the relevant study field in scientific research and/ or applied research and/or artistic creation activities by giving examples of the opportunities offered to and used by the students.

RTU has mechanisms for involvement of students from all study levels and programs in research activities. There are activities aimed at strengthening the Doctoral studies and providing career opportunities during the post-doctoral period to young researchers.

Doctoral grants are provided to Doctoral students on a competitive basis. International calls are made to attract to post-doctoral projects. In addition, the internal Research Excellence Grant for young scientists was established in 2018 as a new initiative, providing 270 000 EUR for 3-year period based on international competition (conditions are similar to EC ERC grant with international call and evaluation performed by external, i.e., foreign well-recognized researchers). The grant allows young and talented researchers to establish their own research groups and make research career at RTU. Internal project calls provide additional funding for publishing articles in SCOPUS/WoS indexed editions, and internal projects within 6 research platforms stimulate involvement of Doctoral and Master students in multi-disciplinary and inter-faculty research projects in cooperation with the industry. The Research Support Fund (10% of the research base funding is allocated to this fund) provides support to Doctoral students (attending conferences, publishing papers and thesis, etc.). Employment of Doctoral students and post-doctoral researchers at RTU went up from 0 FTE in the period of 2013-2016 to 88 FTE (Doctoral students) and 97 FTE (Post-doctoral researchers) in 2018. 17 post-doctoral 3-year long projects with total funding of 2.28 million EUR were launched in 2017. The funding covered salaries, costs of materials and mobility, as well as support for further development of research skills (circa 134,000 EUR are allocated to one project). 16 post-doctoral 3-year long projects were launched in 2018 and 12 post-doctoral 3-year long projects were launched in 2019 with total funding of 3.7 million EUR. 18 post-doctoral 3-year long projects with a total funding of 2.4 million EUR have been launched in 2020. In 2021 10 projects were launched. The post-doctoral projects allow attracting new researchers to RTU from abroad and other Latvian research institutions, and providing academic career opportunities to Doctoral students who graduate from RTU. A total of 26 postdoctoral grants have been awarded to the FMSAC.

Internal project calls within the six research platforms, which are organized every year, have criteria regarding the involvement of students in the project, giving an additional score if students at the Bachelor, Master or Doctoral level are involved in the project.

RTU Innovation and Technology Transfer Center in collaboration with the department of RTU Vice-Rector for Science organizes the study course "Vertically Integrated Project" (VIP), during which interdisciplinary student teams develop a challenging long-term research project under the guidance of experienced researchers. The course is based on the example of the Georgia Institute

of Technology (the USA) course. Within the course, cross-disciplinary student teams are assembled, bringing together students from different study programmes, and ranging from first-year Bachelor students to Doctoral students, as well as involving pupils from the Engineering High School (EHS) of RTU (see additional information about the EHS below). During the course, students participate in research work under supervision of RTU researchers, working together with students of other study programmes and gaining experience in research as well as in team and project work. At the end of the course, each team presents its progress and demonstrates the results obtained. Since the spring of 2019, students are working in eight different research groups

- sensor systems and networks (group leader Prof. Jurģis Poriņš);
- wastewater treatment (group leader Prof. Tālis Juhna);
- energy efficient houses (group leader Leading Researcher Jānis Zaķis);
- bioenergy (group leader assoc. Prof. Linda Mežule);
- robotics (group leader Prof. Mikhail Gorobecs);
- space (group leader, lead researcher Kaspars Kalniņš, assistant Pauls Irbins);
- digital twins (group leader Prof. Jurģis Poriņš, assistant Andis Supe);
- indoor air quality (group leader Prof. A. Borodiņecs in cooperation with RSU)

From 2020 the study course is included in the student innovation grant project and integrated into the academic bachelor study programme "Biotechnology and Bioengineering" as a free choice study course in the 6th semester (2 CP). Students of other study programmes also receive two credit points for participation.

Students of master and often also bachelor study programmes implement their final thesis projects as a part of a larger scientific and/or R&D project, which is run by a senior faculty member. Most Master's students are already active in research projects at the start of their studies. In this way, working in a team of experienced researchers, the results can be published in international scientific journals and/or patented, and the students deservedly are included as the co-authors. This has led to additional options in the allowed format of the Master's thesis. Thus, under certain conditions, the Master's thesis can be prepared as a compilation of thematically unified scientific publications. An example is the Master's thesis of A. Jeminejs defended in 2021 as a “Thesis by Publications”, which included a collection of two published articles and one ready to be submitted. This promotes the development of students' research skills and scientific competencies.

The Engineering High School of Riga Technical University (EHS) is the first general secondary education establishment in Latvia that has been founded within the framework of a university. It is the place where the most talented Latvian pupils can acquire the study courses in exact and natural sciences at an advanced level to get prepared for the engineering studies. At the EHS, special attention is paid to the integration of engineering studies and scientific research activities into the study process.

In cooperation with FMSAC institutes and FCI WSI 37 research projects of EHS students have been developed, as well as 7 graduates of this school study in the study field study programmes.

A success story is the establishment of ITTC DF Labs (http://rtudf.rtu.lv) for design and prototyping. Idea of having the Lab at RTU was inspired by a positive example of Aalto University in Finland. Its task is to provide expertise and shared infrastructure for developing prototypes of new products and technologies, based on ideas of students and researchers. RTU DF also works with industry, start-ups and spin-offs and has established a very good reputation. We could observe that it considerably improved the involvement of students at all study levels in research and innovation activities and promoted cooperation of RTU with industry.

2.4.6. Provide a brief description and assessment of the forms of innovation (for instance, product, process, marketing, and organisational innovation) generally used in the higher education institution, especially in study field subject to the assessment, by giving the respective examples and assessing their impact on the study process.

The study process within the study field is related to technological innovations of products and processes. Students participate in the development of scientific projects, which are often related to the improvement or development of production processes for the needs of cooperating partners. During the internship, students get acquainted with a technological process and develop proposals for its improvement.

Starting from the academic year 2018/2019, the Bachelor's level students complete the study module for developing the professional competence of business, technology transfer and product development, i.e. "Innovative Product Development and Entrepreneurship". The study methodology of the study module is based on joint creation, integration of the parties involved in the development of new products and commercialisation in the study process, provision of continuous feedback on the results of the group work of the students involved in the study process and their achievements. It is targeted at learning by doing and developing integrated theoretical knowledge.

In all fields of study, students' understanding and knowledge of the importance of innovation in indusry is developed at the appropriate level of study.

2.5. Cooperation and Internationalisation

2.5.1. Provide the assessment as to how the cooperation with different institutions from Latvia (higher education institutions/ colleges, employers, employers' organisations, municipalities, non-governmental organisations, scientific institutes, etc.) within the study field contributes to the achievement of the aims and learning outcomes of the study field. Specify the criteria by which the cooperation partners for the study field and the relevant study programmes are selected and how the cooperation is organised by describing the cooperation with employers. In addition, specify the mechanism for the attraction of the cooperation partners.

Within the framework of the study field, in cooperation with various professional organizations, joint conferences and seminars are organized, as well as scientific cooperation, consultations on the development of the field and the necessary changes and improvements in the education system. The choice of cooperation partners is based on similar interests or work in similar scientific fields.

The FMSAC Advisory Board includes representatives of several state institutions and professional associations - the Latvian Association of Chemical and Pharmaceutical Entrepreneurs, the Association of Building Material Producers, the State Environmental Monitoring Bureau, and the Association of Latvian Woodworking Entrepreneurs and Exporters. Representatives of the associations participated in the development of the study programmes and in solving strategic issues of the FMSAC. Thanks to this cooperation, producers' representatives can influence the

suitability of the study programmes for the needs of employers and the strategic focus of the FMSAC.

The academic staff of the study field cooperate with many Latvian universities and research institutions with regard to both academic and research issues, e.g., the University of Latvia, Riga Stradiņš University, Latvian Institute of Organic Synthesis, Latvian State Institute of Wood Chemistry, Institute of Solid State Physics. Representatives of these institutions conduct classes within the study courses, as well as assist with the supervision of graduation papers. Scientific projects are also jointly applied for and implemented. Cooperation partners are selected within the relevant industry sectors. Within the framework of the study field, two joint study programmes with Latvian universities are implemented - “Industrial Pharmacy" in partnership with Riga Stradiņš University and “Biotechnology and Bioengineering” in partnership with the University of Latvia.

The involvement of employers takes place primarily within the framework of study programme internships. Students can undertake an internship both at a manufacturing company and at a research institution. The administration of the study programmes addresses the producers and offers cooperation opportunities for the provision of internships. The student can also find a preferred internship company. Field trips to manufacturers are also organized and companies are offered to present themselves and job opportunities within the framework of Career Days and Company Open Days.

Collaboration with industry and other institutions promotes knowledge- and experience based skills in study courses.

2.5.2. Provide the assessment as to how the cooperation with different institutions from abroad (higher education institutions/ colleges, employers, employers’ organisations, municipalities, non-governmental organisations, scientific institutes, etc.) within the study field contributes to the achievement of the aims and learning outcomes of the study field. Specify the criteria by which the cooperation partners suitable for the study field and the relevant study programmes are selected and how the cooperation is organised by describing the cooperation with employers. In addition, specify the mechanism for the attraction of the cooperation partners.

The choice of cooperation partners is based on the previous experience of the study field and cooperation of experts with foreign institutions in studies, science, project development, membership in associations, etc. forms.

The most important foreign cooperation partners of the academic staff involved in the implementation of the study field during the reporting period are listed below:

Professor L. Bērziņa-Cimdiņa – Member of the European Ceramic Society.

Professor D. Loča – member of NATO (North Atlantic Treaty Organization); COST Action MP1005 – “NAMABIO - From nano to macro biomaterials (design, processing, characterization, modeling) and applications to stem cells regenerative orthopedic and dental medicine” .

Assistant Professor A. Stunda-Zujeva – member of the Society of Glass Technology.

Professor J. Ločs – member of Committee for Socio-economic Analysis of the *European Chemicals Agency*; COST MP 1301 “New Generation Biomimetic and Customized Implants for Bone Engineering"; international project: H2020 WIDESPREAD-04-2017- Teaming Phase 1, project "Baltic

Biomaterials Center of Excellence "

Lecturer K. Ruģele – Member of the Latvian Biogas Association.

Prof. M.Kalniņš - member of the editorial board of the journal ″Mechanics of Composite Materials″ since 1992.

J. Zicāns - member of the editorial board of the Scientific Journal of Riga Technical University ″Materials Science and Applied Chemistry″; member of the National Supervisory Board of Europe's Largest Conference on Nanotechnology and Materials Science, Innovation and Business Networking 7th Biennial EuroNanoForum 2015; member of the Steering Committee of COST Action MP1206 "Electrospun Nano-fibres for bio inspired composite materials and innovative industrial applications".

M. Dzenis, the Chief Editor of the Scientific Journal of Riga Technical University ″Materials Science and Applied Chemistry″.

Professor G. Mežinskis: member of the editorial board of the journal of Kaunas University of Technology "Cheminė Technologija" and the journal of Kaunas University of Technology "Journal of Sustainable Architecture and Civil Engineering". Member of the editorial board of the Scientific Journal of Riga Technical University ″Materials Science and Applied Chemistry″. Member of the American Nano Society.

Professor S.Gaidukovs - member of the Steering Committee of COST Action „Multi-Functional Nano-Carbon Composite Materials Network (MultiComp)".

Professor R. Merijs-Meri - member of the editorial board of the journal "Environmental Research, Engineering and Management" (publisher: Kaunas University of Technology).

Professor M. Knite - expert in the sub-program DC: Materials, Physical and Nanosciences of the program Material Science COST (European Cooperation in the Field of Scientific and Technical Research).

Professor M.Turks - Scientific collaboration with academic institutions: Mainz University (Germany), Vilnius University (Lithuania), Seville University (Spain), Bordeaux University (France), Rijeka University (Croatia); Associate Editor of international SCI journal "Chemistry of Heterocyclic Compounds"; Management Committee member of COST Action CA18132 "Functional Glyconanomaterials for the Development of Diagnostics and Targeted Therapeutic Probes"; Latvian representative at the Division of Organic Chemistry, European Association for Chemical and Molecular science; Member of PhD awarding committees at Taltech (Estonia), Vilnius University (Lithuania), Seville University (Spain); Scientific Board Member of biannual international conference "Chemical Technology and Engineering" (Lviv, Ukraine).

Professor V.Kokars and Assoc.prof. K.Traskovskis - National Tsing-Hua University (Taiwan), Rhein-Wall University of Applied Science (Germany), University of Cagliari (Italy), Vilnius University (Lithuania), Kaunas University of Technology(Lithuania), Yuan Ze University (Taiwan), Linköping University (Sweden), Uppsala University (Sweden), Tianjin University (PR China), Institute of Physics and National Academy of Sciences (Ukraine).

Professor V.Kampars was a representative of Latvia in COST activity CM1404 SMARTCATS, supporting member of the International Centre for Sustainable Development of Energy, Water and Environment Systems - SDEWES Centre.

Professor T.Juhna - United Nations representative of 10-Member-Group of High-level Representatives of Civil Society, Private Sector and Scientific Community to support the UN Technology Facilitation Mechanism, European Innovation Council, representative of EIT in Latvia,

Editor of International journal Drinking Water Engineering and Science.

IWSB has scientific collaboration with more than 20 universities and institutes in EU and EEZ, e.g., SINTEF, Estonian University of Life Sciences, WETSUS, University of Cartagena, IPF Dresden.
Foreign cooperation partners are selected in view of study programme development needs, for example, ensuring the attraction of guest lecturers, development of joint projects, etc. The involvement of cooperation partners is related to the topics and scientific research within specific study programmes.

2.5.3. Specify the system or mechanisms, which are used to attract the students and the teaching staff from abroad. Provide the assessment of the incoming and outgoing mobility of the teaching staff in the reporting period, the mobility dynamics, and the issues which the higher education institution/ college faces with regard to the mobility of the teaching staff.

To attract foreign students to RTU, two communication target groups are mainly addressed:

- the internal: management team; general staff, academic staff; existing students;
- the external: prospective foreign students (foreign students studying in Latvia, foreign pupils and students, parents of foreign pupils and students); foreign graduates; mass media; opinion leaders; educational institutions; student recruitment education agencies; diplomatic and consular missions of the Republic of Latvia.

The communication strategy uses several types of information channels, choosing the most appropriate for each target audience – paid advertising channels, earned and owned ones. Marketing communication is an essential part of addressing foreign audience using all the traditional marketing tools – advertising in media and other channels, event marketing, direct marketing, digital marketing etc. The main marketing tool used to reach foreign audience is participation in various educational exhibitions and seminars organized by educational agencies in target markets. Continuity in the provision of information and promotion of studies is ensured by the long-term partner universities and educational agencies. In order to ensure a permanent presence and the provision of quality information about studies at RTU and the selection of students, RTU has opened its own information and study centres in specific countries.

Various virtual seminars are widely used to address potential students, with the participation of RTU ICFSD employees, existing delegated employees of students and study program directors, who acquaint prospective students with RTU infrastructure, study opportunities and requirements for foreigners, study program content, further study opportunities, as well as career opportunities after graduation.

ICFSD foreign student admission staff provides potential students with the opportunity to use online consultations to solve issues related to admission and study program selection. Consultations are arranged by appointment, every week, for a period of two months before the end of the admission period.

Potential students who have provided their contact information to RTU in connection with the commencement of studies, but have not submitted their applications for studies, are regularly addressed at least once a month.

Public relations tools (press releases, media events, face-to-face meetings, interviews, opinion polls,

etc.) and RTU social media channels (Facebook, WeChat, WhatsApp, YouTube, etc.) are used in corporate communication. RTU internal channels (ORTUS portal, email, etc.), information seminars and special events are used for internal communication.

RTU foreign student enrolment rates are summarized starting with academic year 2012/2013, indicating whether the student is pursuing undergraduate or graduate studies. The number implies only students enrolled in the first year.

		2013./14.		**2014./15.**		**2015./16.**		**2016./17.**		**2017./18.**		**2018./19.**		**2019./20.**		**2020./21.**	
Bachelors	Full-time	2	100%	3	60%	5	30%	10	43%	9	25%	12	42%	11	37%	11	44%
	Mobility			1	20%	6	35%	5	22%	32	76%	14	48%	12	40%	4	16%
Masters	Full-time													4	13%	3	12%
	Mobility													2	7%	2	8%
PhD studnets	Full-time											1	3%	1	3%	4	16%
	Mobility			1	20%	6	35%	8	35%	1	9%	2	7%			1	4%
Total		**2**		**5**		**17**		**23**		**42**		**29**		**30**		**25**	

The number of applications processed is much higher than the number of students actually enrolled. For example, in academic year 2015/2016, 626 applications were received from prospective students, while 349 students commenced their studies; however, in academic year 2016/2017, 670 applications were received, but 445 students were enrolled; in academic year 2017/2018, 1813 applications were received, but 632 students were enrolled; in academic year 2018/2019, 2627 applications were received, but 774 students were enrolled; in academic year 2019/2020, 3340 applications were received, but 870 students were enrolled; in academic year 2020/2021, 2036 applications were received, but 524 students were enrolled; in academic year 2021/2022, 2533 applications were received, but 873 students were enrolled.

During the reporting period 14 teaching staff members have used outgoing mobility on 21 occasions. The number of mobilities is very variable. In the pre-pandemic period, interest in mobility recovered. Most visits have been to Estonia and Lithuania. Visits depend on individual factors related to cooperation in research or academic work. See the list of teaching staff members and visited countries within the scope of mobility in Annex.

Also foreign teaching staff has been involved in implementation of the study programmes of the study field. ERASMUS+ Mobility Program and also other opportunities related to participation in joint international projects are used for attracting guest lecturers. During the reporting period the incoming mobility was used by 52 academic staff members. The number of mobilities fluctuates during the reporting period. The low level of mobility in recent years has been linked to the global epidemiological situation. On average 7 teaching staff members have participated in mobility per academic year. Most of the academic staff members were from neighboring countries, but often enough also from more remote regions. See the list of academic staff and the countries from which they come in the Annex on the Incoming Mobility of Teaching Staff

The plan is to increase or maintain mobility in the future, but t 90 here are some difficulties in planning mobility, as well as in the workload and workload of the acade mic staff in the industry.

2.6. Implementation of the Recommendations Received During the Previous Assessment Procedures

2.6.1. Assessment of the fulfilment of the plan regarding the implementation of the recommendations provided by the experts during the previous accreditation of the study field, as well as the assessment of the impact of the given recommendations on the study quality or the improvement of the study process within the study field and the relevant study programmes.

The preceding assessment of the study field “Chemistry, Chemical Technologies and Biotechnology” took place in 2011, when the experts’ report on the assessment of the study field was signed on 8.12.2011. The study field was accredited by resolution No. 76 of the meeting of the Study Accreditation Commission on 29 May 2013.

The experts’ report on the assessment of the study field contained several recommendations that were taken into account and implemented for the development of the study field:

1. Experts recommended to revise study programs in chemical technology (especially on Master’s level) by choosing more targeted approach for study program.

Study programmes in all education cycles have been reviewed and consolidated. At the Bachelor and Master levels, two study programmes have been merged, at the PhD level – three study programmes have been consolidated. In addition, the newly created PhD study programme is interdisciplinary and it is possible to individualize or, conversely, unite students by interest groups. The content and structure of the academic master study programme "Chemistry and Chemical Technology" allow uniting students of different years within the study course, thus optimizing resources.

2. The study programme system in RTU needs improvement, especially for increasing its competitiveness if compared with other European universities. It is very complicated to understand the aims and learning outcomes of the professional branch programmes compared with the academic branch programmes.

All the study programs representing the study field and coordinated by RTU are academic study programs and their goals and achievable learning outcomes correspond to the nature of academic study programs. The division of academic versus professional study programmes depends on national legislation and this cannot be influenced by RTU.

3. Infrastructure of the university needs to be improved as soon as possible.

The infrastructure of the university has been renovated. The buildings of the faculties involved in both study fields have been renovated, the equipment for the classrooms and scientific laboratories has been renewed, and significant funds have been invested in the purchase of scientific equipment. Currently, the infrastructure fully meets the needs of the students and academic staff, and further investments are planned.

4. Experts recommend for RTU reducing the number of lecture courses and specializations at Bachelor’s and Master Levels especially in Chemical Technology study programmes as the number of students compared to the number of study courses and specializations in the study programme is too low. However, in general the number of contact hours in curricula is low and some study courses don’t get adequate coverage necessary for university education, since self-dependent studies are not developed properly.

Since the previous accreditation, the study programmes have been unified and during this process, the specializations also have been reviewed. The content and specializations of the new study

programmes have also been discussed at the FMSAC Advisory Board. After discussions with the industry and student representatives, it has been concluded that all specializations included in the study programmes are necessary. Even if there are a small amount of students, the specialization can be provided by developing audiovisual materials that students can use for independent study. Study programmes “Chemistry and Chemical Technology” are unique in Latvia and RTU FMSAC is obliged to ensure speciality teaching for all needs of the national industry.

5. Rules and requirements (number and level of publications, participation in national and international conferences, etc.) for Doctoral study programs and the Doctoral Thesis need to be more precisely defined.

Regulations on the number and type of publications and participation in the conferences are formulated in RTU Doctoral Study Regulations, as well as in the methodological guidelines of the doctoral study programme “Chemistry, Materials Science and Engineering”. Requirements for publications have also been formalized by including in the study programme a study course in which publications are evaluated.

6. To reach a higher level of Doctoral studies it is suggested that a Doctoral school or joint Doctoral program is established involving Universities of Latvia or some foreign Universities as well as the research institutes.

RTU has established a joint Doctoral School for all study programmes. Its main tasks are to promote the professional development of PhD students, improve the quality of research work, establish interdisciplinary and inter-institutional cooperation among young researchers, as well as to involve students in science and motivate them to continue their studies at the PhD level. To implement these tasks, the Doctoral School organizes various types of events (seminars, summer schools, discussions, etc.), consults and informs PhD students about various support options, evaluates the existing research environment and provides recommendations for its improvement, as well as cooperates with various foreign partners (e.g., CERN). There is a well-developed cooperation in the study process among RTU, UL and the Latvian Institute of Organic Synthesis in the field of organic chemistry. This cooperation is not bureaucratically institutionalized. It includes a joint delivery of several study courses for students of these higher education institutions.

7. Academic staff should be encouraged to publish scientific articles in high-level international journals.

The interest of the academic staff in publishing their articles in scientific journals is encouraged at the RTU level. When calculating the distribution of different types of state funding between faculties and organizational units, the indicator of publications is also considered, which includes not only the number of publications but also their quality. Every year there is also a competition "The Highest Rated Publication of FMSAC Staff". The publications are selected based on the SNIP (Scopus) and IF (Web of Science) indicators of the journal in which the publication was published. Several of FMSAC professors have reached Hirsch index 15.

8. Closer cooperation with industry to get practical experience on chemical and technological processes at industrial level is recommended.

Cooperation with the industry has been strengthened by introducing internship in several study programmes, which the student can undertake at a manufacturing company or research institute. Practical classes led by representatives of the field are planned within the framework of several study courses. The industry representatives also take part in the supervision of term papers or even graduation papers on a topic of interest to companies. Thus, the student gains practical experience in the field, gets acquainted with its specifics and finds insight into future job opportunities. Cooperation with the industry also takes place beyond the study process. Company information

sessions and field trips to companies are organized for the FMSAC students. Companies are involved in organizing various events as sponsors and the information about the respective company is displayed during these events.

9. There should be more foreign academic staff involved in the study programmes, lectures in English and new text-books in other languages in order to improve competitiveness with other European universities.

Intensive work on attracting foreign instructors has taken place since the previous accreditation. A guest lecturer was invited to deliver the study course at the Bachelor level and the classes were held in English. Although the instructor had a lot of experience in their field, the students expressed dissatisfaction with the teaching process in English. Therefore, it was decided to further attract guest lecturers to the study courses at the Master level. It should be noted that Master students also face difficulties in acquiring the study course in a foreign language. To promote students' skills in acquiring knowledge in English, foreign and Latvian students study together within several study courses that are delivered in English.

10. The study methods which create problem-soling skills should be implemented, especially at the Master level.

The recommendation has been considered and the acquisition of the compulsory part study course of the master's programme is mainly based on case studies. Problem-solving skills are also acquired during the internship study course, when student's task is to get acquainted with the specifics of the internship place and offer improvements in the process. Also, a number of study courses include problem solving methods as teaching methods. These are basically courses related to the development of research projects.

11. The drop-out rate in Bachelor’s level studies is very high, and this problem requires to be examined and amended in order to use resources more efficiently.

The high drop-out rate, especially in the first year of study, can be explained by the existing problem at the national level with STEM training in secondary schools. There is a lack of teachers in schools who would teach students chemistry, physics, and mathematics at an advanced level and in an interesting way. Solutions for this problem are being sought and RTU also plans to get involved in chemistry and physics training for 12th grade pupils, inviting schools to co-operate and providing academic staff and facilities.

RTU has also established the first general secondary education institution founded by the university in Latvia - RTU Engineering High School (EHS), where the most talented students in Latvia can study exact subjects in depth in order to prepare for engineering studies.

The decrease in the number of students after the first semester is compensated by uniting the local and foreign students in the laboratory classes and, if possible, in other types of classes.

2.6.2. Implementation of the recommendations given by the experts during the evaluation of the changes to the study programmes in the respective study field or licensed study programmes over the reporting period or recommendations received during the procedure for the inclusion of the study programme on the accreditation form of the study field (if applicable).

During the reporting period four study programmes were licensed within the study field:

- On 3 June 2015, the second level professional higher education study programme "Industrial Pharmacy", license No. 04051-170,
- On 1 July 2020, the academic bachelor study programme "Biotechnology and Bioengineering", license No. 2020/03K,
- On 21 December 2020, academic master study programme "Chemistry and Chemical Technology", license No. 04051-191,
- On 2 July 2021, academic bachelor study programme "Chemistry and Chemical Technology", license No. 04051-193,

and on 29 September 2021, changes were made to the academic doctoral study programme "Chemical Technology", as a result of which the title of the study programme was changed to "Chemistry, Materials Science and Engineering" and the degree to be obtained.

The study programmes were developed based on the offer of the European and global market and the potential demand by developing studies in English, as well as the attainment of the RTU strategic goals. The study programmes are assessed as highly demanded, a high proportion of students in it is envisaged, as well as support was received from professional associations and organisations. Completion of the plan of implementation of the recommendations provided by the licensing experts is attached. The recommendations of program licensing and change approval experts were not essential and all are taken into account.

Annexes

I - Information on the Higher Education Institution/ College		
Information on the implementation of the study field in the branches of the higher education institution/ college (if applicable)		
List of the governing regulatory enactments and regulations of the higher education institution/ college	List of internal regulations.zip	Ieksejo normativo aktu saraksts.zip
The management structure of the higher education institution/ college	RTU_Management_ Structure.pdf	RTU_Parvaldibas_Struktura.pdf
II - Description of the Study Field - 2.1. Management of the Study Field		
Plan for the development of the study field (if applicable)	DEVELOPMENT PLAN.pdf	Attīstības plāns.pdf
The management structure of the study field	RTU_Study_Field_Management_Structure.pdf	RTU_studiju_virziena_parvaldibas_struktura.pdf
A document certifying that the higher education institution or college will provide students with opportunities to continue their education in another study programme or another higher education institution/ college (agreement with another accredited higher education institution or college) if the implementation of the study programme is terminated.	Agreement.7z	Vienošanās.7z
A document certifying that the higher education institution or college guarantees compensation for losses to students if the study programme is not accredited or the study programme license is revoked due to actions (actions or omissions) of the higher education institution or college and the student does not wish to continue studies in another study programme.	Confirmation - on compensation for losses.edoc	Apliecinājums - par zaudējumu kompensāciju.edoc
Standard sample of study agreement	Study_agreements.zip	Studiju_ligumi.zip
II - Description of the Study Field - 2.2. Efficiency of the Internal Quality Assurance System		
Analysis of the results of surveys of students, graduates and employers	Surveys by programs.7z	Aptaujas pa programmām.7z
II - Description of the Study Field - 2.3. Resources and Provision of the Study Field		
Basic information on the teaching staff involved in the implementation of the study field	Basic information about the academic staff involved in the implementation of the study field.xlsx	Pamatinformācija par studiju virziena īstenošanā iesaistītajiem mācībspēkiem.xlsx
Biographies of the teaching staff members (Curriculum Vitae in Europass format)	CV, ENG.zip	CV, LV.zip
A statement signed by the rector, director, head of the study programme or field that the knowledge of the state language of the teaching staff involved in the implementation of the study programmes within the study field complies with the regulations on the state language knowledge and state language proficiency test for professional and official duties.	Confirmation - knowledge of the state language.edoc	Apliecinājums - valsts valodas zināšanas.edoc
A statement of the higher education institution/ college on the respective foreign language skills of the teaching staff involved in the implementation of the study programme at least at B2 level according to the European Language Proficiency Assessment levels (level distribution is available on the website www.europass.lv, if the study programme or part thereof is implemented)	Confirmation - knowledge of the foreign language.edoc	Apliecinājums - svešvalodu prasme.edoc
II - Description of the Study Field - 2.4. Scientific Research and Artistic Creation		
Summary of quantitative data on scientific and/ or applied research and / or artistic creation activities corresponding to the study field in the reporting period.	Compilation of quantitative data.pdf	Kvanitatīvo datu apkopojums.pdf
List of the publications, patents, and artistic creations of the teaching staff over the reporting period.	Publications.7z	Publikācijas.7z
II - Description of the Study Field - 2.5. Cooperation and Internationalisation		
List of cooperation agreements, including the agreements for providing internship	Cooperation_agreements_EN.pdf	Sadarības_līgumi_LV.pdf
Statistical data on the teaching staff and the students from abroad	Statistical data on foreign students and academic staff.pdf	Statistikas dati par ārvalstu studējošajiem un mācībspēkiem.pdf
Statistical data on the incoming and outgoing mobility of students (by specifying the study programmes)	Statistics on student mobility.pdf	Statistika par studējošo mobilitāti.pdf
Statistical data on the incoming and outgoing mobility of the teaching staff	Academic staff mobility.pdf	Statistikas dati par mācībspēku mobilitāti.pdf
II - Description of the Study Field - 2.6. Implementation of the Recommendations Received During the Previous Assessment Procedures		
Report on the implementation of the recommendations received both in the previous accreditation and in the licensing and/ or change assessment procedures and/ or the procedures for the inclusion of the study programme on the accreditation form of the study field.	Implementation or recommendations.7z	Rekomendāciju izpilde.7z
An application for the evaluation of the study field signed with a secure electronic signature	01000-2.2.1-e_145.edoc	01000-2.2.1-e_145.edoc
III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	RKBM0 43528.zip	RKBM0 43528.zip
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)		
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period	Statistics, Annex 5, CCT 45528.pdf	
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard	6en-labots-pielikums-atbilstību-valsts-izglitibas-standartam.pdf	
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)		
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	Mapping of study courses of the study program Chemistry and Chemical Technology, Annex 8.pdf	Studiju kursa Ķīmija un Ķīmijas Tehnoloģija kartēšana, 8.Pielikums.pdf
The curriculum of the study programme (for each type and form of the implementation of the study programme)	8en-labots-pielikums-programmas-plans.pdf	
Descriptions of the study courses/ modules	Course descriptions, 43528.zip	Studiju kursu_moduļu apraksti, 45528, 10.pielikums.zip
Description of the organisation of the internship of the students (if applicable)		Prakse.zip
III - Description of the Study Programme - 3.4. Teaching Staff		

Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)		

Other annexes

Name of document	Document
RTU_studejoso_priek_un_sudz_iesn_un_izsk_kart.pdf	RTU_studejoso_priek_un_sudz_iesn_un_izsk_kart.pdf
RTU_proposals_complaints.pdf	RTU_proposals_complaints.pdf
RTU IT sistemu saskarnes.zip	RTU IT sistemu saskarnes.zip
Screenshots of RTU IT systems.zip	Screenshots of RTU IT systems.zip
Main research equipment.pdf	Main research equipment.pdf
Par_minimālo_studējošo_skaitu_studiju_programmās.pdf	Par_minimālo_studējošo_skaitu_studiju_programmās.pdf
On_minimal_number_of_students_in_study_programmes.pdf	On_minimal_number_of_students_in_study_programmes.pdf
Additional info for SD CCTB (After visit).pdf	Additional info for SD CCTB (After visit).pdf
LZP atzinums	2022_4S-32_lzp_14.11.2022 - 1-3.N-1708 (LZP).edoc

Industrial Pharmacy (46725)

Study field	*Chemistry, Chemistry Technologies, and Biotechnology*
ProcedureStudyProgram.Name	*Industrial Pharmacy*
Education classification code	*46725*
Type of the study programme	*Second level professional higher education programme (after bachelor, professional bachelor, second level professional higher education study programme) (short programme)*
Name of the study programme director	*Inese*
Surname of the study programme director	*Mieriņa*
E-mail of the study programme director	*inese.mierina@rtu.lv*
Title of the study programme director	*Dr. chem.*
Phone of the study programme director	*26228145*
Goal of the study programme	*The aim of the study programme is to provide an opportunity to acquire in-depth knowledge about medicine, the development and production of finished forms, quality control, and the development and distribution of registration dossiers. This knowledge is accompanied by research skills that, together with the ability to apply them in practice in pharmaceutical companies, would provide the qualifications of an industrial pharmacist.*
Tasks of the study programme	*1. To provide an opportunity to acquire theoretical knowledge about the development of finished forms, production process, technologies, quality control and distribution.* *2. To provide an opportunity to develop critical thinking and the ability to analyze available information, to develop skills for the analysis of cases in the pharmaceutical industry, to promote integrated vision and evidence-based decision-making.* *3. By cooperating between two higher education institutions already in the study process to create preconditions for cooperation between two professions, without which a booming pharmaceutical industry is not possible.* *4. To promote the competitiveness of specialists in the local and EU labour market.*
Results of the study programme	*The graduate of the study programme is able:* *• to join an interdisciplinary team, associate oneself with the goals of the team and contribute to the achievement of common goals;* *• to integrate the theoretical knowledge acquired in the studies of pharmacy and industrial pharmacy, as well as, if necessary, to supplement the knowledge independently in order to solve problems and substantiate one's opinion;* *• to find, select, analyse, use scientific literature, compile scientific literature, perform data processing, summarize the obtained information, critically analyze it, provide one's evaluation and present the results;* *• assess the degree of evidence of the data and decide on further action;* *• choose the most appropriate and innovative way to solve the problem.*

Final examination upon the completion of the study programme	*Research Project and National Degree Examination*

Study programme forms

Full time studies - 1 years, 6 months - latvian

Study type and form	*Full time studies*
Duration in full years	*1*
Duration in month	*6*
Language	*latvian*
Amount (CP)	*60*
Admission requirements (in English)	*Second level professional higher education in pharmacy (degree in pharmacy) or comparable education*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	-
Qualification to be obtained (in english)	*Industrial pharmacist*

Places of implementation

Place name	City	Address
Riga Technical University	RĪGA	KAĻĶU IELA 1, CENTRA RAJONS, RĪGA, LV-1050

3.1. Indicators Describing the Study Programme

3.1.1. Description and analysis of changes in the parameters of the study programme made since the issuance of the previous accreditation form of the study field or issuance of the study programme license, if the study programme is not included on the accreditation form of the study field, including changes planned within the evaluation procedure of the study field evaluation procedure.

Second level higher education study programme “Industrial pharmacy” is created per the explanation on “Short professional program implemented after previous academic (bachelor or master) education or second level higher professional education” of the regulation of the Cabinet of Ministers no 512 “Regulations on state education standard of the second level professional higher education”.

The study programme was licensed in 2015, and the students started their studies in this study programme for the first time in the academic year 2015/2016. The study programme is implemented in collaboration between Riga Technical University and Riga Stradins University. Such collaboration ensures that the best academic staff in the particular area are involved in implementing the study programme. Students gain comprehensive knowledge and proficiency on the whole circulation path of medicine, from the synthesis of biologically active compounds to introducing them in the finished dosage forms and registration of the medicine, quality control, and marketing issues through the graduation of this study programme. Thus specialists who find themselves bearings are known full and able to explain to the patient all cycles of the elaboration and implantation of medicine are prepared.

Riga Technical University ensures study courses on the synthesis of medicinal substances and pharmaceutical preparation. In turn, Riga Stradins University ensures study courses on the development of finished dosage forms, registration, clinical trials, pharmaceutical marketing, and good manufacturing practice issues.

The duration of studies in the program “Industrial pharmacy” is 1.5 years, agreeing with 60 CP.

Several changes are performed in the study program from the academic year 2015/2016 to the academic year 2021/2022:

1. According to the “Civil Protection and Disaster Management Law” the study course on civil defence issues is compulsory. Due to that, a study course RSU008“Civil Defence and Environmental Protection” (2 CP) has been incorporated as a part B study course since academic year 2018/2019.
2. The study course “The Chemistry and Technology of Medicinal Substances (selected chapters)” (ĶOS505, 2 CP, the study course was provided by RTU MSAC) has been removed from the subjects of Part A of the study program because RTU has removed it from the list of offered courses since 2021.
3. The study course “Preparation of Scientific Papers” (RSU005, 2 CP) has been included in part A of the study program since 2021.
4. The study course “Drug Development” (RSU007, 2 CP) has been included in part B of the study program since 2021.
5. Due to the election of the Dean of FMSAC, the director of the field of study is changed: professor Valdis Kokars held this position till the year 2018, but professor Māris Turks has

held this position since 2018.

6. The director of the study program is changed from the side of RTU. Professor Mara Jure was the director of this stud program from 2015 to 2021. Since 2021 assistant professor Inese Mieriņa has held this position.

3.1.2. Analysis and assessment of the study programme compliance with the study field. Analysis of the interrelation between the code of the study programme, the degree, professional qualification/professional qualification requirements or the degree and professional qualification to be acquired, the aims, objectives, learning outcomes, and the admission requirements. Description of the duration and scope of the implementation of the study programme (including different options of the study programme implementation) and evaluation of its usefulness.

The second level higher education program “Industrial pharmacy” is implemented in close synergy between Rigas Technical University and Rigas Stradins University. Following the code 46725 of the study program “Industrial Pharmacy”, it is designed as a second-level professional education (46), which prepares specialists in the field of health care and social welfare (7), health care (72), specifically in pharmacy (725). **The study program is designed to prepare specialists with such knowledge, skills, and competencies that fully comply with the code and title of the study program.** The title of the study program "Industrial pharmacy" represents the main proficiencies of the graduates. The alumini gain proficiency in various life cycle issues of biologically active compounds, including evaluation of new medicinal substances, bulk industry, and competencies in elaboration and manufacturing of finished dosage forms, quality control, preparation, and dissemination of registration dosiers. These proficiencies and competencies can be applied in practice in pharmaceutical companies. Besides, the students develop their proficiency in research for solving problems in the pharmaceutical industry. The program develops an integral vision of all disciplines involved in the successful elaboration of medicine. When the studies are successfully finished in the second level higher education study program “Industrial pharmacy” the graduate is granted with “Professional qualification of the industrial pharmacist”. A pattern of the diploma and its appendix is added in Annex 1.

The study program "Industrial Pharmacy" **aims** are to provide an opportunity to acquire in-depth knowledge of the development and production of dosage forms, quality control, development and distribution of registration documents and research skills that would ensure the qualification of an industrial pharmacist in pharmaceutical companies.

The main **tasks** of the study program “Industrial Pharmacy” are:

1. to provide an opportunity to acquire theoretical knowledge about the development of pharmaceutical forms, production processes, technologies, quality control, and distribution;
2. to provide an opportunity to develop critical thinking and the ability to analyze available information, to develop skills for analyzing the situation in the pharmaceutical industry, to promote integrated vision and evidence-based decision-making;
3. by cooperating between two higher education institutions, to create preconditions for cooperation between two professions already in the study process, without which a booming pharmaceutical industry is not possible;
4. Promote the competitiveness of professionals in the local and EU labor market.

The graduates of the study program “Industrial pharmacy” will have gained the necessary

knowledge, proficiency, and competencies to understand and participate in all stages of developing and manufacturing medicine. “Professional qualification of the industrial pharmacist” is gained through various study results which give consecutive knowledge in all life cycle of the medicine. The **study results** include the following proficiencies and competencies:

- The students gain essential knowledge and competencies in developing new medicine and legal issues. Besides, they will be able to explain all processes dealing with the development of new medicine for the patients.
- The students are in charge of clinical trials and can judge the results of the clinical trials.
- The students have an insight into the theoretical principles of bulk manufacturing, the requirements for the manufacturing space, and good manufacturing practice. The students are proficient in choosing, developing, and implementing the most appropriate dosage form for the particular pharmaceutical substance and type of usage. The students will have the competencies for preparing the documentation for the medicine registration.
- The students know the modern medicine delivery forms: they orient in principles of nanotechnologies regarding dosage forms, nanoforms, and nanotechnologies for delivering the active ingredients in pharmacy, cosmetics, and diagnostics.
- The students will get both knowledge on research and manufacturing aspects of the medicine and competencies in the selling process of pharmaceutical products, including legal and ethical issues and organization and monitoring principles.
- The role of intellectual property rights is vital in pharmacy. Thus, this study program will give the knowledge of the types of intellectual property, emphasizing the chemistry and pharmacy issues. The students will be proficient in patent-searching, reading, and writing the claims.
- The studies in this program, writing the qualification thesis, etc., will develop the academic writing skills regarding preparing methodological part, analysis, evaluation and interpretation of the results, and sarching and analysis of scientific literature.
- Alumni of the study program will be able to join an interdisciplinary team, associate themselves with the team's goals, contribute to achieving common goals, and develop their skills as leaders.

All the knowledge gained through the theoretical courses is strengthened in the study placement in the leading pharmaceutical companies.

As it can be concluded from the study results, this study program aims are to give knowledge, develop and strengthen in the practical placement such proficiencies and competencies which allows the graduate to involve in all stages of the medicine from the manufacturing and registration to distribution of the medicine.

In order to be credited for the studies in the study program “Industrial pharmacy” the second level professional higher education in pharmacy (a pharmacist’s degree) or equivalent higher education is required. Such critery for matriculation is promoted because the study program “Industrial pharmacy” gives an in-depth understanding of the medicine cycle, starting from manufacturing to a drugstore. The lack of basic knowledge in pharmacy can disturb the effective study process and to gain all skills in accordance to the profesion`s standard. The pattern of the study agreement is in Appendix 2.

The study program “Industrial Pharmacy” **is implemented as** a full-time study program. Duration of studies - 1.5 years, which corresponds to 60 CP. In implementing the study program, theoretical courses are planned in the first term that provides theoretical knowledge in the field and the latest scientific findings. In contrast, the acquired theoretical knowledge is strengthened in a real work environment in the second and third terms. “Placement in Industrial Pharmacy” and “Research Project” are implemented in leading pharmaceutical companies.

3.1.3. Economic and/ or social substantiation of the study programme, analysis of graduates' employment.

Implementation of the study program “Industrial Pharmacy” in close synergy between Riga Technical University and Riga Stradins University has several multi-level economic and / or social justification. Firstly, the joint implementation of the study program will ensure the efficient disposal of the resources and infrastructure at both universities. Faculty of Materials Science and Applied Chemistry of Riga Technical University has the infrastructure and equipment needed to master the synthesis and manufacturing of medicine. In turn, the infrastructure and equipment of Riga Stradins University allow acquiring skills related to the development of finished drug forms. Concerning the academic staff, Riga Technical University employs high-level professors with experience in researching biologically active compounds, which is confirmed by the implemented projects and publications (see Section 3.4.1). This experience provides a study course related to the production of pharmaceutically active substances based on the latest scientific advances. It should also be noted that the implementation of the joint study program allows effective usage of the capacity and time resources of the academic staff. Some of the compulsory study courses included in the joint study program “Industrial Pharmacy” are also included in the programs implemented by RTU FMSAC. As the study program “Industrial Pharmacy” has a relatively small number of students and a small number of MSAC students study these study courses as optional courses, it is possible to provide these study courses simultaneously to students of several study programs and universities. Joint implementation of study courses for students of several programs not only saves financial resources but can also reduce the load on the infrastructure. In the long run, the simultaneous implementation of study courses for students of different study programs can promote interdisciplinary cooperation in the future in their professional carrier, which could potentially create products with high added value and promote Latvia's economic development.

Secondly, pharmaceutical products play an essential role in the Latvian export market. In addition, this market is constantly expanding: pharmaceutical companies exported goods worth more than 560 million euros in 2021 (https://eksports.csb.gov.lv/lv/years/products-selected/export/2021/TOTAL-sp_24 / TOTAL). The export and the domestic market continue to expand. The quality control requirements of the pharmaceutical industry have increased. Thus, there is a growing demand for specialists who can monitor pharmaceuticals' development and quality control processes, prepare documentation, and communicate effectively with industry regulators. The study program "Industrial Pharmacy" prepares specialists who can prepare a dosiers of drug registration documents for pharmaceutical companies. Graduates of the study program “Industrial Pharmacy” work as industrial pharmacists in the industry's leading companies. The demand for graduates of this study program is also confirmed by regular job offers from various companies looking for specialists with knowledge and skills in the production of pharmaceutically active substances and the preparation of documents.

3.1.4. Statistical data on the students of the respective study programme, the dynamics of the number of the students, and the factors affecting the changes to the number of the students. The analysis shall be broken down into different study forms, types, and languages.

The study program "Industrial Pharmacy" is implemented as full-time study. Studies are conducted in Latvian. Students were recruited every year when the study program “Industrial Pharmacy” was enrolled. Since 2018, recruiting is not organized every year. Thus the industry's demand for specialists is met, but there is no situation where more industrial pharmacists are trained than needed in the labor market. The matriculation and ex-matriculation of applicants (including, if necessary, for the insufficient acquisition of the study program) and the performance and supervision of student record keeping are ensured by Riga Stradins University.

Up to six applicants can be matriculated for the study financed by state budgetary grants and five - funded by natural and legal persons. On average, five applicants start their studies every year (if there has been recruiting for the studies in the given year) (see Appendix 3). There is a tendency to increase interest in the study program: in 2021, seven applicants started their studies, which means that a part of the students studies without budgetary grants. Thirteen students have completed this study program up to date. Almost 70% of all students who have started their studies in the corresponding academic year have graduated their studies. Throughout the study program “Industrial Pharmacy”, three students have been deducted from the studies without completing their studies: two of them at their request, but one - for not attending classes. Since 2019/2020 two to three students have been on academic leave.

3.1.5. Substantiation of the development of the joint study programme and description and evaluation of the choice of partner universities, including information on the development and implementation of the joint study programme (if applicable).

The development and implementation of joint study programs are regulated by the RTU Senate "Procedure for Application, Development and Amendments to Study Programs" (see the file in Annex 06 to the List of Internal Regulatory enactments). The choice of partner universities is the responsibility of the initiator of developing the joint study program in coordination with the study field commission and the vice-rector for studies.

The study program “Industrial Pharmacy” was initiated by the Association of Employers, namely, the Latvian Association of Chemical and Pharmaceutical Entrepreneurs, together with Riga Stradins University, thus creating an opportunity to train the necessary specialists for the industry. Information on compliance with the Law on Higher Education Institutions requirements regarding joint study programs (Annex 4) and the inter-university agreement (Annex 5) is given in the relevant annexes. The joint study program “Industrial Pharmacy” of Riga Technical University and Riga Stradins University prepares health care specialists - industrial pharmacists. Therefore, naturally, this study program is developed in close cooperation with Riga Stradins University, which provides several different programs that prepare health care professionals, including pharmacists. The study program “Industrial Pharmacy” is an excellent example of synergy between universities to prepare specialists with interdisciplinary skills: firstly, graduates have the necessary knowledge in the production of pharmaceuticals (i.e., chemical engineering (2.4) in the field of organic matter technology) and secondly, graduates have skills, relating to the inclusion of pharmaceutical preparations in finished dosage forms and the preparation of dossiers for the registration of medicinal products (i.e. in basic medical sciences, including pharmacy (3.1)).

When creating a joint study program “Industrial Pharmacy”, each of the partner universities provides those study courses for the teaching of which it has the necessary competencies. Riga Technical University is the leading technical and engineering university in the Baltic region. Riga

Technical University's leading position in organic chemistry (and especially in the synthesis of biologically active compounds) and chemical engineering is confirmed by the publications in the journals, implemented research grants, and agreements with leading pharmaceutical companies in Latvia and abroad (see CVs of the academic staff involved in the implementation). These staff competencies ensure the implementation of study courses taking into account the latest achievements in science. Riga Technical University is the only university in Latvia and the Baltic States that provides training in chemical engineering, integrating aspects of chemistry and forming an interdisciplinary vision in various sub-sectors of chemistry, chemical technology, and materials science. Riga Stradins University is a leading university in Latvia that trains specialists in various health care fields. Thus, establishing the joint study program “Industrial Pharmacy” of these two universities was a natural continuation to prepare the missing specialists for pharmaceutical companies, involving the best teaching staff in the implementation of the study program.

Riga Technical University provides study courses related to chemical engineering processes, chemical industry aspects, and issues related to the synthesis of biologically active compounds. These topics are covered by study courses “The Chemistry and Technology of Pharmaceuticals” (ĶOS501) and “Patents” (ĶOS603), which make up 27% of Part A subjects (calculated based on credit points). In addition, Riga Technical University also provides the subject of Part B “Nanotechnologies in Drug Delivery and Diagnostics” (ĶOS719). Study courses related to pharmacy, including both research and marketing, and the production of finished forms, are provided by the teaching staff of Riga Stradins University. Students' knowledge is assessed according to the criteria adopted by both partner universities. Students are introduced to the evaluation criteria at the beginning of the study course. The information is available in the study course description on the online portals of both universities.

3.2. The Content of Studies and Implementation Thereof

3.2.1. Analysis of the content of the study programme. Assessment of the interrelation between the information included in the study courses/ modules, the intended learning outcomes, the set aims and other indicators with the aims of the study course/ module and the aims and intended outcomes of the study programme. Assessment of the relevance of the content of the study courses/ modules and compliance with the needs of the relevant industry, labour market and with the trends in science on how and whether the content of the study courses/ modules is updated in line with the development trends of the relevant industry, labour market, and science.

The study program “Industrial Pharmacy” **fully complies with the requirements of the state education standard** regarding “short professional programs (see Annex 6) implemented after the acquisition of academic (bachelor or master) education or second level professional higher education”. The content of the study program fulfills the achievable tasks set for such a program. As a result of graduating from the study program, **specialists are skillful for work in pharmaceutical companies - an essential exporting part of the Latvian economy**. It should be noted that the program prepares specialists in demand in the labor market: various job advertisement sites regularly provide information that the job is offered directly to the industrial pharmacist. The program prepares specialists - industrial pharmacists with in-depth knowledge of

the development and production of finnished dosage forms, quality control, and preparation and circulation of registration documents. Graduates of the study program are competent in their field. Besides, they are also strong team players and leaders, able to solve problems, analyze large amounts of data and scientific literature, including patents, evaluate the reliability of evidence and incorporate the latest scientific achievements in solving real problems in the company. Theoretical courses of the study program provide skills in producing pharmaceutical preparations, their incorporation into finished dosage forms, the latest scientific achievements in the field, good manufacturing practice, drug registration issues, scientific writing, and pharmaceutical marketing. In addition, a study course on intellectual property protection issues must be taken within the subjects of the compulsory part. To prepare these specialists for work in pharmaceutical companies, an essential part of the training is internships and research work organized in close cooperation with the leading companies in the industry. Limited choice courses allow the development skills and competencies for innovative industry solutions such as nanotechnology in the administration of therapeutic and diagnostic agents.

When the content of the study program was created, the professional standard was also taken into account (1.90. Professional standard of the industrial pharmacist; information on the program's compliance with the professional standard is summarized in Annex 7). The study program provides graduates with **knowledge** of management methods, business and intellectual property rights, the latest trends in pharmacy, and an understanding of the basic principles of industrial building design at the conceptual level. **At the level of understanding**, graduates gain knowledge and improve skills in developing and producing active pharmaceutical ingredients (including suitable equipment and basic scaling principles), biotechnology and nanotechnology in drug production, packaging, drug distribution and monitoring of health care products, the role and responsibilities of the qualified person. The study program develops skills at the **application level** in the following aspects of the field: the origin and analysis of active pharmaceutical ingredients and excipients, finished dosage forms and their manufacturing aspects (including formulation, compatibility, and stability studies), good manufacturing practice guidelines (including quality requirements, compliance, and monitoring) and clinical trials. Students can deeply consolidate the acquired theoretical knowledge in practice in leading pharmaceutical companies.

The theoretical courses are planned mainly in the first term of study. The students can strengthen the acquired theoretical knowledge in practice during the second and third terms. Implementation of the research project solving the company's issues is a part of the internship. The plan of the study program is given in Appendix 8. A list of all study courses and course descriptions to be acquired within the study program “Industrial Pharmacy” is given in Appendix 9. The achievable results and the acquirable competencies of the courses provided by RTU are summarized in Annex 10.

3.2.2. In the case of master’s and doctoral study programmes, specify and provide the justification as to whether the degrees are awarded in view of the developments and findings in the field of science or artistic creation. In the case of a doctoral study programme, provide a description of the main research roadmaps and the impact of the study programme on research and other education levels (if applicable).

The academic staff of both the Faculty of Materials Science and Applied Chemistry of the Riga Technical University and the Riga Stradins University are actively involved in research. As a result, a number of internationally indexed publications has risen. As shown from the Sci-Val data (Fig. 1),

part of RTU FMSAC publications are in the fields and sub-fields of chemistry (including organic and medicinal chemistry), chemical engineering, and biochemistry. Riga Stradins University is the leading higher education institution providing education in health care. Thus naturally, publications of RSU are in various fields related to medicine (Fig. 2). **Active involvement in research allows** i**ncorporating the latest scientific achievements in pharmacy** in the acquisition of the second level higher education study program "Industrial Pharmacy". In addition, during their studies, students must develop a research project on topics of interest to the pharmaceutical industry. Such topics not only solve problems relevant to companies but naturally require the study of the latest scientific literature and solutions based on the latest scientific facts.

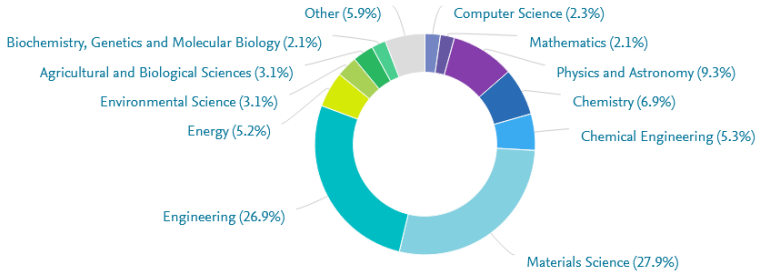


Fig. 1. Distribution of publications of the academic staff of the Faculty of Materials Science and Applied Chemistry of Riga Technical University by field of science (Sci-Val data)

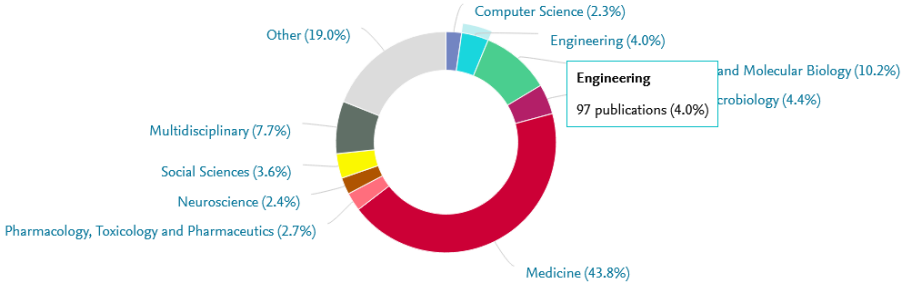


Fig. 2. Distribution of publications of the academic staff of Riga Stradins University by field of science (Sci-Val data)

3.2.3. Assessment of the study programme including the study course/ module implementation methods by indicating what the methods are, and how they contribute to the achievement of the learning outcomes of the study courses and the aims of the study programme. In the case of a joint study programme, or in case the study programme is implemented in a foreign language or in the form of distance learning, describe in detail the methods used to deliver such a study programme. Provide an explanation of how the student-centred principles are taken into account in the implementation of the study process.

The Faculty of Materials Science and Applied Chemistry of Riga Technical University implements the **principles of student-centered education** and provides a variety of support mechanisms for students to achieve the goals set in the study courses. Students are introduced to the requirements for the successful acquisition of the study course in the first lesson. Moreover, the information can also be found on the ORTUS course website. All electronically available study materials are also included on the study course website in ORTUS. In addition, since the Covid-19 pandemic, some study courses have provided online lectures that allow students to learn specific material at a time,

place, and pace that suits them. It is possible to receive consultations on the unclear issues of the study course at specially prearranged times. Using the ORTUS environment, it is possible to contact the lecturer implementing the study course by e-mail. In order to acquire study courses and control progress, it is necessary to complete homework and tests. The student then receives feedback on the results achieved in the self-reliant work, which allows understanding of which issues need to be supplemented.

Regarding the practical implementation of studies, when planning lessons, it is considered that students may need time to move between the campus of Riga Technical University and Riga Stradiņš University. Even though these universities are located relatively close to each other, when planning classes, the following principle is taken into account: on days when classes are held at Riga Technical University, they are not scheduled at Riga Stradiņš University, and *vice versa*.

The rules of Riga Technical University foreseens that students` questionnaire is implemented twice per term (in the midle and at the end of the course). During the questionnaire, students are asked to answer various questions about the course and the quality of the study process. In addition, it is possible to present any improvements or changes for the study course in the comments section. The received survey results are analyzed and discussed at different levels (in individual discussions with the lecturer, in the meetings of the structural units implementing the study course, and in the commissions of the study field). In addition, for example, the study field commission includes lecturers and student representatives, who ensure the involvement of students in the control and improvement of study quality. After analyzing the results, it is decided on the necessary changes in the study course, which are repeatedly reviewed after receiving the results of repeated questionnaires (in the next semester, when the study course is implemented), and the effectiveness of the changes is determined. Students can express suggestions for changes and improvements in the study course during the semester survey and at any time by contacting either the structural units of management / record keeping or the student self-government. A Short Program Council has been established to control the study process, consisting of four representatives (two from each university, including the directors of the study program on both sides). The Council sets united requirements for implementing the program and the evaluation of study results in both universities. Based on the results of student surveys, it evaluates the quality of the study process and, if necessary, decides on changes.

RTU regularly gives the opportunity for lecturers to participate in various courses to develop and promote communication and teaching skills, get acquainted with the latest trends in pedagogy and didactics.

3.2.4. If the study programme envisages an internship, describe the internship opportunities offered to students, provision and work organization, including whether the higher education institution/ college helps students to find an internship place. If the study programme is implemented in a foreign language, provide information on how internship opportunities are provided in a foreign language, including for foreign students. To provide analysis and evaluation of the connection of the tasks set for students during the internship included in the study programme with the learning outcomes of the study programme (if applicable).

The study program “Industrial Pharmacy” includes internships in leading Latvian pharmaceutical companies for 26 CP. The study practice is organized and administered by Riga Stradins University.

The internship program is attached in Annex 11. The internship is designed so that the student gets a view of all the processes in the company related to the work of an industrial pharmacist:

- - introduction to the factory (in the amount of 2 CP);
- - production of active pharmaceutical ingredients (in the amount of 4 CP);
- - production of finished dosage forms (in the amount of 4 CP);
- - quality control (in the amount of 4 CP);
- - registration department and marketing department (in the amount of 4 CP)
- - specialization in the production of active substances or finished dosage forms, which includes the development of research work (in the amount of 8 CP).

3.2.5. Evaluation and description of the promotion opportunities and the promotion process provided to the students of the doctoral study programme (if applicable).

3.2.6. Analysis and assessment of the topics of the final theses of the students, their relevance in the respective field, including the labour market, and the marks of the final theses.

Students defend their research project before graduating from the study program "Industrial Pharmacy". The research work is organized and administered by Riga Stradins University. T**he research work is developed in a manufacturing company as an integral part of the practice in industrial pharmacy**. Thus, it is ensured that the research work is implemented on topical issues for the producers (i.e. the industry). Research projects have been developed on the following topics:

- Counterfeiting of medicines
- Pharmaceutical forms - Characterization of the physicochemical and structural properties of the components for the preparation of a powder for oral solution
- Validation of the manufacturing process of the finished dosage form
- Validation of the potentiometric titration method for quantitative determination of the finished dosage form
- Validation of product X 5 mg weight and shelf life in bulk during the manufacturing process
- Development of a validation protocol for the manufacturing process of the finished dosage form
- Modern approach to the development of finished dosage forms
- Improving the formulation of veterinary dosage forms and monitoring poor flowability and adhesion to the punch
- Primary research of a patent-free finished dosage form
- Development of a generic drug (solid dosage form)
- Dependence of mouse size on mass wetting endpoint in pseudo-rotating layer rotor unit
- Effect of changes in the amount of microcrystalline cellulose on the properties of mice
- Optimization of pelletization process parameters.

Research reports are defended as part of the State Examination. 7% of the defended research projects received a grade of “5” (average), 15% - “6” (almost good), 31% - “8” (very good), 23% -

“9” (excellent) and 23% - “10” (excellent).

3.3. Resources and Provision of the Study Programme

3.3.1. Assessment of the compliance of the resources and provision (study provision, scientific support (if applicable), informative provision (including libraries), material and technical provision, and financial provision) with the conditions for the implementation of the study programme and the learning outcomes to be achieved by providing the respective examples.

Riga Technical University provides a study environment that allows for student-centered studies focused on including the latest scientific findings in the study process. Students have access to scientific databases (e.g., Scopus, Web of Knowledge, ScienceDirect, Wiley, etc.) that provide access to industry-leading journals. For details about the resources in the Library of Riga Technical University see Part 2.3.3.

Riga Stradins University library fully provides students and academic staff access to five e-book databases and seven full-text databases of journals, including the unique e-book database in the pharmaceutical industry - AccessPharmacy. E-books in pharmacy are available in the subscription databases AccessPharmacy, ebook Academic Collection (EBSCO), Ebook Central (Proquest), AccessMedicine and ClinicalKey. For example, the database Ebook Central (Proquest) has 1035 e-books in the "Pharmacy" section and ebook Academic Collection (EBSCO) - 425 e-books. The full texts of journals in pharmacy are available in the subscribed databases: SAGE Premier 2022, Health Research Premium Collection (Proquest), MEDLINE Complete (EBSCO), BMJ Journals, Wiley Online Journals, Science Direct, Academic Search Complete (EBSCO). 593 journal titles appear in the Primo subfield "Pharmacy and Pharmacology" in the unified search engine. Two databases contain drug information: DynaMed, ClinicalKey. Part of the subscribed databases is available in the libraries of both universities.

The implementation of the study program “Industrial Pharmacy” on the part of RTU is ensured by the Institute of Technology of Organic Chemistry, Department of Chemical Technology of Biologically Active Compounds. According to the plan of the jointly implemented study program, RTU is not involved in the involvement of students' research works. However, it has all the necessary infrastructure and state-of-the-art scientific equipment (e.g. Brucker 500 and 300 MHz nuclear magnetic resonance apparatus, Agilent and Waters liquid and gas chromatographic systems with various detectors) to develop research on pharmaceutical topics (in particular, synthesis of pharmaceutically active substances). For details about equipmnet available at Riga Technical University see Part 2.3.2.

RSU Department of Applied Pharmacy and the upcoming Laboratory of Finished Dosage Forms allow acquiring skills related to the development and analysis of finished dosage forms. The Faculty of Pharmacy has been developing very rapidly in recent years; external funding has been attracted, which provides for the construction of a new faculty building with laboratories for finished dosage forms, as well as the purchase of equipment and technology for studies and science. New analytical equipment (HPLC - FD/PDA/RI, HPLC - MS/MS, GC/HS - FID, GC – FID, ICP-MS/MS, Calorimeter, Rheometer, Polarimeter, FTIR, TLC/HPTLC) is currently available or is being purchased.

Technological equipment that will ensure the complete production process and research of solid drugs (High-shear mixer, Fluid bed dryer/processor, Roller compactor, Bench top tablet press-simulator, Rotary tablet press, Automatic capsule filling machine, Tablet coater, Semi-automatic blister packing machine) is available.

3.3.2. Assessment of the study provision and scientific base support, including the resources provided within the framework of cooperation with other science institutes and higher education institutions (applicable to doctoral study programmes) (if applicable).

3.3.3. Indicate data on the available funding for the corresponding study programme, its funding sources and their use for the development of the study programme. Provide information on the costs per one student within this study programme, indicating the items included in the cost calculation and the percentage distribution of funding between the specified items. The minimum number of students in the study programme in order to ensure the profitability of the study programme (indicating separately the information on each language, type and form of the study programme implementation).

Riga Stradins University admits students to the "Industrial Pharmacy" study program. The financial calculations of Riga Stradiņš University show that so far, although the study program has a relatively small number of students (in the years when students are admitted, up to 6 students start their studies in this program), the study program with the current number of students can be considered profitable.

The study courses provided by RTU are financed following the agreement (RTU reg. no. 01000-4.1/56, 18.08.2014; in Latvian) concluded between Riga Stradins University and Riga Technical University. It envisages that funding for studies (from the state budget or natural and legal persons) is received by Riga Stradins University. Then depending on the study program plan, study courses (and their amount by credit points), and the number of students, a payment on the study courses implemented by Riga Technical University is made. The fee for one credit point is determined following the decision of the RTU Senate (data on the fee for 1 CP are summarized in Figure 3). Most of the study courses provided by RTU are mainly organized as lectures and/or practical work - the implementation of study courses does not include laboratory work. The study course " Nanotechnologies in Drug Delivery and Diagnostics" is an exception, which also provides for laboratory work. The received funding is mainly used for lecturers' salaries and infrastructure maintenance payments. Although the fee for 1 CP has increased and the number of students studying in the study program “Industrial Pharmacy” has increased (see Section 3.1.4), it should be noted that the costs per student have also increased (for example, due to infrastructure and utility payments). Since part of the study courses provided by RTU are also studied by RTU students, these courses are offered simultaneously to students of different programs due to cost optimisation.

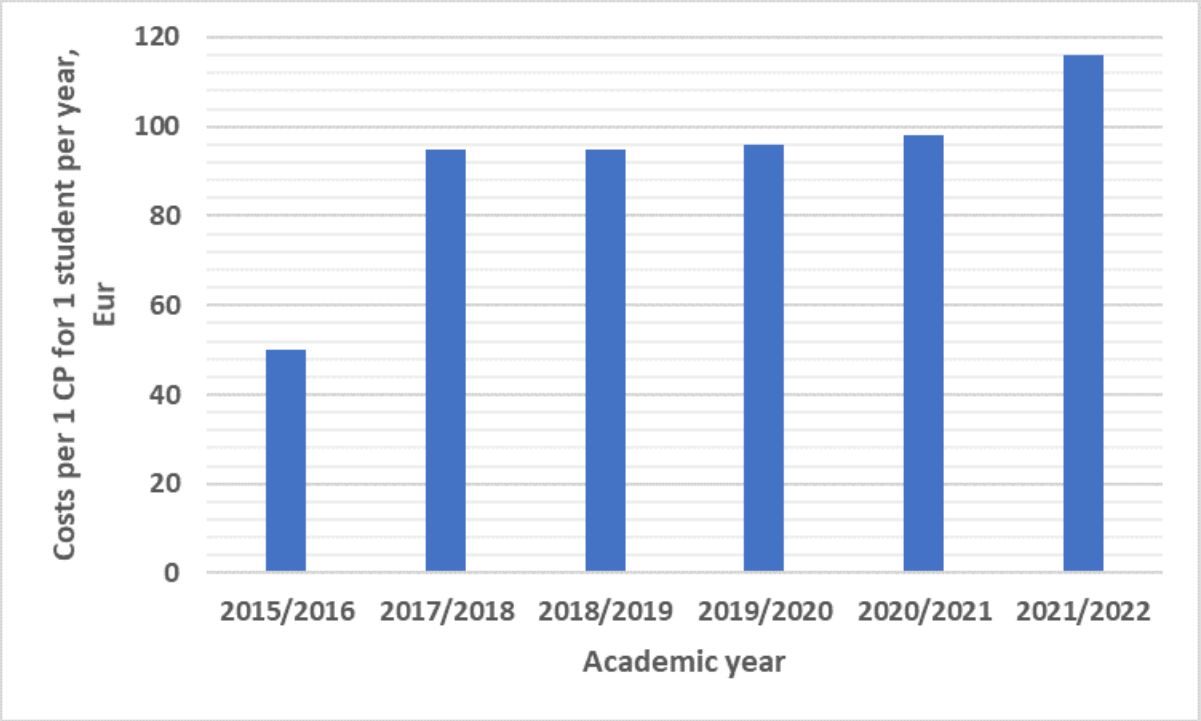


Fig. 3. Costs of one credit point per student according to the RTU Senate regulations on study courses (equated to the costs of the master's program "Chemistry" and "Chemical Technology"

3.4. Teaching Staff

3.4.1. Assessment of the compliance of the qualification of the teaching staff members (academic staff members, visiting professors, visiting associate professors, visiting docents, visiting lecturers, and visiting assistants) involved in the implementation of the study programme with the conditions for the implementation of the study programme and the provisions set out in the respective regulatory enactments. Provide information on how the qualification of the teaching staff members contributes to the achievement of the learning outcomes.

Implementation of the study program “Industrial Pharmacy” (including various elective courses offered) involves 12 lecturers. Three lecturers are involved from RTU:

Professor, *Dr. chem*. **Māra Jure** is the author of more than 170 scientific publications and four patents, and the editor-in-chief of 2 monographs. ECTS / DS international expert and member of the Latvian Bologna Process Promoter Group. Director of RSU and RTU joint professional study program “Industrial Pharmacy” on behalf of RTU (2015-2021). Supervisor of 4 doctoral dissertations, 4 engineers, 13 masters, and 37 bachelor's theses. Expert of the Latvian Council of Science in Chemistry, Chemical Engineering and Pharmaceuticals, member of the Council of Experts of the Chemical Industry and allied industries. Participant and manager of several Latvian and international projects. Member of the organizing committee of Paul Valden Symposiums, a member of the editorial board of Kaunas University of Technology's collection of articles "Cheminë technologija" (ISSN 1392-1231). Member of the RTU Senate (since 2003) and Chairman of the Senate (2006-2012), head of the RTU Senate Legislative Commission and member of the RTU

Rector's Council (2006-2012), member of the FMSAC Council (since 1993), Member of the Promotion Council "RTU P-01". Corresponding member of the Latvian Academy of Sciences (LAS) (since 2005), member of the Expert Commission of the Department of Chemistry, Biology, and Medicine of the LAS (since 2017). Representative of Latvia in the Working Group on the History of Chemistry of the European Chemical Society. Vice-Dean of RTU FMSAC in study affairs (1993-2019), Head of the Department of Chemical Technology of Biologically Active Compounds (since 2000).

Professor, *Dr. chem*. **Aigars Jirgensons** is the author of more than 75 publications indexed in the SCOPUS database (Hirsch index 16). A. Jirgenson's scientific interests include the research of new therapeutic substances and the development of new synthetically valuable methods. He is the leader of various research projects, such as the European Regional Development Foundation Project: Inhibitors of Malaria Blood Stage Proteases; H2020, Marie Curie Actions ETN-2017, Project: CARTNET (Combating Antimicrobial Resistance Training Network); H2020, Research Innovative Staff Exchange, Project: PELICO (Peptidomimetics with Photocontrolled Biological Activity); ERANET LAC, Project: TALASA (Targeting Lipoic Acid as Redox and Cofactor Modulator in MRSA); Fluorinated Small Rings for Drug Discovery; Development of Novel Fluoromethylene Transfer Reagents; Derivatization of Amino Acids via C (sp3) -H Bond Activation; LIOS Student Grant: Electrochemical Generation of Carbenium Ions and their Reaction with Nucleophiles. In addition, A.Jirgensons conducts contract research for major European pharmaceutical companies. A.Jirgensons is the director of the Latvian Institute of Organic Synthesis in research, the head of the Methodological Group of Organic Synthesis, a correspondent member of the Latvian Academy of Sciences, and an expert in the chemistry of the Latvian Council of Science.

Lecturer **Kristīne Čapase-Jastržembska** is ensuring the patenting process of the Latvian Institute of Organic Synthesis. She has the necessary practical experience and knowledge in protecting intellectual property. In addition, K. Čapase-Jastržembska works directly with patents that protect the inventions of organic chemistry, medicinal chemistry, and biochemistry - thus the intellectual property related to pharmacy. K. Čapase-Jastržembska is also involved in developing the intellectual property rights policy of the Baltic Biomaterials of Excellence.

The following lecturers (only those responsible instructors are enumerated) from Riga Stradiņa University are involved in implementing this study program: prof. em., *Dr. pharm.* **Ilze Bārene**, assistant professor, *Dr. med*. **Dins Šmits**, Professor, *Dr. pharm.* **Maija Dambrova**, master of clinical pharmacy Inga Gūtmane, assistant professor, *Dr. pharm*. **Reinis Vilšķērts**, associate professor, *Dr. pharm*. **Baiba Mauriņa** and Professor *Dr. med.* **Oļegs Sabeļņikovs**. Prof. em I. Barene has many years of practical experience in drug registration and in the State Agency of Medicines. All lecturers are actively involved in scientific work, which is also confirmed by publications indexed in international databases (herein, data from the SCOPUS database are given): D. Šmits is the author of 7 publications (Hirsch index – 4); M. Dambrova – 155 (28), R. Vilšķērsts – 41 (17), B. Mauriņa – 17 (4) and O. Sabelnikovs – 21 (12). Teaching staff from foreign universities, e.g., Professor **A. Juppo** (University of Helsinki) and Professor **V. Briedis** (Kaunas University of Health Sciences) are also involved in implementing study courses provided by RSU. Most of the involved academic staff are experts of the Latvian Science Council: D. Šmits, M. Dambrova, R. Vilškērsts and B. Mauriņa are experts in basic medical sciences (including pharmacy), and O. Sabelņikovs – in medical and health sciences (clinical medicine).

3.4.2. Analysis and assessment of the changes to the composition of the teaching staff over the reporting period and their impact on the study quality.

The academic staff in most of the study courses provided by RTU has remained unchanged since establishing the joint study program “Industrial Pharmacy”. Changes in the teaching staff have taken place only for one study course. Until 2017, the study course “Patents” was taught by Māra Rozenblate, a leading expert of the Patent Office of the Republic of Latvia. Since 2018, this study course has been given by lecturer K.Čapase-Jastržembska, who has practical experience as a patent attorney at the Latvian Institute of Organic Synthesis, where the patentable fields are directly related to organic chemistry, including medicinal chemistry and patenting of new biologically active substances. Thus, a specialist in the field, who has in-depth competencies in intellectual property protection in issues related to the pharmaceutical industry, is involved in implementing this study course.

3.4.3. Information on the number of the scientific publications of the academic staff members, involved in the implementation of doctoral study programme, as published during the reporting period by listing the most significant publications published in Scopus or WoS CC indexed journals. As for the social sciences, humanitarian sciences, and the science of art, the scientific publications published in ERIH+ indexed journals or peer-reviewed monographs may be additionally specified. Information on the teaching staff included in the database of experts of the Latvian Council of Science in the relevant field of science (total number, name of the lecturer, field of science in which the teaching staff has the status of an expert and expiration date of the Latvian Council of Science expert) (if applicable).

3.4.4. Information on the participation of the academic staff, involved in the implementation of the doctoral study programme, in scientific projects as project managers or prime contractors/ subproject managers/ leading researchers by specifying the name of the relevant project, as well as the source and the amount of the funding. Provide information on the reporting period (if applicable).

3.4.5. Assessment of the cooperation between the teaching staff members by specifying the mechanisms used to promote the cooperation and ensure the interrelation between the study programme and study courses/ modules. Specify also the proportion of the number of the students and the teaching staff within the study programme (at the moment of the submission of the Self-Assessment Report).

The interconnection of study courses was planned to avoid duplication of content, but the study courses would complement each other. Most theoretical courses are planned in the first semester of the study program. Thus, when starting the practice and implementation of the research project, students are equipped with all the necessary theoretical knowledge to complete these tasks successfully. When creating the content of the study courses, the lecturers had the opportunity to get acquainted with the descriptions of other study courses, thus finding points of contact and

opportunities for synergy of subjects. At the end of each study course, an anonymous student survey is conducted, and joint analysis of these results allows new opportunities for teacher collaboration to be defined.

Up to 10 students study the study program simultaneously (the first and the second year together). On the RTU side, the study program is provided by three lecturers. So the ratio of students to teachers is 3: 1. Considering that together with the academic staff involved in Riga Stradins University 9 lecturers are involved in implementing the study program, the ratio of students to lecturers is 1: 1.

Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	diploms-un-pielikums-en.pdf	diploms-un-pielikums-lv.pdf
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)		
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)	4en-labots-pielikums-atbilstiba-augstskolu-likumam.pdf	4labots-pielikums-atbilstiba-augstskolu-likumam.pdf
Statistics on the students in the reporting period	3en-pielikums-Statistikas-dati-par-studejosiem.xlsx	3-pielikums-Statistikas-dati-par-studejosiem.pdf
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard	6en-labots-pielikums-atbilstību-valsts-izglitibas-standartam.pdf	6-labots-pielikums-atbilstību-valsts-izglitibas-standartam.pdf
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)	A7en-pielikums-atbilstiba-profesijas-standartam.pdf	7-ar-linku-pielikums-atbilstiba-profesijas-standartam.pdf
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	papildinats-kartejums-en.pdf	papildinats-kartejums-lv.pdf
The curriculum of the study programme (for each type and form of the implementation of the study programme)	8en-labots-pielikums-programmas-plans.pdf	8labots-pielikums-programmas-plans.pdf
Descriptions of the study courses/ modules	kursu-apraksti-1fails-en.pdf	kursu-apraksti-1-faila-lv.pdf
Description of the organisation of the internship of the students (if applicable)	11en-pielikums-Prakses-programma.pdf	11-pielikums-Prakses-programma.pdf
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)		

Chemistry, Materials Science and Engineering (51528)

Study field	*Chemistry, Chemistry Technologies, and Biotechnology*
ProcedureStudyProgram.Name	*Chemistry, Materials Science and Engineering*
Education classification code	*51528*
Type of the study programme	*Doctoral study programme*
Name of the study programme director	*Māris*
Surname of the study programme director	*Turks*
E-mail of the study programme director	*maris.turks@rtu.lv*
Title of the study programme director	*Profesors*
Phone of the study programme director	
Goal of the study programme	*To provide the highest qualification corresponding to the doctoral level in the field of chemistry, chemical engineering, materials science and physics, as well as to prepare for pedagogical work.*
Tasks of the study programme	*General tasks of the study programme:* *- to ensure competitive doctoral level education in chemistry, chemical engineering, materials science and physics corresponding to Bologna recommendations;* *- to guarantee the highest education level in the selected fields of fundamental sciences, to provide skills to formulate and to solve independently scientific and practical tasks, to organize and to lead research work; to provide skills and experience necessary for pedagogical work.*

Results of the study programme	*Graduates of the study programme, depending on their thesis research project, receive a Ph.D. degree in one of the following specializations: chemistry, engineering sciences (in chemistry), materials science, physics and astronomy.* *Graduate of the study programme:* *- is at the highest level familiar with the theories, methods and equipment of the selected scientific field and its related branches, as well as development trends;* *- is able to perform independently complex process planning, implementation, data processing, analysis and interpretation using the theories of the chosen scientific field and its related fields and the available hardware;* *- is able to scientifically describe new research or production results for scientific publications, technological process instructions, reports and to present these results to scientific peers, industry professionals and the general public;* *- by combining the acquired knowledge and skills with actual scientific information, is able to prepare, apply for and manage scientific, innovative and collaborative projects and research (including international) following the project call, market requirements and available resources;* *- is able to promote the technological, social or cultural progress of a knowledge-based society in an academic and professional context.*
Final examination upon the completion of the study programme	*Doctoral thesis.*

Study programme forms

Full time studies - 4 years - latvian

Study type and form	*Full time studies*
Duration in full years	*4*
Duration in month	*0*
Language	*latvian*
Amount (CP)	*192*
Admission requirements (in English)	*Master of engineering or natural sciences, or comparable education*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Doctor of Science (Ph.D.) in Chemical Engineering*
Qualification to be obtained (in english)	*-*

Places of implementation

Place name	City	Address
Riga Technical University	RĪGA	KAĻĶU IELA 1, CENTRA RAJONS, RĪGA, LV-1050

Full time studies - 4 years - english

Study type and form	*Full time studies*
Duration in full years	*4*
Duration in month	*0*

Language	*english*
Amount (CP)	*192*
Admission requirements (in English)	*Master of engineering or natural sciences, or comparable education. The assessment of the level of English language proficiency under the requirements specified in regulatory enactments.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Doctor of Science (Ph.D.) in Chemical Engineering*
Qualification to be obtained (in english)	-

Places of implementation

Place name	City	Address
Riga Technical University	RĪGA	KAĻĶU IELA 1, CENTRA RAJONS, RĪGA, LV-1050

Full time studies - 4 years - latvian

Study type and form	*Full time studies*
Duration in full years	*4*
Duration in month	*0*
Language	*latvian*
Amount (CP)	*192*
Admission requirements (in English)	*Master of engineering or natural sciences, or comparable education*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Doctor of Science (Ph.D.) in Chemistry*
Qualification to be obtained (in english)	-

Places of implementation

Place name	City	Address
Riga Technical University	RĪGA	KAĻĶU IELA 1, CENTRA RAJONS, RĪGA, LV-1050

Full time studies - 4 years - english

Study type and form	*Full time studies*
Duration in full years	*4*
Duration in month	*0*
Language	*english*
Amount (CP)	*192*
Admission requirements (in English)	*Master of engineering or natural sciences, or comparable education. The assessment of the level of English language proficiency under the requirements specified in regulatory enactments.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Doctor of Science (Ph.D.) in Chemistry*
Qualification to be obtained (in english)	-

Places of implementation

Place name	City	Address
Riga Technical University	RĪGA	KAĻĶU IELA 1, CENTRA RAJONS, RĪGA, LV-1050

Full time studies - 4 years - english

Study type and form	*Full time studies*
Duration in full years	*4*
Duration in month	*0*
Language	*english*
Amount (CP)	*192*
Admission requirements (in English)	*Master of engineering or natural sciences, or comparable education. The assessment of the level of English language proficiency under the requirements specified in regulatory enactments.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Doctor of Science (Ph.D.) in Materials Science*
Qualification to be obtained (in english)	-

Places of implementation

Place name	City	Address
Riga Technical University	RĪGA	KAĻĶU IELA 1, CENTRA RAJONS, RĪGA, LV-1050

Full time studies - 4 years - latvian

Study type and form	*Full time studies*
Duration in full years	*4*
Duration in month	*0*
Language	*latvian*
Amount (CP)	*192*
Admission requirements (in English)	*Master of engineering or natural sciences, or comparable education*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Doctor of Science (Ph.D.) in Materials Science*
Qualification to be obtained (in english)	-

Places of implementation

Place name	City	Address
Riga Technical University	RĪGA	KAĻĶU IELA 1, CENTRA RAJONS, RĪGA, LV-1050

Full time studies - 4 years - latvian

Study type and form	*Full time studies*
Duration in full years	*4*
Duration in month	*0*
Language	*latvian*
Amount (CP)	*192*
Admission requirements (in English)	*Master of engineering or natural sciences, or comparable education. The assessment of the level of English language proficiency under the requirements specified in regulatory enactments.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Doctor of Science (Ph.D.) in Physics and Astronomy*
Qualification to be obtained (in english)	-

Places of implementation

Place name	City	Address
Riga Technical University	RĪGA	KAĻĶU IELA 1, CENTRA RAJONS, RĪGA, LV-1050

Full time studies - 4 years - english

Study type and form	*Full time studies*
Duration in full years	*4*
Duration in month	*0*
Language	*english*
Amount (CP)	*192*
Admission requirements (in English)	*Master of engineering or natural sciences, or comparable education*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Doctor of Science (Ph.D.) in Physics and Astronomy*
Qualification to be obtained (in english)	-

Places of implementation

Place name	City	Address
Riga Technical University	RĪGA	KAĻĶU IELA 1, CENTRA RAJONS, RĪGA, LV-1050

3.1. Indicators Describing the Study Programme

3.1.1. Description and analysis of changes in the parameters of the study programme made since the issuance of the previous accreditation form of the study field or issuance of the study programme license, if the study programme is not included on the accreditation form of the study field, including changes planned within the evaluation procedure of the study field evaluation procedure.

In the period from academic years 2013/2014 to 2020/2021 inclusive, three academic PhD study programs in two study fields were implemented at RTU FMSAC:

- study programs “Chemistry” and “Chemical Technology” in the study field “Chemistry, Chemical Technologies and Biotechnology”,
- study program “Materials Science” in the study field “Physics, Materials Science, Mathematics and Statistics”.

These programs were accredited for six years in the 2013 accreditation process. The curriculum of the study programs has been changed several times to keep pace with industry requirements and new technologies.

By the decision of the RTU Senate of 29 October 2018 (Minutes No. 623), Prof. Māris Turks was appointed the Head of the PhD Study Program “Chemical Technology”. By Order No. 02000-1.1-e/51 of the RTU Vice-Rector for Academic Affairs of 19 June 2020 the implementation of the study program “Chemical Technology” in the International Cooperation and Foreign Students Department was allowed. In the academic year 2020/2021 students were admitted and the implementation of the study program in English started.

By decision No. 2021/12-I of the Higher Education Quality Commission of 29 September 2021, extensive changes to the study program “Chemical Technology” were made:

1. the title of the program was changed to “Chemistry, Materials Science and Engineering”;
2. the following education classification codes were assigned: 51441, 51443, 51521 and 51528;
3. the wording of the degree awarded was changed to “PhD degree in chemistry; or materials science; or chemical engineering; or physics and astronomy”;
4. the previous education requirements were changed to “Master of engineering or natural sciences, or comparable education”.

These changes also include the closure of the study programs “Chemistry” and “Materials Science”. Admission to these programs was discontinued as of 2022. First- and second-year PhD students enrolled in these programs were transferred to the study program “Chemistry, Materials Science and Engineering”.

Extensive changes in the study program “Chemical Technology” made in the previous year and the non-promotion of the two above-mentioned programs for accreditation are due to a decrease in the number of students, changes in the demand and delivery of education services in the sector, and the need for an interdisciplinary program to educate and train young specialists. In recent years, the research areas selected by the PhD students enrolled and their PhD Theses defended show a synergy between two or more fields of science, which necessitates an individualized set of theoretical study courses for each individual student. In order to enable PhD students to develop and acquire the necessary set of knowledge, skills and competencies, a decision was taken to

change the program establishing a modern structure of the academic PhD program that meets the requirements of the field. The program covers aspects of chemistry, materials science, physics, as well as engineering aspects in these fields. Last but not least, the optimization of resources – efficient sharing of the intellectual, material, technical, and research resources – was also a key aspect to consider.

The job sectors of the prospective graduates of the academic PhD study programme corresponds to the priority direction of Latvia's strategic specialization in science "Technology, materials and engineering systems to increase the added value of products and processes and cybersecurity".

Given the industry demand for the graduates with the skills and competencies to undertake research, the working group initially defined the program's learning outcomes, which were used as the basis for the program structure and the desired curriculum. During the development of the program, it was recognized that the inclusion of science-specific courses in the compulsory part of the program and the definition of specializations would limit the intake of PhD students involved in the interdisciplinary projects. It could also create barriers to the admission of PhD candidates who change their professional field completely or who wish to acquire knowledge, skills and competencies in a different specialization in the future. As a result, it was found that the current structure of the program could not cater for the education and training of such PhD students and that courses for the development of general scientific competencies should be included in the compulsory part. At the same time, such courses should be adaptable to the needs of a specific PhD student or group of PhD students. At the same time, courses providing general scientific competencies can also be tailored to the interests of PhD students who continue their research in the field of science.

The structure and content of the program developed by the working group has been discussed at various stages with industry representatives and the Faculty Advisors' Board It was also discussed with potential and current PhD students.

3.1.2. Analysis and assessment of the study programme compliance with the study field. Analysis of the interrelation between the code of the study programme, the degree, professional qualification/professional qualification requirements or the degree and professional qualification to be acquired, the aims, objectives, learning outcomes, and the admission requirements. Description of the duration and scope of the implementation of the study programme (including different options of the study programme implementation) and evaluation of its usefulness.

In accordance with the "Regulations on the Fields and Sub-fields of Science in Latvia", the study program "Chemistry, Materials Science and Engineering" covers both the Natural Sciences and Engineering and Technology. The study program has been developed in accordance with the "Law on Higher Education Institutions of the Republic of Latvia", the "Law on Scientific Activity" and the Regulation of the Cabinet of Ministers of the Republic of Latvia No 1001 (from 27 December 2005) on the "Procedures and Criteria for the Conferral of a Doctoral Degree in Science (Promotion)". It complies with the RTU Regulations of Doctoral Studies.

The study program is designed as an interdisciplinary program with four codes - 51441, 51443, 51521 and 51528, including both natural sciences and engineering. Such a set of codes fully

reflects the name of the study program, its content and the range of possible awarded degrees. The codes comply with Cabinet of Ministers Regulation No 322 Latvian Classification of Education. The first and second levels of classification, represented by the first two digits of code 51, are doctoral studies (doctoral degree), which can be implemented after obtaining a master's or professional master's degree or as a continuation of the educational program with code 49. The duration of studies in full-time studies is three to four years. The third, fourth and fifth levels of classification (thematic groups, subject areas and program groups), denoted by the next three digits 528, are Chemical Technologies (52 stands for Engineering and Technology), 521 - Mechanics and Metalworking, including Materials Science (52 stands for Engineering and Technology), 441 - Chemistry and 443 - Physics (44 stands for Physical Sciences).

The goals and objectives of the academic PhD study programme “Chemistry, Materials Science and Engineering” correspond to level 8 of the Latvian Qualification Framework (LQF) and it is targeted at applicants possessing a Master's degree in engineering or natural sciences, or equivalent without additional admission rules.

Admission of the applicants is carried out in accordance with the FMSAC Methodology for the Evaluation of Applicants for Admission to PhD Studies.

The admission methodology specifies the following evaluation criteria:

1. number of publications and their scientific quality with a coefficient of 1.00;
2. the weighted average mark of the Master studies with a coefficient of 1.00;
3. participation in scientific research projects with a coefficient of 0.25;
4. participation in scientific conferences with a coefficient of 0.30;
5. scientific and pedagogical work at RTU with a coefficient of 0.25.

The title of the study program “Chemistry, Materials Science and Engineering” indicates the goal of the study programme – to provide the highest qualification corresponding to the PhD level in the field of chemistry, chemical engineering, materials science and in the field of physics, as a supporting branch of the previous three branches, as well as to prepare for pedagogical work.

Acquired knowledge, skills and competencies will make graduates able to work as leading specialists in chemical and materials industry companies and scientific institutions. According to the defined problem, quality and time requirements, they will be able to plan, organize, and lead the production process. The graduates will also be prepared for building their independent academic career and will be able to submit their own project proposals for various grant calls.

The following study program **tasks** have been determined in order to attain the desired goals:

- to ensure competitive doctoral level education in chemistry, chemical engineering, materials science and physics corresponding to Bologna recommendations;
- to guarantee the highest education level in the selected fields of fundamental sciences, to provide skills to formulate and to solve independently scientific and practical tasks, to organize and to lead research work; to provide skills and experience necessary for pedagogical work.

Graduate of the program (**outcomes**):

- is at the highest level familiar with the theories, methods and equipment of the selected scientific field and its related branches, as well as development trends;
- is able to perform independently complex process planning, implementation, data processing, analysis and interpretation using the theories of the chosen scientific field and its related fields and the available hardware;
- is able to scientifically describe new research or production results for scientific publications,

technological process instructions, reports and to present these results to scientific peers, industry professionals and the general public;
- by combining the acquired knowledge and skills with actual scientific information, is able to prepare, apply for and manage scientific, innovative and collaborative projects and research (including international) following the project call, market requirements and available resources;
- is able to promote the technological, social or cultural progress of a knowledge-based society in an academic and professional context.

The content of the study programme is developed in such a way that the objectives and the learning outcomes of the study courses to be achieved would ensure the achievement of the overall goal and results of the study program, and compliance with the degrees to be awarded. The above is confirmed by the mapping of the learning outcomes to be achieved in study courses (see Annex 1.2). The biggest focus in the study process is on acquiring knowledge, professional and practical competencies based on the science achievements, theoretical knowledge, and the industry specifics. The study programme is the only one in Latvia which provides leading level professionals with competencies in chemical engineering and materials science.

By completing the study programme, the PhD thesis is defended. The PhD degree is awarded for an independently developed research project, which is summarised in a form of a PhD thesis – dissertation or a research summary complemented with publications (PhD by Publication). The latter contains scientifically original results of significant importance in the relevant sub-branch of science. The compliance of the PhD thesis is assessed in accordance with the criteria and procedures for awarding a PhD degree specified in national legislation. The decision regarding the awarding of a PhD degree is made by the promotion council of the relevant branch of science following the procedures specified in national legislation.

Upon graduating from the study program and defending the doctoral thesis, one of the four program degrees can be awarded - Doctor of Science (Ph.D.) in Chemistry or Doctor of Science (Ph.D.) in Materials Science; or Doctor of Science (Ph.D.) in Chemical Engineering, or Doctor of Science (Ph.D.) in Physics and Astronomy. Doctoral theses can be submitted for defence to one of the three doctoral councils - RTU's doctoral council "Chemistry and Chemical Technology" or "Materials Science" or UL's doctoral council "Physical and Astronomical Sciences". Upon receipt of the doctoral thesis for examination, the relevant council evaluates the relevance of the research to the field and the degree to be awarded.

The full study workload in the programme is 192 credit points (288 ECTS) of which compulsory core subjects block constitutes 20 credit points (30 ECTS), free choice – 18 credit points (27 ECTS), and Scientific work – 154 credit points (231 ECTS).

Thus, the mutual connection between the title of the study programme, the degree to be acquired, the goal and objectives, the learning outcomes, as well as the admission requirements are observed.

The study program is planned to be acquired in full-time studies. Its implementation started in the 2021/2022 academic year, transferring the first and second-year students of the existing programs to the new program version.

3.1.3. Economic and/ or social substantiation of the study programme, analysis of graduates' employment.

The study program conforms to the strategic development directions of the university, the needs of the public and the national economy and development trends. All the programs include the requirements of the Latvian and the European Union legislation.

The relevance of the program is determined by the need for high-level scientific staff for the Latvian and international labour market with advanced knowledge and practical skills in chemistry, chemical technology, materials science or physics, or related fields. In Latvia, the chemical industry has experienced rapid growth in recent years. The sector’s share of the manufacturing industry was 9% in 2021. The study program is aimed at educating and training the highest-level scientific professionals for national and international labour markets, who have interdisciplinary knowledge and research skills and competencies that are essential for addressing science and engineering issues in the course of various scientific and innovative research activities.

This allows uniting students at a single PhD program without having to create a separate program for each field. The structure of the program is designed to allow students to be grouped together as needed, but also to tailor the program for the needs of each individual. This also allows for optimizing the cost of program delivery.

The International Evaluation of Scientific Institutions Activity (2013-2018) also highlights the need to consolidate scientific fields and adapt them to modern trends, which is closely linked to the organization of education and scientific work for PhD students.

When analyzing the employment of the program graduates, it should be noted that all graduates have already been employed in some scientific institute related to the program areas before starting their studies, and upon graduation, they continue working in a scientific institute as senior researchers or are involved in the development of innovations in chemical or materials science industry.

The majority of employers of the program graduates are the Latvian scientific institutes - scientific institutes of RTU, Latvian Institute of Organic Synthesis, Latvian State Institute of Wood Chemistry, Institute of Solid State Physics and companies whose activities are focused on the development of new products and technologies and their application in product manufacturing.

3.1.4. Statistical data on the students of the respective study programme, the dynamics of the number of the students, and the factors affecting the changes to the number of the students. The analysis shall be broken down into different study forms, types, and languages.

The study programme “Chemistry, Materials Science and Engineering” is implemented in Latvian and English in Riga. Applicants with an academic or professional Master's degree in natural sciences or engineering, or a degree comparable to them may be admitted to study in the study programme.

Statistical data on students in the study program are provided for the PhD study program “Chemical Technology” implemented during the reporting period. The study program is implemented as full-time studies in Latvian and English.

During the reporting period, 36 PhD students were admitted to the program, of which 6 were international students. The foreign countries from which students were admitted are China, India,

Iran, Greece, and Serbia. Currently, 33 doctoral students are studying in the program. Figure 3.1.4.1 shows data on the number of students enrolled in the program, 3.1.4.2. - the total number of students, but in Figure 3.1.4.3 - students dropout.

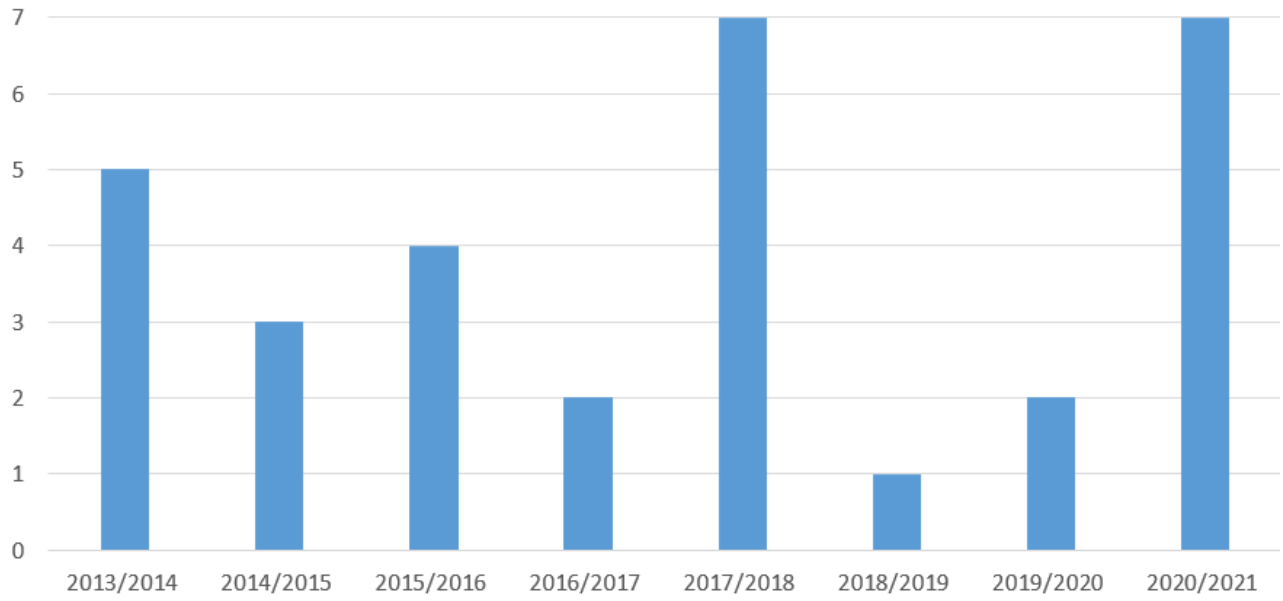


Fig. 3.1.4.1. Number of students enrolled in the program per study year

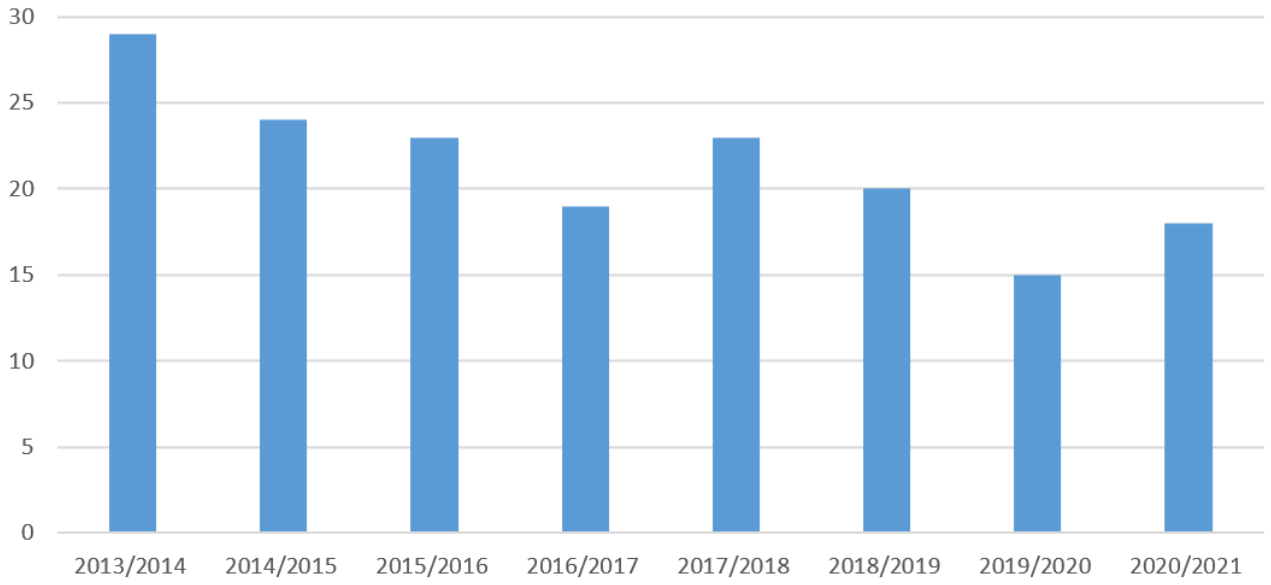


Fig. 3.1.4.2. Total number of students per study year

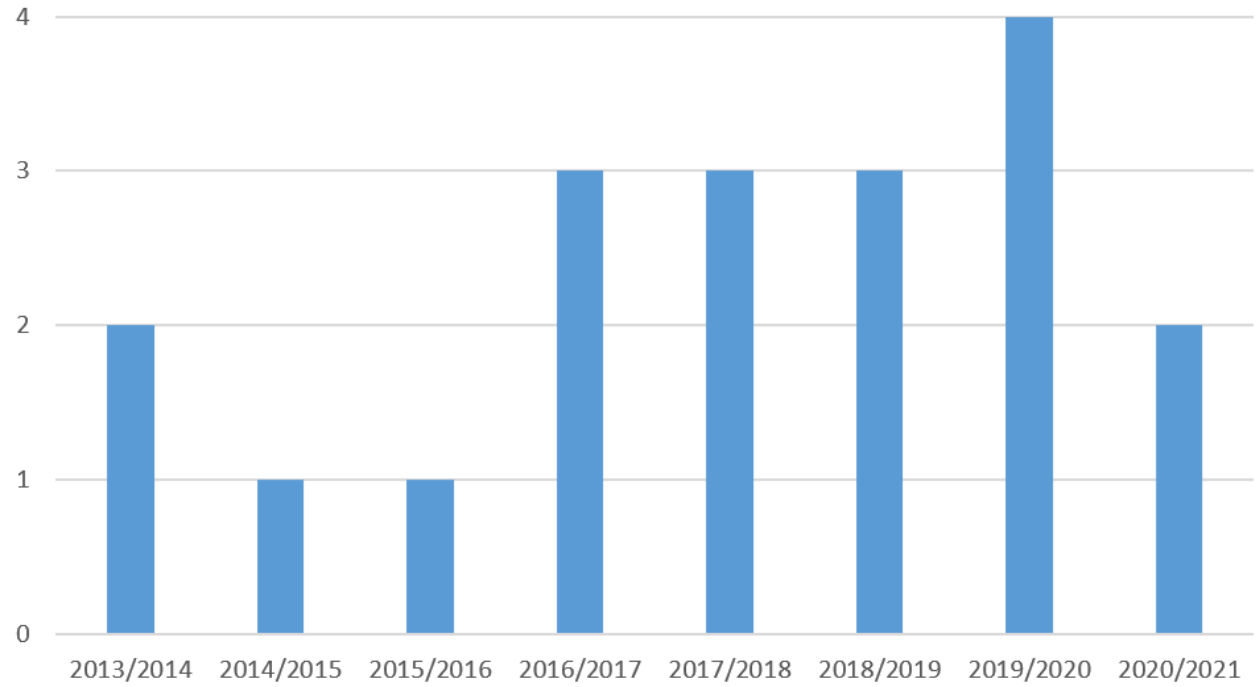


Fig. 3.1.4.3. Student dropout data per study year

The total number of defended PhD theses of the program in the reporting period is 28, an average of 3 graduates per year.

24 graduated from the study program “Materials Science” and 27 - from “Chemistry” during the reporting period.

The number of students enrolled varies significantly from year to year, mainly due to the availability of funding for research projects.

In the reporting period, the number of students on academic leave fluctuated between 10–50% of the number of students. Basically, academic leave is used by final-year PhD students to finish the work and write PhD thesis. The reason is also parental leave, health conditions, as well as the inability to combine PhD studies with work if it is not related to science.

The main reason for student dropout is the lack of funding, as a result, the student has to combine scientific work with work in the labour sector. This reduces the opportunity to focus on studies and scientific work. To awoid the latter, starting from the 2022/2023 academic year, the departments hosting PhD students will have to guarantee at least 0.5 FTE in research work for each PhD student. In addition, several PhD grant calls have been open at RTU since 2016.

In the study program, full-time students have the opportunity to participate in an international exchange project Erasmus+ or other mobility projects. This opportunity has been rarely used, but it should be noted that the interest in mobility lately has increased.

3.1.5. Substantiation of the development of the joint study programme and description and evaluation of the choice of partner universities, including information on the development and implementation of the joint study programme (if applicable).

3.2. The Content of Studies and Implementation Thereof

3.2.1. Analysis of the content of the study programme. Assessment of the interrelation between the information included in the study courses/ modules, the intended learning outcomes, the set aims and other indicators with the aims of the study course/ module and the aims and intended outcomes of the study programme. Assessment of the relevance of the content of the study courses/ modules and compliance with the needs of the relevant industry, labour market and with the trends in science on how and whether the content of the study courses/ modules is updated in line with the development trends of the relevant industry, labour market, and science.

The study program complies with the requirements of the regulations of the Republic of Latvia, RTU internal regulations, RTU and FMSAC strategy, as well as promotes the achievement of the United Nations Sustainable Development Goals.

The study program volume is 192 CP (288 ECTS), and the duration of full-time studies is four years. The program is implemented in Latvian and English.

There are no substantive differences between the two forms, except that according to the decision of the RTU Senate of November 26, 2018, an international student must take a Latvian language course in addition to the content of the study program.

In order to provide the PhD student with the knowledge and competence base necessary for the development of scientific work, in the first year of study, the PhD student takes two compulsory (Part A) study courses - Scientific Seminars (10 CP, 15 ECTS) and Academic Writing (2 CP, 3 ECTS). This provides the student with general insights into the common issues in the field that a senior-level professional should be familiar with and which are necessary for the successful development of the PhD Thesis.

After admission in accordance to the methadological guidelines of the program, each PhD student is individually assigned to an Advisory Council, which advises the PhD students on the development of their scientific work, the preparation of publications, and assesses the progress of the scientific work, as well as recommends free elective study courses.

During the PhD studies, the student summarizes the results of their scientific work in scientific publications. The skills required for the development and submission of publications are assessed as part of the Part A course “Original Research Article” (4 CP/6 ECTS for each of 2 articles: 8 CP/12 ECTS in total) The results obtained during the PhD research must be published:

- *at least three articles* in scientific journals indexed in Scopus and/or Web of Science, or
- *at least two articles* in scientific journals indexed in Scopus and/or Web of Science and *one publication* in conference proceedings,

where the PhD student is the first author of at least one article. In this way, the PhD student learns how to summarize, interpret, evaluate and describe the results of the individual research in the form of a publication, and learns the nuances of the publication submission and acceptance procedure.

The study program does not contain a field-specific study courses part (B). The tasks and content of this part have been transferred to part C, thus providing the possibility to adapt the program's

content to ensure each student's knowledge, skills and competencies. Such a program structure also provides an opportunity to exclude the creation of several programs or sub-programs, ensuring optimal use of resources and the opportunity to adapt the program to current scientific trends. The structure of the program was reviewed and approved at the same time as the decision of the Study Quality Commission on the change of the program title was made.

In the free elective part of the study program (Part C), the PhD student, in cooperation with their supervisor and the Advisory Council, chooses study courses that broaden the scope of their knowledge, skills and competencies both in the areas related to the theme of the scientific work and soft skills in the volume of 18 CP (27 ECTS). Depending on the scheduling of the selected courses, the PhD student shall follow them throughout the four years of study.

The PhD Thesis research amounts to 154 CP (231 ECTS).

The curriculum and structure of the program provide PhD students with the relevant knowledge, skills and competencies to be acquired during their studies and enable them to successfully take up employment in their chosen field after graduation. The study courses of the compulsory part are self-renewing, as their curriculum and learning are based on the available, up-to-date scientific information and methods.

The study program provides cross-linkage between the information included in the study courses, learning outcomes, set aims, methods, as well as linkage of every study course with the aims and learning outcomes of the study program.

The structure of the study program and the curriculum of the courses were discussed at the Advisory Board of the FMSAC. The curriculum of the courses was supplemented or changes were made to the content of the courses according to the recommendations of the industry experts. The program and its curriculum were also examined by the study program committee, where experts from the industry are also represented.

Each member of the academic staff involved in the programme implements ascientific and/or industrial projects and has a sufficient and up-to-date number of scientific publications on the subject of the lectured course. This confirms the ability of the academic staff to include the latest scientific discoveries and technological solutions in the content of the study course.

3.2.2. In the case of master’s and doctoral study programmes, specify and provide the justification as to whether the degrees are awarded in view of the developments and findings in the field of science or artistic creation. In the case of a doctoral study programme, provide a description of the main research roadmaps and the impact of the study programme on research and other education levels (if applicable).

The theoretical and practical parts of the study program are based on the current scientific developments in the field. Each course of the compulsory part is based on the latest developments in the chosen field. The main task of the PhD student is to carry out thorough research work, analyzing a specific scientific problem and applying methods and analytical equipment specific to the field. Each year, students are required to present their results at an international scientific conference relevant to the topic of their PhD Thesis. This helps them to develop their skills in formulating, presenting, and discussing scientific ideas.

All faculty academic staff involved in the implementation of the study program and in the

development of the thesis are scientifically active members of the field, who not only teach, but also lead or participate in scientific projects. This is reflected in the budget of FMSAC, 73% of which is generated from research activities. The most important national and international projects carried out during the reporting period are listed below. During the reporting period, the academic staff of the Faculty has implemented projects amounting to more than 13 M EUR.

There are 4 main foci of research at FMSAC:

1. Biomaterials research
2. Inorganic materials (including their physics)
3. Organic chemistry (broadly defined: biologically active compounds, biofuels, catalysts, organic and hybrid functional materials, organic materials for photonics),
4. Polymers & composite materials (including their physics).

Mainly research is implemented in interdisciplinary and multidisciplinary projects. Below are some of the most important specialization projects

Chemistry and Technology of Biomaterials:

1. Baltic Biomaterials Centre of Excellence - H2020 WIDESPREAD-04-2017- Teaming Phase 1 (project period 05.2017-08.2018, 397 624.00 EUR)
2. Photocrosslinked hydrogels for guided periodontal tissue regeneration - EURONANOMED II ERA.NET (project period 03.2015-02.2018, 604 380.00 EUR)
3. Nanostructured osteochondral scaffold: novel biomimetic triggers for enhanced bone regeneration - EURONANOMED III ERA.NET (project period 10.2018-12.2021, 1 224 665.00 EUR)
4. An international network on new strategies for processing calcium phosphates - The European Union Seventh Framework Programme (PIRSES-GA-2013) (project period 11.2013-10.2017, 455 400 EUR)

Production Technology and Environmental Aspects:

1. Influence of the magnetic field-initiated stirring on biotechnological processes - Central Finance and Contracting Agency of the Republic of Latvia (project period 03.2017-02.2020, 644 408.00 EUR)
2. The quest for disclosing how surface characteristics affect slideability - Central Finance and Contracting Agency of the Republic of Latvia (project period 04.2017-03.2020., 594 054.28 EUR)
3. Pharmaceutical wastewater treatment - Investment and Development Agency of Latvia (project period 08.2020-04.2022, 662 571,78 EUR)

Chemistry and Technology of Inorganic Materials:

1. Development of active under sunlight immobilized TiO_2-ZnO based photocatalysts - Central Finance and Contracting Agency of the Republic of Latvia (project period 04.2017-03.2020. 524 397.90 EUR)
2. Mineral and synthetic nanopowders for obtaining of porous ceramics and modification of ceramic materials - Central Finance and Contracting Agency of the Republic of Latvia (project period 03.2017-02.2020, 503 495 EUR)

Chemistry and Technology of Biologically Active Compounds:

1. Synthetic methodologies towards value added products based on applications of sulfur dioxide as polar reaction medium and reagent - Latvian Council of Science Grant (project period 2018-2021, 300 000 EUR).

2. Development of pentacyclic triterpenoid – azole conjugates: from cancer chemopreventive agents and adjuvants in cancer chemotherapy to novel anti-cancer drug candidates - ERA.NET RUS Plus (project period 2018-2021, 493 500 EUR).
3. Synthesis of novel (deaza)purine-triazole conjugates and applications of their fluorescent properties - Latvian-Lithuanian-Taiwanese joint grant (project period 2015-2017, 225 000 EUR).
4. Organic reactions in and with liquid sulfur dioxide - Latvian Council of Science Grant (project period 2013-2016, 206 788 EUR).
5. Biosynthesis and isolation of macrolide type of antibiotics and antiparasitic agents and production of synthetic derivatives thereof - ERDF (project period 2010-2013, 297 883 EUR).

Chemistry and Technology of Polymer Materials:

1. Multifunctional materials and composites, photonics and nanotechnology “IMIS2” - Latvian State Project (project period 01.09.2014-31.05.2018, 2 250 000 EUR)
2. Development of perspective nanocomposites on the bases of secondary polymers and elaboration of manufacturing and processing technologies thereof - ERDF project (project period 01.01.2010.-31.12.2013., 418 000 EUR)
3. Innovative use of industrial byproducts for sustainable asphalt pavement mixtures - Fundamental and Applied Research Project of the Latvian Council of Sciences (project period 10.2018.-10.2021., 300 000 EUR)
4. Enhanced electromagnetic protection and cybersecurity through field deployable innovative shielding, monitoring and data destruction technologies - Project of Latvian State Program (project period, since 2022.- , 460 000 EUR).
5. Natural bioplastics from lignin, hemicellulose and cellulose - Fundamental and Applied Research Project of the Latvian Council of Sciences (project period 2020.-2022., 300 000 EUR)
6. Wood Mimicking Biocomposites - Fundamental and Applied Research Project of the Latvian Council of Sciences (project period 2018.-2021., 300 000 EUR).

Sustainable Chemistry:

1. Novel heteroatom-doped nanocarbon catalysts for fuel cell and metal-air battery applications - ERA.NET RUS Plus, State Education Development Agency Republic of Latvia (project period 2018 – 02.2021, 188 000 EUR)
2. Synthesis of biodiesel *via* interesterification of rapeseed oil - Central Finance and Contracting Agency of the Republic of Latvia (project period 03.2017-02.2020, 581 007 EUR)
3. Hybrid energy harvesting systems - Central Finance and Contracting Agency of the Republic of Latvia (project period 2017-2020, 647 361 EUR)
4. Thermoelectric nanomaterials/topological insulators for more effective waste heat converting to usable energy - Central Finance and Contracting Agency of the Republic of Latvia (project period 03.2017-02.2020, 648 185 EUR)
5. Design and Investigation of Light Emitting and Solution Processable Organic Molecular Glasses - Central Finance and Contracting Agency of the Republic of Latvia (project period 2017-2020, 648 330 EUR).

According to the SciVal database (2016-2021), the results of all research projects have been published in more than 900 scientific publications, 20% of which are in Q1-level journals.

Following the program's direction, PhD students can also develop their research in other Latvian scientific institutes.

PhD students are often involved in supervising or advising students at the lower education cycles

on their graduation papers, laboratory works and seminars. In most cases, the supervision of Bachelor's and Master's thesis projects is linked to the PhD student's own research topic. As a result of this collaboration, the PhD student educates and trains lower-level students in the development of research work and in the compilation of results into publications. This results in joint scientific publications by students of different cycles. This develops the PhD student's pedagogical and knowledge transfer skills.

3.2.3. Assessment of the study programme including the study course/ module implementation methods by indicating what the methods are, and how they contribute to the achievement of the learning outcomes of the study courses and the aims of the study programme. In the case of a joint study programme, or in case the study programme is implemented in a foreign language or in the form of distance learning, describe in detail the methods used to deliver such a study programme. Provide an explanation of how the student-centred principles are taken into account in the implementation of the study process.

The study program is implemented by providing an opportunity to study theories, technologies, and the latest trends in the chosen field in depth, to acquire practical skills through seminars, practical classes, and research work. In general, the study program and the planning of each semester are designed to focus on the acquisition and consolidation of the knowledge and professional skills required by the individual, by dividing the study courses and the development of the PhD Thesis into semesters. In this way, the student is guided towards the acquisition of the knowledge, skills and competences they need.

The structure and curriculum of the study program allow adapting to changes in the number of students and optimizing the delivery of the study courses by combining students from different years into one study course. This not only provides economic benefits but also allows for the creation of sufficiently large groups of students to carry out the expected group work and to foster students' collaborative skills. However, care is also taken to ensure that the study courses are sequenced and logical and allow achieving the learning outcomes of the study program.

To ensure integration of the acquired knowledge, competencies and skills of the graduates, elaborating and implementing the study courses, a special focus is made on reflection of the topical case studies in the study program curriculum (at the level of lectures, seminars, and practical classes), integration and cross-disciplinarity of the study courses and the study program; optimization of the curriculum in cooperation with external and industry experts. Individual studies play a significant role. Description of the course of autonomous studies is included in the description of the study course as a mandatory part. Students' skill to learn individually is systematically developed within all the study courses. Students acquire skills of practical and research work by regular use of literature and internet resources, including international scientific databases, which are available at RTU Library with electronic access to ORTUS, to develop successful Theses.

At the beginning of each study course, the academic staff inform students about the study course acquisition requirements and familiarize students with specific evaluation criteria of the study course. They are published in the portal ORTUS. Twice per academic term, students evaluate the performance of the academic staff in ORTUS environment by answering the survey questions. These include evaluation of the study process, individual tasks, acquired skills, the academic staff's

attitude, and cooperation with the students. Survey questionnaires are anonymous. Graduates complete graduate questionnaires.

Within each study course, students must pass planned assessment tests, complete individual home assignments and develop term papers. Only the students who have fulfilled all requirements of the study course are admitted to the examination. Results of exams and tests are registered in the electronic database of RTU Study Management System.

The academic staff of the study program regularly improve the study curricula by introducing yet more new learning organizational practices into the study process. The study un scientific process integrates international experience, FMSAC learning environment and infrastructure are adapted for the groups of students with various professional interests, maintaining the stable quality of studies.

Depending on the research area of the PhD Thesis, one can apply for **a degree in one of four scientific fields**. If the thesis focuses on chemistry or physics, the student will develop a PhD Thesis in the natural sciences and obtain a PhD in chemistry or physics and astronomy, and if the thesis is related to chemical engineering or materials science, the student will develop a PhD Thesis on engineering sciences and obtain a PhD in materials science or chemical engineering.

Public presentation of the PhD Thesis shall take place in accordance with the Cabinet of Ministers Regulation No. 1001 (27/12/2005) “Procedures and Criteria for Awarding a Doctoral Degree”.

The degree in chemistry or physics and astronomy is secured by the RTU-UL agreement on the viva voce examination of the PhD Thesis at the Doctoral Board in Physics and Astronomy of the University of Latvia. Work is in progress to develop amendments to the Cabinet Regulations, which would give RTU the right to establish its own Doctoral Board in Physics and Astronomy.

Organizational units of RTU, including Personnel, Research, International Relations Departments, and the Centre for Academic Excellence regularly inform the academic staff about opportunities to advance their competencies in the field of scientific research, methodological and teaching skills, general competencies (foreign languages, information technologies, public speaking and presentation skills, etc.), and specific professional activities. ORTUS accumulates information about the scientific activities of the academic staff.

Courses and seminars about new educational methods are organized for the academic staff, they are also offered professional advancement and training courses at the faculty, RTU and international scale. RTU Centre for Academic Excellence organizes activities for the development of the academic staff on the university level.

The methods employed at the study program promote the achievement of the aims and outcomes of the study courses and the study program based on the student-centred principles of education. The study program owes its value to a professional dialogue between the academic staff and students, involving students in the improvement of the curricula and methods of the study courses. Students can take part in the improvement of the study process directly – expressing their aspirations to the academic staff of a certain study course, a department chair, the director of the PhD study program, or through representatives of the student self-government, whose representatives are members of FMSAC Council, RTU Senate and RTU Senate commissions, as well as members of RTU Constitutional Assembly.

Indirectly, students express their thoughts about the course of study during anonymous mid-semester and end-of-semester questionnaires. Graduates of the program fill in survey questionnaires about the program as a whole. The results of the questionnaires are examined at departmental meetings and proposals for changes are made. The most important points of the questionnaire are also discussed at the meeting of the Study Program Committee. Careful analysis

of the questionnaire results allows for informed changes to the course and program content.

The program director regularly discusses current issues of the study process and quality, involving in these discussions other interested parties.

FMSAC relationships with students are based on the principles of mutual confidence, respect and fairness. This imposes students both extra obligations and offers additional rights. Students have an opportunity to influence their learning process, to exercise their autonomy, to provide feedback on the study process, aligning it with their professional growth interests. The feedback between students, academic staff and program administration is greatly influenced by FMSAC student self-government that takes an active part in all mentioned processes.

3.2.4. If the study programme envisages an internship, describe the internship opportunities offered to students, provision and work organization, including whether the higher education institution/ college helps students to find an internship place. If the study programme is implemented in a foreign language, provide information on how internship opportunities are provided in a foreign language, including for foreign students. To provide analysis and evaluation of the connection of the tasks set for students during the internship included in the study programme with the learning outcomes of the study programme (if applicable).

3.2.5. Evaluation and description of the promotion opportunities and the promotion process provided to the students of the doctoral study programme (if applicable).

The promotion procedure (PhD Thesis defence procedure) is determined by the Regulations on Promotion Councils and Promotion at RTU. The promotion at RTU is allowed for the scientific domains, which are accredited for PhD study programmes in accordance with the Regulations of the Cabinet of Ministers No. 1000. At present, two Promotion Councils operate at RTU being entitled to confer a scientific degree in Chemistry and Chemical Engineering, or in Materials Science. The Promotion Council is created individually for each PhD thesis defence by appointing PhD holding scientists of the specific research area. This ensures a high-level and scientifically competent review and thesis defence process.

The degree of Physics and Astronomy is awarded to the graduates of the program within the cooperation agreement by the Promotion Council of the University of Latvia.

The Promotion Councils confer the PhD degree for an independently developed and publicly defended PhD Thesis under the supervision of an experienced scientist (a professor, an associate professor, an assistant professor and/or the leading researcher, who is approved in accordance with the procedure determined at RTU). The PhD Thesis may be composed in the form of:

- a dissertation (monograph);
- a compilation of thematically unified scientific publications (PhD Thesis by Publication).

PhD studies in the PhD program shall be completed by passing all examinations and credit tests

provided for in the PhD study plan, submitting the PhD Thesis to the Promotion Council of the relevant field, public defence of the PhD Thesis and obtaining the PhD degree.

The organizational unit of RTU, where the PhD Thesis has been developed, decides at the meeting that the PhD Thesis has been developed and is to be submitted to the Promotion Council of the relevant field. The candidate for a scientific degree shall submit an extract of the minutes of the meeting together with the other required documents to the Promotion Council of the relevant field.

The Promotion Council accepts a PhD Thesis if the author has justified the choice of the research topic, defined the aim and objectives of the research, described the scientific achievements of the thesis project implementation and the methods used, presented and discussed the results and findings of the thesis, summarizing them in publications, conclusions and theses to be put forward for the public defence procedure. If the PhD Thesis meets the general requirements determined by FMSAC, the referees, the members of the Promotion Council are appointed, and the date of the public defence procedure is arranged.

Once accepted, the electronic version of the abstract (in Latvian and English) and appendices are uploaded to ORTUS portal. Until 2021, one copy of the PhD Thesis and the thesis summary (in Latvian and English) is deposited in the RTU Library, 2 copies of the PhD Thesis and 7 copies of the summary (in Latvian and English) are deposited in the National Library of Latvia. Certificates on the transfer of the PhD Thesis and summaries to the libraries shall be submitted to the Secretary of the Promotion Council before the public defence procedure. Since March 2021, all PhD theses are submitted only as e-documents to the aforementioned libraries.

The Regulations on Promotion Council and Awarding of PhD Degree at RTU contain information on how the public defence procedure of the PhD Thesis and the awarding of a scientific degree is carried out.

The PhD degree is awarded to the candidate on the basis of the decision of the Promotion Council by the order of the Rector of RTU.

3.2.6. Analysis and assessment of the topics of the final theses of the students, their relevance in the respective field, including the labour market, and the marks of the final theses.

When starting doctoral studies, the doctoral student chooses the PhD research topic and the scientific supervisor. The topics are very different and they are based on both global trends of science and contemporary needs of industry. These include both national and international levels of research. The availability of topics depends on the availability of research funding.As the research may cover a broader range of issues than originally planned, the title of the PhD Thesis may be refined before the public defense procedure.

During the reporting period, 28 PhD Theses were publicly defended within the study program "Chemical Technology". The PhD Theses can be found at https://ortus.rtu.lv/science/en/publications/doctoral_thesis/.

Title of the defended Doctoral Theses

Improvement of the wastewater treatment method for the hydrothermal pool of veneer production, characterization of the obtained coagulates and possibilities of use

Poly(Vinyl Alcohol) Cryo-Hydrogel Systems for Development of Biomaterials

Electrochemical Disinfection of Water Using Titanium Oxide Ceramic Electrodes

Investigation and Technology Elaboration of Cotton/Polyester Fabric Chemical Processing

Controlled Release Drug Delivery Systems Based on Silver Doped Hydroxyapatite

Development of Preparation Technology and Investigation of Properties of Latvian Clays for Application in Cosmetic Products

Anaerobic Digestion of Dairy Residues and Process Enhancement Using Composite Materials from Industrial Wastes

Novel Extraction Method for Obtaining of Extractives with a High Content of Betulin

The Effect of Mullite-Forming Additives on the Properties of Porous Alumina Ceramics

Nano-Sized Calcium Phosphates and Their Biomedical Potential

Heterogeneous Composites of Polyvinyl Alcohol and Polyvinyl Acetate

The Synthesis of Hydraulic Binder Suitable for Restoration of Dolomitic Roman Cement Objects

Improvement of the Properties of Birch Plywood with Thermo-Hydro Treatment Method

Model Based Biomass Yield Optimization and Control for E. coli BL21 (DE3) Hepatitis B Core Antigen (HBcAg) Producer Fed-Batch Fermentation Process

Research and Modification of Natural Polyphenols and Proanthocyanidins Extracted from the Deciduous Tree Bark Growing in Latvia for Production of Ecological Functional Products and Materials

Multifunctional Carbon Materials on the base of Wood and Lignocellulose
Application of Fourier Transform Infrared Spectroscopy in Analyis of Synthesized and Natural Calcium Phosphate
Phase transitions in Sn_xS_y Thin Films and Their Properties
Carbon Nanotube Based Thermoplastic Polymer Composites
Efficient Separation of Biomass from Veneer Production Hydrothermal Treatment Wastewater, its Characterization and Application Possibility
Development of Renewable Feedstock Based Rigid Polyurethane Foam and Nanoclay Composites
Development of Innovative Polyol Systems from Recycled Polyethylene Terephtalate and Renewable Raw Materials for Rigid Polyurethane Foams
Degenerated ZnO Nanocrystals: Synthesis, Properties and Applications
Innovative Alkyd Emulsion Composition Enhanced with Nanosized Iron Oxides for the Protection of Thermally Treated Wood in Outdoor Conditions
Pourous Cordierite Ceramics from Mineral and Synthetic Raw Material Compositions
Research and Development of Multifunctional Porous Materials on the Basis of Clay and Glass Waste
UV Activated Copolymerization Coatings of Urethane Acrylates for Use in the Cosmetic Industry
Lignocellulose Based Nanoporous Carbon Materials for Fuel Cells

The defended PhD Theses have been peer-reviewed and assessed as being relevant to the research theme and the current requirements of the scientific field, and have shown innovative results in the field. The range of themes is very broad and often covers several fields.

In fact, the changes made to the program in 2021 combine the doctoral-level programs implemented by FMSAC. 51 more PhD theses have been defended in the reporting period - 24 in the “Material Science” program and 27 in the “Chemistry” program.

3.3. Resources and Provision of the Study Programme

3.3.1. Assessment of the compliance of the resources and provision (study provision, scientific support (if applicable), informative provision (including libraries), material and technical provision, and financial provision) with the conditions for the implementation of the study programme and the learning outcomes to be achieved by providing the respective examples.

The study program is mainly implemented by five scientific institutes of the FMSAC:

- Institute of Technology of Organic Chemistry;
- Institute of Applied Chemistry;
- Institute of General Chemical Engineering;
- Institute of Polymer Materials;
- Institute of Materials and Surface Engineering.

They provide education and learning support: develop and update descriptions of the study courses, implement the corresponding study courses, supervision and defence of the theses, and other activities related to learning, teaching and research work.

All institutes mentioned above are actively engaged in the implementation of scientific projects, which contribute to the systematic renewal of the scientific and technical resource base, which is also available to students both during their theoretical studies and in the development of their research work. In the assessment period, 8.2 MEUR have been invested in the renovation of buildings and 9.2 MEUR - in modern research equipment. In recent years, academic and research laboratories, as well as classrooms have been renovated, and funds have been invested in the purchase of equipment for conducting the digital learning process and in the renewal of technical equipment. The list of available research labs and classrooms is given in table 3.3.1. below. This provides students with ample opportunities to get acquainted with the latest methods and equipment in their chosen field and to gain practical experience in their use during their studies. A full list of research equipment can be found in Annex.

Table 3.3.1. FMSAC space available for teaching and science

Type of use of the room	**Number of rooms**	**Area, m^2**
Meeting / Conference Room	3	239
Computer class	2	74
Classroom / study room	16	1139
Cabinets / Teachers' rooms	64	1801
Study and scientific laboratory	106	19232
Auxiliary room	16	308
Warehouse	4	100
Library	1	540

In total	**212**	**23433**

In 2016, significant investments were made in the development of the Scientific Library (SL) infrastructure by building additional premises (2240 m^2). The library is equipped with self-service facilities. The SL is accessible for users with disabilities. The SL central building is attached to the FMSAC and it provides the students with unique opportunity to use study rooms in both FMSAC and SL.

The financing of each information resource for study programs is determined according to the total allocated fund for RTU SL. The collection is supplemented according to the recommendations of the study program director and lecturers considering the granted funding.

Editions that are not available in the SL are delivered through an interlibrary subscription or international subscription. Internet access is provided throughout the SL. The SL provides copying, scanning, printing and binding services, as well as there is a self-service canteen.

In the Chemistry Branch of the RTU Scientific Library is located in FMSAC. Its reading room provides freely accessible workplaces for students, educational and scientific literature in different languages. The library provides internet access, as well as copying, scanning, and printing services are available. The Library's Chemical Branch provides open-access databases of abstracts, such as Chemical Abstracts and a significant collection of chemistry journals, which includes the most important journals in the sector – these are editions of ACS, RSC, Wiley, Elsevier, Springer and the collection of journals issued in Russia. It is the most complete collection of journals of the chemical sector in Latvia.

The stocks of the Chemistry Branch of the RTU Scientific Library contain printed books and various editions (PhD theses and summaries thereof) in line with the study fields and scientific work of the RTU FMSAC. All editions in the branch are open access. The stock of the Branch contains 6607 titles / 8396 copies of books, which are reflected in the Electronic Catalogue of the RTU Scientific Library (https://kopkatalogs.lv/) as at 10.03.2022. Most of them are in English.

In the Chemical Branch of the RTU Scientific Library, it is possible to use the database of full-text scanned materials "Chemistry", which contains mostly popular articles in press editions on a variety of chemical, pharmaceutical, materials science and technology topics starting from 2014. The database "Chemistry" is available in the electronic catalogue. Full texts are available only on computers of the Chemistry Branch. The stock of the Chemistry Branch of the RTU Scientific Library contains a Collection of Rarities of 686 books (928 copies). 139 books were issued before 1899. The collection includes the works of P. Valdens, V. Ostvalds and other academic staff of the Faculty. The oldest book is *B. Faujas de Saint-Fond "Minéralogie Des Volcans, ou description de toutes les substances produites ou rejetées par les feux souterrains"* issued in 1784. In the Collection of Rarities, most of the books are in German (700 copies), in Russian (121 copies) and in Latvian (59 copies). The entire Collection of Rarities is reflected in the electronic catalogue of the RTU Scientific Library (https://kopkatalogs.lv/).

The study programme mainly is implemented in the building at P.Valdena Street 3/7, Riga, which is a part of the RTU Ķīpsala Campus.

There are for the shared use currently 54 classrooms, 187 laboratories, 19 specialised study rooms, 10 computer classrooms, 12 workshops and several research centres of national importance importance in the Campus. In addition, there are laboratories and work rooms for the scientific groups of each faculty. There is also a student hostel on the Campus with 950 beds and a special block for people with disabilities. The entire RTU infrastructure is available to students and academic staff of the study programme.

In general, it can be concluded that the resource and provision base correspond to the conditions for the implementation of the study programme and the achievements of study results.

3.3.2. Assessment of the study provision and scientific base support, including the resources provided within the framework of cooperation with other science institutes and higher education institutions (applicable to doctoral study programmes) (if applicable).

There has been long standing collaboration between RTU FMSAC and external scientific institutes like Latvian Institute of Organic Synthesis, Latvian State Institute of Wood Chemistry, and Institute of Solid State Physics. Since 2013, research work for 9 theses has been implemented in the aforementioned institutes. There are also several part-time teaching staff at FMSAC, which are full-time researchers at those institutes. This results in collaborative projects, common use of research infrastructure and co-authorship in publications. Several infrastructure projects dealing with purchase and installing of top-notch research equipment have been implemented in collaboration between RTU FMSAC and those institutes.

Starting from the 4th quarter of 2021, PhD students and academic and research staff of the PhD study programme "Chemistry, Materials science and Engineering" have been involved with the research employment project "Strengthening of PhD students and academic personnel of Riga Technical University and BA School of Business and Finance in the strategic fields of specialization" (project No 8.2.2.0/20/I/008) of the Specific Objective 8.2.2 "To Strengthen Academic Staff of Higher Education Institutions in Strategic Specialization Areas" of the Operational Programme "Growth and Employment" (3rd round), supported by the European Social Fund (ESF). The project is being implemented in close cooperation with several other Latvian research institutions, as Latvian Institute of Organic Synthesis, Latvian State Institute of Wood Chemistry, and Institute of Solid State Physics, University of Latvia, among others.

Within the project, the PhD students involved work for a RTU-based department or external research institution and develop an individual set of deliverables related to their PhD thesis topic for at least 12 months, while receiving an ESF-funded employment grant and unit costs for materials and mobility.

As of March 2022, the number of PhD students of "Chemistry, Materials Science and Engineering" employed in the project is 9, including 8 working for the RTU, and 1 student working for the Latvian Institute of Organic Synthesis.

Under the project, in March 2022, the RTU established a new consultative Project Council that brings together members of all RTU faculties as well as the said research institutions, amongst others. The primary aim of the Council is to work on internal documentation regarding the project and bring forward discussions on the further development of doctoral studies at the RTU, coherent cooperation with partner institutions in all study fields in which the RTU grants a PhD degree, including chemistry, chemical technology, and bio-technology.

In the frame of BBCE project Institute of General Chemical Technology (IGCT) and Rudolfs Cimdins Riga Biomaterials Innovations and Development Centre of RTU (RTU RBIDC) are offering multiple opportunities for their PhD students to spend some time (1-12 months) during their PhD studies as international mobility/training within the PhD scope at IGCT and RTU RBIDC. The trainings are performed at long term international partner (Academia and Research Centres) facilities under the scientific guidance of world class researchers of a particular area (H-index of scientific advisors at

hosting partner facilities are up to Hirsh index=100). Long term collaborators such as AO Research Institute Davos, Switzerland (in 2021 was hosting 3 PhD students from 3-6 months); Friedrich-Alexander University Erlangen-Nuremberg, Germany (in 2021 was hosting 1 PhD student for 6 months); Institute National Polytechnique de Toulouse (in 2022 was hosting 1 PhD student for 1 month); Johann Wolfgang Goethe-Universität Frankfurt am Main (in 2021 was hosting 1 PhD student for 1 month); Center of Autoimmune and Allergic Diseases (CAAD, Novara, Italy), Università del Piemonte Orientale in Novara (in 2021 was hosting 1 PhD student for 3 months) are involved in these trainings. Moreover, the possibility to participate in summer and winter schools organized by international collaborators as well as by RTU RBIDC are also offered for the PhD students. Within these schools, they can gain new knowledge on high impact scientific writing, how to transfer research findings to the market; but also what are the possibilities for developing new materials for bone regeneration and drug delivery purposes.

3.3.3. Indicate data on the available funding for the corresponding study programme, its funding sources and their use for the development of the study programme. Provide information on the costs per one student within this study programme, indicating the items included in the cost calculation and the percentage distribution of funding between the specified items. The minimum number of students in the study programme in order to ensure the profitability of the study programme (indicating separately the information on each language, type and form of the study programme implementation).

The state budget subsidy and foreign students' tuition fees are used for the implementation of the study program. This covers the teaching costs and basic infrastructure costs for the use of laboratory space. It should be noted that the state budget subsidy does not cover the salaries of PhD students that are employed as research assistants and/or researchers. The latter is done by finances of national and international grants. Also, the speciality chemicals and materials are provided by research projects.

Information regarding the financial resources of the academic study program “Chemical Technology” is presented in Table 3.3.3. The distribution of financial resources for the program "Chemistry and Chemical Technology" for the 2021/2022 academic year is not yet available, as the financial year at RTU ends in September.

Table 3.3.3. Financial resources

Academic year	State budget funding, EUR	Total funding for the program, EUR	Cost per 1 student, EUR
2013./2014.	129 436,00	129 436,00	11 598,00
2014./2015.	122 054,79	122 054,79	11 598,06
2015./2016.	114 697,16	114 697,16	12 797,86
2016./2017.	83 265,90	83 265,9	12 797,86

2017./2018.	100 742,28	100 742,28	13 375,97
2018./2019.	104 963,95	104 963,95	14 001,69
2019./2020.	88 675,43	88 675,43	14 582,21
2020./2021.	74 617,69	74 617,69	14 773,44

The analysis of the information shows that the state budget grants for the study programme have decreased during the reporting period. The cost per student has increased, which is justified by the overall increase in total RTU costs (utilities, building maintenance, etc.).

Information on the minimum number of students in RTU study programmes is provided in the appendix of the self-evaluation report "On the minimal number of students in study programmes".

The specific development of each study program is the responsibility of each study program director. Also, the faculty administration supervises the study program. For the development of all study programmes, central funding is used for the updating the collection of library, improvement and maintenance of shared classrooms, public relations, programme marketing activities, development and maintenance of information systems related to the study process, development of the Ķīpsala complex and other activities. In addition, see:

- Provision of study facilities in Part II, Chapter 3, Section 2.3.1.
- Provision of research facilities in Part II, Chapter 3, Section 2.3.1.
- Provision of information facilities in Part II, Chapter 3, Section 2.3.3.
- Provision of the material and technical base in Part II, Chapter 3, Section 2.3.2.
- Provision of the financial basis in Part II, Chapter 3, Section 2.3.1.

3.4. Teaching Staff

3.4.1. Assessment of the compliance of the qualification of the teaching staff members (academic staff members, visiting professors, visiting associate professors, visiting docents, visiting lecturers, and visiting assistants) involved in the implementation of the study programme with the conditions for the implementation of the study programme and the provisions set out in the respective regulatory enactments. Provide information on how the qualification of the teaching staff members contributes to the achievement of the learning outcomes.

The scientific competence of the academic staff involved in the academic PhD study programme “Chemistry, Materials Science and Engineering” can be evaluated by the following criteria: publications in scientific journals indexed by SCOPUS or Web of Science, other databases recognised in the scientific world, as well as participation in international and Latvian scientific journal editorial boards; participation in international projects.

Since 2021, nine doctors of sciences are directly involved in the provision of the study courses of

the program – full-time professors at RTU: *Dr.chem.* Māris Turks, *Dr.sc.ing.* Andris Šutka; *Dr.sc.ing.* Jānis Ločs, *Dr.sc.ing.* Remo Merijs-Meri, Ph.D. Kārlis-Agris Gross, *Dr.phys.* Juris Blūms, *Dr.habil.phys.* Māris Knite, *Dr.habil.phys.* Yuri Dehtjar, and Associate Professor, *Dr.chem.* Kaspars Traskovskis. All are elected to RTU.

Other senior researchers of the faculty are also involved in the supervision or co-supervision of PhD Theses, holding expert rights of the Latvian Council of Science as required.

The rationale for the selection of academic staff is related to the experience, research interests, and scientific performance of the scientists, considering the specifics of the study program and the study courses.

All members of the academic staff responsible for each study course are experts in the field. This is confirmed by their expert status of the Latvian Council of Science, participation in the EU and Latvian research projects, and registration as an expert at the EU portal. Participation in the EU projects and regular peer-review of articles allows keeping up to date with the latest developments and research in the field.

Professor Māris Turks is the author of more than 120 scientific publications and 37 patents, has given oral presentations at 20 international conferences and 15 guest lectures at foreign universities and research institutes. The distribution of publications by topic is shown in Figure 3.4.1.1. He has supervised 10 PhD, 29 master's and 45 bachelor's theses. Expert of the Latvian Council of Science in the field of chemistry and in the field of chemical engineering. Participant and manager of several Latvian and international projects. Member of the editorial boards of several scientific conference programs and the editorial board of international journals. Member of the RTU Senate, Chairman of the Doctoral Council "RTU P-01". Academician of the Latvian Academy of Sciences (LAS) and member of the LAS Senate. Project evaluation council member at the Latvian Competence Centre of Pharmaceutical, Biomedical and Medical Technology, Head of Division “Natural substance medicine, nutritional supplements, functional cosmetics”. Latvian representative at the Division of Organic Chemistry, European Association for Chemical and Molecular sciences. Management Committee member: COST Action CA18132 Functional Glyconanomaterials for the Development of Diagnostics and Targeted Therapeutic Probes.

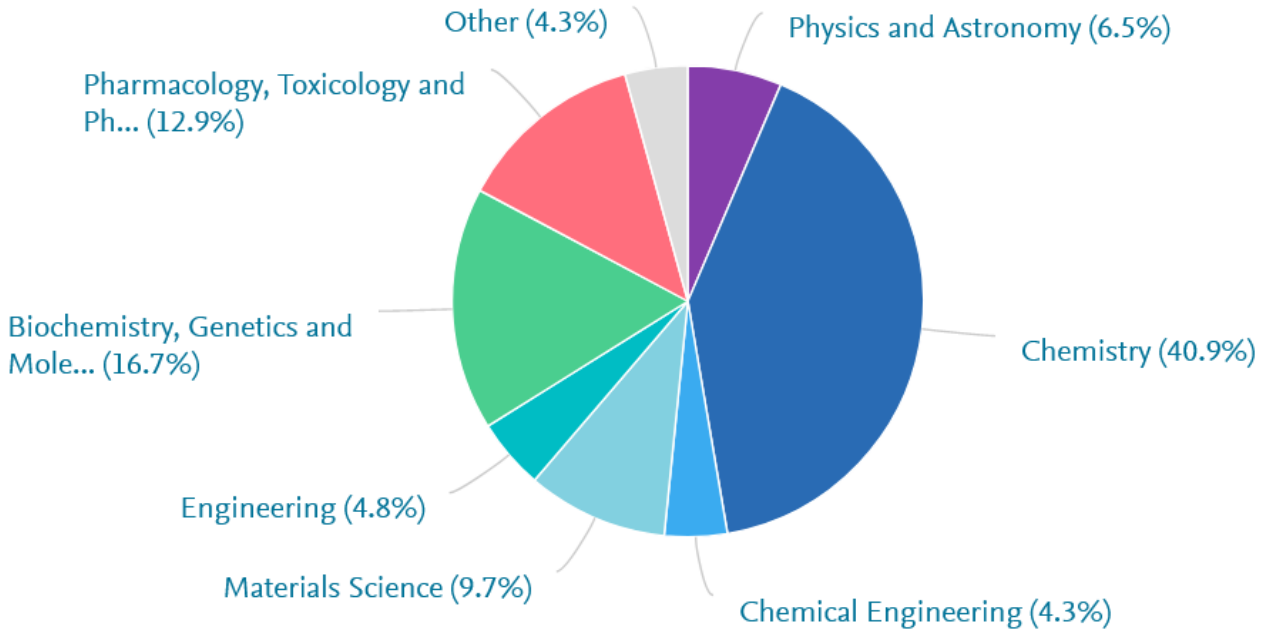


Fig. 3.4.1.1. Prof. M.Turks publications by subject area (SciVal data for 2011-2020).

Associate professor **Kaspars Traskovskis** has published 37 peer-reviewed scientific articles indexed in the Scopus database. He has supervised 4 bachelor's, 2 masters and 1 PhD thesis. The distribution of publications by topic is shown in Figure 3.4.1.2. . He has coordinated and implemented several Latvian and international scientific projects. He has Latvian Council of Science expert status in the area of Chemistry. He is a member of the Doctoral Council "RTU P-01". He is performing reviewer duties in several international scientific journals. He holds a member status in RTU FMSAC Council and Scientific commission.

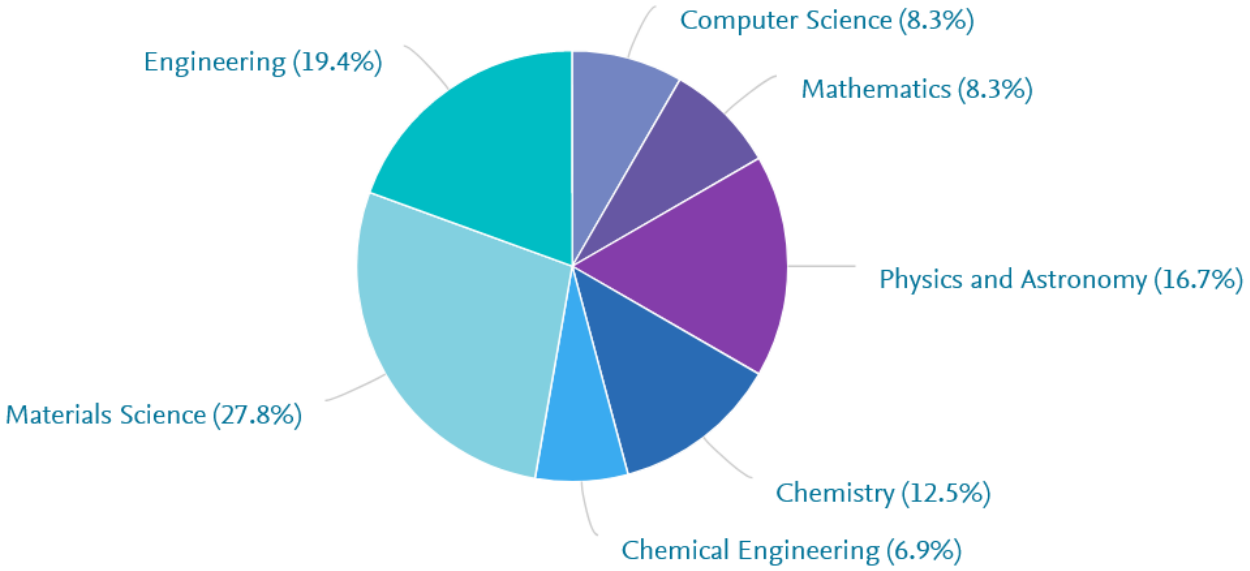


Fig. 3.4.1.2. Asoc. Prof. K.Traskovskis publications by subject area (SciVal data for 2011-2020).

Professor **Remo Merijs-Meri** is the author of more than 110 scientific publications and 4 patents, has given oral presentations, including plenary lecture, at more than 20 international conferences and 2 guest lectures at foreign universities and research institutes. The distribution of publications by topic is shown in Figure 3.4.1.3.. He has supervised 4 PhD, 26 master's and 19 bachelor's theses. Expert of the Latvian Council of Science in the field of materials science and in the field of chemical engineering. Participant and manager of several Latvian and international projects. Member of the organization board of several Baltic Polymer Symposium series international scientific conferences. Member of the editorial board of international journal Environmental Research, Engineering and Management. Corresponding member of the Latvian Academy of Sciences (LAS). Together with academic and commercial co-operation partners in 2022. Diploma of the LAS "Most important achievements of the 2021st Year" has been received, whereas in 2017. Diploma of the president of the LAS on the achievements in applied sciences in 2016. has been received.

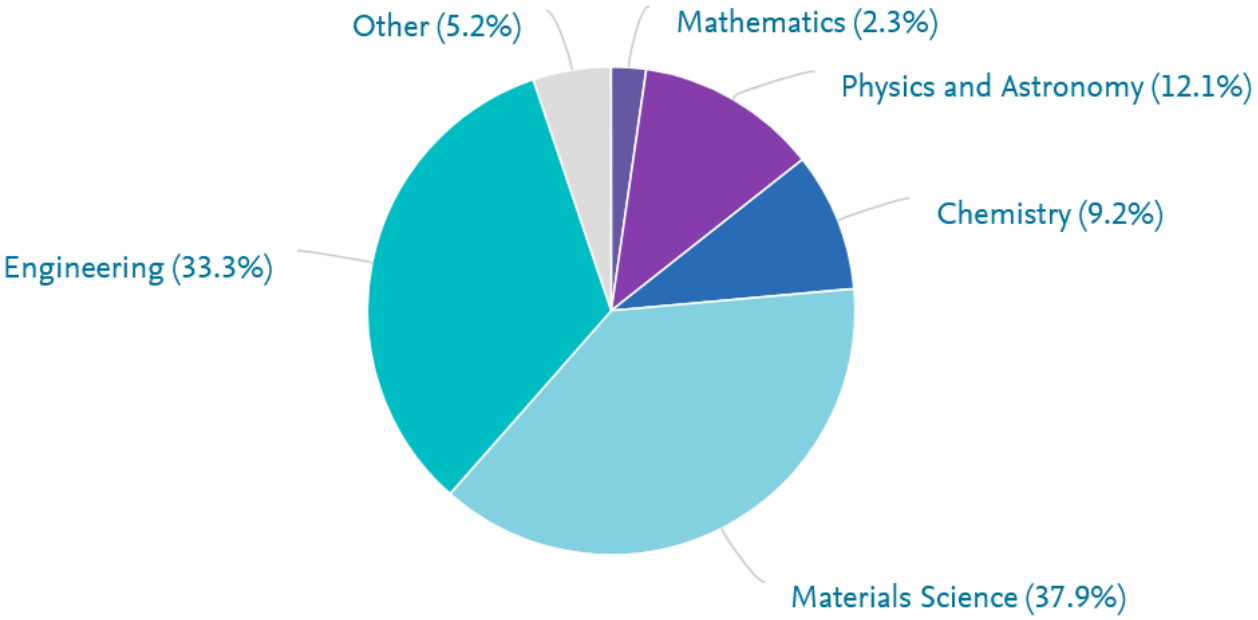


Fig. 3.4.1.3. Prof. R.Merijs-Meri publications by subject area (SciVal data for 2011-2020).

Professor **Andris Šutka** is the author of more than 90 scientific publications and 5 patents, has given oral presentations at 10 international conferences, given a guest lecture course (16 lectures) at the University of Tartu, as well as lectured at 3 foreign universities and research institutes. The distribution of publications by topic is shown in Figure 3.4.1.4.. Supervisor of 2 PhD, 2 master's and 6 bachelor's theses. Expert of the Latvian Science Council in the fields of Materials Science and Chemical Engineering. Leader for 8 Latvian and 5 international research projects. Participation in several promotion councils. Full member of the Latvian Academy of Sciences.

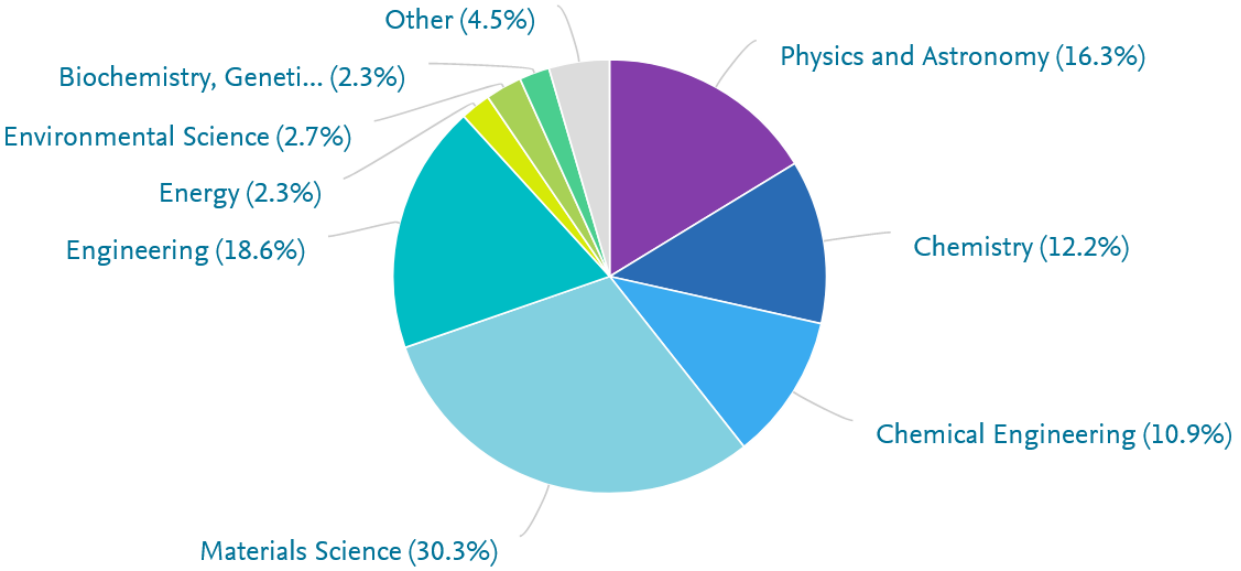


Fig. 3.4.1.4. Prof. A.Šutka publications by subject area (SciVal data for 2011-2020).

Prof. **Kārlis Agris Gross** is an Australian born Latvian scientist providing an international perspective and experience from universities in Germany, USA, Finland, France and Australia. The 150 scientific papers (giving more than 4000 citations) and 2 patents are in the field of materials science and engineering. Doctoral student supervision has been given to 3 students in Australia, 4 students in Latvia and 4 present students in the FMSAC and mechanical engineering. Research directions involve biomaterials, sliding on ice and a new direction in food science is being initiated. The present EU project entails sliding on ice and icing of cold surfaces.

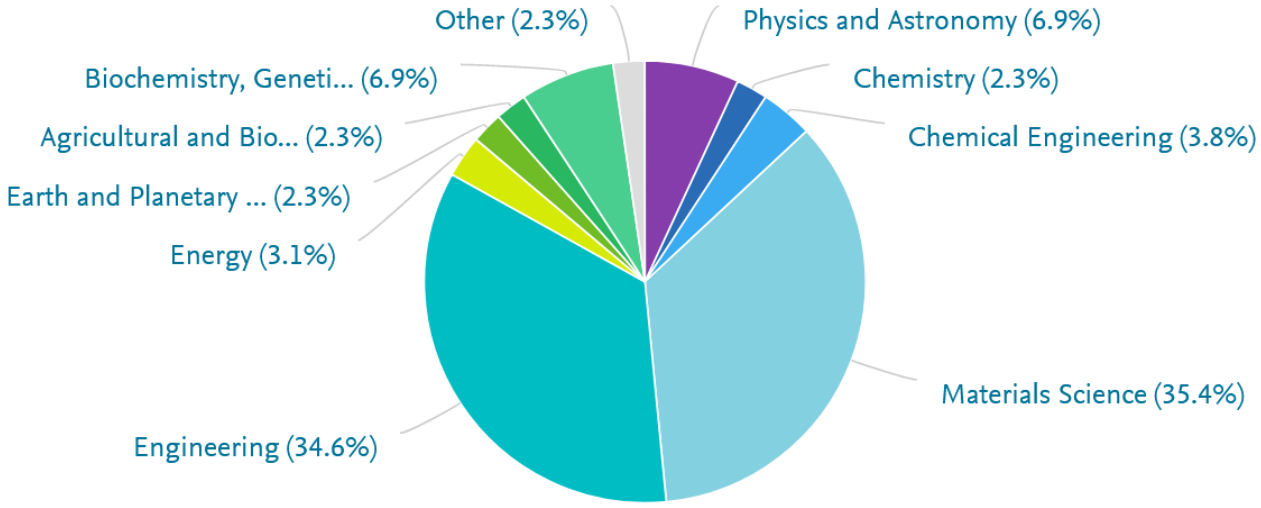


Fig. 3.4.1.5. Prof. K.-A.Grosa publikāciju sagalījums pa tēmām (SciVal dati par periodu 2011-2020).

Professor **Juris Blums** is the author or co-author of more than 60 scientific publications, 33 of which are indexed in the SCOPUS database. H-index 8 (SCOPUS). He has participated in more than 25 scientific and methodological conferences and is the author or co-author of several methodological publications. The distribution of publications by topic is shown in Figure 3.4.1.6. He has completed several research and teaching rounds at Tallinn University of Technology in Estonia, the University of Essen in Germany, Kaunas University of Technology in Lithuania, and the University of Oulu in Finland in order to to raise his qualification. Since 1992, he has been teaching various physics and physics-related courses at Riga Technical University in several bachelor's and master's level study programs. Direction of scientific research - development of wearable and portable energy harvesters, design and research of properties of nanostructured materials. He is the director of the RTU Institute of Technical Physics, a member of the RTU Constitutional Assembly and Senate, a member of the Council of the Faculty of Materials Science and Applied Chemistry, as well as a member of the Council of the Institute of Technical Physics. Works in several Latvian and Lithuanian Promotion Councils.``

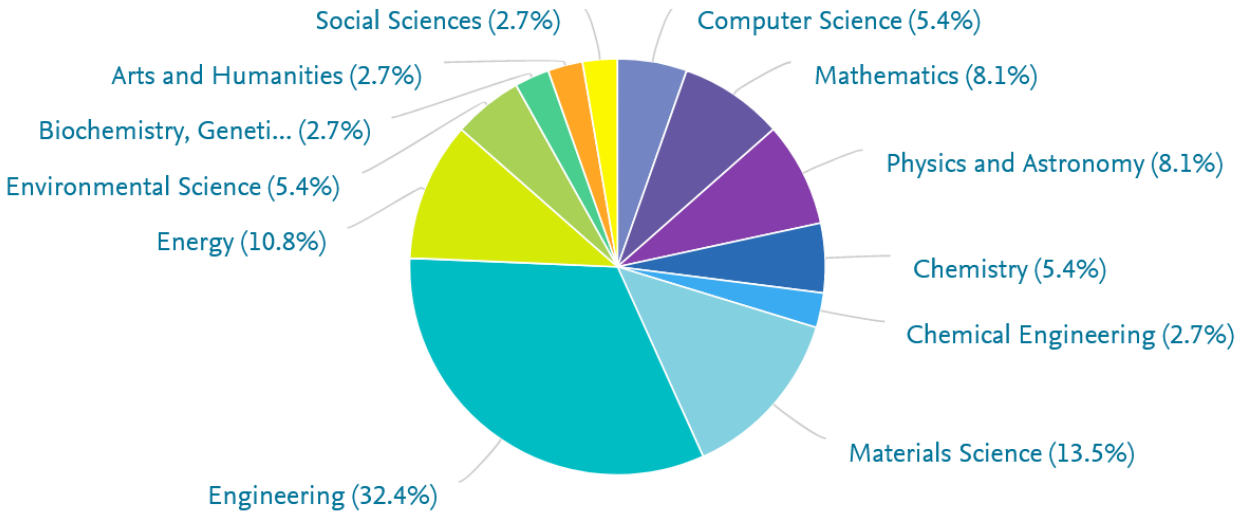


Fig. 3.4.1.6. Prof. J.Blūms publications by subject area (SciVal data for 2011-2020).

Professor **Māris Knite** is the author of more than 140 scientific publications (84 of them are indexed in the SCOPUS database) and 4 patents. He has given presentations at 34 international conferences and 3 guest lectures at foreign universities and research institutes. He has supervised

10 PhD, 15 master's and 18 bachelor's theses. Expert of the Latvian Council of Science in the field of Natural Sciences: Physics and Astronomy and in the field of Engineering and Technologies: Materials Science. Participant and manager of several Latvian and international scientific projects as well as participant of several National Programs projects. Member of the editorial boards of scientific conference programs and the referee of many international journals. Former member as well as former chairman of the RTU Senate, former chairman of the Doctoral Council "RTU P-18". Academician of the Latvian Academy of Sciences (LAS) and former member of the LAS Senate. Management Committee member of COST Action MP 0902 „Composites of Inorganic Nanotubes and Polymers" *(*COINAPO).

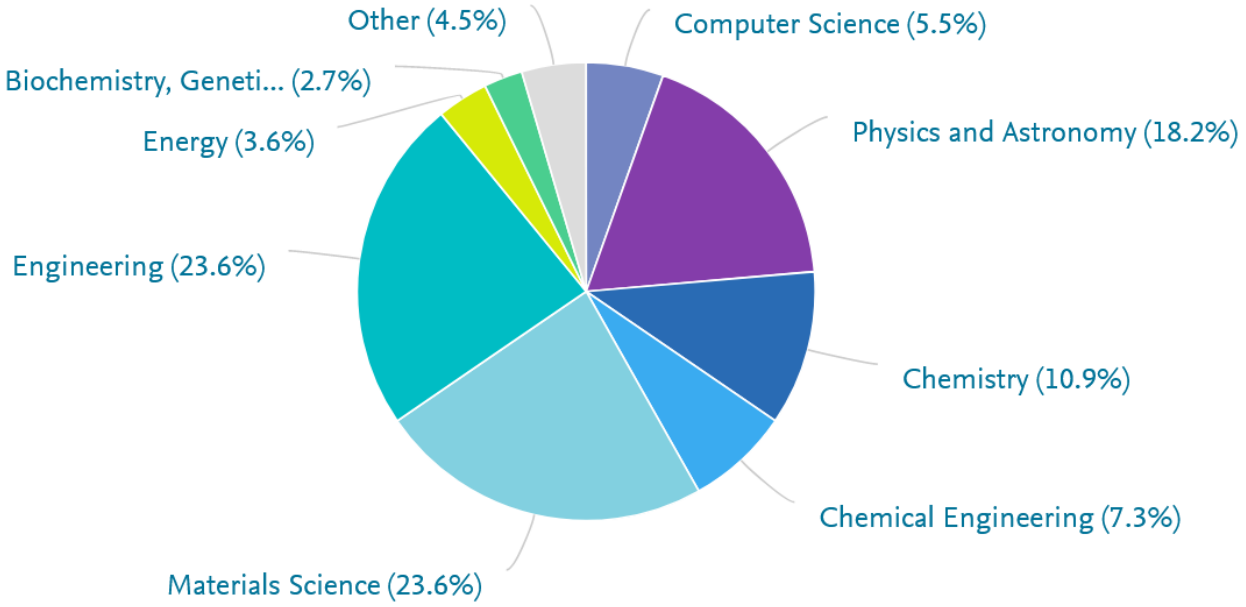


Fig. 3.4.1.7. Prof. M.Knite publications by subject area (SciVal data for 2011-2020).

Professor **Jurijs Dehtjars/Yuri Dekhtyar** is the author of more than 560 scientific publications and patents, has presented papers at several international conferences, and has given more than 20 guest lectures at foreign universities. Prepared 14 PhD's, more than 40 Master's and 60 Bachelor's. Participant and coordinator of Latvian and international projects. Member of the editorial boards of several scientific conference programs and the editorial board of international journals. Member of RTU Science Council, Chairman of RTU Promotion Council and Member of LU Promotion Council, Academician of the Latvian Academy of Sciences (LAS). Latvian representative Federation of European Medical Physicists' Organizations (EFOMP), member of the Professional Matters Committee.

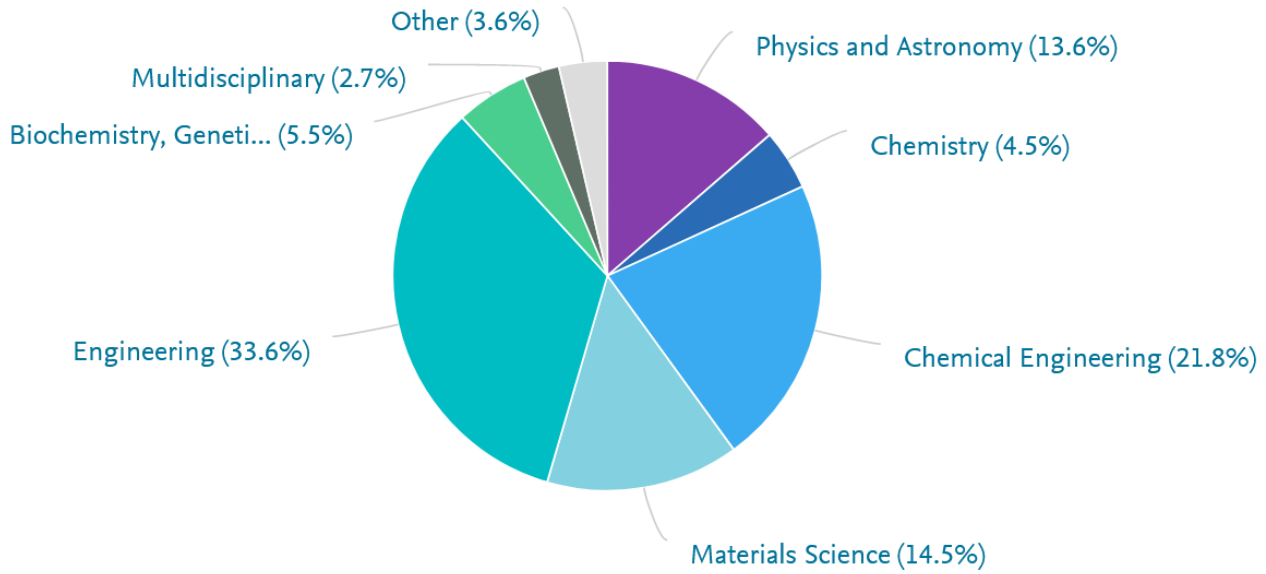


Fig. 3.4.1.7. Prof. Jurijs Dehtjars/Yuri Dekhtyar publications by subject area (SciVal data for 2011-2020).

Professor **Jānis Ločs** is the author of more than 95 scientific publications and 8 patents, has given oral presentations at 15 international conferences and 5 guest lectures at foreign universities and research institutes. The distribution of publications by topic is shown in Figure 3.4.1.9. He has supervised 10 PhD, 16 master's and 12 bachelor's theses. Expert of the Latvian Council of Science in the field of chemistry, chemical engineering and materials science. Participant and manager of several Latvian and international projects, including coordination of H2020 projects. Member of the editorial boards of several scientific conference programs. Member of the RTU Senate (2013 – 2021), currently a member of the RTU Council. Chairman of the Doctoral Council "RTU P-02". Academician of the Latvian Academy of Sciences (LAS). Latvian representative at the European Chemical Agency, Committee of Socioeconomical analysis (2015 – 2020). Management Committee member of several COST Actions. Member of the board of Scandinavian Society for Biomaterials.

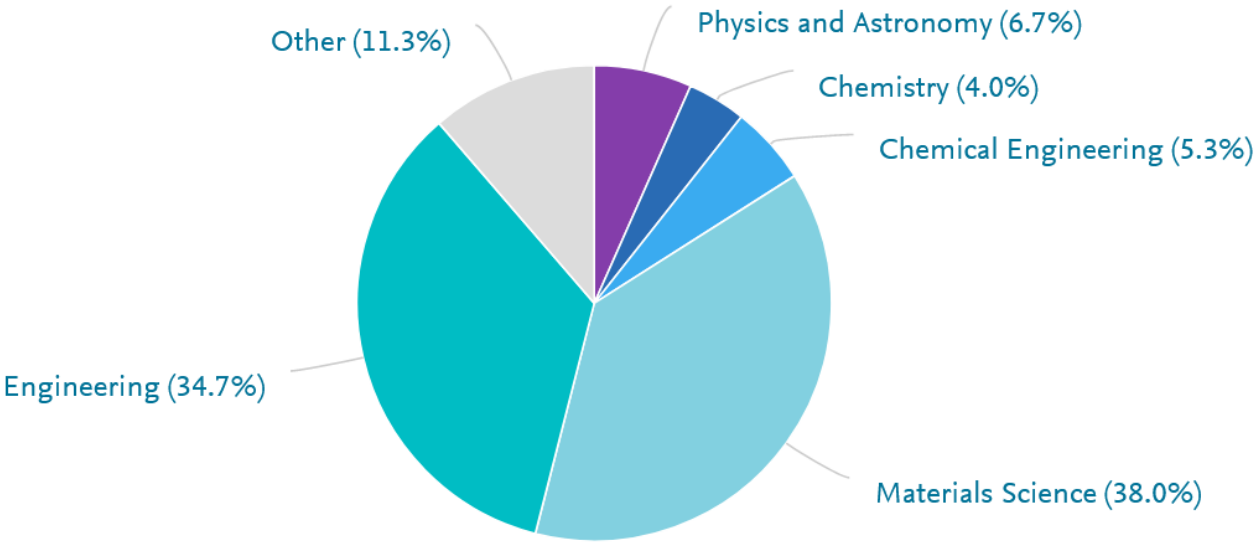


Fig. 3.4.1.7. Prof. **Janis Ločs** publications by subject area (SciVal data for 2011-2020).

Academic staff actively publish and participate in scientific conferences, apply for and lead research projects, and improve their academic knowledge by participating in methodological seminars.

As shown in the figure, the faculty academic staff of the program is primarily involved in research areas of chemistry, chemical technology, and materials science. Such scientific activity in the fields

corresponding to the program forms the necessary competence of the academic staff to ensure a high-quality study process.

The structure of the program allows PhD students to take study courses at other Latvian and international universities as part of their free elective study courses. This provides the student with the opportunity to gain the specific required knowledge not included in the program from other members of the academic staff.

General evaluation of the academic staff is provided by the information and CVs of the members of academic staff given in the study field report Criteria 3.3.5.-3.3.6. of Part II, Section 3.

The qualification of the teaching staff involved in the implementation of the study program complies with the conditions for the implementation of the study program and the requirements of the regulatory enactments specified in the state.

3.4.2. Analysis and assessment of the changes to the composition of the teaching staff over the reporting period and their impact on the study quality.

The last changes in the 2021 reporting period have significantly altered the composition of the academic staff involved in the implementation of the compulsory part of the program. It has been rejuvenated and a number of new faculty members have been recruited who have proven their scientific competence at the international level, the involvement of the specialists in physics in the study program has been extended and strengthened. These changes are based on the results of the alumni surveys and in view of the overall renewal of the scientific staff of the Faculty.

The free elective part allows PhD students to continue to study the compulsory courses included in the previous programs and to gain knowledge and competencies from experienced academic staff.

Changes in the teaching staff have a positive effect on the quality of the study process. Students have the opportunity to get acquainted with a wider range of research equipment and use it in the study process and for their PhD thesis projects. Students are regularly involved in various levels of scientific and industrial projects implemented by FMSAC - this attracts young people to the university.

If necessary, lecturers from partner universities abroad will be involved in the implementation of the study programme, industry professionals will also be invited to deliver practical lectures

For a more detailed list of all teaching staff who will be involved in the implementation of the study programme, please see the table and their scientific biographies (CVs) in Annex 10, as well as the list of their publications related to the study programme in peer-reviewed journals in the last six years.

3.4.3. Information on the number of the scientific publications of the academic staff members, involved in the implementation of doctoral study programme, as published during the reporting period by listing the most significant publications published in Scopus or WoS CC indexed journals. As for the social sciences, humanitarian sciences, and the science of art, the scientific publications published in ERIH+ indexed journals or peer-reviewed monographs may be additionally specified. Information on the teaching staff included in the database of experts of the Latvian Council of Science in the relevant field

of science (total number, name of the lecturer, field of science in which the teaching staff has the status of an expert and expiration date of the Latvian Council of Science expert) (if applicable).

Information on the total number of publications of the teaching staff involved in the program is given in 3.4.1. section. Below is provided a list containing one important publication for each professor. The full list of publications can be found in Annex 11.

1. Šutka A, Malnieks K, Lapčinskis L, Kaufelde P, Linarts A, Berziņa A, Zabels R, Jurķans V, Gorņevs I, **Blums J,** Knite M. The role of intermolecular forces in contact electrification on polymer surfaces and triboelectric nanogenerators. *Energy Environ. Sci*. **2019**, *12*(8), 2417-21. Cited by 33 documents (Scopus data).
2. Bystrov V.S., Coutinho J., Bystrova A.V., **Dekhtyar Y.D.,** Pullar R.C., Poronin A., Palcevskis E., Dindune A., Alkan B., Durucan C., Paramonova E.V. Computational study of hydroxyapatite structures, properties and defects. *J. Phys. D.* **2015**; 48(19), Article number 195302. Cited by 32 documents (Scopus data).
3. **Šutka A., Gross K.A.** Spinel ferrite oxide semiconductor gas sensors. *Sens Actuators, B Chem* **2016**; 222, 95-105. Cited by 208 documents (Scopus data).
4. Chin SJ, Vempati S, Dawson P, **Knite M,** Linarts A, Ozols K, McNally T. Electrical conduction and rheological behaviour of composites of poly(ε-caprolactone) and MWCNTs. Polymer 2015;58:209-21. Cited by 52 documents (Scopus data).
5. Prakasam M, **Locs J,** Salma-Ancane K, Loca D, Largeteau A, Berzina-Cimdina L. Biodegradable materials and metallic implants-A review. J Funct Biomater [Internet]. 2017;8(4) Article number 44. DOI: 3390/jfb8040044. Cited by 173 documents (Scopus data).
6. Kuzhir P, Paddubskaya A, Plyushch A, Volynets N, Maksimenko S, MacUtkevic J, Kranauskaite I, Banys J, Ivanov E, Kotsilkova R, Celzard A, Fierro V, Zicans J, Ivanova T, **Merijs Meri R,** Bochkov I, Cataldo A, Micciulla F, Bellucci S, Lambin P. Epoxy composites filled with high surface area-carbon fillers: Optimization of electromagnetic shielding, electrical, mechanical, and thermal properties. J Appl Phys [Internet], 2013;114(16), 164304. DOI: 10.1063/1.4826529. Cited by 61 documents (Scopus data).
7. **Šutka A,** Käämbre T, Pärna R, Juhnevica I, Maiorov M, Joost U, Kisand V. Co doped ZnO nanowires as visible light photocatalysts. Solid State Sci [Internet]. 2016; 56, 54-62. DOI: 10.1016/j.solidstatesciences.2016.04.008. Cited by 74 documents (Scopus data).
8. **Traskovskis K,** Sebris A, Novosjolova I, Turks M, Guzauskas M, Volyniuk D, Bezvikonnyi O, Grazulevicius JV, Mishnev A, Grzibovskis R, Vembris A. All-organic fast intersystem crossing assisted exciplexes exhibiting sub-microsecond thermally activated delayed fluorescence. *J. Mater. Chem. C*. **2021**, *9*(13), 4532-43. DOI: 10.1039/d0tc05099g. Cited by 5 documents (Scopus data).
9. Kovaļovs A, Novosjolova I, Bizdena E, Bižane I, Skardziute L, Kazlauskas K, Jursenas S, **Turks M.** 1,2,3-triazoles as leaving groups in purine chemistry: A three-step synthesis of N6-substituted-2-triazolyl-adenine nucleosides and photophysical properties thereof. Tetrahedron Lett [Internet]. 2013;54(8):850-3. DOI: 10.1016/j.tetlet.2012.11.095. Cited by 41 documents (Scopus data).
10. Garskaite E, **Gross K-A,** Yang S-, Yang TC-, Yang J-, Kareiva A. Effect of processing conditions on the crystallinity and structure of carbonated calcium hydroxyapatite (CHAp). Crystengcomm [Internet]. 2014;16(19):3950-9. DOI: 10.1039/c4ce00119b. Cited by 94 documents (Scopus data).

All lecturers of the program are LCS experts in the following fields:

Teaching staff	Field of science	Latvian Council of Science expert term
M. Turks	Natural Sciences - Chemistry	04.05.2025
	Engineering Sciences and Technologies - Chemical Engineering	04.05.2025
	Engineering Sciences and Technologies - Materials Science	04.05.2025
K. Traskovskis	Natural Sciences - Chemistry	01.06.2025
J. Ločs	Natural Sciences - Chemistry	02.12.2023
	Engineering Sciences and Technologies - Chemical Engineering	02.12.2023
	Engineering Sciences and Technologies - Materials Science	02.12.2023
A. Šutka	Engineering Sciences and Technologies - Chemical Engineering	03.11.2024
	Engineering Sciences and Technologies - Materials Science	16.10.2022
R. Merijs-Meri	Engineering Sciences and Technologies - Chemical Engineering	03.03.2024
	Engineering Sciences and Technologies - Materials Science	03.03.2024
J. Blūms	Engineering Sciences and Technologies - Materials Science	03.03.2024
	Natural Sciences - Physics and Astronomy	03.02.2024
M. Knite	Engineering and Technologies - Materials Science	03.02.2024
	Natural Sciences - Physics and Astronomy	03.02.2024
J. Dehtjars	Natural Sciences - Physics and Astronomy	24.03.2023
	Engineering Sciences and Technologies - Medical engineering	02.02.2025
	Engineering Sciences and Technologies - Mechanical Engineering and Mechanics	24.03.2023
K.-A. Gross	Engineering Sciences and Technologies - Materials Science	01.06.2025

3.4.4. Information on the participation of the academic staff, involved in the implementation of the doctoral study programme, in scientific projects as project managers or prime contractors/ subproject managers/ leading researchers by specifying the name of the relevant project, as well as the source and the amount of the funding. Provide information on the reporting period (if applicable).

In total, more than 150 scientific projects have been implemented at the faculty during the reporting period. Below is a list of projects whose leaders or co-leaders have been lecturers of the program and whose funding exceeds EUR 50 000.

Project title	Project leaders/co-leader	Project period	Funding source	Funding, EUR
Cable sheath and ambient temperature monitoring service	**Blūms Juris**	03.2014-10.2015	Contract work	51 040
Refined Step - International network for the development of new calcium phosphate processing strategies	**Gross Kārlis-Agris**	11.2013-10.2017	FP7 project	325 090
Implants signal to bone for bone growth and attachment	**Gross Kārlis-Agris**	01.2017-12.2019	ERA-NET	210 100
Processing of Metal Surfaces to Lower Friction and Wear	**Gross Kārlis-Agris**	10.2014-12.2017	National research program	99 174
Freedom of rearrangement and expansion: The use of the increased energy of metastable materials to improve the properties of implants	**Gross Kārlis-Agris**	08.2018-08.2021	LCS grant	99 970
Development of innovative functional materials and nanomaterials for use in environmental control technologies	**Knite Māris**	09.2013-08.2015	ESF	417 450
Multifunctional materials and composites, photonics and nanotechnology. Project no. 3 Nanocomposite materials.	**Knite Māris**	10.2014-03.2018	National research program	127 378
Pharmaceutical Wastewater Treatment	**Šutka Andris**	07.2017-10.2020	ERDF	333 216

New hetero-doped nano-carbon catalysts for fuel cells and metal-to-air batteries	**Šutka Andris**	03.2018-02.2021	ERA-NET	210 000
Quantum dots of plasmonic oxides for energy-saving smart windows	**Šutka Andris**	08.2018-08.2021	LCS grant	99 974
Earth abundant Ca-Fe-oxide-based materials with tailored antimicrobial functionalities for diverse applications on surface, in water and membranes	**Šutka Andris**	06.2021-05.2024	ERA-NET	216 133
Environmentally friendly synthesis of organometallic compounds for encapsulation of enzymes and energy recovery	**Šutka Andris**	01.2021-12.2023	Latvian-Lithuanian-Taiwan scientific cooperation project	75 000
Stimuli responsive transdermal drug delivery system	**Šutka Andris**	12.2017-06.2022	ERDF	133 805
Bioresorbable implantable triboelectric nanogenerator devices	**Šutka Andris**	04.2021-09.2024	SEDA	207 528
Intermolecular H-bond structure design in polymers for stronger triboelectrification	**Šutka Andris**	12.2020-12.2021	LCS grant	100 389
Biosynthesis and isolation of macrolide type of antibiotics and antiparasitic agents and production of synthetic derivatives thereof	**Māris Turks**	12.2010-11.2013	ERDF	297 883
Research of APL-01 compound production technology on a laboratory scale	**Māris Turks**	05.2015-09.2015	Competence Center	29 040

Development of Palononsetron Hydrochloride Production Technology in Laboratory Scale	**Māris Turks**	08.2013-11.2013	Contract reaserch	59 656
Development of a method for the preparation of the active pharmaceutical ingredient Rivaroxaban, which belongs to the group of blood anticoagulants	**Māris Turks**	01.2017-02.2018	Contract reaserch	112 530
Development of a method for obtaining the active pharmaceutical ingredient Ranolazine	**Māris Turks**	02.2018-12.2018	Contract reaserch	108 295
Development of pentacyclic triterpenoid – azole conjugates: from cancer chemopreventive agents and adjuvants in cancer chemotherapy to novel anti-cancer drug candidates.	**Māris Turks**	03.2018-02.2021	ERA-NET	493 500
Synthesis of novel (deaza)purine-triazole conjugates and applications of their fluorescent properties	**Māris Turks**	01.2015-12.2017	Latvian-Lithuanian-Taiwan scientific cooperation project	225 000
Organic reactions in and with liquid sulfur dioxide	**Māris Turks**	01.2013-12.2016	LCS grant	206 788
Development of Novel Agents for Antitumor and Antimicrobial Therapy.	**Māris Turks**	01.2014-12.2017	LCS grant	93 116
Synthetic methodologies towards value added products based on applications of sulfur dioxide as polar reaction medium and reagent.	**Māris Turks**	08.2018-08.2021	LCS grant	300 000
Development of novel anticancer agents in the series of lupane triterpenoids for rare cancer therapy	**Māris Turks**	2016-2018	RTU/RSU project	150 000

Development of multiheterocyclic chemistry for the preparation of new biologically active compounds	**Māris Turks**	2010-2013	LCS grant	102 145
Multilayer silicon nanocapacitor with advanced dielectric layers	**Jurijs Dehtjars**	03.2017-02.2020.	ERDF	648 605
Analog element research used in the production of Hi-End audio products	**Jurijs Dehtjars**	04.2019-11.2021	ERDF	958 048
Structure of the planar field emission microtriode	**Jurijs Dehtjars**	02.2021 -11.2023	ERDF	540 539
Multifunctional materials and composites, photonics and nanotechnology “IMIS2” project Nanocomposite materials	**Remo Merijs-Meri**	2014-2018	National research program	2 250 000
High performance short-fibre biobased hybrid composites for injection moulding	**Remo Merijs-Meri**	2017-2021	M-ERA.NET	185 000
Biobased and biodegradable polymer composites for environmental sustainability	**Remo Merijs-Meri**	2020-2021	LCS grant	100 389
Development of perspective nanocomposites on the bases of secondary polymers and elaboration of manufacturing and processing technologies thereof	**Remo Merijs-Meri**	2010-2013	ERDF	418 000
Finely dispersed filler containing polymer matrix hybridcomposites: design, development of technologies and investigation of properties	**Remo Merijs-Meri**	2013-2016	LCS grant	210 000

Innovative two-component systems based on silyl-terminated polymers for sealants and adhesives of advanced application	**Remo Merijs-Meri**	2014-2015	ERDF	285 648
Innovative use of industrial byproducts for sustainable asphalt pavement mixtures	**Remo Merijs-Meri**	2018-2021	LCS grant	300 000
Innovative use of reclaimed asphalt pavement for sustainable road construction layers	**Remo Merijs-Meri**	2017-2020	ERDF	300 000
Carbonaceous nanoparticles containing ultra-light aerogels and thermoplastic polymer composites: correlations between electromagnetic, stress-strain and thermo-physical properties	**Remo Merijs-Meri**	2014-2015	Latvian-Belarusian cooperation project	56 800
Sonochemical technology for bioactive bone regeneration scaffold production „SONOSCA”	**Jānis Ločs**	02.2012-01.2015	ERA-NET	61 477
Multidisciplinary Research in Biomaterials Technology of New Scientist Group	**Jānis Ločs**	10.2013-08.2015	ESF project	414 953
Tough, Strong and Resordable Orthopaedic Implants (GoImplant)	**Jānis Ločs**	09.2013-01.2017	ERA-NET	188 404
Multifunctional injectable nano HAp composites for the treatment of osteoporotic bone fractures “NANOFOROSTEO”.	**Jānis Ločs**	01.2014-12.2016	ERA-NET	166 850
PhOtocrosslinked hydrogels for guided periodontal TissUe REgeneration “POStURE”	**Jānis Ločs**	03.2015-02.2018	ERA-NET	214 501

Baltic Biomaterials Centre of Excellence	**Jānis Ločs**	05.2017-08.2018	Horison2020	298 218
Drug delivering 3D printed scaffold strategy brings human body implants to the next level of personalization	**Jānis Ločs**	07.2018-01.2021	ERA-NET	181 700
NANOstructured oSteoChOndral scaffold: novel biomimetic tRiggErS for enhanced bone regeneration “NANO-SCORES”	**Jānis Ločs**	10.2018-10.2021	EuroNanoMed3	191 690
Future of synthetic bone graft materials - in vivo guided biosynthesis of biomimetic hydroxyapatite (2018-2021).	**Jānis Ločs**	09.2018-12.2021	LCS grant	300 000
Precision medicine for muscolo-skeletal regeneration, prosthetics, and active aging. ”PREMUROSA”	**Jānis Ločs**	02.2020-12.2026	Horison2020	230 068
Marie Sklodowska-Curie Actions Individual Fellowships: Metabolites as immunomodulatory additives for biomaterials “Met4Bone”	**Jānis Ločs**	08.2020-07.2022	Horison2020	152 202
Baltic Biomaterials Centre of Excellence “BBCE” Phase 2	**Jānis Ločs**	01.2020-12.2026	Horison2020	7 547 400
NANO delivery system for one-shot regenerativa terapy of peri-implantis, “ImplantNano".	**Jānis Ločs**	09.2020-08.2023	ERA-NET	218 757
Rising competitiveness of early stage researchers and research management in Latvia, “RISEus2”.	**Jānis Ločs**	01.2021-12.2023	Horison2020	488 125

3.4.5. Assessment of the cooperation between the teaching staff members by specifying the mechanisms used to promote the cooperation and ensure the interrelation between

the study programme and study courses/ modules. Specify also the proportion of the number of the students and the teaching staff within the study programme (at the moment of the submission of the Self-Assessment Report).

The interaction and interconnection between the academic staff delivering various study courses were carefully planned during the development of the program. The study courses are arranged according to the years of study so that their acquisition is based on the prior knowledge and aligned with the learning outcomes to be achieved. When designing a study course for Part C, all members of the academic staff get acquainted with the curriculum and delivery of the other courses in order to avoid duplication of content and reduce the likelihood that some important themes are not covered. The continuity of courses is carefully monitored at the general discussions on program design, as well as during the annual attestation of PhD students and in the preparation of the plans for the following academic years. This allows students to experience and understand the interrelation among different fields of chemistry, materials science, and technology. Such purposeful development of the program and plans allows the academic staff to be aware of the need for cooperation and the ways to promote it.

At the end of each academic year, the results of the questionnaire on the performance of the academic staff are evaluated and good practices are exchanged, discussing further cooperation paths. The relevance of the assessment criteria and the course learning outcomes to the overall learning outcomes of the study program is an important part of the discussion.

Academic staff collaborate not only within the study program, but also in conducting research activities. This cooperation provides opportunities for the proposal and implementation of joint projects and is reflected in joint publications. This contributes to the continuous development of the study process and the scientific level of PhD students.

The student-academic staff ratio at the study programme at the time of submission of the self-evaluation report is 44/9 (including third and fourth-year students of the study programs “Chemical Technology”, “Chemistry”, and “Materials Science”), or one academic staff member per 5 students.

Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	Diploms, RKDI0 (51528), LV+EN.pdf	Diploms, RKDI0 (51528), LV+EN.pdf
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)	AIP Conclusion KDI0.pdf	AIP Atzinums, Par doktora studiju programmas īstenošanas iespējamību.edoc
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period	Statistical data on students 51528.pdf	Statistika par studējošajiem 51528.pdf
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard		
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)		
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	Mapping of study courses of the study programme Chemistry, Materials Science and Engineering, Annex 8.pdf	Studiju kursa Ķīmija, materiālzinātne un tehnoloģijas kartēšana, 8.Pielikums.pdf
The curriculum of the study programme (for each type and form of the implementation of the study programme)	RKDI0 (51528) Planning, Annex 9.pdf	RKDI0 (51528) plānojums, 9.pielikums.pdf
Descriptions of the study courses/ modules	Course descriptions, 51528.zip	Studiju kursu moduļu apraksti, 51528.zip
Description of the organisation of the internship of the students (if applicable)		
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)	Confirmation - on compliance of the academic staff of the doctoral study programmes.edoc	Apliecinājums - LZP eksperti doktora programmā.edoc
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)	Confirmation - on compliance of the academic staff.edoc	Apliecinājums - AL 55. pants par prof. skaitu akadēmiskās programmās.edoc

Chemistry and Chemical Technology (45528)

Study field	*Chemistry, Chemistry Technologies, and Biotechnology*
ProcedureStudyProgram.Name	*Chemistry and Chemical Technology*
Education classification code	*45528*
Type of the study programme	*Academic master study programme*
Name of the study programme director	*Māris*
Surname of the study programme director	*Turks*
E-mail of the study programme director	*maris.turks@rtu.lv*
Title of the study programme director	*Profesors, Dr.chem.*
Phone of the study programme director	
Goal of the study programme	*The aim of the study programme is to educate innovative and highly qualified chemical technology specialists, which are oriented towards the introduction of new technologies and knowledge. The graduates are expected to take leading positions in industry or academia in the following specializations Production technology and environmental aspects, Chemistry and technology of polymer materials, Chemistry and technology of biologically active compounds, Chemistry and technology of biomaterials, Chemistry and technology of inorganic materials, and Sustainable chemistry, as well as further doctoral studies.*
Tasks of the study programme	*General tasks of the study programme:* *1. Ensure competitive master level education in chemical engineering corresponding to EFCE (European Federation of Chemical Engineering) Bologna recommendations, preparing students for jobs in leading positions, to develop scientific research skills and to promote their use.* *2. To provide the students with the knowledge and to improve professional skills and abilities in the specialization of choice, by monitoring appropriate progress and study results in each study course and integrating them into research.* *3. To provide students with in-depth knowledge within the chosen specialization of chemical technology, and to enable the students to acquire interdisciplinary knowledge thus developing skills and competencies in accordance with fast-changing labour market requirements.* *4. To develop problem-solving skills (problem identification, goal formulation and plausible solution) by acquiring skills in theoretical study courses, internships and Master Thesis.* *5. To encourage the interaction between students and academic personnel in order to implement fundamental and applied R&D projects in both industry and academia, and to promote the publishing of the obtained results.* *6. To ensure the intellectual development of students and to promote the amplification of their intellectual abilities during theoretical and practical activities.* *7. To develop an interest in students about further professional development, lifelong learning or acquiring a doctoral degree.*

Results of the study programme	*Graduate of the study programme:* *• demonstrates extended and specialized knowledge and know-how of the contemporary discoveries and development trends in chemistry, chemical technology and the selected specialization;* *• is familiar with the methods and equipment for the planning, implementation, processing, analysis and interpretation of industrial production and scientific research and understands their nature and areas of application;* *• is able practically and theoretically to apply the contemporary knowledge and know-how of chemistry, chemical technology and the selected field of specializations in practice; is able to transfer this knowledge to others;* *• is able to choose, apply, plan and independently use methods and equipment for planning, implementation, processing, analysis and interpretation of results;* *• is able to formulate, explain, compare, summarize and present the obtained results of scientific research or technological processes to industry specialists and the society;* *• is able to initiate, administer and develop scientific, innovation, cooperation and production projects in accordance with the project call, market requirements and available resources; is able to critically analyse, integrate, plan and implement the latest technologies and discoveries in research and production processes;* *• is able to assess, explain and justify the adequacy of planning, implementation and data analysis of the problem to be solved; is able to develop an innovative approach to the complex use of various methods and tools to meet market demand in a competitive environment.*
Final examination upon the completion of the study programme	*Master's thesis*

Study programme forms

Full time studies - 2 years - latvian

Study type and form	*Full time studies*
Duration in full years	*2*
Duration in month	*0*
Language	*latvian*
Amount (CP)	*80*
Admission requirements (in English)	*Bachelor degree in chemistry, chemical technology, materials science or comparable education*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Master degree of engineering science in chemical technology*
Qualification to be obtained (in english)	-

Places of implementation

Place name	City	Address

Riga Technical University	RĪGA	KAĻĶU IELA 1, CENTRA RAJONS, RĪGA, LV-1050

Full time studies - 2 years - english

Study type and form	*Full time studies*
Duration in full years	*2*
Duration in month	*0*
Language	*english*
Amount (CP)	*80*
Admission requirements (in English)	*Bachelor degree in chemistry, chemical technology, materials science or comparable education. The assessment of the level of English language proficiency under the requirements specified in regulatory enactments.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Master degree of engineering science in chemical technology*
Qualification to be obtained (in english)	*-*

Places of implementation

Place name	City	Address
Riga Technical University	RĪGA	KAĻĶU IELA 1, CENTRA RAJONS, RĪGA, LV-1050

3.1. Indicators Describing the Study Programme

3.1.1. Description and analysis of changes in the parameters of the study programme made since the issuance of the previous accreditation form of the study field or issuance of the study programme license, if the study programme is not included on the accreditation form of the study field, including changes planned within the evaluation procedure of the study field evaluation procedure.

In the period from the academic year 2013/2014. until 2015/2016. two academic Master's study programmes "Chemical Technology" and "Chemistry" were implemented, which were accredited for six years in the accreditation process in 2013. Following the industry requirements and the latest technologies changes have been made several times in the content of both study programmes. Starting from the study year 2016/2017 a new Master's study program "Applied Chemistry" was opened and the admission of students to the program "Chemistry" was discontinued.

Analogous to the Bachelor's study program, in response to the changes in the number of students, demand, changes in the industry, the provision of education services and the requirements for training of new specialists, in 2019 it was decided to create a new, modern Master's academic study programme that would meet the requirements of the industry. The aspect of optimization of the process – efficient use of intellectual, material, technological and research resources – was as important.

In 2019, within the framework of the SAM project (Reducing fragmentation of study programs at Riga Technical University and strengthening resource sharing, No. 8.2.1.0/18/A/013), the development of a new and united academic Master's study programme "Chemistry and Chemical Technology" was launched on the basis of the two previous academic Bachelor's study programmes– "Chemical technology", (Latvian education classification code: 45524) and "Applied Chemistry" (Latvian education classification code: 45440). According to the decision of the Ministry of Education Study Quality Commission on December 9, 2020, the study programme No. 2020/69-L was licensed and license No. 04051-191 was obtained. The job sectors of the prospective graduates of the new academic Master's study programme corresponds to the priority direction of strategic specialization of Latvia in science "Technology, materials and engineering systems to increase the added value of products and processes and cybersecurity".

The development of the study programme "Chemistry and Chemical Technology" was based on the current events in the industry and the surveys of industry operators as well as former and current students.

They highlighted the need for more comprehensive knowledge, broader skills and competencies in the selected field of specialisation, reducing the volume of the compulsory part of the programme and extending the volume of restricted elective courses. The programme also took into account the interest in an interdisciplinary model of Master's studies, which were expressed in surveys, which would allow the acquisition of competencies in several areas. The content of this programme also stems from the diversification of the chemical technology industries in the context of modern technological development.

The development of the new programme also took into account the opinions of industry representatives, who expressed the need for graduates with practical experience in the field of

chemistry or chemical technology and the competence of a managing employee in the organisation of manufacturing work.

The majority of the leading and young academic staff of FMSAC were involved in the working group to develop the study program “Chemistry and Chemical Technology”.

Taking into account the manufacturers’ demand for graduates with the skills and competencies of a managing specialist, the working group initially defined the learning outcomes of the programme, from which the content of the compulsory part followed. The range of possible specialisations was selected sequentially and the learning outcomes specified in the study courses currently implemented and the specialist LQF 7 skills previously identified and important for the sectors are “mapped”. As a result, the courses to be transferred directly from the study programmes to be closed, the courses to be improved and the new units of learning outcomes to be formed from the remaining skills were determined. On the basis of this analysis, the content of each individual course was further created, taking into account the possibilities of combining them for the creation of an interdisciplinary programme.

At the request of industry representatives, the programme was supplemented with internship, during which the student would get practical experience in performing the tasks of managing employee.

The content of the programme developed by the working group at various stages was discussed repeatedly with the Faculty Convent of Councillors and presented to potential students.

3.1.2. Analysis and assessment of the study programme compliance with the study field. Analysis of the interrelation between the code of the study programme, the degree, professional qualification/professional qualification requirements or the degree and professional qualification to be acquired, the aims, objectives, learning outcomes, and the admission requirements. Description of the duration and scope of the implementation of the study programme (including different options of the study programme implementation) and evaluation of its usefulness.

The goals and objectives of the academic Master's study program "Chemistry and Chemical Technology" correspond to level 7 of the Latvian Qualification Framework (LQF), and it is targeted at applicants possessing Bachelor's degree in chemistry, chemical technology, materials science, or equivalent without additional admission rules.

The applicants take part in the competition with a weighted average grade from the Bachelor’s study programme records. The weighted average grade is calculated as the sum of all the grades received in each study course multiplied by the credit points acquired in the study programme and is divided by the total number of credit points within the study programme. If credit points are not verified, the number is calculated as the multiplication of the grades and contact hours obtained in each study course divided by the total number of contact hours.

The title of the study programme indicates the goal of the study programme – to educate innovative and highly qualified chemical technology specialists, which are oriented towards the introduction of new technologies and knowledge. The graduates are expected to take leading positions in industry or academia in the following specializations Production technology and environmental aspects, Chemistry and technology of polymer materials, Chemistry and technology of biologically active compounds, Chemistry and technology of biomaterials, Chemistry and

technology of inorganic materials, and Sustainable chemistry.

Acquired knowledge, skills and competencies will make graduates be able to work as a leading specialist in chemical and materials industry companies and scientific institutions. According to the provided task, quality and time requirements, they will be able to plan, organize, and lead the production process. The graduates are prepared also for further studies in Doctoral programs.

The following study program **tasks** have been determined in order to attain the desired goals:

- to ensure competitive master-level education in chemical engineering corresponding to EFCE (European Federation of Chemical Engineering) Bologna recommendations, to prepare students for jobs in leading positions, to develop scientific research skills, and to promote their use.
- to provide the students with knowledge and to improve professional skills and abilities in the specialization of choice, by monitoring appropriate progress and study results in each study course and integrating them into research.
- to provide students with in-depth knowledge within the chosen specialization of chemistry and chemical technology, and to enable the students to acquire interdisciplinary knowledge thus developing skills and competencies in accordance with fast-changing labour market requirements.
- to develop problem-solving skills (problem identification, goal formulation and plausible solution) by acquiring skills in theoretical study courses, internship and Master Thesis.
- to encourage the interaction between students and academic personnel in order to implement fundamental and applied R&D projects in both industry and academia, and to promote the publishing of the obtained results.
- to ensure the intellectual development of students and to promote the amplification of their intellectual abilities during theoretical and practical activities.
- to develop an interest in students about further professional development, lifelong learning or acquiring a doctoral degree.

Graduate of the program (**outcomes**):

- demonstrates extended and specialized knowledge and know-how of the contemporary discoveries and development trends in chemistry, chemical technology and the selected specialization;
- is familiar with the methods and equipment for the planning, implementation, processing, analysis and interpretation of industrial production and scientific research and understands their nature and areas of application;
- is able practically and theoretically to apply the contemporary knowledge and know-how of chemistry, chemical technology and the selected field of specializations in practice; is able to transfer this knowledge to others;
- is able to choose, apply, plan and independently use methods and equipment for planning, implementation, processing, analysis and interpretation of results;
- is able to formulate, explain, compare, summarize and present the obtained results of scientific research or technological processes to industry specialists and the society;
- is able to initiate, administer and develop scientific, innovation, cooperation and production projects in accordance with the project call, market requirements and available resources;
- is able to critically analyse, integrate, plan and implement the latest technologies and discoveries in research and production processes;
- is able to assess, explain and justify the adequacy of planning, implementation and data analysis of the problem to be solved; is able to develop an innovative approach to the complex use of various methods and tools to meet market demand in a competitive

environment.

The content of the study programme is developed in such a way that the objectives and the learning outcomes of the study courses to be achieved would ensure the achievement of the overall goal and results of the study programme. The above is confirmed by the mapping of the learning outcomes to be achieved in study courses (see in Annex 1.2). The biggest focus in the study process is on acquiring knowledge, professional and practical competencies based on the science achievements, theoretical knowledge, and the industry specifics. The study programme is the only one in Latvia which provides leading level professionals with competencies in chemical technology.

A Master's degree of Engineering Science in Chemical Technology is awarded after successful completion of the study programme theoretical and practical study courses, internship in a manufacturing company or scientific institution and defence of a Master's thesis to the Final Examination Commission.

Thus, the mutual connection between the title of the study programme, the degree to be acquired, the goal and objectives, the learning outcomes, as well as the admission requirements are observed.

The full study workload in the programme is 80 credit points of which compulsory core subjects block constitutes 24 credit points, elective part – 20 credit points, free choice – 12 credit points, Internship – 4 credit points, Master's thesis – 20 credit points.

The content of the study programme is designed to ensure that a graduate complies with employers' demands for a highly qualified graduate with in-depth knowledge in the selected areas or an interdisciplinary knowledge base in both chemistry and chemical technology, as well as practical skills in the particular field of specialisation. To provide the student with the necessary qualification, the student first learns one joint study course of the programme "Chemical Industry and Sustainability". It provides the student with a general insight into the common issues of the sector, which a managing level specialist should know. As part of the compulsory part of the programme, the student chooses to learn the theoretical basic courses of one of the six areas of specialisation. In the part of professional specialisation study courses, a student may continue to learn a block of courses in the selected field or to provide himself/herself with the necessary knowledge and competence base by combining courses from two specialisations. The programme includes a large restricted elective part, which makes it possible to expand knowledge and skills by learning courses at different levels and fields.

In this way, it will be ensured that knowledge, skills and competences are mastered so that, when starting professional activity, the graduate has the appropriate qualifications to get involved quickly and successfully in the performance of job duties in the selected field both in Latvian and foreign companies and research institutions.

The study program is created for full-time studies. Its implementation started in the 2020/2021 academic year.

Program code 45528 complies with Cabinet of Ministers Regulation No 322 Latvian Classification of Education. The first and second levels of classification, represented by the first two digits of code 45, are academic education (master's degree), to be implemented after obtaining a bachelor's or professional bachelor's degree. Duration of full-time studies is one to two years. The total duration of full-time studies is at least five years. The third, fourth and fifth levels of classification (thematic groups, subject areas and program groups), denoted by the next three digits 528, are Chemical Technologies (52 stands for Engineering and Technology).

3.1.3. Economic and/ or social substantiation of the study programme, analysis of graduates' employment.

The study program corresponds to the strategic development directions of the university, the needs of the public and the national economy and development trends. The program conforms to the legal requirements of Latvia and the European Union.

The topicality of the programme was determined by the need to prepare high-level specialists for the Latvian and international labour market with in-depth knowledge and practical skills in the management of the chemical industry and in the selected specialisation. The study programme focuses on the preparation of managing level specialists for the Latvian and international labour market, who would possess interdisciplinary knowledge and practical skills, which are essential in addressing chemical manufacturing and research issues in the various sub-fields of chemistry and chemical technology.

The programme thus created provides an opportunity to bring students together in one Master's programme without creating a separate programme for each sub-field. Study courses are designed in such a way that they can be mastered by students of the first and second years together, enabling to optimise the costs of implementing the programme.

When analysing the employment of applicants of the previous programmes, it should be noted that a large part of the applicants have already been employed in a manufacturing company or scientific institutes of the selected field of specialisation before the beginning of their studies, but when they graduated, everyone has been involved in the work in the sector. Part of them deals with quality control of manufacturing processes and products, the other part is employed as research associates.

Latvian pharmaceutical companies, manufacturers of construction materials and manufacturers and recyclers of polymer materials dominate among employers. Food and cosmetics production and recycling companies, certification laboratories, and state control institutions are also employing students. Graduates are employed as research associates in a number of Latvian research institutes, such as the Latvian Institute of Organic Synthesis, the Latvian State Institute of Wood Chemistry, the Institute of Solid State Physics, etc.

3.1.4. Statistical data on the students of the respective study programme, the dynamics of the number of the students, and the factors affecting the changes to the number of the students. The analysis shall be broken down into different study forms, types, and languages.

The study programme "Chemistry and Chemical Technology" is implemented in Latvian and English in Riga. Applicants with an academic or professional Bachelor's degree in chemistry, chemical engineering or materials science, or a degree comparable to them may be admitted to study in the study programme.

Statistics on students in previous programmes – "Chemistry", "Applied Chemistry" and "Chemical Technology" – show general trends. Figure 3.1.4.1 shows data on the number of students enrolled in previous programmes, Figure 3.1.4.2 shows the total number of students and Figure 3.1.4.3

shows the number of dropouts. Student count statistics clearly show the falling interest in the former “Chemistry” study programme. The number of dropouts during the reporting period was around 50. Due to the COVID-19 pandemic and various restrictions in the assessment of students, a diminished dropout rate was observed in the year of studies 2019/2020, which balanced at the expense of the next year of studies.

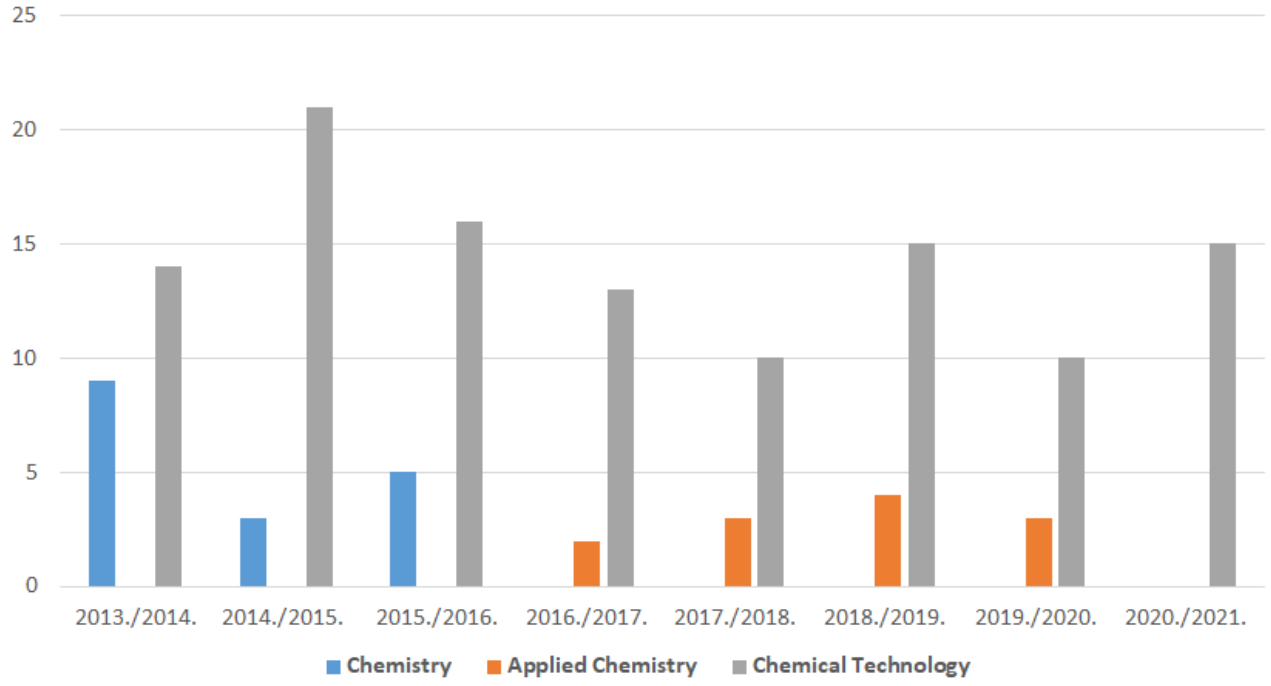


Figure 3.1.4.1. Number of students enrolled in the programs

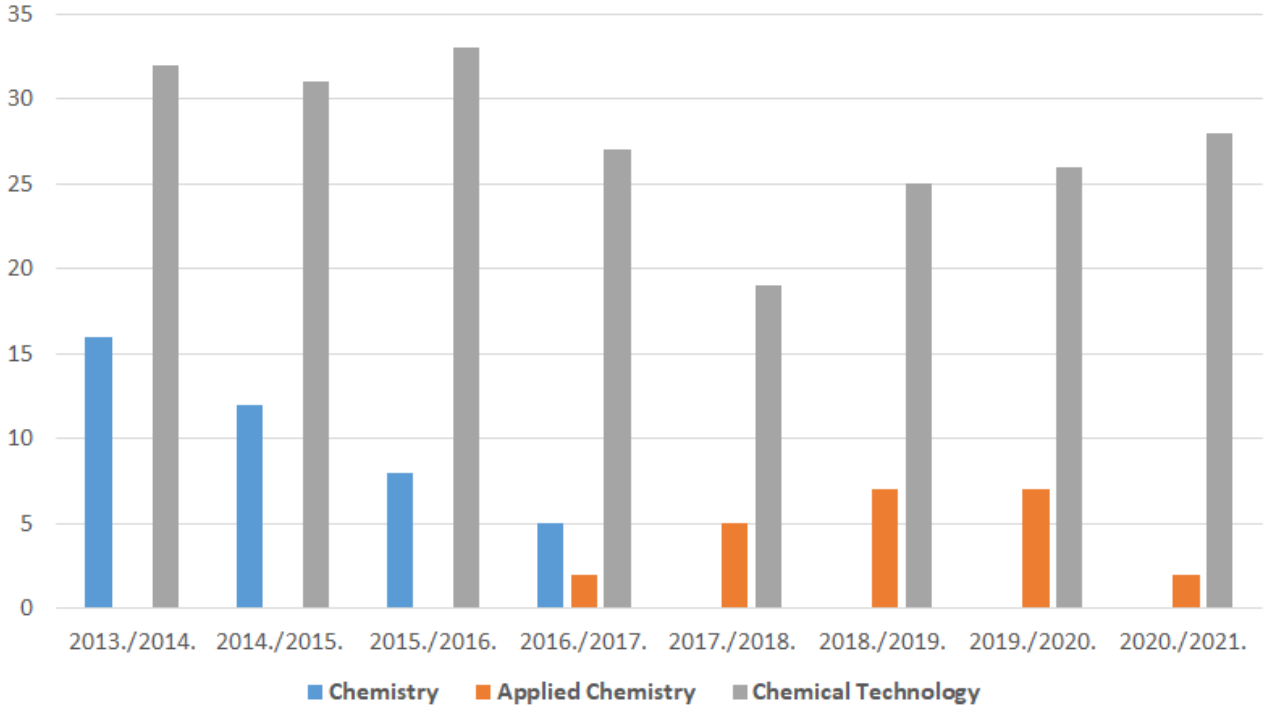


Figure 3.1.4.2. The total number of students in programs

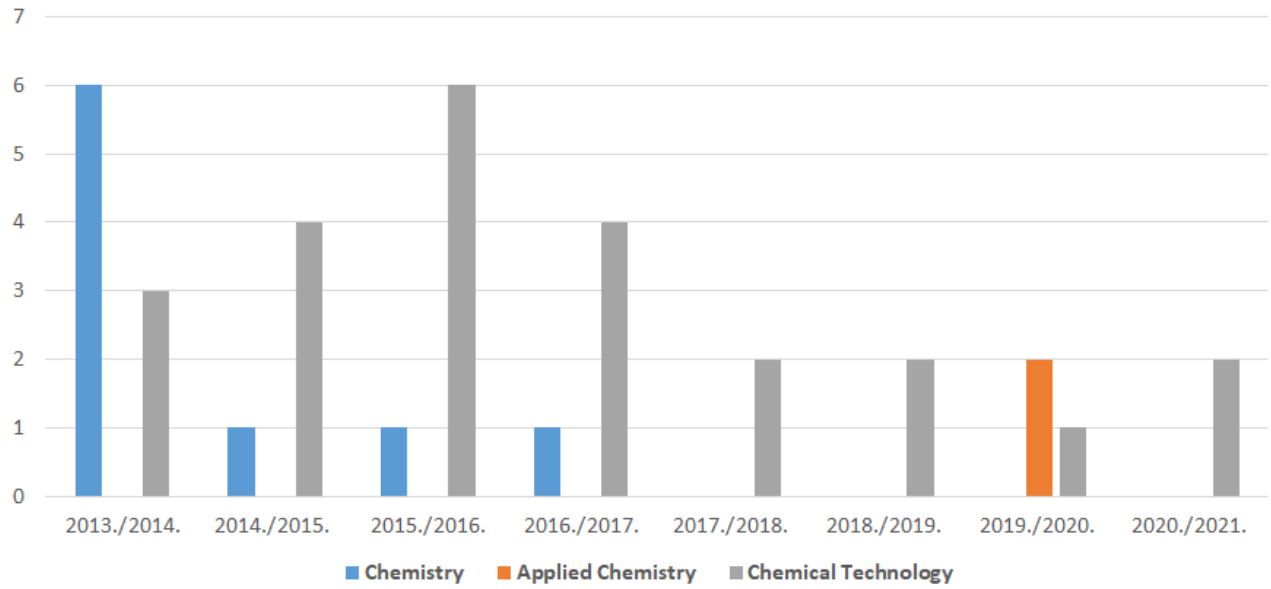


Figure 3.1.4.3. The total number of dropouts

A diminishing number of students has been observed in recent years, which is due to the demographic situation in Latvia. Students already have sufficient knowledge in bachelor level studies to successfully demonstrate themselves in the labour market. The main reasons for student dropouts in the previously implemented "Chemical Technology" and "Applied Chemistry" programmes were starting employment, which is not always compatible with studies. There were also cases when the immatriculated applicant did not start studies at all.

The implementation of the study programme following the receipt of the licence started in the year of studies 2020/2021. So far, 29 students were enrolled in the programme, 5 of whom were foreign students. Foreign countries from which students were enrolled are China, Sri Lanka and India.

The programme provides the opportunity for students to participate in the Erasmus+ international exchange project. However, it should be noted that this possibility is used rarely. As indicated by the students, the reasons for this are usually the complicated process of coordinating the courses to be studied and financial aspects.

3.1.5. Substantiation of the development of the joint study programme and description and evaluation of the choice of partner universities, including information on the development and implementation of the joint study programme (if applicable).

3.2. The Content of Studies and Implementation Thereof

3.2.1. Analysis of the content of the study programme. Assessment of the interrelation between the information included in the study courses/ modules, the intended learning outcomes, the set aims and other indicators with the aims of the study course/ module and the aims and intended outcomes of the study programme. Assessment of the relevance of the content of the study courses/ modules and compliance with the needs of

the relevant industry, labour market and with the trends in science on how and whether the content of the study courses/ modules is updated in line with the development trends of the relevant industry, labour market, and science.

By analysing compliance with Regulations of the Cabinet of Ministers No. 240 “Regulations on the National Standard of Academic Education” of 13 May 2014, it can be concluded that the academic Master’s study programme “Chemistry and Chemical Technology” complies with the requirements set out in the standard. A comparison of the programme with the requirements of the standard is made in Annex 6.

The study program provides cross-linkage between the information included in the study courses, learning outcomes, set aims, methods, as well as linkage of every study course with the aims and learning outcomes of the study program. The aim of the study program has been set based on the recent developments in the profession, as well as on the needs of the economy and society. The program tasks have been structured to allow training of students according to the levels of the Latvian qualification framework (LQF), as well as to promote the competitiveness of the students in the changing socio-economic environment and international labour market.

The study program is implemented in the form of lectures, practical classes and lab works, allocating considerable time (60%) for self-studying to study in detail the latest theories and trends in the chosen field of chemistry and chemical technology. The curriculum of the study program has been designed to meet the requirements of the regulations and elaborated in accordance with RTU Senate decision “On the unified requirements in respect to the study programs”.

The length of study is 2 years, with 4 academic semesters (in total 120 ECTS), during which compulsory, compulsory and free elective study courses are acquired, as well as an internship. The studies are finalized with the completion and defence of the Master’s thesis.

There are several principles of choosing and acquiring study courses in the study program.

The objective of the compulsory course of the programme on the latest achievements in the sector (Part A1, Part 8 CP/12 ECTS) — “Chemical Industry and Sustainability” is to provide students with a minimum set of knowledge, skills and abilities on the main operating aspects of a chemical manufacturing company.

In the part of the theoretical basic courses and information technology study courses in the field of the programme (Part A2, 16 CP/24 ECTS), the student shall deepen his/her knowledge and understanding of the theories of the selected field and acquire the necessary specific skills and abilities by learning the selected block of specialisation study courses. In the part of professional specialisation study courses (Part B1, 16 CP/24 ECTS), a student continues to study the selected specialisation courses or forms a set of courses corresponding to his/her professional interests from the offer of two specialisations that complement each other. This part of the programme includes courses which provide insight into the theories and technologies of the field, which are also applicable to other related industries. The free elective part (Part C, 12 CP/18 ECTS) is used freely at the discretion of the student. Students are encouraged to choose courses in this part that contribute to their personal growth, interdisciplinary competence and the necessary management skills.

The lecture courses are general-theoretical, they are supplemented with research work elements in the form of reports, research and other kinds of self-studying. Practical guidance is individual, whereas each student develops an independent study project in the framework of a common topic.

Attendance of practical classes is mandatory for all students during the entire study period. Within each study course, students must pass planned assessment tests, complete individual home assignments and develop term papers. Only the students who have fulfilled all requirements of the study course are admitted to the examination. Results of exams and tests are registered in the electronic database of RTU Study Management System.

The structure of the study programme and the content of its courses were examined in the Advisors' Board of the Faculty of Materials Science and Applied Chemistry. According to industry experts, the content of the courses was supplemented or changes were made to the content of the study courses, in line with the recommendations of industry representatives. The Advisors' Board expressed the need for a programme for graduates with developed practical skills in the field of chemistry and chemical technology. This was taken into account when developing compulsory study courses and including in them group works and supplementing programmes with an internship. The programme and its content were also reviewed in the Study Field Committee, which includes industry representatives.

Each member of the academic staff involved in the programme has a sufficient and up-to-date number of scientific publications on the subject of the lectured course. This confirms the ability of the academic staff to include the latest scientific discoveries in the content of the study course.

The study course of the compulsory part A1 provides practical classes with industry representatives and trips to manufacturing companies, during which the student will have the opportunity to familiarise with the specifics and job opportunities of the sector.

At the end of the programme, the student must complete a Master’s thesis project which includes a review of literature on the subject of the thesis, the experimental part and the summary of results. If, during studies, the student has actively engaged in the development of scientific projects and has published the obtained results in scientific journals, the Master’s thesis may be prepared in accordance with the regulations on the Master’s thesis (see Annex) as a thematically uniform set of scientific publications with an accompanying summary.

The topics for Master’s thesis are offered by faculty departments and those are always related to the topical directions of research. The thesis project can also be done in a manufacturing company or a scientific institute. In such a case, the second (academic) supervisor shall be involved from the department, who supervises the quality of the thesis and compliance with the objectives of the programme and the learning outcomes. The implementation of Master’s thesis project in this way contributes to the practical preparedness of graduates for work in the sector.

3.2.2. In the case of master’s and doctoral study programmes, specify and provide the justification as to whether the degrees are awarded in view of the developments and findings in the field of science or artistic creation. In the case of a doctoral study programme, provide a description of the main research roadmaps and the impact of the study programme on research and other education levels (if applicable).

The theoretical and practical part of the study programme is based on the scientific developments of the sector. Each specialisation includes at least one course on the latest achievements in the selected sector or a project work, in which a student carries out a small research work, analysing a specific scientific problem and using sector specific methods and analytical equipment. In the last year of studies, students of the programme should participate in the RTU student conference with

an oral report on the topic of the Master's thesis. This trains skills in formulating scientific thought, presenting and discussing.

All faculty teaching staff involved in the implementation of the programme are scientifically active in their respective research fields, and besides their teaching duties implement scientific projects and/or industrial R&D projects. This is reflected in faculty revenues, of which 73% are funds derived from scientific and/or R&D activity. Below is the selected list of Latvian and international projects implemented in the reporting period amounting to more than 13 MEUR in which faculty teaching staff has been involved.

Chemistry and Technology of Biomaterials:

1. Baltic Biomaterials Centre of Excellence - H2020 WIDESPREAD-04-2017- Teaming Phase 1 (project period 05.2017-08.2018, 397 624.00 EUR)
2. Photocrosslinked hydrogels for guided periodontal tissue regeneration - EURONANOMED II ERA.NET (project period 03.2015-02.2018, 604 380.00 EUR)
3. Nanostructured osteochondral scaffold: novel biomimetic triggers for enhanced bone regeneration - EURONANOMED III ERA.NET (project period 10.2018-12.2021, 1 224 665.00 EUR)
4. An international network on new strategies for processing calcium phosphates - The European Union Seventh Framework Programme (PIRSES-GA-2013) (project period 11.2013-10.2017, 455 400 EUR)

Production Technology and Environmental Aspects:

1. Influence of the magnetic field-initiated stirring on biotechnological processes - Central Finance and Contracting Agency of the Republic of Latvia (project period 03.2017-02.2020, 644 408.00 EUR)
2. The quest for disclosing how surface characteristics affect slideability - Central Finance and Contracting Agency of the Republic of Latvia (project period 04.2017-03.2020., 594 054.28 EUR)
3. Pharmaceutical wastewater treatment - Investment and Development Agency of Latvia (project period 08.2020-04.2022, 662 571,78 EUR)

Chemistry and Technology of Inorganic Materials:

1. Development of active under sunlight immobilized TiO_2-ZnO based photocatalysts - Central Finance and Contracting Agency of the Republic of Latvia (project period 04.2017-03.2020. 524 397.90 EUR)
2. Mineral and synthetic nanopowders for obtaining of porous ceramics and modification of ceramic materials - Central Finance and Contracting Agency of the Republic of Latvia (project period 03.2017-02.2020, 503 495 EUR)

Chemistry and Technology of Biologically Active Compounds:

1. Synthetic methodologies towards value added products based on applications of sulfur dioxide as polar reaction medium and reagent - Latvian Council of Science Grant (project period 2018-2021, 300 000 EUR).
2. Development of pentacyclic triterpenoid – azole conjugates: from cancer chemopreventive agents and adjuvants in cancer chemotherapy to novel anti-cancer drug candidates - ERA.NET RUS Plus (project period 2018-2021, 493 500 EUR).
3. Synthesis of novel (deaza)purine-triazole conjugates and applications of their fluorescent properties - Latvian-Lithuanian-Taiwanese joint grant (project period 2015-2017, 225 000 EUR).

4. Organic reactions in and with liquid sulfur dioxide - Latvian Council of Science Grant (project period 2013-2016, 206 788 EUR).
5. Biosynthesis and isolation of macrolide type of antibiotics and antiparasitic agents and production of synthetic derivatives thereof - ERDF (project period 2010-2013, 297 883 EUR).

Chemistry and Technology of Polymer Materials:

1. Multifunctional materials and composites, photonics and nanotechnology “IMIS2” - Latvian State Project (project period 01.09.2014-31.05.2018, 2 250 000 EUR)
2. Development of perspective nanocomposites on the bases of secondary polymers and elaboration of manufacturing and processing technologies thereof - ERDF project (project period 01.01.2010.-31.12.2013., 418 000 EUR)
3. Innovative use of industrial byproducts for sustainable asphalt pavement mixtures - Fundamental and Applied Research Project of the Latvian Council of Sciences (project period 10.2018.-10.2021., 300 000 EUR)
4. Enhanced electromagnetic protection and cybersecurity through field deployable innovative shielding, monitoring and data destruction technologies - Project of Latvian State Program (project period, since 2022.- , 460 000 EUR).
5. Natural bioplastics from lignin, hemicellulose and cellulose - Fundamental and Applied Research Project of the Latvian Council of Sciences (project period 2020.-2022., 300 000 EUR)
6. Wood Mimicking Biocomposites - Fundamental and Applied Research Project of the Latvian Council of Sciences (project period 2018.-2021., 300 000 EUR).

Sustainable Chemistry:

1. Novel heteroatom-doped nanocarbon catalysts for fuel cell and metal-air battery applications - ERA.NET RUS Plus, State Education Development Agency Republic of Latvia (project period 2018 – 02.2021, 188 000 EUR)
2. Synthesis of biodiesel *via* interesterification of rapeseed oil - Central Finance and Contracting Agency of the Republic of Latvia (project period 03.2017-02.2020, 581 007 EUR)
3. Hybrid energy harvesting systems - Central Finance and Contracting Agency of the Republic of Latvia (project period 2017-2020, 647 361 EUR)
4. Thermoelectric nanomaterials/topological insulators for more effective waste heat converting to usable energy - Central Finance and Contracting Agency of the Republic of Latvia (project period 03.2017-02.2020, 648 185 EUR)
5. Design and Investigation of Light Emitting and Solution Processable Organic Molecular Glasses - Central Finance and Contracting Agency of the Republic of Latvia (project period 2017-2020, 648 330 EUR).

According to the SciVal database (2016-2021), the results of all research projects have been published in more than 950 scientific publications, 20% of which are in Q1-level journals.

3.2.3. Assessment of the study programme including the study course/ module implementation methods by indicating what the methods are, and how they contribute to the achievement of the learning outcomes of the study courses and the aims of the study programme. In the case of a joint study programme, or in case the study programme is implemented in a foreign language or in the form of distance learning, describe in detail the methods used to deliver such a study programme. Provide an explanation of how the student-centred principles are taken into account in the implementation of the study process.

The study programme is implemented equally in both languages by providing an opportunity to learn in depth the theories, technologies and latest trends of the selected sector, to acquire practical skills in seminars, practical and laboratory classes. The study courses, internship and the development of the graduation paper are divided proportionally into semesters of the study program, so that they complement each other in order to ensure that students move in a targeted way towards acquiring knowledge and skills.

The structure of the study programme and the content of the programme make it possible to adapt to the changes in the number of students and to optimise the implementation of courses by uniting students from different years into one study course. It does not only provide economic benefits, but also provides an opportunity to create sufficiently large groups of students to implement the intended group work and to promote the cooperation skills of the student. However, there are also groups of study courses, the sequence of which is maintained to ensure that the fulfilment of the learning outcomes of the programme.

In general, the study programme and the planning of each semester are designed to focus on acquiring and strengthening knowledge and professional skills for each student, when working individually and in a team.

Assessment of learning outcomes is made according to the regulation on the assessment of learning outcomes (https://www.rtu.lv/writable/public_files/RTU_studiju_rezultatu_vertesanas_nolikums.pdf (in Latvian); the English translation is in the file of Appendix 04 of the List of Internal regulations) and regulations on the final examinations at Riga Technical University (see the file of Appendix 08 of the List of Internal regulations). The academic staff responsible for the study courses, in accordance with the specifics of the study course content and study programme, as well as the needs of the students, choose the methods of structuring, teaching and evaluating the study courses.

Courses and seminars about new educational methods are organized for the academic staff. Professional advancement and training courses are offered at the faculty, RTU and international scale. RTU Centre for Academic Excellence organizes activities for the development of the academic staff on the university level.

The methods employed at the study program promote the achievement of the aims and outcomes of the study courses and the study program based on the student-centred principles of education. The study program owes its value to a professional dialogue between the academic staff and students, involving students in the improvement of the curricula and methods of the study courses. Students can take part in the improvement of the study process directly – expressing their aspirations to the academic staff of a certain study course, a department chair, the program director, or through representatives of the student self-government, whose representatives are members of FMSAC Council, RTU Senate and RTU Senate commissions, as well as members of RTU Constitutional Assembly.

Indirectly, students express their thoughts on the course during an anonymous survey in the middle of a semester and at the end of the semester. In turn, graduates of the programme fill out general surveys for the entire programme as a whole. The results of surveys are reviewed at department meetings and proposals for changes are developed. The main items of the survey are also discussed at the Study Field Committee meeting. A careful analysis of survey results makes it possible to make well-considered changes to the content of the course and the programme.

FMSAC relationships with students are based on the principles of mutual confidence, respect and

fairness. This imposes students both extra obligations and offers additional rights. Students have an opportunity to influence their learning process, to exercise their autonomy, to provide feedback on the study process, aligning it with their professional growth interests. The feedback between students, academic staff and program administration is greatly influenced by FMSAC student self-government that takes an active part in all mentioned processes.

At the beginning of each study course, the academic staff informs students about the study course acquisition requirements and familiarize students with specific evaluation criteria of the study course. They are published in the portal ORTUS. Twice per academic term, students anonymously evaluate the performance of the academic staff in ORTUS environment by answering the survey questions. These include evaluation of the study process, individual tasks, acquired skills, the academic staff's attitude, and cooperation with the students. Graduates complete graduate questionnaires.

The program director regularly discusses current issues of the study process and quality, involving in these discussions other interested parties.

To ensure integration of the acquired knowledge, competencies and skills of the graduates, elaborating and implementing the study courses, a special focus is made on reflection of the topical case studies in the study program curriculum (at the level of lectures, lab works and practical classes), integration and cross-disciplinarity of the study courses and the study program; optimization of the curriculum in cooperation with external and industry experts. Individual studies play a significant role. Description of the course of autonomous studies is included in the description of the study course as a mandatory part. Students' skill to learn individually is systematically developed within all the study courses. Students acquire skills of practical and research work by regular use of literature and internet resources, including international scientific databases, which are available at RTU Library with electronic access to ORTUS, to develop successful research papers, as well as Master's Theses.

Organizational units of RTU, including Personnel, Research, International Relations Departments, and the Centre for Academic Excellence regularly inform the academic staff about opportunities to advance their competencies in the field of scientific research, methodological and teaching skills, general competencies (foreign languages, information technologies, public speaking and presentation skills, etc.), and specific professional activities. ORTUS accumulates information about the scientific activities of the academic staff. To offer high-quality teaching, seminars on the teaching methodology are organized for the academic staff of RTU, which address opportunities for the application of different study methods, experience and good practices.

The academic staff of the study programme regularly improve the study curricula by introducing yet more new learning organizational practices into the study process. The study process integrates international experience, FMSAC learning environment and infrastructure are adapted for the groups of students with various professional interests, maintaining the stable quality of studies.

3.2.4. If the study programme envisages an internship, describe the internship opportunities offered to students, provision and work organization, including whether the higher education institution/ college helps students to find an internship place. If the study programme is implemented in a foreign language, provide information on how internship opportunities are provided in a foreign language, including for foreign students. To provide analysis and evaluation of the connection of the tasks set for students during the internship included in the study programme with the learning outcomes of the study programme (if applicable).

Based on a recommendation by industry representatives the study programme includes a study internship of 4 CP (6 ECTS). Its objective is to improve the skills and competencies of a student in a professional environment, as well as to strengthen and supplement knowledge in line with the requirements of the professions of the chemistry and chemical technology sectors in the position of managing employee. The progress of the internship is governed by the internal regulations "On Procedures for Organising Internship at RTU" adopted by the RTU Senate, internal regulations and methodological guidelines of the Faculty of Materials Science and Applied Chemistry. In the second study semester, the student should have an internship in a manufacturing company or a scientific institute. A student may choose a place of internship according to his/her own interests or it can be offered by the faculty. The place of internship chosen by the student must be approved by the internship coordinator.

The internship is supervised by the internship coordinator appointed by the head of the structural unit, who is responsible for the planning, provision and supervision of the internship. The internship on the part of the company is led by the internship supervisor – an employee appointed by the company who has higher education and work experience in the field corresponding to the student's specialization.

FMSAC, the company and the student enter into a tripartite agreement, which sets out the obligations, rights and responsibilities of the parties. The appointment of a student in the internship is formalized by an order of the Dean of FMSAC, indicating the term of the internship, the name of the company and the coordinator of the student's practice. If the company is not located in Latvia or the student is a foreign citizen, a tripartite agreement will be concluded in English.

So far, all foreign students have successfully had internship in scientific institutes. Companies have shown interest in accepting foreign students for internship. A foreign student can choose a place of internship in Latvia, abroad or in his/her country of residence.

The internship guidelines and methodological instructions describe the goals and tasks of the internship and the schedule of the internship and the procedure for reporting and defence, as well as the evaluation method in detail.

The tasks of the internship are closely related to the learning outcomes to be achieved in the study program.

General internship tasks:

1. To get acquainted with the organisational structure, its operation, its goals, tasks, operational system, sites and methods, and relation to other organisations, in compliance with its scope and field of operation.
2. To get acquainted with the available equipment, technological processes, quality control measures and issues, which are solved at the internship place, the processes and methods of resolving them. Familiarising with the work techniques and the operation principles of the equipment and processes used during the completion of the internship.
3. Practical involvement in the work of the internship place by completing individual internship tasks according to the defined schedule in cooperation with the staff of the internship place.
4. Collection of all required data, summarising them and preparing the internship report.

Internship in a professional environment contributes to all learning outcomes of the program, as it is a key stage prior to the development of a Master's Thesis. During the internship, a student has to demonstrate the knowledge defined in the study program, apply their skills and demonstrate the acquired competencies. Internship can provide a better reflection of students' performance than

individual study courses.

Appendix "Description of the organisation of the traineeship of the students" provides the Senate resolution on the Internship management procedure at RTU, which was revised in 2019. It states that the internship coordinator at an organizational unit helps students find the internship place. If additional assistance is required, students can contact the Career Support and Services Unit, where a career consultant and project manager assist students in finding and addressing companies where to undergo internship, as well as promote the development of career management skills through a variety of activities that can ensure the achievement of successful results during the internship. Once a year, the Career Support and Services Unit organizes RTU Career Day, where students also have the opportunity to meet face-to-face with company representatives and discuss future opportunities. More information about the event and participants of the previous years is available at https://www.rtu.lv/lv/studentuserviss/karjeras-centrs-ssc/karjeras-diena (in Latvian). In 2021, due to the pandemic, the event was organized in a digital mode.

In 2022, once the epidemiological restrictions were lifted, chemistry-related Career Day was organized by FMSAC. Companies came to the faculty in a face-to-face meeting and presented career opportunities and discussed the necessary skills and competencies with the students.

An additional resource developed in 2015 is a website that invites companies to post vacancies that are relevant to RTU students (https://ekarjera.rtu.lv/). Students have the opportunity to log in with the University username and keep abreast of current internships and job opportunities in their field.

RTU Development Fund provides additional support for practical skills promotion (https://www.rtu.lv/en/developmentfund). Many practical skills competitions are offered during the year, which are organized in cooperation with companies.

Each year, the University concludes cooperation agreements with companies and organizations (template in English is in the file of Appendix 37 of the list of Internal regulations), where the parties agree on the provision of internship places to students.

The regulations and methodological instructions on the procedure for organizing the internship are attached in Annex 12.

3.2.5. Evaluation and description of the promotion opportunities and the promotion process provided to the students of the doctoral study programme (if applicable).

3.2.6. Analysis and assessment of the topics of the final theses of the students, their relevance in the respective field, including the labour market, and the marks of the final theses.

The Master’s thesis of the study programmes “Chemistry”, “Applied Chemistry” and “Chemical Technology” were very varied and always related to ongoing studies or processes in the sector. These include the development of new medical substances, cosmetic products, innovative materials (e.g. polymeric materials, wood materials, biomaterials, silica materials, organic materials)

extraction methods and technologies, research in the field of sustainable chemical solutions, and technology optimisation solutions to be used in the sector. Part of the thesis is developed in cooperation with industry. It makes it possible for students to familiarise themselves and evaluate the operational processes of companies and scientific institutes, to acquire practical skills, as well as to offer the necessary optimisation solutions, both in the manufacturing process and in the development of the product, reflected in the graduation papers. This is also continued in the new study program "Chemistry and Chemical Technology".

Topics of Master's theses are selected according to the programme's specialisation directions.

General topics of Master's theses in "Production Technology and Environmental Aspects" specialization:

1. Research on the development of innovative composites
2. Research on the treatment of chemically polluted water and the development of various sorbents
3. Research of CO_2 adsorption technologies and materials in biofuel production
4. Research of biotechnological processes
5. General technology, mass transfer research

General topics of Master's theses in "Sustainable Chemistry" specialization:

1. Kinetics investigation of catalytic oxidation reactions turning diols and triols into high added value products
2. Production of biofuel from industrial waste
3. Investigation of interesterification of rapeseed oil towards biofuel production
4. Photonic materials for OLED production
5. Medium-fast pyrolysis of agricultural and forestry waste
6. New catalysts for hydrocarbon synthesis using Fischer–Tropsch method

General topics of Master's theses in "Chemistry and Technology of Polymer Materials" specialization:

1. Investigations on nanocomposites and hybrid composites with carbon allotropic forms
2. Investigations on lignocellulosic fibers containing polymer composites and hybrid composites
3. Utilization of industrial, forestry and agricultural byproducts for development of polymer composites
4. Investigations on polyurethane foam composites
5. Assessment of 3D printing technologies for polymer nanocomposites
6. Investigations on processing and dyeing technologies of textile fibers
7. Investigations on ageing of natural polymers and solutions for materials protection against the effects of aggressive factors of external environment

In co-operation with industry:

8. Solutions of polymer anti-corrosion coatings
9. Lignocellulosic fibers reinforced polymer composites
10. Utilization of forestry and industrial byproducts for development of polymer composites

General topics of Master's theses in "Chemistry and Technology of Biologically Active Compounds" specialization:

1. Elaboration of methods for synthesis of natural compounds, studies of possible modifications, exploring biological activity of derivatives;

2. Novel approaches and development of methodology for total synthesis of natural compounds;
3. Use of liquid SO_2 as a polar solvent in organic synthesis;
4. Crystal engineering of multicomponent pharmaceutical solids;
5. Synthesis and investigation of photophysical properties of hybrids and conjugates of heterocycles.

General topics of Master's theses in “Chemistry and Technology of Biomaterials” specialization:

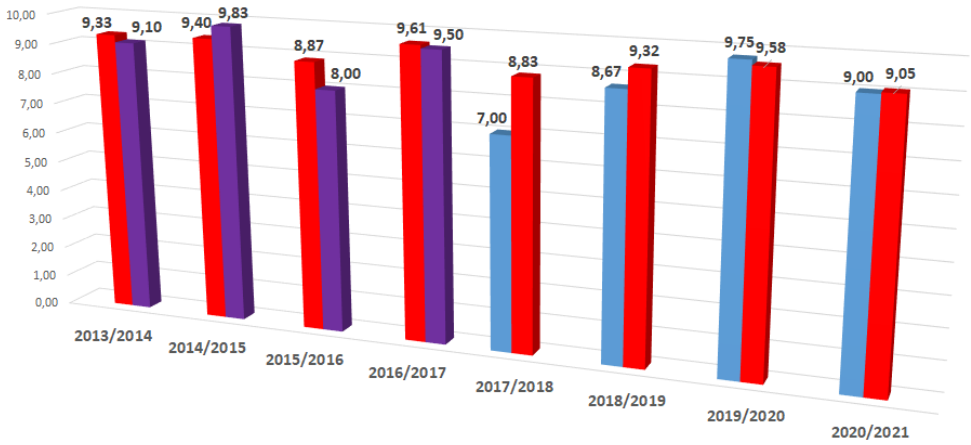
1. Development of synthesis technology for biomaterials for bone tissue regeneration
2. Development of synthesis technology for calcium phosphate and biopolymer-based drug delivery systems for bone tissue regeneration
3. Scale-up studies for the synthesis of different calcium phosphates
4. Development of synthesis technology for composites based on calcium phosphates and biopolymers for bone tissue engineering
5. Development of analytical methods for characterization of physicochemical properties of biomaterials
6. Development of technology for obtaining of various forms of biomaterials based on calcium phosphates and biopolymers for bone tissue regeneration
7. Studies on physicochemical, *in vitro* antibacterial and cell viability properties of developed biomaterials

General topics of Master's theses in "Chemistry and Technology of Inorganic Materials" specialization:

1. Synthesis and properties of nanostructured photocatalysts.
2. Synthesis and properties of biomaterials.
3. Preparation, modification and properties of functional nanomaterials.
4. Synthesis and properties of ceramics.
5. Research of construction materials and binders.
6. Synthesis and properties of materials for batteries.

In order to ensure the development of high-quality Master’s thesis, at the end of the third semester and two months before defence departments organise an intermediate control of the progress of the thesis draft, during which the student presents the thesis project, as well as gets recommendations from the teaching and scientific staff of the department for the improvement of the Master’s thesis.

The average assessment of the Master’s theses of previous programmes has been consistently high and was about 9.0 (Fig. 3.2.6). There was a small decline in 2017/2018. The quality of Master’s theses has not been affected by the pandemic, because most start drafting their papers in the first year of studies and this is often related to their direct job duties. Until the year of studies 2020/2021, Master’s Thesis were defended at the meetings of structural units, but since the last year they have been defended in unit committee of representatives of structural units for thematically unified working groups. It provides a broader vision of the level of skills, knowledge and competence of graduates of the programme.



	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021
Applied Chemistry					7,00	8,67	9,75	9,00
Chemical Technology	9,33	9,40	8,87	9,61	8,83	9,32	9,58	9,05
Chemistry	9,10	9,83	8,00	9,50				

Figure 3.2.6. Average assessment of the Master's theses

3.3. Resources and Provision of the Study Programme

3.3.1. Assessment of the compliance of the resources and provision (study provision, scientific support (if applicable), informative provision (including libraries), material and technical provision, and financial provision) with the conditions for the implementation of the study programme and the learning outcomes to be achieved by providing the respective examples.

The study program is mainly implemented by five scientific institutes of the FMSAC:

- Institute of Technology of Organic Chemistry;
- Institute of Applied Chemistry;
- Institute of General Chemical Engineering;
- Institute of Polymer Materials;
- Institute of Materials and Surface Engineering.

They provide education and learning support: develop and update descriptions of the study courses, implement the corresponding study courses (including practical and laboratory works and seminars), supervision and defence of the graduate papers, and other activities related to learning, teaching and research work. All these institutes are active in the attracting and implementing of scientific projects that contribute to the systematic renewal of the scientific infrastructure, which is also available to students both in the standard study courses and during development of their Master's thesis. In recent years, training laboratories and auditoriums have been renovated, funds have been invested in purchasing digital training process management equipment, and renewal of technical equipment. In the assessment period 8.2 MEUR have been invested in the renovation of buildings and 9.2 MEUR - in modern research equipment. The available infrastructure is summarized in table 3.3.1. Thus, students are always welcome to get acquainted with methods and equipment in chemistry and chemical technology and to acquire practical experience in their use during studies.

Table 3.3.1. FMSAC space available for teaching and science

Type of use of the room	Number of rooms	Area, m^2
Meeting / Conference Room	3	239
Computer class	2	74
Classroom / study room	16	1139
Cabinets / Teachers' rooms	64	1801
Study and scientific laboratory	106	19232
Auxiliary room	16	308
Warehouse	4	100
Library	1	540
In total	**212**	**23433**

In 2016, significant investments were made in the development of the Scientific Library (SL) infrastructure by building additional premises (2240 m^2). The total area of the SL premises is 6393 m^2, of which 3417 m^2 are reader service premises. There are 713 working places for SL users. The SL has four group rooms and six individual booths, a rare book reading room and a conference room. The library is equipped with self-service facilities. The SL is accessible for users with disabilities.

At the request of the academic staff of the study programs “Chemistry”, “Applied Chemistry” and “Chemistry Technology”, 43 new books were purchased by the SL amounting to 3000 EUR in the period of 2013 – 2021. Electronic databases and electronic books available in them can also be used for study work. Most resources and purchased books are in English. Textbooks in Latvian are prepared by the academic staff of the course and published by RTU publishing house.

The RTU SL central building is attached to the FMSAC and it provides the students with unique opportunity to use study rooms in both FMSAC and SL.

In the Chemistry Branch of the RTU Scientific Library is located in the the FMSAC. Its reading room provides freely accessible workplaces for students, educational and scientific literature. The library provides internet access, as well as copying, scanning, and printing services are available. The Library’s Chemical Branch provides open-access databases of abstracts, such as Chemical Abstracts and a significant collection of chemistry journals, which includes the most important journals in the sector – these are editions of ACS, RSC, Wiley, Elsevier, Springer and the collection of journals issued in Russia. It is the most complete collection of journals of the chemical sector in Latvia.

The stocks of the Chemistry Branch of the RTU Scientific Library contain printed books and various editions (doctoral theses and summaries thereof) in line with the directions of study and scientific work of the RTU FMSAC. All editions in the branch are open access. The stock of the Branch contains 6607 titles / 8396 copies of books, which are reflected in the Electronic Catalogue of the RTU Scientific Library (https://kopkatalogs.lv/) as at 10.03.2022.

In the Chemical Branch of the RTU Scientific Library, it is possible to use the database of full-text scanned materials “Chemistry”, which contains mostly popular articles in press editions on a variety of chemical, pharmaceutical, materials science and technology topics starting from 2014. The database “Chemistry” is available in the electronic catalogue. Full texts are available only on computers of the Chemistry Branch. The stock of the Chemistry Branch of the RTU Scientific Library contains a Collection of Rarities of 686 books (928 copies). 139 books were issued before 1899. The collection includes the works of P. Valdens, V. Ostvalds and other academic staff of the Faculty. The oldest book is *B. Faujas de Saint-Fond “Minéralogie Des Volcans, ou description de toutes les substances produites ou rejetées par les feux souterrains”* issued in 1784. In the Collection of Rarities, most of the books are in German (700 copies), in Russian (121 copies) and in Latvian (59 copies). The entire Collection of Rarities is reflected in the electronic catalogue of the RTU Scientific Library (https://kopkatalogs.lv/).

The study programme mainly is implemented in the building at P.Valdena Street 3/7, Riga, which is a part of the RTU Ķīpsala Campus.

There are for the shared use currently 54 classrooms, 187 laboratories, 19 specialised study rooms, 10 computer classrooms, 12 workshops and several research centres of national importance in the Campus. In addition, there are laboratories and work rooms for the scientific groups of each faculty. There is also a student hostel on the Campus with 950 beds and a special block for people with disabilities. The entire RTU infrastructure is available to students and academic staff of the study programme.

In general, it can be concluded that the resource and provision base correspond to the conditions for the implementation of the study programme and the achievements of study results.

3.3.2. Assessment of the study provision and scientific base support, including the resources provided within the framework of cooperation with other science institutes and higher education institutions (applicable to doctoral study programmes) (if applicable).

3.3.3. Indicate data on the available funding for the corresponding study programme, its funding sources and their use for the development of the study programme. Provide information on the costs per one student within this study programme, indicating the items included in the cost calculation and the percentage distribution of funding between the specified items. The minimum number of students in the study programme in order to ensure the profitability of the study programme (indicating separately the information on each language, type and form of the study programme implementation).

The state budget grants and foreign students' tuition fees are utilised for implementation of the study program. Information regarding the financial resources of the academic Master’s study programs "Chemistry”, “Applied Chemistry” and “Chemical Technology” are presented in Table 3.3.3. The distribution of financial resources for the program "Chemistry and Chemical Technology" for the 2021/2022 academic year is not yet available, as the financial year at RTU ends in September.

Table 3.3.3. Financial resources

Academic year	State budget funding, EUR	Tuition fees for local students, EUR	Tuition fees for foreign students, EUR	Total funding for the program, EUR	Cost per 1 student, EUR
2013./2014.	149 627.00	-	-	149 627.00	6399
2014./2015.	142 434.18	-	-	142 434.18	6399
2015./2016.	130 627.32	-	-	130 627.32	6399
2016./2017.	108 886.18	-	-	108 886.18	6399
2017./2018.	100 742.27	-	-	100 742.27	6688
2018./2019.	122 457.94	-	-	122 457.94	7001
2019./2020.	138 317.01	-	13 836.81	152 153.82	7291
2020./2021.	127 641.03	-	8 140.99	135 782.02	7387

The analysis of the information shows that the state budget grants for the study programme have decreased during the reporting period. The cost per student has increased, which is justified by the overall increase in total RTU costs (utilities, building maintenance, etc.).

Information on the minimum number of students in RTU study programmes is provided in the appendix of the self-evaluation report "On the minimal number of students in study programmes".

The profitability of the program for foreign students is achieved by combining lessons for foreign and state-funded students.

Tuition fees are set in line with the National Audit Office's warning that tuition fees for students studying with budget students cannot be less than the public funding for this service.

The specific development of each study programme is the responsibility of each study programme director. Also the faculty administration supervises the study programms. For the development of all study programmes, central funding is used for the updating the collection of library, improvement and maintenance of shared classrooms, public relations, programme marketing activities, development and maintenance of information systems related to the study process, development of the Ķīpsala complex and other activities. In addition, see:

- Provision of study facilities in Part II, Chapter 3, Section 2.3.1.
- Provision of research facilities in Part II, Chapter 3, Section 2.3.1.
- Provision of information facilities in Part II, Chapter 3, Section 2.3.3.
- Provision of the material and technical base in Part II, Chapter 3, Section 2.3.2.
- Provision of the financial basis in Part II, Chapter 3, Section 2.3.1.

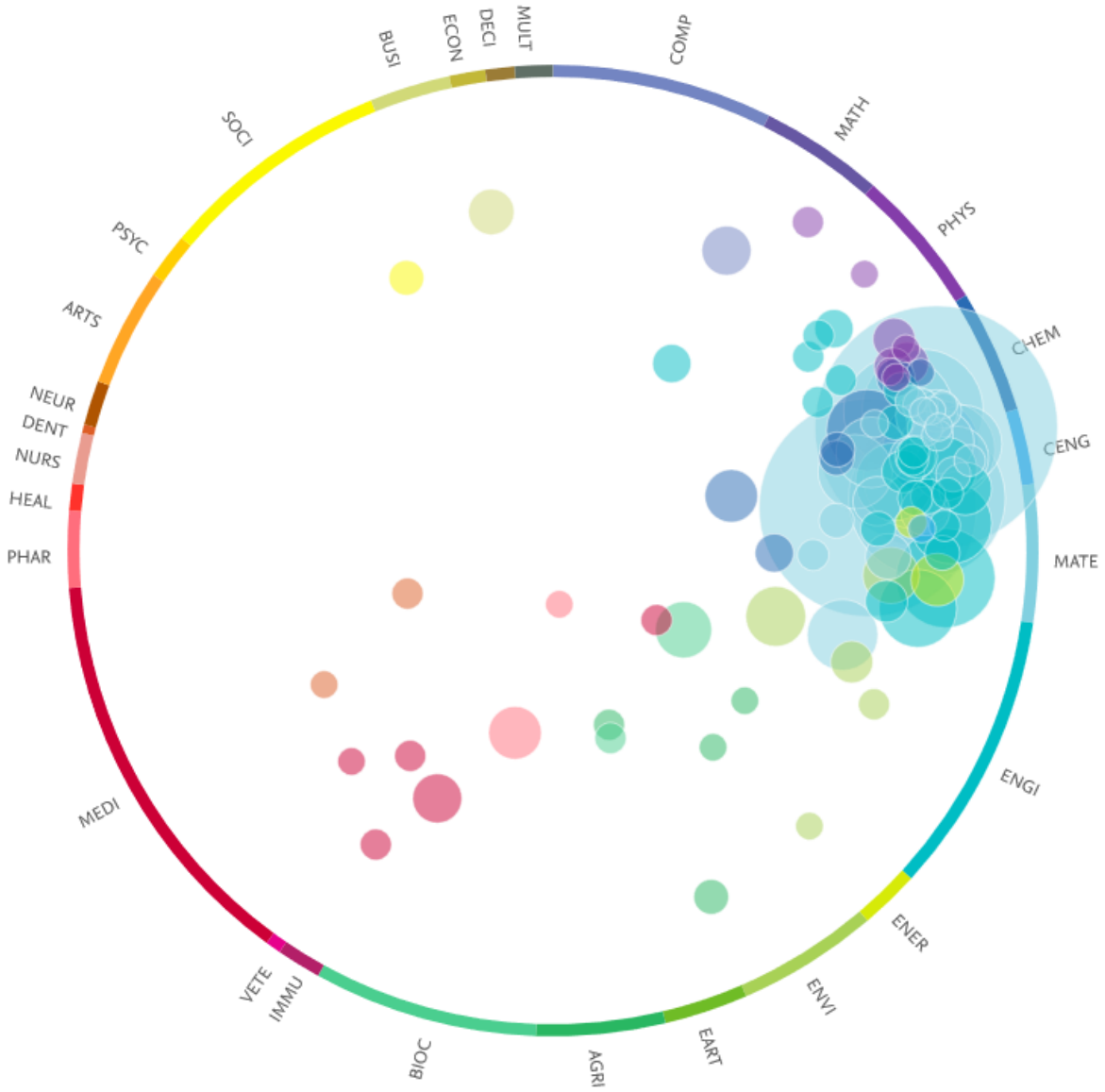
3.4. Teaching Staff

3.4.1. Assessment of the compliance of the qualification of the teaching staff members (academic staff members, visiting professors, visiting associate professors, visiting docents, visiting lecturers, and visiting assistants) involved in the implementation of the study programme with the conditions for the implementation of the study programme and the provisions set out in the respective regulatory enactments. Provide information on how the qualification of the teaching staff members contributes to the achievement of the learning outcomes.

The scientific competence of the academic staff involved in the academic Master's study programme “Chemistry and Chemical Technology” can be evaluated by the following criteria: publications in scientific journals indexed by SCOPUS or Web of Science, other databases recognised in the scientific world, as well as participation in international and Latvian scientific journal editorial boards; participation in international projects.

49 teachers are involved in the implementation of the study programme (47 of them elected to RTU) - 15 professors, 9 associate professors, 14 docents, 4 lecturers, and 4 assistants.

Academic staff actively publishes, participates in scientific conferences and improves their academic knowledge by participating in methodological seminars. The fig. 3.4.1. below shows the range of publications by the faculty academic staff of the study programme for the last six years, covering 450 thematic areas (213 thematic clusters). According to the SciVal tool data, the total number of publications exceeds 900 and 20% of the publications are in Q1 level journals.



MEDI	Medicine
PHAR	Pharmacology, Toxicology and Pharmaceutics
HEAL	Health Professions
NURS	Nursing
DENT	Dentistry
NEUR	Neuroscience
ARTS	Arts and Humanities
PSYC	Psychology
SOCI	Social Sciences
BUSI	Business, Management and Accounting
ECON	Economics, Econometrics and Finance
DECI	Decision Sciences
MULT	Multidisciplinary

Figure 3.4.1. SciVal database data for 2011-2020.

FMSAC along with other RTU faculties and other Latvian universities underwent an international evaluation of scientific institutions. It covered the research activities of Latvian institutions from 1 January 2013 to 31 December 2018. FMSAC achievements were evaluated as “very good” (4 in the scale of 5). Only 16 structural units of all Latvian universities and/or research institutes were evaluated with grades 4 and 5, FMSAC being one of them.

As shown in the figure, the faculty academic staff of the study programme is primarily involved in research areas of chemistry, chemical technology, and materials science. Such scientific activity in the fields corresponding to the study programme forms the necessary competence of the teaching staff to ensure a high-quality study process.

Since the beginning of 2019, the academic staff of the study programme has an opportunity to improve their qualification by participating in internships within ESF project No. 8.2.2.0/18/A/017 "Strengthening of Academic Staff of Riga Technical University in Strategic specialisation Areas". The academic staff may use internships in various Latvian companies for a total volume of 200 hours. 16 of the academic staff members involved in the implementation of the study programme have used this opportunity. The opportunity to improve the knowledge of the English language was used by 15 members of the academic staff (100 or 200 hours).

Compulsory and elective study courses are provided by the following faculty academic staff:

Professor **Māris Turks** is the author of more than 120 scientific publications and 37 patents, has given oral presentations at 20 international conferences and 15 guest lectures at foreign universities and research institutes. He has supervised 10 doctoral, 29 Master's and 45 Bachelor's theses. Expert of the Latvian Council of Science in the field of chemistry and in the field of chemical engineering. Participant and manager of several Latvian and international projects. Member of the editorial boards of several scientific conference programmes and the editorial board of international journals. Member of the RTU Senate, Chairman of the Doctoral Council "RTU P-01". Academician of the Latvian Academy of Sciences (LAS) and member of the LAS Senate. Project evaluation council member at the Latvian Competence Centre of Pharmaceutical, Biomedical and Medical Technology, Head of Division “Natural substance medicine, nutritional supplements, functional cosmetics”. Latvian representative at the Division of Organic Chemistry, European Association for Chemical and Molecular sciences. Management Committee member: COST Action CA18132 Functional Glyconanomaterials for the Development of Diagnostics and Targeted Therapeutic Probes.

Professor **Māra Jure** is the author of more than 29 scientific publications and 4 patents, the editor-in-chief of 2 monographs. ECTS/DS international expert and member of the Latvian Bologna Process Promoters' Group. Director of Riga Stradins University and RTU joint professional study program "Industrial Pharmacy" on behalf of RTU (2015-2021). Supervisor of 4 doctoral dissertations, 4 engineer's projects, 13 Master's and 37 Bachelor's theses. Expert of the Latvian Council of Science in the fields of chemistry, chemical engineering and pharmacy, member of the Council of Experts of the Chemical Industry and allied industries. Participant and project leader of several Latvian and international projects. Member of the Organizing Committee of the Paul Walden Symposiums on Organic Chemistry and a member of the editorial board of the journal "Cheminë technologija" (ISSN 1392-1231) of Kaunas Technical University. Member of the RTU Senate (2003-2018) and Chairman of the Senate (2006-2012), head of the RTU Senate Legislative Committee and member of the RTU Rector's Council (2006-2012), member of the FMSAC Council (since 1993), Member of the Doctoral Council "RTU P-01". Corresponding member of the Latvian Academy of Sciences (LAS) (since 2005), member of the Expert Commission of the Division of Chemical, Biological and Medical Sciences of the LAS (since 2017). Latvian representative at the European Chemical Society (EuChemS) Working party on History of Chemistry. Deputy Dean of RTU FMSAC for educational affairs (1993-2018), Head of the Department of chemical technology of biologically active compounds (since 2000).

Associate professor **Kaspars Traskovskis** has published 35 peer-reviewed scientific articles indexed in Scopus database. He has supervised 4 Bachelor's, 2 Master's and 1 doctoral thesis. He has managed and implemented several Latvian and international scientific projects. He has Latvian Council of Science expert status in the area of Chemistry. He is a member of the Doctoral Council "RTU P-01". He is performing reviewer duties in several international scientific journals. He holds a member status in RTU FMSAC Council and Scientific commission.

Professor **Sergei Gaidukovs** is the author of more than 57 scientific publications and 2 patents, has given oral presentations at 60 international conferences, 10 guest lectures and 3 lecture courses at foreign universities and research institutes. Supervisor of 1 doctoral, 24 Master's and 35 Bachelor's theses. Expert of the Latvian Science Council in the field of Materials Science, in the field of Chemistry and in the field of Chemical Engineering. Participant and manager of several Latvian and international projects and programs. Expert of LAS and RTU Promotion Council. The opponent of several dissertations. Expert of Latvian and international standardization commissions. Expert and rapporteur for the European Chemicals Agency.

Professor **Kristīne Šalma-Ancāne** is the author of the 27 SCOPUS indexed scientific publications, participated in more than 50 scientific conferences with oral and poster presentations, has given 1 guest lecture at foreign universities and research institutes; has supervised 3 doctoral, 5 Master's and 14 Bachelor's theses; Expert of Latvian Council of Science in the field of materials science; principal investigator and coordinator of several Latvian and international projects; member of the scientific commission of several scientific conferences, reviewer of international journals, Corresponding member of the Latvian Academy of Sciences (LAS); RTU MLĶF Study field "Chemistry, chemical technology and biotechnology" committee member; Member of RTU MLĶF Council; Representative of Latvia in the Council of the European Ceramics Society; Member of the European Ceramics Society; Member of the Latvian Association of Young Scientists; Member of the Latvian Materials Research Society, awarded the L`ORÉAL Latvian Scholarship for Women in Science with the support of the Latvian National Commission for UNESCO and the LAS (2016), awarded the honorary title "RTU Young Scientist of the Year" (2016), actively involved in science promotion activities for the general public groups.

Professor **Gundars Mežinskis** is the author of more than 134 scientific publications (60 of which are SCOPUS publications, Hirsch index 17), and 14 patents (including 2 European patents), has given oral presentations at 18 international conferences and 13 guest lectures at foreign

universities and research institutes. He has supervised 6 doctoral, 24 Master's and 10 Bachelor's theses. Expert of the Latvian Science Council in Engineering Sciences and Technologies - Materials Science. Participant and manager of several Latvian and international projects. Member of the program commissions of several scientific conferences and the editorial board of 2 international journals. Member of the RTU Scientific Council and the Promotion Council "RTU P-02", responsible for 1 license agreement with a Latvian company.

Professor **Dagnija Loca** is the author of more than 50 scientific publications and 3 patents, has given presentations at 50 international conferences and more than 10 guest lectures at foreign research institutes. She has supervised 5 postdoctoral researchers as well as 5 doctoral, 11 Master's and 14 Bachelor's theses. Expert of the Latvian Council of Science in the field of chemistry, chemical engineering, and materials science. Participant and coordinator of more than 25 national and international research projects. Member of the scientific and organizing committees of several international scientific conferences and well as guest editor and editor of special issues of international journals such as "Materials" and "Biotechnology and Bioengineering". Member of the RTU Scientific Council, full member of the Latvian Academy of Sciences (LAS) and President of "Materials Research Society of Latvia".

Professor **Jānis Ločs** is the author of more than 95 scientific publications and 8 patents, has given oral presentations at 15 international conferences and 5 guest lectures at foreign universities and research institutes. He has supervised 10 doctoral, 16 Master's and 12 Bachelor's theses. Expert of the Latvian Council of Science in the field of chemistry, chemical engineering and materials science. Participant and manager of several Latvian and international projects, including coordination of H2020 projects. Member of the editorial boards of several scientific conference programs. Member of the RTU Senate (2013 – 2021), currently a member of the RTU council. Chairman of the Doctoral Council "RTU P-02". Academician of the Latvian Academy of Sciences (LAS). Latvian representative at the European Chemical Agency, Committee of Socioeconomic analysis (2015 – 2020). Management Committee member of several COST Actions. Member of the board of the Scandinavian Society for Biomaterials.

Professor **Remo Merijs-Meri** is the author of more than 110 scientific publications and 4 patents, has given oral presentations, including plenary lecture, at more than 20 international conferences and 2 guest lectures at foreign universities and research institutes. He has supervised 4 doctoral, 26 Master's and 19 Bachelor's theses. Expert of the Latvian Council of Science in the field of materials science and in the field of chemical engineering. Participant and manager of several Latvian and international projects. Member of the organization board of several Baltic Polymer Symposium series international scientific conferences. Member of the editorial board of the international journal Environmental Research, Engineering and Management. Corresponding member of the Latvian Academy of Sciences (LAS). Together with academic and commercial co-operation partners in 2022. Diploma of the LAS "Most important achievements of the 2021st Year" has been received, whereas in 2017. Diploma of the president of the LAS on the achievements in applied sciences in 2016. has been received.

Professor **Juris Vanags** is the author of more than 30 scientific publications and 2 patents, has given oral presentations at 25 international conferences. He has supervised 2 doctoral, 5 Master's and 4 Bachelor's theses. Participant and manager of several Latvian and international projects. Member of the Board of the Latvian Association of Biotechnology, a structural unit of the Clean Technology Cluster, Member of the Board of the Smart Materials and Technology Competence Center.

Docent **Juris Mālers** is the author of more than 60 scientific publications, has given oral presentations at 30 international conferences. He has supervised 1 doctoral, 2 Master's and 10

Bachelor's theses. Participant and manager of several Latvian and international projects. The implementer of quality management systems in many Latvian chemical industry companies. Expert of Environmental protection technology.

Professor **Andris Šutka** is the author of more than 90 scientific publications and 5 patents, has given oral presentations at 10 international conferences, given a guest lecture course (16 lectures) at the University of Tartu, as well as lectured at 3 foreign universities and research institutes. Supervisor of 2 doctoral, 2 Master's and 6 Bachelor's theses. Expert of the Latvian Science Council in the fields of Materials Science and Chemical Engineering. Leader for 8 Latvian and 5 international research projects. Participation in several promotion councils. Full member of the Latvian Academy of Sciences.

Asoc.professor **Inna Juhnevica** is an expert of technology of silicate materials. She has published 17 scientific publications and implemented 10 national and international projects. She has supervised 8 Master's theses and 10 Bachelor's theses, all of them related to silicate technology. She is vice-dean of FMSAC for administrative duties and responsible for the popularization of chemistry and achievements of the chemical industry for high school students. Her scientific interests deal with silicate materials, nanomaterials, as well as the sol-gel technology.

3.4.2. Analysis and assessment of the changes to the composition of the teaching staff over the reporting period and their impact on the study quality.

When creating the new Master's study programme "Chemistry and Chemical Technology", the qualifications of the teaching staff involved in the previous programmes and survey results were carefully reviewed. 49 teaching staff members are involved in the implementation of the study programme in Latvian. Except for the teaching staff of the study course "Chemical Industry and Sustainability" (in collaboration with the Faculty of Engineering Economics and Management), all other teaching staff is scientific staff of the faculty.

A large part of the programme is ensured by academic staff of the younger generation. Also teacher groups consisting from one experienced senior staff and young teachers are organized for several study courses. This develops pedagogical skills and abilities of young colleagues and contributes to the improvement of their teaching skills.

The programme includes some study courses from the previous programmes, but many courses are created from scratch, taking into account development trends of manufacturing and scientific directions. For several study courses the teaching staff was changed and young and perspective researchers/professor were employed.

Changes in the teaching staff have a positive effect on the quality of the study process. Students have the opportunity to get acquainted with a wider range of research equipment, and use it in the study process and for their Master's thesis projects. Students are regularly involved in various levels of scientific and practical projects implemented by FMSAC - this attracts young people to the university.

Lecturers from foreign partner higher education institutions are involved in the implementation of the study programme, as well as industry professionals are invited to teach practical lectures.

Since 2021, professor Emiliano Bilotti (School of Engineering and Materials Science, Queen Mary University of London) and professor Bojana Obradovic (Faculty of Technology and Metallurgy,

University of Belgrade) have been working at the department as a visiting teaching staff members within SAM 8.2.2 project “Strengthening of academic staff of the Riga Technical University in strategic specialisation areas” supported by the European Social Fund. There are plans to continue attracting visiting teaching staff.

For a more detailed list of all teaching staff, which are involved in the implementation of the study programme, please see the table and their scientific biographies (CVs) in Annex 11, as well as the list of their publications related to the study programme in the peer-reviewed journals for the past six years.

3.4.3. Information on the number of the scientific publications of the academic staff members, involved in the implementation of doctoral study programme, as published during the reporting period by listing the most significant publications published in Scopus or WoS CC indexed journals. As for the social sciences, humanitarian sciences, and the science of art, the scientific publications published in ERIH+ indexed journals or peer-reviewed monographs may be additionally specified. Information on the teaching staff included in the database of experts of the Latvian Council of Science in the relevant field of science (total number, name of the lecturer, field of science in which the teaching staff has the status of an expert and expiration date of the Latvian Council of Science expert) (if applicable).

3.4.4. Information on the participation of the academic staff, involved in the implementation of the doctoral study programme, in scientific projects as project managers or prime contractors/ subproject managers/ leading researchers by specifying the name of the relevant project, as well as the source and the amount of the funding. Provide information on the reporting period (if applicable).

3.4.5. Assessment of the cooperation between the teaching staff members by specifying the mechanisms used to promote the cooperation and ensure the interrelation between the study programme and study courses/ modules. Specify also the proportion of the number of the students and the teaching staff within the study programme (at the moment of the submission of the Self-Assessment Report).

Interlinking of cooperation between teaching staff of study courses and study courses was carefully planned in the study course of creation of the study programme. Study courses are arranged by years of studies in such a way that their learning is based on the knowledge acquired previously and consistent with the learning outcomes. Within one year, study courses are thematically linked, thereby reinforcing the achievement of the objectives of the study programme. When creating the study programme, each faculty member familiarised with the content of other study courses and the method of their implementation, in order to avoid duplication of content and to reduce the

likelihood of unlearned topics. Points of contact of study courses to understand and experience the relationship between the various fields of chemical and chemical technology were searched in joint discussions on the creation of the study programme. Such a targeted creation of the programme has enabled teaching staff to be aware of the need for cooperation and the ways to achieve it.

At the end of each year, the results of the survey of teaching staff are evaluated and there is an exchange of experience with the discussion of further forms of cooperation. The compliance of assessment criteria and learning outcomes of study courses with general learning outcomes of the study programme is an important part of the discussion.

The student-academic staff ratio at the study programme at the time of submission of the self-evaluation report is 31/49, or one academic staff member per 0.6 students. 29 lecturers are directly responsible for the study process of all the academic staff. Other lecturers are involved in providing separate parts of study courses (laboratory or practical work) if needed.

Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	Diploms, RKMM0 LV+EN.zip	Diploms, RKMM0 LV+EN.zip
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)	AIP Conclusion KMM0.pdf	AIP Atzinums, "Ķīmija un ķīmijas tehnoloģija", RKMM0.edoc
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period	Statistics, Annex 5, CCT 45528.pdf	Statistika, 5.pielikums, ĶĶT 45528.pdf
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard	Compliance with the standard, Annex 6, RKMM0 45528.pdf	Atbilstība standartam, 6.pielikums, RKMM0 45528.pdf
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)		
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	Mapping of study courses of the study program Chemistry and Chemical Technology, Annex 8.pdf	Studiju kursa Ķīmija un Ķīmijas Tehnoloģīja kartēšana, 8.Pielikums.pdf
The curriculum of the study programme (for each type and form of the implementation of the study programme)	RKMM0 (45528) Planning, Annex 9.pdf	RKMM0 (45528) plānojums, 9.pielikums.pdf
Descriptions of the study courses/ modules	Course descriptions (45528), Annex 10.zip	Studiju kursu_moduļu apraksti, 45528, 10.pielikums.zip
Description of the organisation of the internship of the students (if applicable)	Internship_Management_Procedure.zip	Prakses_organizesanas_kartiba.zip
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)	Confirmation - on compliance of the academic staff.edoc	Apliecinājums - AL 55. pants par prof. skaitu akadēmiskās programmās.edoc

Chemistry and Chemical Technology (43528)

Study field	*Chemistry, Chemistry Technologies, and Biotechnology*
ProcedureStudyProgram.Name	*Chemistry and Chemical Technology*
Education classification code	*43528*
Type of the study programme	*Academic bachelor study programme*
Name of the study programme director	*Māris*
Surname of the study programme director	*Turks*
E-mail of the study programme director	*maris.turks@rtu.lv*
Title of the study programme director	*Profesors, Dr.chem.*
Phone of the study programme director	
Goal of the study programme	*The aim of the study programme is to educate chemical technology specialists with academic knowledge and practical research skills in the fields of chemistry and chemical technology. To prepare graduates for independent work in companies related to the organization and control of chemical processes, quality assurance of materials and products in the field of chemical technology, chemistry and materials science, as well as for further studies in the master study programme.*
Tasks of the study programme	*General tasks of studies programme:* *• to ensure competitive bachelor level education in chemical engineering corresponding to EFCE (European Federation of Chemical Engineering) Bologna recommendations;* *• to provide a scientific base for professional activities, to develop scientific analytical skills and ability of independent solving of problems, as well as to prepare graduates for further master level studies.*

Results of the study programme	*Graduate of the study programme (outcomes):* *• demonstrates knowledge and understanding of the basic theories and processes of chemistry, chemical technology and the selected specialization;* *• is familiar with basic methods and equipment for the planning, implementation, result processing, analysis and interpretation of industrial production and scientific research and understands their nature and application areas;* *• is able to apply practically and theoretically basic theories and processes of chemistry, chemical technology and selected specializations to the practice;* *• is able to independently use the basic methods and equipment of planning, implementation, processing of results, analysis and interpretation;* *able to formulate, compare and summarize the obtained research or production results in instructions, reports and is able to present these results to industry professionals and the general public;* *• is able to independently plan, obtain, structure, analyse and implement the basic theories of chemistry, chemical technology and the selected specialization in research and production processes;* *• is able to independently select and implement methods for processing, analysis and interpretation of results and determine the suitability of equipment for the problem to be solved.*
Final examination upon the completion of the study programme	*Bachelor's thesis*

Study programme forms

Full time studies - 4 years - latvian

Study type and form	*Full time studies*
Duration in full years	*4*
Duration in month	*0*
Language	*latvian*
Amount (CP)	*160*
Admission requirements (in English)	*General or vocational secondary education*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Bachelor degree of engineering science in chemical technology*
Qualification to be obtained (in english)	*-*

Places of implementation

Place name	City	Address
Riga Technical University	RĪGA	KAĻĶU IELA 1, CENTRA RAJONS, RĪGA, LV-1050

Full time studies - 4 years - english

Study type and form	*Full time studies*
Duration in full years	*4*
Duration in month	*0*
Language	*english*

Amount (CP)	*160*
Admission requirements (in English)	*General or vocational secondary education. The assessment of the level of English language proficiency under the requirements specified in regulatory enactments.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Bachelor degree of engineering science in chemical technology*
Qualification to be obtained (in english)	-

Places of implementation

Place name	City	Address
Riga Technical University	RĪGA	KAĻĶU IELA 1, CENTRA RAJONS, RĪGA, LV-1050

3.1. Indicators Describing the Study Programme

3.1.1. Description and analysis of changes in the parameters of the study programme made since the issuance of the previous accreditation form of the study field or issuance of the study programme license, if the study programme is not included on the accreditation form of the study field, including changes planned within the evaluation procedure of the study field evaluation procedure.

In the period from the academic year 2013/2014 until 2020/2021 two academic Bachelor's study programmes "Chemical Technology" and "Chemistry" were implemented, which were previously accredited for six years during the accreditation process in 2013. During this period of six years, the content of both study programmes has been changed several times, following the industry requirements and the latest technologies.

Changes in the total number of applicants and students, as well as changes in the industry profile and their demand for specialists, required reorganization of the existing study programmes. In 2019, it was decided to create a new and modern Bachelor's academic study programme "Chemistry and Chemical Technology", which will meet the requirements of the industry for the coming decade. Another important aspect of the reorganization was the optimization of resources - efficient use of intellectual, material, technological and research resources.

The creation of this study programme was done within the framework of the SAM project (Reducing fragmentation of study programmes at Riga Technical University and strengthening resource sharing, No. 8.2.1.0/18/A/013). The development of the academic Bachelor's study programme "Chemistry and Chemical Technology" was launched based on two academic Bachelor's study programmes which were still implemented – "Chemical Technology", (Latvian education classification code: 43524) and "Chemistry" (Latvian education classification code: 43440). According to the decision of the Ministry of Education and Science Study Quality Commission No. 2021/21-L from June 16, 2021, the study programme was licensed and license No. 04051-193 was obtained. The specialization of the prospective alumni of this academic bachelor's study programme corresponds to the priority direction of the Latvian strategic specialization in science – *Technology, materials and engineering systems to increase the added value of products and processes and cybersecurity.*

The development of the study programme "Chemistry and Chemical Technology" was based on the current events in the industry and the surveys of industry partners as well as former and current students. Surveys for several years showed consistent suggestions for changes in the study programme and in the competencies to be acquired.

The indications obtained in the alumni surveys were considered. Those included demands for knowledge in a particular specialization and the ability to work with both mainstream production equipment and new, intelligent technologies. According to the employers' instructions, a significant emphasis has been placed on the in-depth acquisition of theoretical knowledge in close connection with practical skills.

The majority of the leading and also newly employed academic staff of FMSAC was involved in the working group for the development of the study programme "Chemistry and Chemical Technology". The workgroup on study programme development initially analysed the range and scope of knowledge and skills required for the acquisition of the basic directions of chemistry. Based on

these acquired skills and knowledge, the content and scope of study courses required for the acquisition of chemical technology were further developed. Considering the demand of the industry for graduates with certain specialization competencies, a number of specializations were identified in the study programme and the topics and scope necessary for their acquisition were set. The study programme was supplemented with an internship during which the student strengthens the acquired knowledge and skills.

The content of the study programme developed by the workgroup was discussed several times at the Faculty Advisers' Convention at various stages.

The workgroup together with the industry representatives has analysed knowledge, skills and competencies to be acquired at the bachelor's level. This allowed defining common results to be achieved by the general education part of the study programme and to plan the study courses to be created for the compulsory (A) part of the study programme. The industry experts and teaching staff performed a “mapping” of the learning outcomes of currently implemented study courses and previously identified industry topical skills of the Latvian Qualification Framework level 6 specialists. Thus, it was determined, which study courses can be taken directly from the study programmes to be enclosed, which study courses should be redesigned and improved, and which study courses should be made de novo. The field-specific part of the study programme (B part) was developed in a similar way.

3.1.2. Analysis and assessment of the study programme compliance with the study field. Analysis of the interrelation between the code of the study programme, the degree, professional qualification/professional qualification requirements or the degree and professional qualification to be acquired, the aims, objectives, learning outcomes, and the admission requirements. Description of the duration and scope of the implementation of the study programme (including different options of the study programme implementation) and evaluation of its usefulness.

The goals and objectives of the study programme correspond to level 6 of the Latvian Qualification Framework (LQF) and it is targeted at applicants possessing general secondary education or vocational secondary education without additional admission rules.

Admission of applicants to the full-time Bachelor’s study programme (teaching in Latvian) is done based on the results of the high school centralised exams (CE) in mathematics, the Latvian language, a foreign language, chemistry, physics, and final grades in particular subjects in the document of the secondary education.

According to the regulations for admission of foreigners, foreign applicants must pass the entrance exam in English and mathematics. Foreigners who wish to study in the Latvian language must submit a state language proficiency certificate issued by the state language proficiency examination commission. Language proficiency must be at least second level B.

The title of the study programme points out the purpose of the study programme – to prepare for the chemical and chemical technology industry highly qualified specialists of LQF level 6 in chemical technology and environmental aspects, chemistry and technology of biologically active compounds, polymeric materials, inorganic materials and biomaterials as well as in applied chemistry.

Acquired knowledge, skills and competencies will make graduates be able to work in chemical and

materials industry companies and scientific institutions. According to the provided task, quality and time requirements, they will be able to plan, organize, and ensure the production process. The graduates are prepared also for further studies in Master's study programmes.

The **aim** of the study programme is to educate specialists with academic knowledge and practical research skills in the fields of chemistry and chemical technology. To prepare graduates for independent work in companies related to the organization and control of chemical processes, quality assurance of materials and products in the field of chemical technology, chemistry and materials science, as well as for further studies in the master's study programme.

The following **tasks** have been determined in order to achieve the aims of the study programme:

- to ensure competitive bachelor level education in chemistry and chemical engineering corresponding to EFCE (European Federation of Chemical Engineering) Bologna recommendations;
- to provide scientific background for professional activities, to develop scientific analytical skills and ability of independent solving of problems, as well as to prepare graduates for further master's level studies.

Graduate of the study programme (**outcomes**):

- demonstrates knowledge and understanding of the basic theories and processes of chemistry, chemical technology, and the selected specialization;
- is familiar with basic methods and equipment for the planning, implementation, result processing, analysis and interpretation of industrial production and scientific research and understands their nature and application areas;
- can practically and theoretically apply basic theories and processes of chemistry, chemical technology, and selected specializations to the practice;
- can independently use the basic methods and equipment of planning, implementation, processing of results, analysis, and interpretation;
- can formulate, compare, and summarize the obtained research or production results in instructions, reports and is able to present these results to industry professionals and the general public;
- can independently plan, obtain, structure, analyse and implement the basic theories of chemistry, chemical technology and the selected specialization in research and production processes.
- can independently select and implement methods for processing, analysis and interpretation of results and determine the suitability of equipment for the problem to be solved.

The content of the study programme is developed in such a way that the objectives and the learning outcomes of the study courses to be achieved would ensure the achievement of the overall goal and results of the study programme. The above is confirmed by the mapping of the learning outcomes to be achieved in the study courses. The biggest focus in the study process is on acquiring knowledge, professional, and practical competencies based on the science achievements, theoretical knowledge, and the industry specifics. This is the sole study programme in Latvia, which prepares human recourses with competencies in chemical technology.

A Bachelor's degree of Engineering Science in Chemical Technology is awarded after successful completion of the theoretical and practical study courses of the study programme, internship in a company or scientific institution and defence of a Bachelor's thesis to the Final Examination Commission.

This ensures a mutual connection between the title of the study programme, the degree to be acquired, the goal and objectives, the learning outcomes, as well as the admission requirements.

The full study workload in the study programme is 160 credit points (CP) of which compulsory study courses constitute 117 CP, compulsory elective part – 22 CP, free elective choice – 5 CP, internship – 6 CP, Bachelor's thesis – 10 CP.

The content of the study programme is designed to ensure that a graduate complies with employers' demands for a highly qualified graduate with a broad spectrum of knowledge in both chemistry and chemical technology, as well as practical skills in the particular field of specialisation. To provide graduates with the required qualification, the structure of the study programme includes the sequential mastering of knowledge, skills and competencies in accordance with the following principles:

- in the first year of studies, the student strengthens and deepens the basic knowledge mastered in secondary school in exact sciences – mathematics, physics, general chemistry and inorganic chemistry;
- in the second year of studies, the student theoretically and practically masters the theories and methods of the three other basic fields of chemistry – analytical, organic and physical chemistry;
- in the third year of studies, the student masters the basics of chemical technology – basic processes and apparatus for chemical technology, automation and modelling, familiarises with materials science, as well as starts studying the selected specialisation;
- at the beginning of the fourth year of studies, the student continues to study chemical technology and specialisation study courses, has an internship and drafts a Bachelor's thesis in the second semester.

In this way, it will be ensured that knowledge, skills and competencies are mastered so that, when starting a professional activity, the graduate has the appropriate qualifications to get involved quickly and successfully in the performance of job duties in the selected field both in Latvian and foreign companies and research institutions.

The study programme is intended to be studied in full-time intramural studies. Its implementation started in the 2021/2022 academic year, by enrolling students in the first year and transferring second-year students to the new study programme.

Program code 43528 complies with Cabinet of Ministers Regulation No 322 Latvian Classification of Education. The first and second levels of classification, represented by the first two digits of code 43, are academic education (bachelor's degree), to be implemented after general or professional secondary education. Duration of full-time studies is three to four years. The third, fourth and fifth levels of classification (thematic groups, subject areas and program groups), denoted by the next three digits 528, are Chemical Technologies (52 stands for Engineering and Technology).

3.1.3. Economic and/ or social substantiation of the study programme, analysis of graduates' employment.

The study programme conforms to the strategic development directions of the university, the needs of the public and the national economy and development trends. The study programme includes the requirements of the Latvian and the European Union legislation.

The relevance of the study programme was defined by the necessity to prepare specialists for the Latvian and international labour markets with wide knowledge and practical skills in chemistry and, at the same time, chemical technology, and with a specialization in one of the sub-fields. The study

programme aims to provide Latvian specialists with interdisciplinary knowledge and practical skills useful to solve challenges related to chemical production and research.

The study programme thus created provides an opportunity to bring students together in one Bachelor's study programme without creating a separate study programme for each sub-field and enabling students to continue their studies in the United States, which requires a four-year prior education.

Latvian pharmaceutical companies, manufacturers of construction materials and also manufacturers and recyclers of polymer materials dominate among employers. Food and cosmetics production and recycling companies, certification laboratories, and state control institutions are also employing students. Graduates are employed as research associates in a number of Latvian research institutes, such as the Latvian Institute of Organic Synthesis, the Latvian State Institute of Wood Chemistry, and the Institute of Solid State Physics.

Analysing the employment of previous study programme graduates, it should be noted that the majority of graduates start to work while studying. Some are involved in the production process and product quality control, while others are working as researchers in scientific institutions.

3.1.4. Statistical data on the students of the respective study programme, the dynamics of the number of the students, and the factors affecting the changes to the number of the students. The analysis shall be broken down into different study forms, types, and languages.

The study programme is implemented in Latvian and English in Riga. Graduates of both the general secondary education institutions and technical colleges and vocational schools, having completed the secondary education, study in the study programme.

The implementation of the study programme following the receipt of the licence started in the 2021/2022 academic year. 70 students were enrolled in the study programme, 7 of whom were foreign students. Foreign countries from which students were enrolled are China, Sri Lanka, Ukraine and India. Similarly, 40 second-year students of the "Chemical Technology" study programme moved to the new study programme as well.

Statistics on students in previous study programmes – "Chemistry" and "Chemical Technology" – show general trends. Figure 3.1.4.1 shows data on the number of students enrolled in previous programmes, Figure 3.1.4.2. shows the total number of students and Figure 3.1.4.3 shows the number of dropouts. Student count statistics clearly show the falling interest in the "Chemistry" study programme. The number of dropouts during the reporting period was on average around 50. Due to the COVID-19 pandemic and various restrictions on the assessment of students, a drop in the statistics of dropouts was observed in the 2019/2020 academic year, which balanced at the expense of the next academic year.

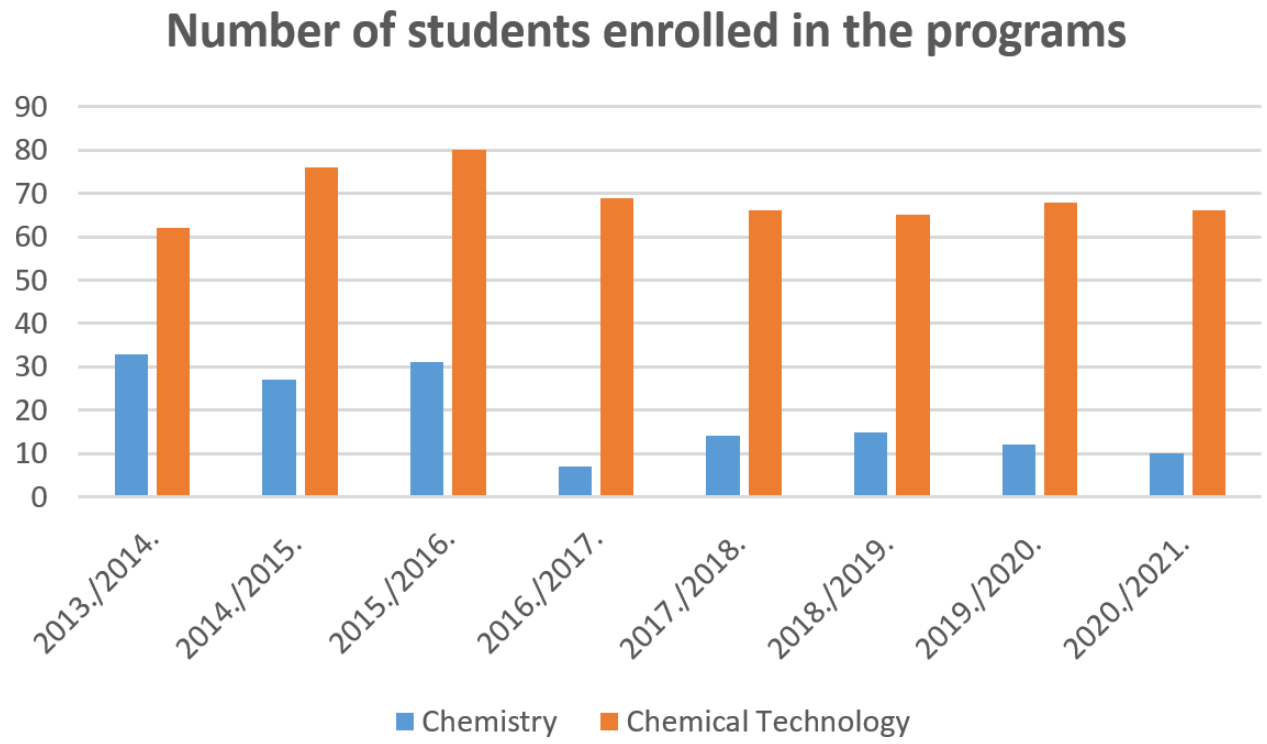


Figure 3.1.4.1. Number of students enrolled in the study programmes

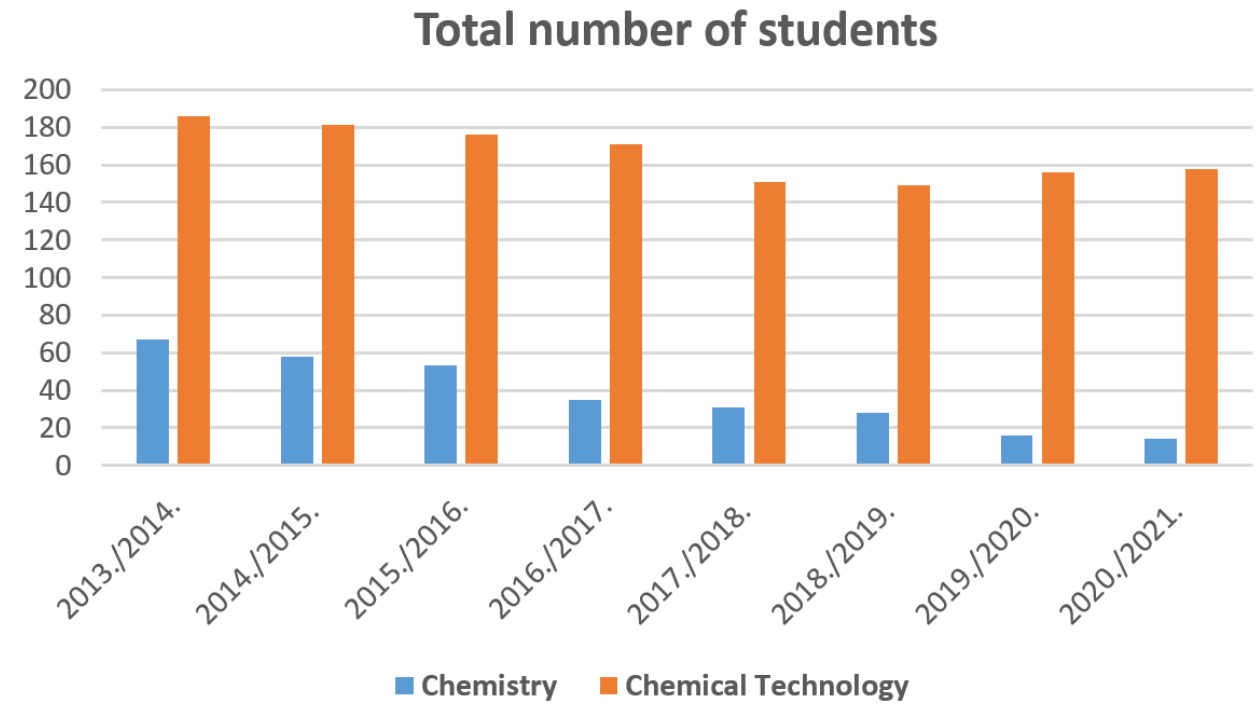


Fig. 3.1.4.2. The total number of students in study programmes

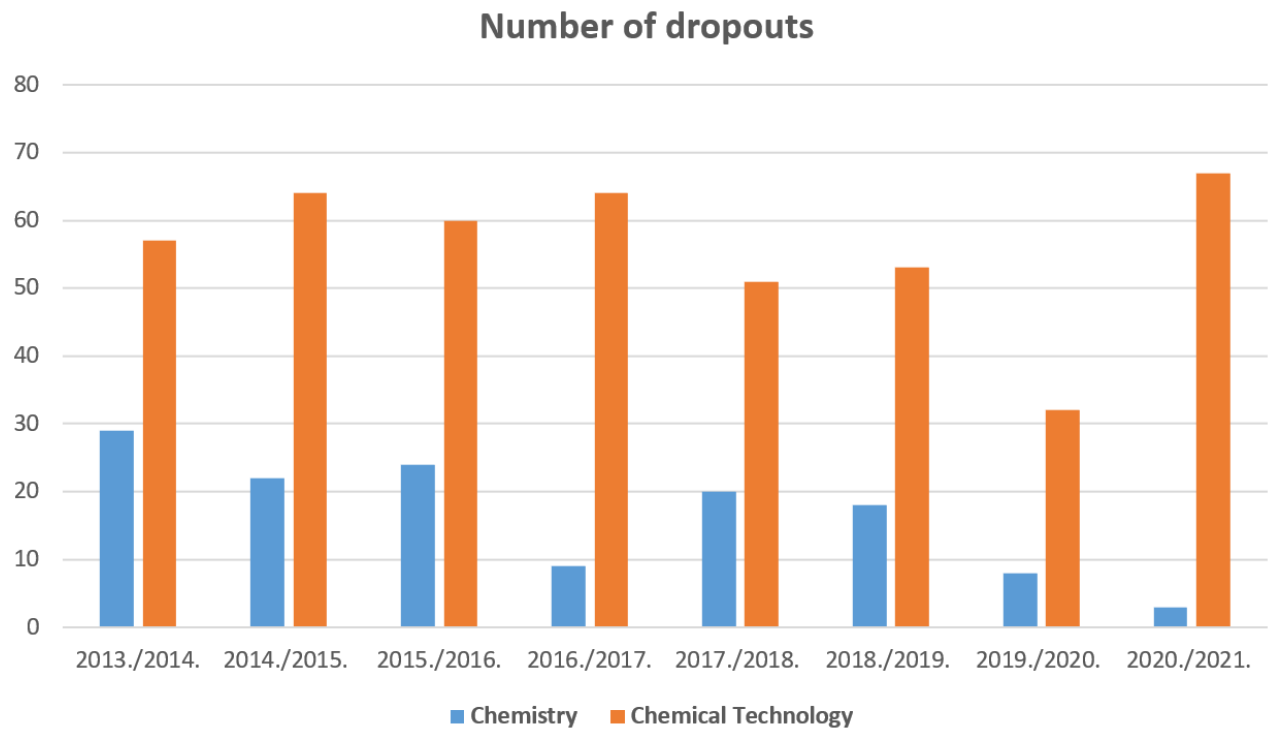


Fig. 3.1.4.3. The total number of dropouts

The main reasons for student drop-outs in the previously implemented “Chemical Technology” and “Chemistry” study programmes are the failure to meet requirements to pass study courses, the recognition gained during their studies that the chosen field does not meet the expectations, everyday reasons, or financial considerations. Due to the epidemiological situation, students' drop-out is also caused by their inability to study remotely.

The full-time study programme provides the opportunity for intramural students to participate in the Erasmus+ international exchange project. However, it should be noted that this possibility is used rarely. As indicated by the students, the reasons for this are usually the complicated process of coordinating the courses to be studied and financial aspects.

Statistical data on students in the reporting period are available in Annex 5.

3.1.5. Substantiation of the development of the joint study programme and description and evaluation of the choice of partner universities, including information on the development and implementation of the joint study programme (if applicable).

3.2. The Content of Studies and Implementation Thereof

3.2.1. Analysis of the content of the study programme. Assessment of the interrelation between the information included in the study courses/ modules, the intended learning outcomes, the set aims and other indicators with the aims of the study course/ module and the aims and intended outcomes of the study programme. Assessment of the

relevance of the content of the study courses/ modules and compliance with the needs of the relevant industry, labour market and with the trends in science on how and whether the content of the study courses/ modules is updated in line with the development trends of the relevant industry, labour market, and science.

By analysing compliance with Regulations of the Cabinet of Ministers No. 240 “Regulations on the National Standard of Academic Education” of 13 May 2014, it can be concluded that the academic Bachelor’s study programme “Chemistry and Chemical Technology” complies with the requirements set out in the standard. A comparison of the study programme with the requirements of the standard is made in Annex 6.

The study programme provides cross-linkage between the information included in the study courses, learning outcomes, set aims, and methods, as well as linkage of every study course with the aims and learning outcomes of the study programme. The linkage is reflected in the study programme mapping (Annex 8).

The aim of the study programme has been set based on the recent developments in the profession, as well as on the needs of the Latvian economy and society. The study programme tasks have been structured to allow training of students according to the levels of LQF, as well as to promote the competitiveness of the students in the changing socio-economic environment and international labour market.

The study programme is implemented in the form of lectures, practical classes and lab works, allocating considerable time for self-studying, whereas diverse basic principles and theories of chemistry and chemical technology are acquired in detail. The curriculum of the study programme has been designed to meet the requirements of the regulations and elaborated in accordance with RTU Senate decision “On the unified requirements in respect to the study programmes”.

The length of study is 4 years, with 8 academic terms. The study programme contains compulsory, elective compulsory study courses and free elective study courses as well as practical placement. Upon completion of their studies, students must complete a Bachelor’s Thesis project.

The study programme is implemented in Latvian and English. There are no differences in content between the two forms, except that, in accordance with the decision of the RTU Senate of 26 November 2018, a foreign student must master the Latvian language course in addition to the content of the study programme (Latvian for foreign students).

The study programme adopts a variety of principles for study course selection and acquisition. The study courses are meant to ensure the mandatory minimum knowledge, skills and competencies for the chemical industry job are included in the compulsory part, and they are acquired in full by all students. The volume of compulsory study courses in the study programme is 117 CP (175.5 ECTS). These study courses develop students' knowledge and skills in the basic fields of chemistry - general, inorganic, organic, physical and analytical, as well as chemical technologies in basic processes and units, plant design, chemical reactor and reaction engineering, process automation and modelling.

The study courses that increase knowledge and awareness or allow for the deeper acquisition of specific skills and competencies in a certain field are included in the compulsory elective part and students should select them within the framework of the study programme limits (22 CP or 33 ECTS).

The planning of the study programme during 8 semesters is shown in Annex 9, with the

accompanying detailed study course descriptions (Annex 10), where the learning outcomes of study courses are consistent with the outcomes of the study programme. All study courses are available on the ortus.lv platform, so other teaching staff and university scientific staff can see descriptions of study courses, thereby ensuring interlinking.

At the end of the study programme, the student must draft a Bachelor's thesis which includes the preparation of a review of literature on the subject of the work done, the practical part and the summary of results. The topics for the thesis are offered by faculty departments and are always related to the scientifical directions of research. The final work can also be developed in a manufacturing company. In such a case, the second work supervisor shall be involved in the department, who supervises the quality of the paper and compliance with the objectives of the study programme and the learning outcomes. The drafting of a graduation paper organised in this way contributes to the practical preparedness of graduates for work in the sector.

The structure of the study programme and the content of its courses were examined in the Advisers' Board of the FMSAC. According to industry experts, the content of the study courses was supplemented or changes were made to the content of the study courses, in line with the recommendations of industry representatives. The Advisers' Board expressed the need for a study programme for graduates with developed practical skills in the field of chemistry and chemical technology. This was considered both in the development of study courses for the compulsory part and by including practical and laboratory works, and supplementing the study programme with a study project in basic processes and apparatus of chemical technology, which the student may, at his/her choice, draft on a topic that is relevant for a manufacturing company. Practical skills are further strengthened during a compulsory internship of 240 h, which must be completed in a manufacturing company or a scientific institute. The study programme and its content were also reviewed by the Study Field Committee, which includes widely represented industry professionals.

Each academic staff member involved in the study programme has a sufficient and up-to-date number of scientific publications on the subject of the lectured course. This confirms and ensures the ability of the academic staff to include the latest scientific discoveries in the content of their study courses.

A number of study courses provide practical classes and tours to manufacturing companies, during which the student will have the opportunity to familiarise with the specifics and job opportunities of the sector.

3.2.2. In the case of master's and doctoral study programmes, specify and provide the justification as to whether the degrees are awarded in view of the developments and findings in the field of science or artistic creation. In the case of a doctoral study programme, provide a description of the main research roadmaps and the impact of the study programme on research and other education levels (if applicable).

3.2.3. Assessment of the study programme including the study course/ module implementation methods by indicating what the methods are, and how they contribute to the achievement of the learning outcomes of the study courses and the aims of the study programme. In the case of a joint study programme, or in case the study programme is implemented in a foreign language or in the form of distance learning, describe in detail

the methods used to deliver such a study programme. Provide an explanation of how the student-centred principles are taken into account in the implementation of the study process.

The study programme provides an equal opportunity for Lavian and foreign students to acquire basic knowledge in practically all directions of chemistry and chemical technology, as well as an opportunity to develop practical skills in seminars, problem solving sessions and laboratory work. The study programme includes the study courses, practice, and Bachelor's Thesis project divided proportionally by semesters, so that they complement each other as much as possible, ensuring students' purposeful progress towards the acquisition of knowledge and skills. The first two years are dedicated to the acquisition and strengthening of knowledge and skills in physics, higher mathematics and basic fields of chemistry. In the third and fourth study years, the emphasis is on the acquisition of chemical technology and a specialized field and the strengthening of skills in practice. In general, the study programme and the planning of each semester are designed to focus on the acquisition and strengthening of knowledge and professional skills for each student, working both individually and in a team.

The study courses are general-theoretical, they are supplemented with research work elements in the form of reports, research and other kinds of self-studying. Practical guidance is individual, whereas each student develops an independent study project in the framework of a common topic. Attendance of problem-solving sessions is mandatory for all students during the entire study period. Within each study course, students must pass planned assessment tests, complete individual home assignments and develop term papers. Only the students who have fulfilled all requirements of the study course are admitted to the examination. Results of exams and tests are registered in the electronic database of RTU Study Management System.

Assessment of learning outcomes is made according to the regulation on the assessment of learning outcomes (https://www.rtu.lv/writable/public_files/RTU_studiju_rezultatu_vertesanas_nolikums.pdf (in Latvian); the English translation is in the file of Appendix 04 of the List of Internal regulations) and regulations on the final examinations at Riga Technical University (see the file of Appendix 08 of the List of Internal regulations). The academic staff responsible for the study courses, in accordance with the specifics of the study course content and study programme, as well as the needs of the students, choose the methods of structuring, teaching and evaluating the study courses.

At the beginning of each study course, the academic staff informs students about the study course acquisition requirements and familiarizes students with specific evaluation criteria of the study course. They are published in the portal ORTUS. Twice per academic term, students evaluate the performance of the academic staff in ORTUS environment by answering the survey questions. These include evaluation of the study process, individual tasks, acquired skills, the academic staff’s attitude, and cooperation with the students. Survey questionnaires are anonymous. Graduates complete graduate questionnaires.

The results of surveys are reviewed at department meetings and proposals for changes are drawn up. The main items of the survey are also discussed at the Study Field Committee meeting. A careful analysis of survey results makes it possible to make well-considered changes to the content of the study course and the study programme.

The study programme director regularly discusses current issues of the study process and quality, involving in these discussions other interested parties.

The methods employed in the study programme promote the achievement of the aims and outcomes of the study courses and the study programme is based on the student-centred principles of education. The study programme owes its value to a professional dialogue between the academic staff and students, involving students in the improvement of the curricula and methods of the study courses. Students can take part in the improvement of the study process directly – expressing their aspirations to the academic staff of a certain study course, a department chair, the study programme director, or through representatives of the student self-government, whose representatives are members of FMSAC Council, RTU Senate and RTU Senate commissions, as well as members of RTU Academic Assembly.

FMSAC relationships with students are based on the principles of mutual confidence, respect and fairness. This imposes students both extra obligations and offers additional rights. Students have an opportunity to influence their learning process, exercise their autonomy, to provide feedback on the study process, aligning it with their professional growth interests. The feedback between students, academic staff and study programme administration is greatly influenced by FMSAC student self-government that takes an active part in all mentioned processes.

Elaborating and implementing the study courses, a special focus is made on reflection of the topical case studies in the study programme curriculum (at the level of lectures, lab works and practical classes), integration and cross-disciplinarity of the study courses and the study programme; optimization of the curriculum in cooperation with external and industry experts. Thus, the interaction of knowledge, competencies and skills acquired by graduates is ensured.

Individual studies play a significant role. Description of the course of autonomous studies is included in the description of the study course as a mandatory part. The skills of the students to learn individually are systematically developed within all the study courses. Students acquire skills of practical and research work by regular use of literature and internet resources, including international scientific databases, which are available at RTU Library with electronic access to ORTUS, to develop successful research papers and also Bachelor’s Theses.

RTU departments, including Personnel, Research, International Relations Departments, and the Centre for Academic Excellence regularly inform the academic staff about opportunities to advance their competencies in the field of scientific research, methodological and teaching skills, general competencies (foreign languages, information technologies, public speaking and presentation skills, etc.), and specific professional activities. ORTUS accumulates information about the scientific activities of the academic staff. To offer high-quality teaching, seminars on the teaching methodology are organized for the academic staff of RTU, which address opportunities for the application of different study methods, experience and good practices.

The academic staff of the study programme regularly improve the curriculum by introducing new learning organizational practices into the study process. The study process integrates international experience, FMSAC learning environment and infrastructure are adapted for the groups of students with various professional interests, maintaining the stable quality of studies.

3.2.4. If the study programme envisages an internship, describe the internship opportunities offered to students, provision and work organization, including whether the higher education institution/ college helps students to find an internship place. If the study programme is implemented in a foreign language, provide information on how internship opportunities are provided in a foreign language, including for foreign students. To provide analysis and evaluation of the connection of the tasks set for students during the internship included in the study programme with the learning

outcomes of the study programme (if applicable).

Based on a recommendation by industry representatives the study programme includes an internship of 6 CP (9 ECTS). Its objective is to improve the skills and competencies of a student in a professional environment, as well as to strengthen and supplement knowledge in line with the requirements of the professions of the chemistry and chemical technology sectors. The internship is regulated by the regulations "On Procedures for Organising Internship at RTU" adopted by the RTU Senate, regulation and methodological guidelines of the FMSAC (see in the Annex). A student must complete the internship in the fifth semester or in the summer before it. A student may choose a place of internship according to his/her own interests or it can be offered by the faculty. The place of internship chosen by the student must be coordinated with the internship coordinator.

If additional assistance is required, students can contact the Career Support and Services Unit, where a career consultant and project manager assist students in finding and addressing companies, where to undergo internship, as well as promote the development of career management skills through a variety of activities that can ensure the achievement of successful results during the internship. Once a year, the Career Support and Services Unit organizes RTU Career Day, where students also have the opportunity to meet face-to-face with company representatives and discuss future opportunities. More information about the event and participants of the previous years is available at https://www.rtu.lv/lv/studentuserviss/karjeras-centrs-ssc/karjeras-diena (in Latvian). Since 2022, FMSAC additionally organizes chemistry-related Career Day by inviting Latvian chemical and materials companies. An additional resource developed in 2015 is a website that invites companies to post vacancies that are relevant to RTU students (https://ekarjera.rtu.lv/). Students have the opportunity to log in with the University username and keep abreast of current internships and job opportunities in their field.

RTU Development Fund provides additional support for practical skills promotion (https://www.rtu.lv/en/developmentfund). Several practical skills scholarship calls are available each year, which are organized in cooperation with companies. Each year, the University signs cooperation agreements with companies and organizations (template in English is in the file of Appendix 37 of the list of Internal regulations), where the parties agree on the provision of internship places to students.

The internship is supervised by the internship coordinator appointed by the head of the structural unit, who is responsible for the planning, provision and supervision of the internship. The internship on the part of the company is led by the internship supervisor – an employee appointed by the company who has higher education and work experience in the field corresponding to the student's specialization.

Companies that promote the achievement of the results of the study programme and correspond to the student's field of specialization are selected to provide the internship for the students.

FMSAC, the company and the student enter into a tripartite agreement, which sets out the obligations, rights and responsibilities of the parties. The appointment of a student in the internship is formalized by an order of the Dean of FMSAC, indicating the term of the internship, the name of the company and the coordinator of the student's practice. If the company is not located in Latvia or the student is a foreign citizen, a tripartite agreement will be concluded in English.

Until now, foreign students have not needed to organise internship. A foreign student will be able to choose a place of internship in Latvia, abroad or in his/her country of residence.

The internship guidelines and methodological instructions describe the goals and tasks of the internship and the schedule of the internship and the procedure for reporting and defence, as well as the evaluation method in detail.

The tasks of the internship are closely related to the learning outcomes to be achieved in the study programme.

General internship tasks:

1. To get acquainted with the organisational structure, its operation, its goals, tasks, operational system, sites and methods, and relation to other organisations, in compliance with its scope and field of operation.
2. To get acquainted with the available equipment, technological processes, quality control measures and issues, which are solved at the internship place, the processes and methods of resolving them. Familiarising with the work techniques and the operation principles of the equipment and processes used during the completion of the internship.
3. Practical involvement in the work of the internship place by completing individual internship tasks according to the defined schedule in cooperation with the staff of the internship place.
4. Collection of all required data, summarising them and preparing the internship report.

Internship in a professional environment contributes to the achievement of all learning outcomes, as it is one of the final stages prior to the drafting of a Bachelor's thesis. During internship, the student must demonstrate the knowledge defined in the study programme, use the skills and demonstrate the competencies to be attained. The internship framework shows a wider student performance than in individual study courses.

3.2.5. Evaluation and description of the promotion opportunities and the promotion process provided to the students of the doctoral study programme (if applicable).

3.2.6. Analysis and assessment of the topics of the final theses of the students, their relevance in the respective field, including the labour market, and the marks of the final theses.

The graduation thesis of the "Chemistry" and "Chemical Technology" study programmes were very varied and always related to ongoing research projects or processes in the sector. These include the development of new medical substances, cosmetic products, development of methods and technologies for obtaining innovative materials (e.g. polymeric materials, wood materials, biomaterials, silicate materials, organic material), research in the field of sustainable chemical solutions, and technology optimisation solutions to be used in the sector. A part of the thesis is developed in cooperation with industry companies. It makes it possible for students to familiarise themselves and evaluate the operational processes of companies and scientific institutes, acquire practical skills, as well as to offer the necessary optimisation solutions, both in the manufacturing process and in the development of the product, reflected in the graduation thesis. This is also continued in the new study program "Chemistry and Chemical Technology".

Topics of Bachelor's theses are selected according to the program's specialisation directions. The

most relevant topics of the specialisations in the last six years are listed below.

Topics of Bachelor's theses in "*Production technology and environmental aspects*" specialization:

1. Research on the development of technologies of innovative composites,
2. Research on the treatment of chemically polluted water and the development of various sorbents,
3. Research of CO_2 adsorption technologies and materials in biofuel production,
4. Research of biotechnological processes,
5. General chemical technology, mass transfer research.

Topics of Bachelor's theses in "*Sustainable chemistry*" specialization:

1. Synthesis of biodiesel using interesterification reactions,
2. Synthesis and properties studies of compounds used in materials for photonics,
3. Synthesis and properties of dicarbonyl compounds and their derivatives,
4. Medium fast and fast pyrolysis of agricultural residues available in Latvia,
5. Studies on the catalytic oxidation of glycerol with oxygen,
6. Chemical modification of graphene oxide.

In cooperation with industry:

7. Ensuring the quality of monitoring of emissions into the atmosphere in a thermal power plant.

Topics of Bachelor's theses in *“Chemistry and technology of polymer materials” specialization:*

1. Investigations on nanocomposites and hybrid composites with carbon allotropic forms,
2. Investigations on lignocellulosic fibres containing polymer composites and hybrid composites,
3. Utilization of industrial, forestry and agricultural byproducts for development of polymer composites,
4. Investigations on polyurethane foam composites,
5. Assessment of 3D printing technologies for polymer nanocomposites,
6. Investigations on processing and dyeing technologies of textile fibers,
7. Investigations on aging of natural polymers and solutions for materials protection against the effects of aggressive factors of external environment.

In co-operation with industry:

8. The use of industrial byproducts for the development of polymer modified bituminous systems,
9. Polymer anti-corrosion coatings,
10. Lignocellulosic fibers reinforced polymer composites,
11. Microbially synthesized polymer composites,
12. Utilization of forestry and industrial byproducts for the development of polymer composites.

Topics of Bachelor's theses in *“Chemistry and technology of biologically active compounds”* specialization:

1. Reactions of purine derivatives with nucleophiles and fluorescence studies of the obtained products,
2. Synthesis of azole conjugates with triterpenes of lupane series,
3. Synthesis, methods of analysis and properties of analogues of avenanthramides,
4. Synthesis and studies of derivatives of sugars,
5. Search for antioxidants in coumarin range,
6. Synthesis and investigation of properties of different derivatives of nitrogen heterocycles as

potentially biologically active compounds.

In cooperation with industry:

7. Extraction technology of betulin from birch bark and synthesis of its derivatives,
8. Improvement of oxidative stability of lipsticks using plant extracts,
9. Application of plant extracts for improvement of oxidative stability of vegetable oils,
10. Aziridine-triazole derivatives as potential MMP inhibitors,
11. Extracts of pine and spruce needles and their applications.

Topics of Bachelor's theses in *“Chemistry and technology of biomaterials”* specialization:

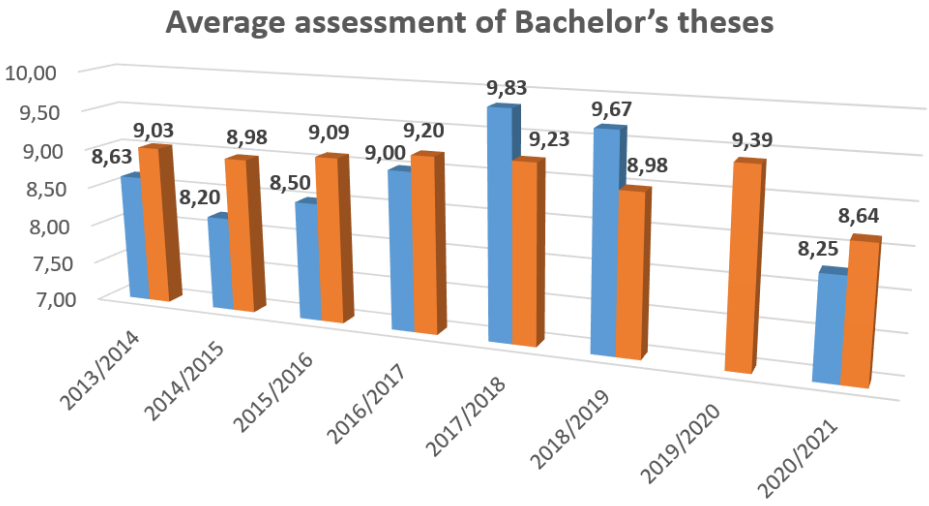
1. Development of synthesis technology for biomaterials for bone tissue regeneration,
2. Development of synthesis technology for calcium phosphate and biopolymer-based drug delivery systems for bone tissue regeneration,
3. Development of synthesis technology for composites based on calcium phosphates and biopolymers for bone tissue engineering,
4. Development of technology for obtaining of various forms of biomaterials based on calcium phosphates and biopolymers for bone tissue regeneration,
5. Studies on physicochemical, *in vitro* antibacterial and cell viability properties of developed biomaterials,
6. Application of instrumental methods of analysis in studies of quality, metabolism and pharmacokinetics of drug substances and preparations.

Topics of Bachelor's theses in "*Chemistry and Technology of Inorganic Materials*" specialization:

1. Synthesis and properties of nanostructured photocatalysts,
2. Synthesis and properties of biomaterials,
3. Preparation, modification and properties of functional nanomaterials,
4. Synthesis and properties of ceramics,
5. Research of construction materials and binders,
6. Synthesis and properties of materials for batteries.

In order to ensure the development of high-quality graduation theses, two months before defence departments organise an intermediate control of the progress of the work, during which the student presents the work done, as well as gets recommendations from the academic and scientific staff of the department for the improvement of the results.

As shown below, the average assessment of Bachelor’s theses of previous study programmes has been consistently high and ranged from 8.2 to 9.8. The drop-in assessments over the last year are due to the difficulty to develop high-quality work during the pandemic due to long-term problems in carrying out systematic day-to-day work in laboratories. Until the 2020/2021 academic year, graduation theses were defended at departmental meetings, but since the last year, they have been defended in joint committees of representatives of departments for thematically unified thematic groups of final theses. It provides a broader vision of the level of skills, knowledge and competence of graduates of thestudy programme.



	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021
Chemistry	8,63	8,20	8,50	Data Table	9,83	9,67		8,25
Chemical Technology	9,03	8,98	9,09	9,20	9,23	8,98	9,39	8,64

3.3. Resources and Provision of the Study Programme

3.3.1. Assessment of the compliance of the resources and provision (study provision, scientific support (if applicable), informative provision (including libraries), material and technical provision, and financial provision) with the conditions for the implementation of the study programme and the learning outcomes to be achieved by providing the respective examples.

The study program is mainly implemented by five scientific institutes of the FMSAC:

- Institute of Technology of Organic Chemistry;
- Institute of Applied Chemistry;
- Institute of General Chemical Engineering;
- Institute of Polymer Materials;
- Institute of Materials and Surface Engineering,

who provide education and learning support: develop and update descriptions of the study courses, implement the corresponding study courses (including practical and laboratory works and seminars), supervision and defence of the Bachelor's thesis, and other activities related to learning, teaching and research work.

All these institutes are active in the development of scientific projects that contribute to the systematic renewal of the scientific-technical base, which is also available to students both in the course of learning study courses and in the development of Bachelor's thesis. In the assessment period, 8.5 MEUR have been invested in the renovation of buildings and 9.5 MEUR - in modern research equipment. Table 3.3.1 gives data on the premises used for the provision of the study programme. In recent years, teaching laboratories and auditoriums have been renovated, funds have been invested in purchasing digital training process management equipment, and the renewal of technical equipment. Thus, students are given extensive opportunities to familiarise themselves

with basic methods and equipment in chemistry and chemical technology techniques and to acquire practical experience in their use during studies.

Table 3.3.1. Premises used for the provision of the study programme

Type of use of the room	**Number of rooms**	**Area, m^2**
Meeting / Conference Room	3	239
Computer class	2	74
Classroom / study room	16	1139
Cabinets / Teachers' rooms	64	1801
Study and scientific laboratory	106	19232
Auxiliary room	16	308
Warehouse	4	100
Library	1	540
In total	**212**	**23433**

Joint study courses of the university are provided in cooperation with the Department of Engineering Mathematics, the Institute of Technical Physics, the Department of Occupational Safety and Civil Defence, the Department of Innovation and Business Management, the Department of Social Sciences and the Department of Languages for Special Purposes.

In 2016, significant investments were made in the development of the RTU Scientific Library (SL) infrastructure by building additional premises (2240 m^2). The library is equipped with self-service facilities. The SL is accessible for users with disabilities.

The financing of each information resource for study programmes is determined according to the total allocated fund for RTU SL. The collection is supplemented according to the recommendations of the study programme director and lecturers considering the granted funding.

At the request of the academic staff of the study programmes “Chemistry” and “Chemistry technology”, 130 new books were purchased by the SL amounting to 12000 EUR in the period of 2013 – 2021. Electronic databases and electronic books available in them can also be used for study work. Most resources and purchased books are in English. Textbooks in Latvian are prepared by the academic staff of the course and published by RTU publishing house.

Editions that are not available in the SL are delivered through an interlibrary subscription or international subscription. Internet access is provided throughout the SL. The SL provides copying, scanning, printing and binding services, as well as there is a self-service canteen.

In the Chemistry Branch of the SL located on the premises of the FMSAC, the reading room provides freely accessible workplaces for students, educational and scientific literature. The library provides internet access, as well as copying, scanning, and printing services are available. The Library’s Chemical Branch provides open-access databases of abstracts, such as Chemical Abstracts and a significant collection of chemistry journals, which includes the most important journals in the sector

– these are editions of ACS, RCS, Wiley, Elsevier, Springer and the collection of journals issued in Russia. It is the most complete collection of journals of the chemical sector in Latvia.

The stocks of the Chemistry Branch of the SL contain printed books and various editions (doctoral theses and summaries thereof) in line with the directions of study and scientific work of the RTU FMSAC. All editions in the branch are open access. The stock of the Branch contains 6607 titles / 8396 copies of books, which are reflected in the Electronic Catalogue of the RTU Scientific Library (https://kopkatalogs.lv/) as at 10.03.2022.

In the Chemical Branch of the RTU Scientific Library, it is possible to use the database of full-text scanned materials "Chemistry", which contains mostly popular articles in press editions on a variety of chemical, pharmaceutical, materials science and technology topics starting from 2014. The database "Chemistry" is available in the electronic catalogue. Full texts are available only on computers of the Chemistry Branch. The stock of the Chemistry Branch of the RTU Scientific Library contains a Collection of Rarities of 686 books (928 copies). 139 books were issued before 1899. The collection includes the works of P. Valdens, V. Ostvalds and other academic staff of the Faculty. The oldest book is *B. Faujas de Saint-Fond "Minéralogie Des Volcans, ou description de toutes les substances produites ou rejetées par les feux souterrains"* issued in 1784. In the Collection of Rarities, most of the books are in German (700 copies), in Russian (121 copies) and in Latvian (59 copies). The entire Collection of Rarities is reflected in the electronic catalogue of the SL.

The study programme mainly is implemented in the building at P.Valdena Street 3/7, Riga, which is a part of the RTU Ķīpsala Campus.

The Campus currently comprises 54 classrooms, 187 laboratories, 19 specialised study rooms, 10 computer classrooms, 12 workshops and several research centres of national importance. There is also a student hostel on the Campus with 950 beds and a special block for people with disabilities. The entire RTU infrastructure is available to students and academic staff of the study programme. Five teaching laboratories are used for compulsory part study courses - laboratory of inorganic and analytical chemistry, laboratory of general and organic chemistry, laboratory of physical chemistry, laboratory of unit operation of chemical engineering, and laboratory of physics. They are equipped according to the requirements of the technical equipment of the laboratory works used in the courses.

In general, it can be concluded that the resource and provision base correspond to the conditions for the implementation of the study programme and the achievements of study results.

3.3.2. Assessment of the study provision and scientific base support, including the resources provided within the framework of cooperation with other science institutes and higher education institutions (applicable to doctoral study programmes) (if applicable).

3.3.3. Indicate data on the available funding for the corresponding study programme, its funding sources and their use for the development of the study programme. Provide information on the costs per one student within this study programme, indicating the items included in the cost calculation and the percentage distribution of funding between the specified items. The minimum number of students in the study programme in order to ensure the profitability of the study programme (indicating separately the information on

each language, type and form of the study programme implementation).

RTU funding from the basic state budget is made up of the study base financing corresponding to the list of study programmes and the number of students; it is used to cover such expenses as utilities, taxes, infrastructure maintenance (including data for the student and graduate register), purchase of equipment and supplies, staff remuneration, and funding for research activities for the implementation of the study programme comes from state budget grants and students' funds.

The number of study places is allocated after discussions with the Ministry of Education and Science. Funding from the state budget is allocated for full-time studies. The amount of study base funding is determined on the basis of the number of study places determined by the state at RTU, as well as the state-defined study place basic expenses and study cost coefficients in the thematic areas of education.

Information regarding the financial resources of the academic Bachelor's study programmes "Chemistry" and "Chemical technology" are presented in Table 3.3.3. The distribution of financial resources for the program "Chemistry and Chemical Technology" for the 2021/2022 academic year is not yet available, as the financial year at RTU ends in September.

Table 3.3.3. Financial resources

Academic year	State budget funding, EUR	Tuition fees for local students, EUR	Tuition fees for foreign students, EUR	Total funding for the program, EUR	Cost per 1 student, EUR
2013./2014.	566 769,00	3 113,00	-	569 882,00	4 266,00
2014./2015.	574 167,01	1 770,00	-	575 937,01	4 265,95
2015./2016.	484 276,88	-	128,12	484 405,00	8 531,90
2016./2017.	437 679,76	-	11 175,95	448 855,71	8 531,90
2017./2018.	453 340,24	360,00	40 472,21	494 172,45	8 917,32
2018./2019.	472 337,75	-	33 741,76	506 079,51	9 334,46
2019./2020.	473 424,26	1 300,00	40 863,89	515 588,15	9 721,47

2020./2021.	474 580,19	2 600,00	39 103,69	516 283,88	9 848,96

The analysis of the information shows that the state budget grants for the study programme have decreased during the reporting period. The cost per student has increased, which is justified by the overall increase in total RTU costs (utilities, building maintenance, etc.).

Information on the minimum number of students in RTU study programmes is provided in the appendix of the self-evaluation report "On the minimal number of students in study programmes". The program has a sufficient number of students.

The profitability of the program for foreign students is achieved by combining lessons for foreign and state-funded students.

Tuition fees are set in line with the National Audit Office's warning that tuition fees for students studying with budget students cannot be less than the public funding for this service.

The specific development of each study programme is the responsibility of each study programme director, as well as the faculty responsible. For the development of all study programmes, central funding is used for the renewal of the scientific library, improvement and maintenance of shared classrooms, public relations, programme marketing activities, development and maintenance of information systems related to the study process, development of the Ķīpsala complex and other activities.

3.4. Teaching Staff

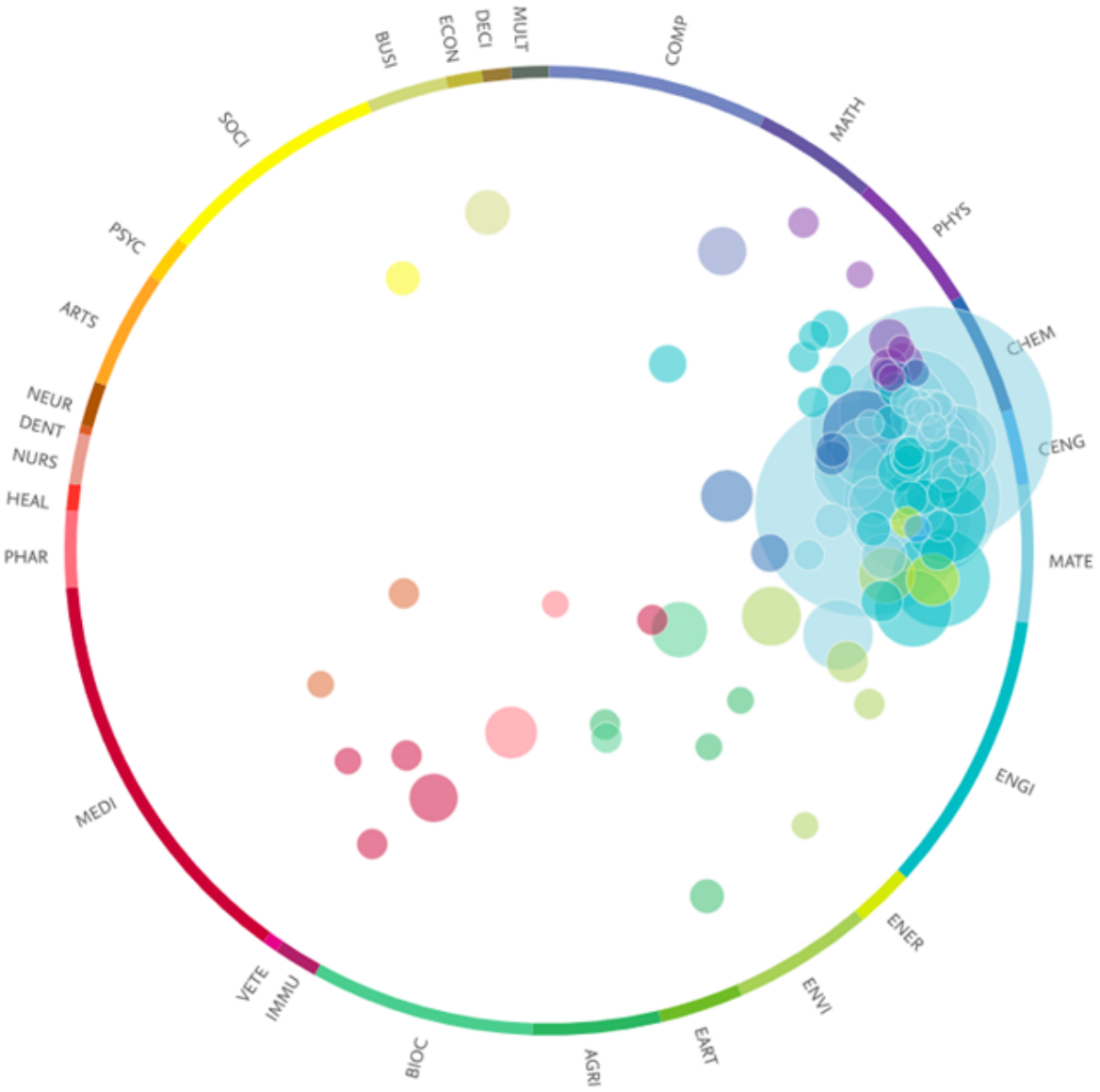
3.4.1. Assessment of the compliance of the qualification of the teaching staff members (academic staff members, visiting professors, visiting associate professors, visiting docents, visiting lecturers, and visiting assistants) involved in the implementation of the study programme with the conditions for the implementation of the study programme and the provisions set out in the respective regulatory enactments. Provide information on how the qualification of the teaching staff members contributes to the achievement of the learning outcomes.

The scientific competence of the academic staff involved in the academic Bachelor's study programme “Chemistry and Chemical Technology” is evaluated based on the following criteria: publications in scientific journals indexed by SCOPUS or Web of Science, other databases recognised in the scientific world, as well as participation in international and Latvian scientific journal editorial boards; participation in international projects.

66 teachers are involved in the implementation of the study programme (63 of them elected to RTU) - 19 professors, 13 associate professors, 21 docents, 6 lecturers and 7 assistants. 63 of the participating teaching staff have been elected to RTU.

Academic staff members actively publish and participate in scientific conferences, and improve their academic knowledge by participating in methodological seminars. The fig. 3.4.1. below shows the range of publications by the faculty academic staff of the study programme for the past six years, covering 450 thematic areas (213 thematic clusters). According to the SciVal tool data, the

total number of publications exceeds 900 and 20% of the publications are in Q1 level journals.



COMP	Computer Science
MATH	Mathematics
PHYS	Physics and Astronomy
CHEM	Chemistry
CENG	Chemical Engineering
MATE	Materials Science
ENGI	Engineering
ENER	Energy
ENVI	Environmental Science
EART	Earth and Planetary Sciences
AGRI	Agricultural and Biological Sciences
BIOC	Biochemistry, Genetics and Molecular Biology
IMMU	Immunology and Microbiology
VETE	Veterinary

Figure 3.4.1. SciVal database data for 2016-2021.

As shown in the figure, the faculty academic staff of the study programme is primarily involved in research areas of chemistry, chemical technology, and materials science. Such scientific activity in the fields corresponding to the study programme forms the necessary competence of the teaching staff to ensure a high-quality study process.

Since the beginning of 2019, the academic staff of the study programme has an opportunity to improve their qualification by participating in internships within ESF project No. 8.2.2.0/18/A/017 "Strengthening of Academic Staff of Riga Technical University in Strategic specialisation Areas". The academic staff may use internships in various Latvian companies for a total volume of 200 hours. 16 of the academic staff members involved in the implementation of the programme use this opportunity. The opportunity to improve the knowledge of the English language was used by 15 members of the academic staff (100 or 200 hours).

Compulsory study courses are provided by the following faculty teaching staff:

Professor **Māris Turks** is the author of more than 120 scientific publications and 37 patents, has given oral presentations at 20 international conferences and 15 guest lectures at foreign universities and research institutes. He has supervised 10 doctoral, 29 master's and 45 bachelor's theses. Expert of the Latvian Council of Science in the field of chemistry and in the field of chemical engineering. Participant and manager of several Latvian and international projects. Member of the editorial boards of several scientific conference programmes and the editorial board of international journals. Member of the RTU Senate, Chairman of the Doctoral Council "RTU P-01". Academician of the Latvian Academy of Sciences (LAS) and member of the LAS Senate. Project evaluation council member at the Latvian Competence Centre of Pharmaceutical, Biomedical and Medical Technology, Head of Division “Natural substance medicine, nutritional supplements, functional cosmetics”. Latvian representative at the Division of Organic Chemistry, European Association for Chemical and Molecular sciences. Management Committee member: COST Action CA18132 Functional Glyconanomaterials for the Development of Diagnostics and Targeted Therapeutic Probes.

Professor **Māra Jure** is the author of more than 170 scientific publications and 4 patents, the editor-in-chief of 2 monographs. ECTS/DS international expert and member of the Latvian Bologna Process Promoters’ Group. Director (2015-2020) of RSU and RTU joint professional study programme “Industrial Pharmacy” on behalf of RTU (2015-2021). Supervisor of 4 doctoral dissertations, 4 engineer’s projects, 13 master's and 37 bachelor's theses. Expert of the Latvian Council of Science in the fields of chemistry, chemical engineering and pharmacy, member of the Council of Experts of the Chemical Industry and allied industries. Participant and project leader of several Latvian and international projects. Member of the Organizing Committee of the Paul Walden Symposiums on Organic Chemistry and a member of the editorial board of journal "Cheminë

technologija" (ISSN 1392-1231) of Kaunas Technical University. Member of the RTU Senate (since 2003) and Chairman of the Senate (2006-2012), head of the RTU Senate Legislative Committee and member of the RTU Rector's Council (2006-2012), member of the FMSAC Council (since 1993), Member of the Doctoral Council "RTU P-01". Corresponding member of the Latvian Academy of Sciences (LAS) (since 2005), member of the Expert Commission of the Division of Chemical, Biological and Medical Sciences of the LAS (since 2017). Latvian representative at the European Chemical Society (EuChemS) Working party on History of Chemistry. Deputy Dean of RTU FMSAC for educational affairs (1993-2019), Head of the Department of chemical technology of biologically active compounds (since 2000).

Professor **Valdis Kokars** has published more than 250 scientific works (70 publications in the Scopus database), and signed 11 patents. Hirsch index is 11. Published the textbook: V. Kokars “General Chemistry”, RTU, 2009, 286 pages. Supervisor of 3 doctoral, 12 master's and 18 bachelor's theses. Expert of the Latvian Council of Science in the field of chemistry and in the field of chemical engineering. Participant and manager of several Latvian and international projects. Academician of the Latvian Academy of Sciences (LAS).

Docent, leading researcher **Reinis Drunka** is the author of 14 Scopus/Web of science cited scientific publications and 1 patent, has given oral presentations at 15 international and 4 local conferences. Expert of the Latvian Council of Science in the field of chemistry and in the subfield of inorganic chemistry. Executor of several Latvian and international (EU) projects. Deputy Director in field of education of the Institute of Materials and Surface Engineering of Riga Technical University (RTU). Author of lecture courses “Inorganic and Nanochemistry” (4 CP) and “Inorganic Chemistry” (9 CP). Expert of students' scientific research work evaluation commission in the field of chemistry at the State Education Content Center of Latvia, member at RTU study field committee "Physics, Materials Science, Mathematics and Statistics", member of scientific commission at RTU Faculty of Applied chemistry and materials science, member of council at RTU Faculty of Applied chemistry and materials science. Expert in the Public procurement office of Latvia. Member of the Board of the Latvian Materials Research Society, representing the field of technical ceramics and nanomaterials.

Associate professor **Kaspars Traskovskis** has published 35 peer reviewed scientific articles indexed in Scopus database. He has supervised 4 bachelor’s, 2 master’s and 1 doctoral thesis. He has managed and implemented several Latvian and international scientific projects. He has Latvian Council of Science expert status in the area of Chemistry. He has served several times as member of the Doctoral Council “RTU P-01”. He is performing reviewer duties in several international scientific journals. He holds a member status in RTU FMSAC Council and Science Committee.

Professor **Svetlana Čornaja** is the author of more than 100 scientific publications, 2 monographs and 6 patents, has given presentations at 16 international conferences. She has supervised 2 doctoral, 6 master's and 10 bachelor's theses. She has developed and teaches the following study courses: Physical Chemistry, Electrochemistry, Kinetics; Physical Chemistry, Thermodynamics; Advanced Physical Chemistry; Kinetics of Electrode Processes; Kinetics of Chemical Processes; Electrochemistry; Fundamentals of Kinetics and Catalysis; Physical Chemistry (advanced course); Physical Chemistry (basic course); Colloidal Chemistry. Expert of the Latvian Council of Science in the field of chemistry. Participant of several Latvian and international projects, head of project research groups. Member of the Council of Professors at the Faculty of Chemistry of the University of Latvia.

Professor **Sergejs Gaidukovs** is the author of more than 57 scientific publications and 2 patents, has given oral presentations at 60 international conferences, 10 guest lectures and 3 lecture courses at foreign universities and research institutes. Supervisor of 1 doctoral, 24 master's and 35 bachelor's theses. Expert of the Latvian Council of Science in the fields of Materials Science,

Chemistry and Chemical Engineering. Participant and manager of several Latvian and international projects and programmes. Expert of Latvian Academy of Sciences and RTU Promotion Council. The opponent of several dissertations. Expert of Latvian and international standardization commissions. Expert and rapporteur for the European Chemicals Agency.

Associate Professor **Irina Novosjolova** is the author of 29 scientific publications and 9 patents, has given oral presentations at 3 international conferences. She has supervised 3 doctoral, 7 master's and 13 bachelor's theses. Expert of the Latvian Council of Science in the fields of Chemistry, Materials Science and Chemical Engineering. Participant and manager of several Latvian and international projects. Secretary of the State Examination Commission on Chemical Technology at RTU. Member of the International Society for Nucleosides, Nucleotides and Nucleic Acids (IS3NA member).

Docent **Olita Medne** is the author of 9 scientific publications and has participated in 10 international conferences. She has supervised 2 Master’s and 4 Bachelor’s Theses. She has participated in several Latvian and international projects. She has completed internship at the University of Michigan, USA, in 2016, supplementing the knowledge in the field of chemical reaction engineering. She has gained an extensive practical experience in production companies: “Tenax”, “Tenapors”, “Stendera Ziepju Fabrika”, “Silvanols”, “Vincents Polyline”, “Iecavnieks&Co”, “Hagmans Nordic”. She has actively cooperated with Latvian industrial companies, organizing student visits to different production factories. She has been a member of the organizing committee of the RTU International Scientific and Technical Conference MSAC for several years and a reviewer of conference articles. She has improved her professional development within the Erasmus+ programme at Kaunas University of Technology (Lithuania), University of Tartu (Estonia), and Mulhouse National School of Chemists (France).

Associate professor **Kristaps Kļaviņs** is the author of more than 35 scientific publications, has given oral presentations at 7 international conferences and 5 guest lectures at foreign universities and research institutes. He has supervised 1 Doctoral, 1 Master's and 1 Bachelor's theses. Expert of the Latvian Council of Science in the field of Chemistry and Chemical Engineering. Participant and manager of several Latvian and international projects. Scientific Focus Group “Materials in vitro” leader within the scope of H2020 project “Baltic Biomaterials Centre of Excellence”.

Professor **Jurijs Ozoliņš** is the author of more than 130 scientific publications and 6 patents, has given oral presentations at 30 international conferences. He has supervised 5 doctoral, 22 master's and 36 bachelor's theses and 2 engineering projects. Expert of the Latvian Council of Science in Engineering and Technology in the field of Chemical Engineering. Participant and manager of several Latvian and international projects. Member of RTU Academic Meeting, Expert of RTU individually appointed promotion councils P-01, Member of the RTU Council of Professors of Chemistry and Chemical Engineering.

Professor **Juris Vanags** is the author of more than 30 scientific publications and 2 patents, has given oral presentations at 25 international conferences. He has supervised 2 doctoral, 5 master's and 4 bachelor's theses. Participant and manager of several Latvian and international projects. Member of the Board of the Latvian Association of Biotechnology, a structural unit of the Clean Technology Cluster, Member of the Board of the Smart Materials and Technology Competence Center.

Assistant professor **Valdemārs Ščerbaks** is the author of more than 20 scientific publications, has given oral presentations at 15 international conferences. He has supervised 2 master's and 4 bachelor's theses. Expert of Environmental quality and management system projects. Participant and manager of several Latvian and international projects. The implementer of quality management system in many Latvian chemical industry companies.

Professor **Andris Šutka** is the author of more than 90 scientific publications and 5 patents, has given oral presentations at 10 international conferences, given a guest lecture course (16 lectures) at the University of Tartu, as well as lectured at 3 foreign universities and research institutes. Supervisor of 2 doctoral, 2 master's and 6 bachelor's theses. Expert of the Latvian Science Council in the fields of Materials Science and Chemical Engineering. Leader for 8 Latvian and 5 international research projects. Participation in several promotion councils. Full member of the Latvian Academy of Sciences.

General evaluation of the academic staff is provided by the information and CVs of the members of academic staff given in the study field report Criteria 3.3.5.-3.3.6. of Part II, Section 3.

The qualification of the teaching staff involved in the implementation of the study programme complies with the conditions for the implementation of the study programme and the requirements of the regulatory enactments specified in the state.

3.4.2. Analysis and assessment of the changes to the composition of the teaching staff over the reporting period and their impact on the study quality.

When creating the new Bachelor's programme "Chemistry and Chemical Technology", the qualifications of the academic staff involved in the previous programmes and survey results were carefully reviewed. 66 academic staff members are involved in the implementation of the study programme in Latvian. A large part of this teaching staff is also scientific staff of the faculty, but there are also invited lecturers from other faculties who complement the content of the programme teaching topics of supporting sectors.

In most cases, academic staff of a younger generation ensures the training of restricted elective courses and they are involved in addition to the academic staff of the compulsory part experienced in practical and laboratory work. Doctoral students are often involved in the practical and laboratory work of elective study courses. This will develop pedagogical skills and abilities in young colleagues.

The programme includes both the study courses from previous programmes and new ones, such as Introduction to Programming Language MATLAB, Basics of Chemical Plant Design, Unit Operations of Chemical Engineering (course project), and a number of field-specific study courses. Academic staff of part of existing study courses has been replaced and new prospective specialists in specific fields, such as analytical chemistry, inorganic chemistry and NMR spectroscopy, have been attracted. Younger academic staff was given the opportunity to prepare from scratch the content of the course, which was then reviewed and coordinated in the Study Field Committee and the Faculty Convention, and coordinated with the students' representatives. This creates an optimal balance between academic knowledge and practical skills.

Changes in the teaching staff have a positive effect on the quality of the study process. Students have the opportunity to get acquainted with a wider range of research equipment, use them in the study process and in their research in the final theses. Students are regularly involved in various levels of scientific and practical projects implemented by FMSAC - this attracts young people to the university.

If necessary, lecturers from partner universities abroad are involved in the implementation of the study programme, as well as industry professionals invited to deliver practical lectures.

Since 2019, lecturer G.G.Boeck (Rostock University, Germany) has been working at the department as a visiting lecturer staff member within SAM 8.2.2 project “Strengthening of academic staff of the Riga Technical University in strategic specialisation areas” supported by the European Social Fund.

For a more detailed list of all teaching staff, which is involved in the implementation of the study programme, please see the table and their scientific biographies (CVs) in Annex 11, as well as the list of their publications related to the study programme in peer-reviewed journals for the past six years.

3.4.3. Information on the number of the scientific publications of the academic staff members, involved in the implementation of doctoral study programme, as published during the reporting period by listing the most significant publications published in Scopus or WoS CC indexed journals. As for the social sciences, humanitarian sciences, and the science of art, the scientific publications published in ERIH+ indexed journals or peer-reviewed monographs may be additionally specified. Information on the teaching staff included in the database of experts of the Latvian Council of Science in the relevant field of science (total number, name of the lecturer, field of science in which the teaching staff has the status of an expert and expiration date of the Latvian Council of Science expert) (if applicable).

3.4.4. Information on the participation of the academic staff, involved in the implementation of the doctoral study programme, in scientific projects as project managers or prime contractors/ subproject managers/ leading researchers by specifying the name of the relevant project, as well as the source and the amount of the funding. Provide information on the reporting period (if applicable).

3.4.5. Assessment of the cooperation between the teaching staff members by specifying the mechanisms used to promote the cooperation and ensure the interrelation between the study programme and study courses/ modules. Specify also the proportion of the number of the students and the teaching staff within the study programme (at the moment of the submission of the Self-Assessment Report).

Interlinking of cooperation between academic staff of study courses and courses was carefully planned in the course of preparation of the programme. Study courses are arranged by years of studies in such a way that their learning is based on the knowledge acquired previously and consistent with the learning outcomes. Within one year, study courses are thematically linked, thereby reinforcing the achievement of the objectives of the programme. When creating the programme, each lecturer was familiarised with the content of the courses to be learned previously and the method of their implementation, in order to avoid duplication of content and to reduce the likelihood of unlearned topics. Points of contact of study courses to understand and experience the

relationship between the various fields of chemistry and chemical technology were searched in joint discussions on the development of the programme. Such a targeted development of the programme has enabled teaching staff to be aware of the need for cooperation and the ways to achieve it.

At the end of each semester, the results of the survey of academic staff are evaluated and there is an exchange of experience with the discussion of further forms of cooperation. There is an extensive discussion on the assessment criteria and the compliance of the learning outcomes of study courses with the overall outcomes of the programme.

The student-academic staff ratio at the study programme at the time of submission of the self-evaluation report is 133/66, or one academic staff member per 2 students. 36 lecturers of all the academic staff are directly responsible for the study process. Other lecturers are involved in providing separate parts of study courses (laboratory or practical work) if needed.

Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	RKBM0 43528.zip	RKBM0 43528.zip
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)	AIP Conclusion KBM0.pdf	AIP Atzinums, "Ķīmija un ķīmijas tehnoloģija" .pdf
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period	Statistics, Annex 5, CCT 43528.pdf	Statistika, 5.pielikums, ĶĶT 43528..pdf
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard	Compliance with the standard, Annex 6, RKBM0 43528.pdf	Atbilstība standartam, 6.pielikums, RKBM0 43528.pdf
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)		
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	Mapping of study courses of the study program Chemistry and Chemical Technology, Annex 8.pdf	Studiju kursa Ķīmija un Ķīmijas Tehnoloģija kartēšana, 8.Pielikums.pdf
The curriculum of the study programme (for each type and form of the implementation of the study programme)	RKBM0 (43528) Planning, Annex 9.pdf	RKBM0 (43528) plānojums, 9.pielikums.pdf
Descriptions of the study courses/ modules	Course descriptions (43528), Annex 10.zip	Studiju kursu moduļu apraksti (43528), 10.pielikums.zip
Description of the organisation of the internship of the students (if applicable)	Internship Management Procedure.zip	Prakses organizesanas kartiba.zip
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)	Confirmation - on compliance of the academic staff.edoc	Apliecinājums - AL 55. pants par prof. skaitu akadēmiskās programmās.edoc

Biotechnology and Bioengineering (43421)

Study field	*Chemistry, Chemistry Technologies, and Biotechnology*
ProcedureStudyProgram.Name	*Biotechnology and Bioengineering*
Education classification code	*43421*
Type of the study programme	*Academic bachelor study programme*
Name of the study programme director	*Tālis*
Surname of the study programme director	*Juhna*
E-mail of the study programme director	*talis.juhna@rtu.lv*
Title of the study programme director	*Profesors, Dr.sc.ing.*
Phone of the study programme director	
Goal of the study programme	*The aim of the study programme is to prepare highly qualified experts and scientists who are able to compete in both the local and international scientific labor market in various fields of biotechnology and bioengineering.*
Tasks of the study programme	*• to provide an opportunity to acquire theoretical and practical courses in biology, as well as basic courses in mathematics, physics and chemistry,* *• to provide an opportunity to take in-depth courses in a relatively specialized direction of molecular or organism biology,* *• to develop skills related to critical thinking, analysis and reasoning,* *• to develop skills in the design of biotechnological equipment and processes, and product development,* *• to develop skills to conduct independent research in a selected sub-sector of biology and summarize the results in a Bachelor's thesis and obtain a Bachelor's degree in Natural sciences.*

Results of the study programme	*Knowledge:* *1. shows the characteristic basic and specialized knowledge in the fields of biotechnology and bioengineering, understands the most important concepts of the field and regularities in the context of the basic concepts in biology, other natural sciences and engineering.* *2. is familiar with the field of intellectual property issues, professional ethics issues and requirements.* *Skills:* *3. uses modern laboratory equipment for research, analyzes the obtained research data, interprets them, uses them in planning of further research and presents the research results;* *4. independently obtains, selects and analyzes information and uses it to make decisions and solve problems in the field of science or profession related to biotechnology and bioengineering;* *5. explains the acquired knowledge and discusses it with arguments both with experts and non-experts.* *Competencies:* *6. evaluates the impact of his / her professional activity on the environment and society and participates in the development of the relevant professional field, applies the principles of scientific ethics in practice;* *7. carries out scientific research - from hypothesis to results with careful data collection, analysis and presentation;* *8. demonstrates a scientific approach to solving complex problems, takes responsibility and initiative, working individually or in a team, including with specialists from other fields, makes decisions and finds creative solutions in changing or uncertain circumstances;* *9. demonstrates the skills required for the commercialization of research results in biotechnology.*
Final examination upon the completion of the study programme	*Bachelor's thesis*

Study programme forms

Full time studies - 3 years - latvian

Study type and form	*Full time studies*
Duration in full years	*3*
Duration in month	*0*
Language	*latvian*
Amount (CP)	*120*
Admission requirements (in English)	*General or vocational secondary education*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Bachelor degree in natural sciences*
Qualification to be obtained (in english)	-

Places of implementation

Place name	City	Address
Riga Technical University	RĪGA	KAĻĶU IELA 1, CENTRA RAJONS, RĪGA, LV-1050

Full time studies - 3 years - english

Study type and form	*Full time studies*
Duration in full years	*3*
Duration in month	*0*
Language	*english*
Amount (CP)	*120*
Admission requirements (in English)	*General or vocational secondary education. The assessment of the level of English language proficiency under the requirements specified in regulatory enactments.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Bachelor degree in natural sciences*
Qualification to be obtained (in english)	*-*

Places of implementation

Place name	City	Address
Riga Technical University	RĪGA	KAĻĶU IELA 1, CENTRA RAJONS, RĪGA, LV-1050

3.1. Indicators Describing the Study Programme

3.1.1. Description and analysis of changes in the parameters of the study programme made since the issuance of the previous accreditation form of the study field or issuance of the study programme license, if the study programme is not included on the accreditation form of the study field, including changes planned within the evaluation procedure of the study field evaluation procedure.

Study programme ”Biotechnology and Bioengineering” was licensed in 2020 (Decision of the Study Quality Commission on July 2, 2020, Licence No. 2020/30K). No official changes have been made to the study programme since licensing.

During the licensing process of the study programme in 2020, the experts made six recommendations that should be implemented until the accreditation of the study field. One of the six recommendations has been analysed for implementation, four have been implemented and one will be implemented when there are foreign students. Detailed information on the implementation of the recommendations is available in Section 2.6.1. and its subsequent Annex “Report on the implementation of the recommendations”.

3.1.2. Analysis and assessment of the study programme compliance with the study field. Analysis of the interrelation between the code of the study programme, the degree, professional qualification/professional qualification requirements or the degree and professional qualification to be acquired, the aims, objectives, learning outcomes, and the admission requirements. Description of the duration and scope of the implementation of the study programme (including different options of the study programme implementation) and evaluation of its usefulness.

The study programme corresponds to the RTU study field "Chemistry, Chemical Technology and Biotechnology" and has been developed in accordance with the Law on Higher Education Institutions of the Republic of Latvia. The code of the study programme according to the Latvian education classification is 43421 (Cabinet of Ministers Doc. no. 322 on the classification of Latvian education 13.06.2017.) and it has been developed taking into account RTU's strategic goals, market supply and potential demand. When analyzing the usefulness of the study process, "Teachers' professionalism", "Teachers' support for students" and "Application of knowledge in practice" were chosen as the main criteria. Approximately 40% of the study programme consists of biology study courses, as well as 12% of other natural sciences study courses, but the proportion of engineering sciences study courses is approximately 20%. Students of the study programme acquire knowledge, skills and competencies corresponding to the 6th level of the European Qualifications Framework (EQF).

The aim of the study programme is to prepare highly qualified experts and scientists who are able to compete in both the local and international scientific labour market in various fields of biotechnology and bioengineering.

Tasks of the study programme:

• to provide an opportunity to acquire theoretical and practical study courses in biology, as well as basic study courses in mathematics, physics and chemistry,
• to provide an opportunity to take in-depth study courses in a relatively specialized direction of molecular or organism biology,
• to develop skills related to critical thinking, analysis and argumentation,
• to develop skills in the design of biotechnological equipment and processes, and product development,
• to develop skills to conduct independent research in a selected sub-sector of biology and summarize the results in a Bachelor's thesis and obtain a Bachelor's degree in Natural sciences.

Achievable study results

Knowledge:

1. shows the characteristic basic and specialized knowledge in the fields of biotechnology and bioengineering, understands the most important concepts of the field and regularities in the context of the basic concepts in biology, other natural sciences and engineering;
2. is familiar with the field of intellectual property issues, professional ethics issues and requirements.

Skills:

1. use modern laboratory equipment for research, analyze the obtained research data, interpret them, use them in the planning of further research and present the research results;
2. independently obtains, selects and analyses information and uses it to make decisions and solve problems in the field of science or profession related to biotechnology and bioengineering;
3. explains the acquired knowledge and discusses it with arguments both with experts and non-experts;

Competencies:

1. evaluates the impact of his / her professional activity on the environment and society and participates in the development of the relevant professional field, applies the principles of scientific ethics in practice;
2. carries out scientific research - from hypothesis to results with careful data collection, analysis and presentation;
3. demonstrates a scientific approach to solving complex problems, takes responsibility and initiative, working individually or in a team, including with specialists from other fields, makes decisions and finds creative solutions in changing or uncertain circumstances;
4. demonstrates the skills required for the commercialization of research results in biotechnology.

According to the Regulations on the State Academic Education Standard (Cabinet of Ministers Doc. No. 240 "Regulations on the State Academic Education Standard" (13.05.2014.)), the volume of the study program is 120 CP and the duration of studies is three years (six semesters, students acquire 20 CP per semester). The compulsory part of the study programme includes 26 study courses (including a bachelor's thesis) with a total amount of 92 CP, including study courses in accordance with the requirements of the Civil Protection and Disaster Management Law and the Environmental Protection Law. The amount of the limited elective part is 22 CP, there are seven study courses with a total amount of 30 CP. In addition, the study programme is a part of free choice in the amount of six credit points. At the beginning of the studies, a study agreement is concluded between the student and the University of Latvia (a sample agreement in Latvian is attached in Annex 2), which has been developed in accordance with the Cabinet of Ministers 23.01.2007. to Regulation No. 70

“Regulations to be included in the study agreement”, afterwards an agreement on the study agreement on starting studies at RTU is made.

At the end of the study programme, students develop a Bachelor's thesis in the amount of 10 CP. After the completion of the study programme, the graduates of the study programme are awarded a Bachelor's degree in Natural Sciences and a joint diploma from both partner institutions (sample in Annex 3), prepared in accordance with the Cabinet of Ministers Regulation No. 202 “Procedures for Issuing State-Recognized Higher Education Certificates” from 16.04.2013.

The opinion of the Higher Education Council in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions regarding the number of students in the academic full-time study programme is attached in Annex 5.

3.1.3. Economic and/ or social substantiation of the study programme, analysis of graduates' employment.

The study program is designed to contribute to the achievement of the goals set in the current UL Development Strategy for 2021 - 2027 [1] and RTU Strategy for 2021 - 2025[2]: 1) preparation of human resources in accordance with the requirements of the Latvian and EU labor market, 2) internationalization of education, 3) development / improvement of international study programmes, including EU study programmes creation or improvement of official languages, creation of joint and double degree programmes with foreign universities. The study programme continues to contribute to the achievement of the strategic goals of the RTU Strategy: 1) excellent science; 2) quality studies; 3) sustainable valorisation and 4) institutional excellence.

According to the European Federation of Biotechnology, the following definition of biotechnology has been established: "Biotechnology is a scientific field, which, based on knowledge in microbiology, biochemistry, genetics, genetic engineering, immunology, chemical technology, and machine building, employs biological objects (microorganisms, animal and plant tissue cells) and molecules (nucleic acids, proteins, enzymes, hydrocarbons, etc.) to industrially produce chemicals and products essential for humans and animals[3]. It includes many activities, such as: red or medical biotechnology, green or agricultural and environmental biotechnology, white or industrial biotechnology, blue or marine biotechnology, and gray or virological biotechnology. Thus, the application of biotechnology can be found in such important fields as medicine, pharmacy, agriculture, environmental protection, food and chemical industry, energy, etc. According to a study by acatech of the German National Academy of Sciences and Engineering[4], biotechnology is one of the key technologies in the 21st century, encompassing applications in healthcare as well as in manufacturing and agriculture.

Red or medical biotechnology is represented by more than 1,700 companies and has a market share of more than € 17 billion in Europe alone. It was already forecasted that in 2015, 50% of all medicines would be obtained through biotechnology. Among the four well-established biotechnology centers (US, Europe, Canada and Australia), in 2012 the US and Europe ranked first in the total number of medical biotechnology companies, accounting for 1,799 private and 165 public companies in Europe[5].

According to the United Nations, the world's population is projected to grow from 7.71 billion in 2019 to an average of 8.18 billion in 2024 and 10.88 billion in 2100[6]. Based on data obtained in

2017, food scarcity is a new societal challenge and around 811.7 million people worldwide are already chronically hungry and undernourished[7]. Along with other agricultural technologies, green or agricultural biotechnology will also have to face these challenges by increasing productivity on smaller plots of land and reducing the amount of water required, simultaneously minimizing the potential negative effects of these activities on the environment. According to a Zion Market Research report, the agricultural biotechnology market was $ 32.89 billion in 2018 and is projected to grow to $ 67.01 billion in 2025[8]. Thus, it is already necessary to provide new specialists with innovative ideas to solve these problems.

Europe is a leader in "white" or industrial biotechnology, producing more than 60% of the world's enzymes. Enzymes and other biotechnologically derived substances are being used to produce bioproducts in sectors such as chemistry, food, paper and printing, detergents, textiles and bioenergy (biogas, biofuels), etc., with an increasing focus on the use of renewable resources. The manufacturing biotechnology sector in the European Union continues to develop. Sales of products obtained as a result of biotechnological processes in 2010 amounted to EUR 91.9 billion, accounting for 6.2% of total sales of chemicals, and a significant increase in sales by 2020, reaching EUR 515 billion[9]. This raises the issue of training new biotechnology specialists and their availability in the European Union, including Latvia.

Based on the European Commission's Communication, further efforts are needed to foster growth, competitiveness and jobs in Europe, and the European Heads of State and Government at the March 2012 European Council reaffirmed these efforts in support of key enabling technologies (KETs). Industrial biotechnology, or white biotechnology, has been identified as a specially supportable KET. The European Commission's definition of KETs states that: “KETs are a knowledge-intensive fields and involve intensive research and development, rapid innovation cycles, high capital expenditure and a highly skilled workforce. They promote processes, innovative goods and services in all areas of the economy and are systemically important. These are multidisciplinary technologies that cover many areas of technology with a tendency towards convergence and integration. KETs can help technology leaders in other areas to exploit research activities for commercial gain. Based on current research, economic analysis of market trends and their contribution to societal challenges, the following technologies have been identified as EU KETs: microelectronics and nanoelectronics, nanotechnology, photonics, advanced materials, industrial biotechnology and advanced manufacturing technologies"[10]. The role of the biotechnology sector in delivering innovative products, new jobs and growth in the European Union is thus noted. Determining the need for the development of the biotechnology segment, there is a growing need for new highly qualified specialists able to work in the mentioned fields, which the study programme will be able to provide, preparing young scientists capable of working in both biotechnology and bioengineering. Knowledge of biotechnology requires a combination of knowledge from life sciences and engineering.

As the first students were admitted to the study programme only in the autumn of 2020, at the time of submitting the report there are no data on the employment of graduates, but it is known that some students are employed in research projects (RTU and UL structural units), public administration institutions and independent institutes related to biotechnology.

[1]https://www.lu.lv/fileadmin/user_upload/LU.LV/www.lu.lv/Dokumenti/Dokumenti_LV/1._VISPAREJIE_DOKUMENTI/LU_strategija_buklets_2021.pdf

[2]https://www.rtu.lv/en/university/strategy

[3]https://www.princeton.edu/~ota/disk3/1984/8407/840724.PDF

[4]acatech (ed.) Innovation potential of biotechnology

https://www.acatech.de/wp-content/uploads/2018/03/IMPULS_Biotechnologie_EN_KF_final.pdf

[5]Ernst&Young. Biotechnology Industry report 2013. Beyond borders. Matters of evidece. https://www.ey.com/Publication/vwLUAssets/Beyond_borders/$FILE/Beyond_borders.pdf

[6]United Nations. Worlds population prospects 2019. https://population.un.org/wpp/Publications/Files/WPP2019_Volume-I_Comprehensive-Tables.pdf

[7]Food and Agriculture Organization of the United Nations http://www.fao.org/hunger/en/

[8]https://www.globenewswire.com/news-release/2019/07/09/1879856/0/en/Global-Agricultural-Biotechnology-Market-Will-Reach-USD-67-01-Billion-By-2025-Zion-Market-Research.html

[9] Ernst&Young. Biotechnology Industry report 2013. Beyond borders. Matters of evidece. https://www.ey.com/Publication/vwLUAssets/Beyond_borders/$FILE/Beyond_borders.pdf

[10] "Eiropas stratēģija par svarīgām pamattehnoloģijām". https://eur-lex.europa.eu/legal-content/lv/TXT/?uri=CELEX%3A52012DC0341

3.1.4. Statistical data on the students of the respective study programme, the dynamics of the number of the students, and the factors affecting the changes to the number of the students. The analysis shall be broken down into different study forms, types, and languages.

The implementation of the study programme in Latvian was started in the academic year of 2020/2021. In this call it was possible to apply for two budget places and 28 paid places in the joint admission. There were a total of 173 applications for the two budget places, of which 50 were under Priority 1; 86 applications for 28 paid places, five of them with priority 1 [1]. A total of 27 students signed the study agreement. In 2021/2022 for the single application for two budget and 38 paid places, 194 (of which 38 with priority 1) and 105 (of which seven with priority 1) applications were received, respectively, and study agreements were signed with 26 students. The number of students in admission is close to the plan, when the study programme has about 30 students in the first year of study. The number of applications in the study programme, including the number of applications with Priority 1, confirms that potential students are interested in the specific study programme. Interest could also increase if the number of budget places in the study programme continues to increase (not all students are ready or able to pay for studies), as well as interest could increase when the study program is included in the accredited study field (several students have questions about the accreditation status of the study programme). Starting from the academic year 2022/23, a total of 10 budget financing places are planned in the study programme.

By April 15, 2022, ten of all enrolled students have dropped out. In seven cases of own will (personal reasons) and in three cases due to timely non-fulfillment of the requirements of the study programme.

Due to the COVID-19 pandemic and various restrictions on organizing full-time studies, restrictions and requirements for foreign students (vaccination and recognition of certificates), in the first two years of the study programme, studies are conducted only for the Latvian language. The study programme in English is planned to start in 2022/23 academic year. Statistical data on students during the reporting period are available in Appendix 5.

[1] Statistics of Applications for Studies at Universities

https://epakalpojumi.latvija.lv/EServices/EP190-v1-0/?language=EN

3.1.5. Substantiation of the development of the joint study programme and description and evaluation of the choice of partner universities, including information on the development and implementation of the joint study programme (if applicable).

Referring to today's challenges to use resources as sustainably as possible and to expand the range of interdisciplinary studies, in 2020 the University of Latvia, in cooperation with Riga Technical University, established and started accepting students in the joint academic bachelor's study program "Biotechnology and Bioengineering". These studies enable prospective students to simultaneously study natural sciences, mainly biology, and engineering, thus ensuring an investment in STEM fields.

The development and implementation of joint study programmes are regulated by the RTU Senate "Procedure for Application, Development and Amendments to Study Programmes" (see the file of Annex 06 of the list of Internal regulations). The choice of partner universities is the responsibility of the initiator of the development of the joint study programme, in coordination with the study field commission and the vice-rector for studies. A table confirming the compliance of the joint study programme “Biotechnology and Bioengineering” with the requirements of the Law on Higher Education Institutions is attached in Annex 4.

3.2. The Content of Studies and Implementation Thereof

3.2.1. Analysis of the content of the study programme. Assessment of the interrelation between the information included in the study courses/ modules, the intended learning outcomes, the set aims and other indicators with the aims of the study course/ module and the aims and intended outcomes of the study programme. Assessment of the relevance of the content of the study courses/ modules and compliance with the needs of the relevant industry, labour market and with the trends in science on how and whether the content of the study courses/ modules is updated in line with the development trends of the relevant industry, labour market, and science.

The content of study programme “Biotechnology and Bioengineering” has been developed in accordance with the Cabinet of Ministers of the Republic of Latvia Regulations No. 240 “Regulations on the State Academic Education Standard” and meets the requirements set out in the standard. In annex “Compliance of the study program with the state education standard” the program is compared with the standard requirements.

The **aim** of the study programme is to prepare highly qualified experts and scientists who are able to compete in both the local and international scientific labor market in various fields of biotechnology and bioengineering. The goals set in the individual study courses and the results to be achieved are directly related to the goals and tasks of the study programme. The connection is reflected in the mapping of the study programme (Appendix “Mapping of study courses/modules to

achieve the study results of the study programme").

The study courses in the study programme plan are arranged in such a way as to initially provide students with basic knowledge in biology, biotechnology, bioengineering and natural sciences (chemistry, physics, mathematics), as well as economics and management sciences. In the further study process, students already acquire in-depth knowledge of various issues related to biotechnology and bioengineering, the equipment / facilities used, practical experience in the organization of work in companies, as well as the legal regulation of these processes. In the Compulsory elective study courses, students can choose courses in specific examples of biotechnology applications (medical biotechnology, industrial biotechnology, genetic engineering, agrobiotechnology), or gain additional knowledge in data processing and teamwork. The results to be achieved by the study courses are defined in such a way as to ensure the achievement of the overall results of the study programme in accordance with the acquired knowledge, skills and competences.

The study programme Compulsory study courses is formed from the following (Part A, 92 CP):

1. Introduction to the design of biological systems 3 KP
2. Information technology 2 KP
3. Biophysics 4 KP
4. Mathematical basics of biotechnology 5 KP
5. Basics in Latvian language (for study program in English) or English I (for study program in Latvian) 2 KP
6. Basics of economics and management 4 KP
7. General and physical chemistry 4 KP
8. Genetics and genomics 4 KP
9. Basics in materials science and engineering 2 KP
10. Biomolecules and cells 6 KP
11. Data analysis and mathematical statistics 2 KP
12. Principals of entrepreneurship 2 KP
13. Basics in microbiology 6 KP
14. Cultivation and physiology of microorganisms 2 KP
15. Metabolism 4 KP
16. Introduction to gene and cell engineering 4 KP
17. Electrical processes and equipment in biotechnology 2 KP
18. Gene and cell technologies 4 KP
19. Mathematical modelling of metabolism 2 KP
20. Biological reactors 4 KP
21. Fermentation – product identification and purification 4 KP
22. Organisation of biotechnological processes 6 KP
23. Environmental protection for biotechnologists 1 KP
24. Civil protection 1 KP
25. Legal regulation of biotechnological processes and bioethics 2 KP
26. Biotechnology and bioengineering bachelor thesis 10 KP

Compulsory Elective Study Courses (Part B, 16 CP) where students can select from the following study courses:

1. Challenges in Medical Biotechnology 4 KP
2. Introduction to industrial and environmental biotechnology 6 KP
3. Topics in plant tissue, cell culture and

agrobiotechnology 6 KP

4. Gene engineering of eukaryotic 6 KP
5. Big data analysis of nucleic acid sequencing 2 KP
6. Vertically integrated project 2 KP
7. Teamwork for business design 4 KP

Students choose free study courses (Part C, 6 CP) centrally by registering in the UL or RTU information system.

The planning of the study programme during 6 semesters is presented in Appendix “Study programme plan” with detailed study course descriptions (Appendix “Study course/module description”), where the results of the study courses are in line with the results of the study programme. All RTU study courses are freely available on portal ortus.lv, thus, other lecturers and university researchers can see the descriptions of study courses, thus ensuring interconnection.

The study programme at RTU is coordinated and provided by the Faculty of Civil Engineering Water Systems and Biotechnology Institute (WSBI), which has its own administrator to ensure study coordination, programme selection and general student counseling. Doctoral and master's level students assist in the management of the study courses for the teaching staff of WSBI and other structural units. The study course "Biological Reactors" (BŪK711) is co-coordinated by a lecturer from the University of Porto (Portugal), some lectures are provided by lecturers from the University of Cartagena (Spain). Study courses “Basics in materials science and engineering” (ĶVT728) and “Fermentation – product identification and purification” (ĶOS721) are provided by the RTU Faculty of Materials Science and Applied Chemistry, which has the appropriate equipment for practical and laboratory work in chemistry and materials science. Study course “Electrical processes and equipment in biotechnology” (EEM792) is provided by lecturers from the Faculty of Energy and Electrical Engineering. The Faculty of Computer Science and Information Technology and the Faculty of Engineering Economics and Management are also involved in the implementation of the study programme.

The directors of the study programmes of each higher education institution, as well as the Interuniversity study programme council at a higher level are responsible for the mutual coordination between the two higher education institutions.

3.2.2. In the case of master’s and doctoral study programmes, specify and provide the justification as to whether the degrees are awarded in view of the developments and findings in the field of science or artistic creation. In the case of a doctoral study programme, provide a description of the main research roadmaps and the impact of the study programme on research and other education levels (if applicable).

Not applicable

3.2.3. Assessment of the study programme including the study course/ module implementation methods by indicating what the methods are, and how they contribute to the achievement of the learning outcomes of the study courses and the aims of the study programme. In the case of a joint study programme, or in case the study programme is implemented in a foreign language or in the form of distance learning, describe in detail

the methods used to deliver such a study programme. Provide an explanation of how the student-centred principles are taken into account in the implementation of the study process.

Biotechnology and bioengineering is one of the areas of smart specialization in Latvia - “Biomedicine, medical technologies, biopharmaceuticals and biotechnology”, where the development potential is also visible in Latvia and the demand for labour is expected. At present, biotechnology in Latvia is available as a study programme only as a 1st level professional higher education study programme, which does not provide specialists with academic knowledge for process management and innovation development. In bachelor's or master's study programmes, biotechnology is integrated only as one of the sub-fields, for example, in the bachelor's and master's study programmes "Biology" implemented by the UL, or in RTU bachelor's study programme "Chemistry and Chemical Technology", but the existing study programmes cannot prepare experts who have both knowledge in biology as a type of natural sciences and in various fields of engineering. **The aim** of the study programme "Biotechnology and Bioengineering" is to prepare highly qualified experts, leaders, and scientists who are able to compete in both the local and international scientific labor market in various fields of biotechnology and bioengineering.

Studies are organized in a full-time format, where a student-centered approach to the development and implementation of the study programme content is strictly observed:

1. **Involvement of students in the study process and improvement**: regular surveys of students, meetings with the directors of study programmes and with the semester teaching staff
2. **Respect for student abilities**: the teaching staff of the study courses take into account and respects the diversity of students and the diversity of their needs, using different ways of implementing the study programme, according to the students' abilities.
3. **Examination of student complaints:** RTU has appropriate procedures for resolving student complaints. The process of reviewing complaints takes place through the director of the study programme and, if necessary, the head of the Department of Studies or even the vice-rector for studies. If the study programme director receives an application from a student or student group about the non-compliance of a study course or incompetence of a lecturer, the next step is to find out the reasons and participate in the relevant lectures. If the students' complaint is substantiated, the lecturer is given instructions to improve the study course or the lecturer is replaced with another one whose competence corresponds to the specific study course. Meetings with the study programme monitoring committee (vice-rectors for studies at UL and RTU) are organized at least once a year to agree on admission plans, training method and funding allocation model.
4. **Competence development of the academic staff**: in order to improve the qualification, RTU academic staff are encouraged to participate in courses and seminars on the latest teaching and pedagogical methods internationally, as well as there is an opportunity to attend training courses at the faculty or RTU. The RTU Center for Academic Excellence and the Department of Studies of the UL Faculty of Pedagogy Psychology and Art (PPMF) in cooperation with the Adult Pedagogical Education Center (PPIC) organize in-service training activities at the RTU and LU levels, respectively.
5. **Promotion of students' independence**: studies are based on the student's independence, at the same time providing the teacher's guidance and support - the description and content of each student's work, as well as its evaluation methods are indicated in the description of each study.

6. Integration of foreign students into the learning environment: so far, foreign students have not been accepted into the program, but the internal regulations set up several mechanisms for the integration of foreign students - Latvian language learning opportunities, access to the foreign student departments of both universities, assistance in solving technical issues.

The study programme includes both study courses, which provide only theoretical lectures, and study courses, in which more emphasis is placed on the laboratory and practical work. In addition, separate study courses also use group work on complicated engineering projects, e.g., the "VIP course", or research. LU provides its own courses and RTU its own. Lessons are planned for students in such a way that they do not have to move from one university to another more often than once during the day. In these cases, longer breaks are provided in the lesson schedule. Each study course defines the knowledge, skills, and competencies to be acquired that contribute to the achievement of the results of the study programme. Tests are determined by each responsible lecturer in accordance with the results of the study course, which are available to students in the study course descriptions and are explained at the beginning of each study course. Each lecturer in his / her study course tests student knowledge, skills and competencies indicated in the study course description (reports, tests, presentations, independent work, situation analysis, group work, etc.). The final grade is the sum of all test and exam grades, the percentage distribution of which is also indicated in the description of each study course and is also introduced to students at the beginning of the semester. The main advantage of a summary grading system is that the final mark is made up of several components. Thus, while working during the semester, students are already influencing their final grade. The evaluation criteria for study courses and individual / homework provided by RTU are published in advance on the ORTUS portal. Also, the evaluation of homework, tests, reports, presentations and other work performed during the semester is given a certain share in the final evaluation.

The structure of the assessment for their study course is determined by the teaching staff themselves, with respect to the decision of the RTU Senate that the examination mark may not exceed 50% of the final assessment. When choosing the criteria and methods of assessment of study achievements, the specifics of each study programme and the results to be achieved are taken into account.

The following principles are observed in the assessment of the acquisition of study results:

- openness of assessment of knowledge and skills - a set of requirements for positive assessment of educational achievements has been determined;
- the principle of compulsory assessment - it is necessary to obtain a positive assessment of the acquisition of the compulsory content of the study programme.

For the study courses provided by RTU, all study course materials, time planning, evaluation criteria and obtained evaluations are available to students in the Moodle environment. In courses where the specifics of the study course and the availability of computers allow it, it is also possible to organize intermediate and final examinations in the Moodle environment. Assessment of study results at RTU takes place in accordance with the Regulations on Assessment of Study Results[1] and Regulations on Final Examinations[2] at Riga Technical University and at the University of Latvia in accordance with the Procedure for Organizing Study Course Examinations[3] at the University of Latvia and Regulations on Final Tests at the University of Latvia.

[1]https://www.rtu.lv/writable/public_files/RTU_studiju_rezultatu_vertesanas_nolikums.pdf (in Latvian); the English translation is in the file of Appendix 04 of the List of Internal regulations)

[2]see the file of Appendix 08 of the List of Internal regulations

[3]https://www.lu.lv/fileadmin/user_upload/LU.LV/www.lu.lv/Dokumenti/Dokumenti_LV/3._STUDIJU_U

N_ZINATNES_PROCESU_REGLAMENTEJOSIE_DOKUMENTI/9_STUDIJ_3.PDF (in Latvian)

3.2.4. If the study programme envisages an internship, describe the internship opportunities offered to students, provision and work organization, including whether the higher education institution/ college helps students to find an internship place. If the study programme is implemented in a foreign language, provide information on how internship opportunities are provided in a foreign language, including for foreign students. To provide analysis and evaluation of the connection of the tasks set for students during the internship included in the study programme with the learning outcomes of the study programme (if applicable).

The study programme does not provide specialized internships, but according to the content of individual study courses, lecturers organize practical visits to companies to show the relevance and specifics of various biotechnological processes, for example, in the study course “Basics in Microbiology” (BŪK709) the students visited biological wastewater treatment station “Daugavgriva” to get acquainted with one of the directions of environmental biotechnology, the specifics of the technologist's work and the connection of biological processes with engineering.

In order to promote career opportunities, once a year RTU Career Support and Services Department organizes RTU Career Day, where students have the opportunity to meet with representatives of companies in person and communicate about future opportunities. More about the participants of the event and previous years can be found here https://www.rtu.lv/lv/studentuserviss/karjeras-centrs-ssc/karjeras-diena (in Latvian). In 2021 and 2022, due to the pandemic, the event took place in a virtual environment.

Many students are involved in research work at RTU and UL. For example, in 2021, at least 3 students from this study programme worked on scientific projects at the RTU Water Systems and Biotechnology Institute.

An additional resource that has been offered since 2015 is a website where companies are invited to place vacancies that are relevant to RTU students (https://ekarjera.rtu.lv/) (in Latvian). Students have the opportunity to log in with a university username and follow the current job opportunities in their field.

Additional support in promoting practical skills is the RTU Development Fund (https://www.rtu.lv/lv/attistibasfonds) (in Latvian). During the year, several hundred competitions for the promotion of practical skills are being offered, which are organized in cooperation with companies and where students have the opportunity to acquire practical skills.

3.2.5. Evaluation and description of the promotion opportunities and the promotion process provided to the students of the doctoral study programme (if applicable).

Not applicable

3.2.6. Analysis and assessment of the topics of the final theses of the students, their relevance in the respective field, including the labour market, and the marks of the final theses.

As the final assessment in the study programme, Bachelor's thesis (10 CP) is foreseen. Since the first admission of students took place in the autumn of 2020, there are no defended final theses at the time of submitting the report. At the time of preparing the report, a survey of students was conducted on the planned topics and directions of the final theses. The main directions chosen are related to:

- Food microbiology
- Modeling of microorganism metabolism
- Wastewater treatment technologies
- Development of birch juvenility markers
- Development of wastewater monitoring system for monitoring viral pollution
- Biomaterials and regenerative medicine
- Fungal/yeast microbiology

3.3. Resources and Provision of the Study Programme

3.3.1. Assessment of the compliance of the resources and provision (study provision, scientific support (if applicable), informative provision (including libraries), material and technical provision, and financial provision) with the conditions for the implementation of the study programme and the learning outcomes to be achieved by providing the respective examples.

RTU studies take place in Ķīpsala, where the RTU Ķīpsala student campus is located. Its construction began in 1965 with the aim of creating a single study and science center. Construction will continue and it is planned to concentrate the majority of university students in Ķīpsala by the end of 2022. After the completion of the construction, RTU Ķīpsala student campus will become the most modern engineering study center in the Baltics. During the development of the campus, sustainability is taken into account at all aspects. Confirming the concern for the sustainable development of the environment and the desire to get involved in its promotion, RTU has joined the Sustainable Development Solutions Network, which aims to achieve the 17 goals set by the UN for sustainable global development in 2030. RTU is currently the only organization from the Baltic States admitted to this network. The University is also committed to promoting the creation and distribution of sustainable products that are directly related to the results of the study program.

RTU buildings are equipped with modern climate control equipment, technical solutions, buildings are controlled remotely and it is possible to monitor energy consumption to make the buildings more comfortable for students, teachers, scientists and guests. One of the results achieved in developing RTU infrastructure is participation in the Green Metric rating, where RTU Ķīpsala student campus is recognized as the 59th greenest in the world, and RTU as the 129th greenest university in the world [1], thus confirming the connection with the goal of the study program "Biotechnology

and Bioengineering". RTU is a leader in the Baltic region with a green thinking infrastructure. The infrastructure of Ķīpsala student campus is provided with everything necessary for students, staff and guests to park their bicycles, cars and quench their thirst at drinking water points without paying for it. When developing the infrastructure, all groups of people are considered, including people with special needs: parking spaces are provided near each building, access to auditoriums, laboratories and other premises without hindrance, braille for obtaining information and inspecting buildings, all sanitary facilities are designed as required. The association of disabled people and their friends “APEIRONS” (https://www.apeirons.lv/) has praised RTU's achievements in infrastructure issues related to the provision of people with special needs.

RTU Ķīpsala student campus currently has 54 classrooms, 187 laboratories, 19 special study rooms, 10 computer classes, 12 workshops and several research centers of national importance, which are available for the implementation of various study programs, including “Biotechnology and Bioengineering”. There is also a student service hotel on the campus with 950 beds and a special block for people with special needs to ensure a favorable and comfortable living. Other elements of RTU infrastructure are also available for the needs of students and teachers - canteens and cafes, photocopiers, student hotels, RTU sports and recreation centers, swimming pool, etc. Vending machines for the purchase of various drinks and snacks are installed in the premises of RTU.

RTU Water Systems and Biotechnology Institute provides the necessary equipment (e.g. microscopes, bioreactors) and materials for laboratory work and research in the study courses "Fundamentals of Microbiology", "Biotechnological Reactors", "Introduction to Environmental and Industrial Biotechnologies". The study course "Fermentation - identification and purification of end products" takes place in the premises of the Institute of Organic Chemical Technology.

RTU Scientific Library (https://www.rtu.lv/lv/studijas/biblioteka) is a library of national significance, which has acquired its status as a result of library accreditation. RTU Scientific Library provides RTU study process and research activities with the necessary information, performs library, bibliographic and informational services for RTU students, lecturers and employees. The library collection contains 1.4 million printed documents and e-resources in databases corresponding to RTU branches. By mid 2022, the collection of the RTU Scientific Library with the reference of information resources to the bachelor's study program "Biotechnology and Bioengineering" includes more than 15,000 copies of printed publications. In 2016, significant investments were made in the development of the library infrastructure, building additional premises for the Central Library in the area of 2240 m2. The total area of the library premises is 6393 m2, of which 3417 m2 are reader service premises. There are 713 workplaces for library users. The library has four group rooms and six individual booths, a Rarity Reading Room, and a conference hall. The library is accessible to users with reduced mobility. In order to improve the operation of the RTU Scientific Library and to ensure the information needs of studies and research work, the Library Council has been established, where it is decided to supplement the library collection with printed publications and subscribe to the necessary databases. The Library Council has approved the “RTU ZB Collection Acquisition Policy”, which determines the basic principles of collection creation and development in accordance with RTU's study and research activities. Upon receipt of funding from the RTU for the library, funding for the information resources for each study program is calculated. The collection is supplemented according to the recommendations of the study program managers and researchers and the allocated funding.

The Scientific Library offers a guidebook, which contains the websites of various Latvian and foreign publishers and bookstores for searching for ordered publications and e-resources. Database subscription agreements are concluded both directly with the supplier and through V / A “Cultural Information Systems Center”, which is the national representative of Latvia in the international non-profit organization EIFL (Electronic information for Libraries, http://www.eifl.net/). The EIFL Licensing

Program offers national libraries a subscription to internationally recognized databases at a significantly reduced subscription fee which is offered to individual subscribers, saving libraries financial resources.

RTU subscribes to databases such as ProQuest Ebook Central, Academic Search Complete EBSCOhost, Applied Science & Technology Source EBSCOhost, Business Source Ultimate EBSCOhost, EBSCOhost eBook Academic Collection, Wiley Online Library, SpringerLink, The International Monetary Fund.

Databases funded by the Latvian Ministry of Education and Science are also available for the RTU Scientific Library: ScienceDirect, SCOPUS (Elsevier), Web of Science. Latvian databases are LETA, Letonika, Latvian standards database (available only in the library premises).

The most significant changes since licensing in 2020 are:

- Microsoft Teams system has been introduced at the UL and RTU to provide remote study (including online lecture) opportunities during the Covid-19 pandemic;
- supplemented informative resources for the provision of the program.

The study process of the LU takes place in the House of Nature and the House of Sciences. The House of Nature was put into operation in 2015. The total indoor area is 18,540 m2, it has a total of 30 auditoriums, 45 student teaching laboratories and 69 research laboratory rooms. All auditoriums have a projector and a laptop computer for presentations, white boards. Interactive whiteboards are also available in some of the auditoriums. In the large auditoriums located on the 1st floor of the nature house, sound equipment and recording options are also available. The science house was commissioned in 2019. The total indoor area is 20018 m2, it has a total of 15 auditoriums, 8 seminar rooms, 78 scientific and teaching laboratories. A greenhouse is located on the seventh floor of the nature house, which is available for scientific research and student training. Modern equipment for ensuring optimal plant growth conditions and automatic regulation is installed in the greenhouse. Microscopes connected to stationary computers, individual work spaces with micropipette sets are available in the educational laboratories provided for the implementation of the study program. The laboratories have cold rooms (both -20oC and -80oC) for storing samples and reagents. Within Project no. 8.1.1.0/17/I/010 "Modernization of the infrastructure of the STEM study areas of the University of Latvia and concentration of resources", equipment was purchased to ensure the possibilities of practical work in biotechnology: a set of fermentation equipment Sartorius Biostat (8 fermenters with equipment); UHPLC ("Waters") and gas chromatography ("SCION Instruments") systems for chromatographic analysis of fermentation metabolites; spectrophotometer; laboratory table centrifuge for processing fermentation samples; as well as other laboratory equipment necessary for practical work (incubator-shaker, scales, thermostats, plate reader, autoclave). In room 432 of the LU Nature House, a fermentation teaching laboratory has been set up for the practical work of student groups, in which a set of Sartorius Biostat fermenters has been installed. The laboratory allows to realize learning fermentation processes for groups of up to 20-24 students. For the purposes of the study program, the teaching laboratories that are already used for biochemistry, molecular biology and microbiology laboratory work within the Biology study program will also be used. There are five computer classrooms (the largest capacity is 20 workstations) in the nature house. Both Windows and Linux operating systems are available in computer classes. Microsoft Office office applications, statistical programs (R, SPSS, PC-Ord), field-specific programs are available. Wireless network coverage is provided throughout the building. The nature house has a cafe, a natural science library, individual work booths. The building is accessible to people with mobility impairments - the building has several elevators, appropriately equipped sanitary facilities. The first two floors of the Nature House are available to students 24 hours a day.

[1] http://greenmetric.ui.ac.id/detailranking2018/?univ=rtu.lv

3.3.2. Assessment of the study provision and scientific base support, including the resources provided within the framework of cooperation with other science institutes and higher education institutions (applicable to doctoral study programmes) (if applicable).

Not applicable

3.3.3. Indicate data on the available funding for the corresponding study programme, its funding sources and their use for the development of the study programme. Provide information on the costs per one student within this study programme, indicating the items included in the cost calculation and the percentage distribution of funding between the specified items. The minimum number of students in the study programme in order to ensure the profitability of the study programme (indicating separately the information on each language, type and form of the study programme implementation).

The financial basis of both the Faculty of Biology of the UL and the Faculty of Civil Engineering of RTU, which is necessary for the implementation of study programs, is provided by income from student fees and state budget financing studies (grants). The study financial base of both partner institutions is sufficient to ensure the study process in the study programs implemented so far. The financial situation is regularly monitored by reviewing the costs of study programs, the compliance of the planned workload of the teaching staff with the actual workload of students and work. LU and RTU already have the necessary equipment for the implementation of the study program, which means that the “Biotechnology and Bioengineering” program can be implemented without additional expenses for the purchase of equipment / purchase of equipment. The calculation of the cost of the Bachelor's study program “Biotechnology and Bioengineering” for the jointly implemented program of the UL and RTU, which was performed using the tool developed by the Department of Studies and the Department of Finance and Accounting of the UL, is 2759 EUR per student per year.

The calculation is made on the condition that the study program has on average 82 students (30 in the first year of study), of which six are state-subsidized students, as well as more than 50% of paid students are students from non-European Union countries. The number of students admitted in the first year of study is not less than 20 students of the Latvian stream and 18 students of the English stream. In this case, the program is profitable and the actual profitability of the program is 40 euros per student per year. If the state does not provide state-subsidized study places, then the program is also profitable for 82 paid students, if at least 53% of them are from non-European Union countries. In addition to teaching staff costs, the cost calculation also includes general staff costs - 502 EUR per student per year, infrastructure costs - 378 EUR per student per year, services - 29 EUR per student per year and 717 EUR are indirect costs of the UL.

3.4. Teaching Staff

3.4.1. Assessment of the compliance of the qualification of the teaching staff members (academic staff members, visiting professors, visiting associate professors, visiting docents, visiting lecturers, and visiting assistants) involved in the implementation of the study programme with the conditions for the implementation of the study programme and the provisions set out in the respective regulatory enactments. Provide information on how the qualification of the teaching staff members contributes to the achievement of the learning outcomes.

All academic staff in the study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions. The selection of the teaching staff involved in the implementation of the study programme is based on several criteria to ensure that the study courses are led by qualified lecturers who are specialists in their field with active scientific activity. The following are the minimum criteria for the selection of the lecturers:

- compliance of the qualification of the teaching staff with the requirements specified in regulatory enactments;
- the direction of scientific research corresponds to the content of the study programme and/or study course;
- an appropriate level of knowledge of English to teach study courses in both Latvian and English.

In the implementation of the study programme, RTU has involved a total of 13 lecturers, of which 8 are professors, 1 associate professor, 2 assistant professors, 1 lecturer and one foreign visiting docent. Everyone has a PhD in engineering, economics or mathematics. On behalf of the UL, study courses are provided by 4 professors, 4 associate professors, 3 docents and 4 lecturers. Accordingly, teaching staff with appropriate qualifications and knowledge in the relevant fields have been selected to provide the study programme.

All involved teachers have multifaceted knowledge and skills in the academic, scientific and practical fields, including in cooperation with industry, which provides students with the opportunity to go on study visits during their studies. 57% of RTU teaching staff are experts of the Latvian Science Council in such sub-sectors as environmental biotechnology, mathematics, economics and business, political science, electrical engineering, electronics, information and communication technologies, construction and transport engineering, chemistry, chemical engineering, materials science, which certifies the competence of the teaching staff topics in scientific news. The qualification is also confirmed by active participation in the study courses of other study programmes, their teaching and participation in various institutional positions not only at RTU, but also at the international level.

Short CVs of the teaching staff involved in the study program (full CVs are available in the annex):

Professor, Dr.sc.ing. **Tālis Juhna** received his PhD in engineering from Lulea Technical University (Sweden) in 2002. He has been a professor at Riga Technical University since 2005. Head of the study program "Biotechnology and Bioengineering". In 2012, he obtained the position of Vice-Rector for Science at Riga Technical University. Board member and founder of Conelum (2017). Member and Deputy Chairman of the Supervisory Board of SIA Rīgas ūdens (2021). Head of the LZP Advisory Council (2021). Further education: Cambridge, UK, preparation of EU framework projects, financial aspects (2007). Riga Coaching School, Leadership Leadership Courses (2020). Research interests: Ensuring water quality in the urban environment and obtaining energy from wastewater and renewable natural resources. Has established a Water Research Laboratory, which conducts

research on drinking water treatment, distribution systems, water quality and the formation of biofilms in the network. Improved the system of innovation development and implementation at Riga Technical University, creating various support mechanisms (eg, RTU Design Factory) for the development of new technologies. International and Latvian Science Council, Ministry of Education and Science, etc. manager and participant in institutional research programs. Published works: More than 100 scientific works have been written, published in Latvian, Russian and English, including scientific monographs and patents. He is the author of several textbooks. He has served on the editorial boards of scientific journals and is the author of more than 60 (cited> 540 times, Scopus Hirsch index 14) scientific articles published in journals and international conference proceedings. Pedagogical work: Several doctoral theses have been successfully completed in a joint program with KTH; the supervisor of doctoral theses and a scientific consultant. Introduced several study courses for the development of students' innovation skills (eg Vertically Integrated Projects, Demola) Organizational work: leads the Department of Science at RTU and supervises about 500 scientists in all institutes. Has implemented a funding distribution system in RTU. Member of the boards of several science centres of excellence, science councils and business incubators (eg Green Technology Incubator). He has worked as an expert in the evaluation of many projects (eg EU Framework Program projects) and as a consultant in the development of water engineering projects. LZP expert: Engineering sciences and technologies - Construction and transport engineering sciences. Chairman of the Promotion Council “RTU P-12”.

Associate Professor, Dr.sc.ing. **Linda Mežule.** She is an Associate Professor at RTU, Director of Water Systems and Biotechnology Institute and Senior Researcher at the Water Research and Environmental Biotechnology Laboratory; co-author of more than 40 international scientific publications in the environmental biotechnology, water engineering and microbiological quality assessment sectors. Since 2005, she has been actively involved in various international and local scientific projects. Currently, she is a scientific leader (project coordinator) of four projects (two ERDF practical research projects, EEA and Norway grants, the Latvian Council of Science Programme for Fundamental and Applied Studies) related to the development of new technologies for resource recirculation and environmental biotechnologies. She is a scientific adviser of Bachelor, Master and Doctoral Theses of students from natural sciences, environmental sciences and engineering industries. In 2017, she received the award of RTU Young Scientist of the Year. She is a co-founder of biotech companies LLC Conelum and LLC MyPots. SCOPUS h-index 9. Latvian Council of Science expert in the field of environmental biotechnologies.

Professor, Dr.sc.ing. **Jānis Grabis,** RTU Faculty of Computer Science and Information Technology, Director of Institute of Information Technology. More than 125 scientific publications on enterprise information, project management and business process optimization and digitalization referenced in Scopus (Scopus h-index is 12). Worked as a research associate at University of Michigan-Dearborn and guest professor at Stockholm University. Project lead or participant for more than 12 scientific projects funded by European Commission, European regional and development fund, Latvian Council of Science, Latvian State Research Program and EEZ and Norwegian grant program as well as more than 10 applied research projects funded by companies. Study program director for undergraduate, master and doctoral study programs in Information Technology. RTU Professor of the Year in 2021.

Professor **Māris Turks** is the author of more than 120 scientific publications and 37 patents, has given oral presentations at 20 international conferences and 15 guest lectures at foreign universities and research institutes. He has supervised 10 doctoral, 29 Master's and 45 Bachelor's theses. Expert of the Latvian Council of Science in the field of chemistry and in the field of chemical engineering. Participant and manager of several Latvian and international projects. Member of the editorial boards of several scientific conference programs and the editorial board of international

journals. Member of the RTU Senate, Chairman of the Doctoral Council "RTU P-01". Academician of the Latvian Academy of Sciences (LAS) and member of the LAS Senate. Project evaluation council member at the Latvian Competence Centre of Pharmaceutical, Biomedical and Medical Technology, Head of Division “Natural substance medicine, nutritional supplements, functional cosmetics”. Latvian representative at the Division of Organic Chemistry, European Association for Chemical and Molecular sciences. Management Committee member: COST Action CA18132 Functional Glyconanomaterials for the Development of Diagnostics and Targeted Therapeutic Probes.

Professor **Dagnija Loca** is the author of more than 50 scientific publications and 3 patents, has given presentations at 50 international conferences and more than 10 guest lectures at foreign research institutes. She has supervised 5 postdoctoral researchers as well as 5 doctoral, 11 Master's and 14 Bachelor's theses. Expert of the Latvian Council of Science in the field of chemistry, chemical engineering, and materials science. Participant and coordinator of more than 25 national and international research projects. Member of the scientific and organizing committees of several international scientific conferences and well as guest editor and editor of special issues of international journals such as “Materials” and “Biotechnology and Bioengineering”. Member of the RTU Scientific Council, full member of the Latvian Academy of Sciences (LAS) and President of “Materials Research Society of Latvia”.

Professor, Dr.math. **Andrejs Koliskins.** He is Professor at RTU, Director of the Institute of Applied Mathematics and Senior Researcher at the Department of Engineering Mathematics. He is a co-author of more than 140 research publications in applied mathematics, fluid mechanics and eddy current nondestructive testing. Since 1990 he has been actively involved in different international research projects (including projects in Canada and Hong Kong in collaboration with University of Ottawa and Hong Kong University of Science and Technology). He is a co-author of three monographs published by Academic Press and CRM, University of Montreal. Currently he is the project leader for collaborative project funded by the Latvian Council of Science under the Program of Fundamental and Applied Research. He is a scientific adviser of Master and Doctoral students (4 PhD theses are defended). Since 2021 he is the State emeritus scientist. Scopus h-index is 11, web of Science h-index is 10. Expert of the Latvian Council of Science in the area of Natural Sciences – Mathematics.

Professor **Nadežda Kuņicina** holds a Doctoral degree in electrical engineering and has been elected Professor of Electrical Engineering, Electronics, Information and Communication Technologies (Electrical Engineering and Automation). She holds the Expert status of the Latvian Council of Science in Social Sciences - Educational Sciences until 6 January 2024 and in Engineering and Technology - Electrical Engineering, Electronics, Information and Communication Technology until 3 September 2023. Professor Nadežda Kuņicina conducts research in the field of electrical engineering, mainly related to improving the efficiency of electricity use in industrial electronics and electric vehicles. Nadežda Kuņicina has participated in the development of study programmes, such as Erasmus plus KA 2 Applied Curricula in Space Exploration and Intelligent Robotics Systems - APPLE (2017-20); Electrical Energy Markets and Engineering Education - ELEMEND (2017-21); Innovative Approach towards a Master Program on Smart Cities Technologies - SMARTCITY (2018-21); Development of Practically-Oriented Student-Centred Education in the Field of Modelling of Cyber-Physical Systems - CybPhys (2019-22), Knowledge Triangle for a Low Carbon Economy - KALCEA (2020-23). Within the projects, academic objects and methodological tools have been developed on the following topics: innovation in information and communication technologies; introduction to the specialisation in design of energy-efficient technologies; metrology and mathematical modelling; Internet of Things and smart electrical technologies; energy saving in electrical equipment; electrical processes and equipment in biotechnology; thermal energy, fundamentals of control theory; energy efficient technologies; fundamentals of industrial computer

networks; automation theory; automation elements; non-traditional non-contact electromechanical converters; non-traditional energy converter systems and storage; methods of analysis and calculation of electronic circuits. Nadežda Kuņicina develops study materials within the following study courses: “Fundamentals of Industrial Computer Networks”, “Computerization of Mathematical Tasks in Electrical Engineering”, “Elements of Automation”, “Industrial Safety”, “Control Fundamentals of Critical Infrastructures”, “Design of Adaptive Systems”, “Linear and Non-linear Systems”

Professor **Andrejs Podgornovs** has a Doctoral degree in electrical engineering, in the sub-field of electrical machinery and equipment. He has more than 15 years of experience in the field of higher education: provision and management of the study process, research, management of international and local contract work. He actively works with students of all study levels, under his leadership more than 25 qualification papers have been developed and publicly presented. He has been regularly nominated for the lecturer's award by RTU Student Parliament. He continues to improve his professional experience by participating in international projects and performing contract work for state institutions and commercial companies. Chairman and active participant of the Latvian Technical Standardization Committee “Electrical Energy” since its establishment in 2012.

Assistant Professor and Senior Researcher **Igors Uteševs** holds a Doctoral degree in electrical engineering, electrical technology, and automation. He is engaged in scientific research, participates in international conferences, seminars and courses. He has more than 16 years of professional experience at the University. Igors Uteševs’ acquired skills and knowledge are integrated into study courses “Biotechnological Processes and Equipment”, “Fundamentals of Industrial Computer Networks”, “Computerization of Mathematical Tasks in Electrical Engineering”, “Elements of Automation”, “Industrial Safety”, Control Fundamentals of Critical Infrastructures”, “Design of Adaptive Systems” and others. The competence of Igors Uteševs ensures the successful achievement of learning results by students.

Dr.sc.ing. **Brigita Daļecka** was born in 1990. Graduated from the Faculty of Biology of the University of Latvia and obtained a master's degree in natural sciences (2014). During her studies, she gained international experience practicing at the KWR Water Research Institute (the Netherlands), studying the occurrence of microscopic fungi in drinking water. She has started her scientific activities at RTU Water Research and Biotechnology Laboratory. Since 2016, he has been studying for a doctorate at RTU and KTH at the Royal Swedish Institute of Technology, researching the possible use of microscopic fungi in the treatment of domestic wastewater from pharmaceutically active substances. In parallel with his research work, he works at the RTU Design Factory as a project manager at EIT RawMaterials Baltic Hub, as well as participates in the Student Innovation Grant Program, coordinating the Vertically Integrated Project. B. Daļecka is socially active and gladly participates in various educational activities, promoting the popularization and importance of science.

Assistant Professor **Nuno Azevedo**, University of Porto, Faculty of Engineering, Department of Chemical Engineering. More than 95 articles on chemical and biological engineering have been published in Scopus (or equivalent database) (Scopus h-index of 33). He has worked as a research assistant and participated in 15 research projects, obtained 7 patents, supervised 11 master's and 8 doctoral theses. Developed a new field of independent research related to nucleic acid hybridization mimics. Scientific merit is reflected not only in the increased number of scientific works, but also in the received awards (several times received opinions on scientific achievements, awards for presentations, etc. awards), social media interest, spin-off, which has attracted almost 2 million EUR in investment funds, participation projects, review of documents of international organizations.

Professor, Dr. oec. Elina Gaile-Sarkane obtained a doctor degree in Economics at Riga Technical University in 2003. She has been a professor at Riga Technical University since 2006. Elina currently is a director of the doctoral study programme “Economics and Management” and the professional bachelor study programme “Entrepreneurship and management”. Since 2012 Elina is elected as a Chair of Senate of Riga Technical University and in 2017 she is a dean of the Faculty of Engineering Economy and Management at RTU. Additional education: CEEMAN, IMTA International Teachers Management Academy, Bled Slovenia (2007); Harvard Business School, EECPCL program (Entrepreneurship Education colloquium on Participant-Catered Learning (2008), The Adizes Management Methodology for Mastering Changes and Roles and Styles of Management, organized by The Adizes Academy of Management, Licensee of the Adizes Institute, Santa Barbara, USA (2009 and 2010), Buskerud University Collage and Stevens Institute of Technology. Fundamentals of System Engineering (SDOE 625), Kongsberg, Norway (2010), RTU Dynamic University training course “Change management at Riga Technical University” (2015), Complex Decision Making in Teams (2021), EIT Climate-KIC project EITN08 .1 and 8.2: External participants in EIT RIS programs, HEIs Train-the-trainers (LaunchPad) session I (2022), etc. Elina is a manager and executor of different research programs announced by Latvian Council of Science, Ministry of Education and Science of Republic of Latvia, European Union (for example, Erasmus+), etc. Scientific publications: More than 100 scientific papers are published in Latvian and English, including 2 (two) scientific monographs and 2 (two) patents as well as the author of 2 (two) textbooks. Elina is participating in the scientific and editorial boards of scientific journals as an editor and supervisor, and has been the author of more than 50 scientific articles published in scientific journals and international conference proceedings (Scopus Hirsch Index 7). Pedagogical work: scientific advisor of 6 (six) successfully defended doctoral thesis, at the moment she is the advisor and consultant of several promotion researches. Study courses provided are in the fields of innovation management, strategic and change management, business and company management, etc. Elina is an expert of Latvian Council of Science in 2 (two) sub-sectors of Social Sciences and the Chairwomen of the Promotion Council “RTU P-09”.

Krista Gulbe is a senior researcher at the RTU Institute of Technology of Organic Chemistry and a docent at the Department of RTU Chemical Technology of Biologically Active Compounds. She obtained her scientific degree of Doctor of Science (PH. D.) in chemistry in June 2021. Her research is focused on the development of new synthetic methods in order to demonstrate the applications of sulfur dioxide as a solvent and/or reagent in organic chemistry. K. Gulbe is a co-author of eight scientific articles published in SCI journals and of two patents of the Republic of Latvia. K. Gulbe has participated in 19 international and 3 local scientific conferences. K. Gulbe has also an experience in academic work. She has supervised one bachelor thesis and two high school scientific research projects. She also leads the study course "Fermentation - product identification and purification" for 2nd-year students of the study programme "Biotechnology and Bioengineering".

3.4.2. Analysis and assessment of the changes to the composition of the teaching staff over the reporting period and their impact on the study quality.

Since the beginning of the study programme in the autumn of 2020, there have been no significant changes in the composition of the study courses provided by RTU - all the attracted lecturers continue or have started teaching their study courses with the exception of one assistant that left the RTU position. In some study courses, taking into account the recommendations of the AIC and reducing the workload of the responsible lecturer, additional lecturers are involved: Andrejs

Podgornovs, Igors Uteševs (Electrical processes and equipment in biotechnology), Brigita Daļecka (Vertically integrated project), Krista Gulbe (Fermentation – product identification and purification), which also provides new knowledge. Since the licensing of the study programme at the UL, five additional lecturers have been involved in its implementation: Associate Professor Ģirts Barinovs (Biophysics), Leading Researcher Jelena Kosmača (Biophysics), Lecturer Ilona Mandrika (Introduction to Cell and Genetic Engineering, Metabolism, Biomolecules and Cells), lecturer Kārlis Švirksts (Cultivation and physiology of microorganisms) and lecturer Zane Ozoliņa (Gene and cell technologies).

In general, the increase in the composition of the teaching staff has reduced the risks of the absence of substitutes and expanded the overall level of knowledge of the teaching staff.

3.4.3. Information on the number of the scientific publications of the academic staff members, involved in the implementation of doctoral study programme, as published during the reporting period by listing the most significant publications published in Scopus or WoS CC indexed journals. As for the social sciences, humanitarian sciences, and the science of art, the scientific publications published in ERIH+ indexed journals or peer-reviewed monographs may be additionally specified. Information on the teaching staff included in the database of experts of the Latvian Council of Science in the relevant field of science (total number, name of the lecturer, field of science in which the teaching staff has the status of an expert and expiration date of the Latvian Council of Science expert) (if applicable).

Not applicable

3.4.4. Information on the participation of the academic staff, involved in the implementation of the doctoral study programme, in scientific projects as project managers or prime contractors/ subproject managers/ leading researchers by specifying the name of the relevant project, as well as the source and the amount of the funding. Provide information on the reporting period (if applicable).

Not applicable

3.4.5. Assessment of the cooperation between the teaching staff members by specifying the mechanisms used to promote the cooperation and ensure the interrelation between the study programme and study courses/ modules. Specify also the proportion of the number of the students and the teaching staff within the study programme (at the moment of the submission of the Self-Assessment Report).

In the process of the implementation of the study programme, close cooperation of the teaching staff takes place, which is manifested in the following activities:

- at least once a semester, joint meetings of lecturers and study programme directors are organized to discuss current issues, issues, discussion of strengths and weaknesses, and potential improvement of study courses;
- an opportunity is provided to participate in RTU and UL methodological seminars to share experience and discuss the latest scientific and professional trends, as well as psychological pedagogical techniques and methods for improving the study process;
- cooperation in research projects, where teachers use the gained experience in the study process.

The ratio of the number of students and RTU teaching staff at the time of submission of the study programme self-evaluation report is 13/43 or one teaching staff per 3 students. Seven from all teaching staff are the responsible lecturers who are directly responsible for the study process, the rest are involved if needed. It should also be noted that due to the fact that currently there have been only two admissions, an increase in the number of students is expected.

Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	Diploms_Biotehnologija_bioinzenierija_BSP_ENG_precizets.docx	Diploms_Biotehnologija un bioinzenierija LV_precizets.docx
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)	AIC decision_translation in English.pdf	5 pielikums AP lemums.pdf
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)	Annex 4 Compliance to the joint study programme.docx	4.pielikums atbilstība kopējai studiju programmai.docx
Statistics on the students in the reporting period	Annex 5.docx	5.pielikums studejošo statistika pārskata periodā.docx
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard	Annex compliance to higher education standard.docx	Pielikums studiju programmas atbilstība valsts izglītības standartam.docx
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)		
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	Annex 8 Mapping.docx	8.pielikums studiju kursu kartēšana.docx
The curriculum of the study programme (for each type and form of the implementation of the study programme)	Annex 9 study plan.docx	9.pielikums studiju programmas plānojums.docx
Descriptions of the study courses/ modules	Annex 10 course descriptions_Full.pdf	10 pielikums_kursu apraksti_visi.pdf
Description of the organisation of the internship of the students (if applicable)		
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)	Confirmation - on compliance of the academic staff.edoc	Apliecinājums - AL 55. pants par prof. skaitu akadēmiskās programmās.edoc