

Expert group joint opinion

Evaluation Procedure: Assessment of Study Field

Higher Education Institution: Riga Technical University

Study field: Chemistry, Chemistry Technologies, and Biotechnology

Experts:

1. Bruno Zelić (Chair of the Experts Group)
2. Sabina Abbrent Novakova (Secretary of the Experts Group)
3. Sergejs Osipovs
4. Marta Viļuma (Student Union of Latvia)
5. Baiba Galviņa (Employers' Confederation of Latvia)

Summary of the Assessment of the Study Field and the Relevant Study Programmes

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Study programmes included in the Study Field are unique in the Latvian higher education system. The management structure of the Study Field and the corresponding study programmes is oriented towards the development of the Study Field. Decision-making takes place efficiently and according to rigid procedures. All procedures developed for student admission, recognition of study period, professional experience, prior formal and non-formal education and for the assessment of students' achievements and learning outcomes are public and easily accessible to all involved stakeholders. Assessments of student's learning outcomes are clearly defined and objective. The principles of academic integrity and mechanisms for their observance, as well as effective anti-plagiarism tools are developed and used. Following shortcomings regarding management of the study field should be taken into account: 1. The horizontal mobility for study programmes in the Study Field is not clearly defined and should be better specified; 2. Lack of master's study programme in the field of Biotechnology and Bioengineering; 3. Underrepresented content related to technologies for academic bachelor study programme "Biotechnology and Bioengineering" and for professional study programme "Industrial Pharmacy"; 4. Lack of lifelong learning programmes offered to graduates employed in companies and institutions; 5. Part of the claims in the SWOT analysis are incorrectly linked to the elements of the analysis; 6. High percentage of dropouts is not recognized in SWOT analysis and consequently is not included in the Study Field Development Plan; 7. The functions of FMSAC dean, Study Field director, and director of three study programmes are combined in one person.

RTU has an effective quality assurance system that is publicly available. Student satisfaction with the study courses and lecturers is regularly monitored at RTU. RTU has established complaints and suggestions mechanisms available on the RTU web site where students can submit their proposals and deliver complaints regarding various types of issues. RTU has close cooperation with employers through informal types of information delivery. Information on the study programmes is accessible on the RTU website in English and in Latvian. As only shortcoming, graduate involvement in the quality assurance processes should be clarified.

RTU has created an effective system for determining and redistributing the financial support necessary for the implementation of the Study field and corresponding study programmes. The infrastructure is well developed, the rooms and laboratories are equipped according to the study direction and learning process thereby ensuring the necessary prerequisites for the further development of study programmes. The equipment of scientific and teaching laboratories ensures the successful completion of the practical part of a specific study course. The RTU library building is comfortable, modern and well equipped. Library resources are available on-site 24/7 as well as remotely. The university's digitization level can be considered high. Students can access electronic learning resources at any time and place available to them. Two shortcomings should be considered in the future: 1. Students of joint study programmes "Biotechnology and Bioengineering" and "Industrial Pharmacy" must use two different IT tools and it creates a certain amount of confusion; and 2. Workload should be better balanced for academic staff who carry out research work and teaching.

The connection of scientific research of the study field with the study process is logical and justified at RTU. Scientific research and the outcomes thereof are integrated in the study process in the study programmes of all levels.

The FMSAC cooperates with the institutions from Latvia within the framework of the Study Field, and such cooperation contributes to the achievement of the aims and learning outcomes of the Study Field and the relevant study programmes. Contrary, cooperation of FMSAC with the institutions from abroad resulting in achievement of the aims and learning outcomes of the Study Field is not evident from available data. Therefore, cooperation of FMSAC with the institutions from abroad should be expanded, developed and better described. RTU has excellently developed systems and procedures to attract foreign teachers and students but this is not used enough to increase low outgoing mobility of FMSAC teaching staff and students.

Regarding recommendations received during the previous assessment it can be stated that most of them are already implemented. Following recommendations should be analyzed and accepted in the future: 1. Measures for decreasing the drop-out rate should be fully developed; 2. Uniform criteria for evaluating learning outcomes in a Course Paper should be established for all specialisations; 3. Measures should be developed so that a greater proportion of foreign students should be included in the matriculation; 4. Additional measures should be developed for providing feedback from international students on the quality of the study programme to improve its implementation; 5. Study programs should be supplemented with personality-forming courses, such as the history of philosophy, the history of art and literature, etc.; and 6. Students with a chemist's education should be matriculated in the programme of Industrial Pharmacy.

All study programs included in the Study field fully comply with the requirements of the Law on Higher Education Institutions and other legal regulations. The same applies to the study programs that meet the Study Field indicators, conditions and criteria. The goals, objectives, and learning outcomes of all study programs are in line and in compliance. Programs are in demand and there is a flow of incoming students each academic year (with the exception of the professional study programme Industrial Pharmacy). The content of all study programs is topical, the content of the study courses is interconnected and complementary, is consistent with the objectives of the programs and ensures the achievement of the learning outcomes, and meets the needs of industry, (scientific) institutions, the labor market and scientific trends. Students of all study programs, including bachelor's and professional study program are closely connected to the ongoing research and participate in scientific projects together with research teams established at the FMSAC and partner institutions.

The resources and provision of the study programs are sufficient for a quality learning process. The scientific, professional and generic competences of the teaching staff ensure the implementation of the study programs at the highest level, with the curriculum based on relevant scientific knowledge. All RTU teaching staff involved in the implementation of the study programs meet the requirements set by the Law on Higher Education Institutions of the Republic of Latvia.

In summary, all study programs belonging to the Study field are excellent, with some mainly minor shortcomings which could be solved in two years or at the latest by the next accreditation.

I - Assessment of the Study Field

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1.1 Management of the Study Field

Analysis

1.1.1. The study field "Chemistry, Chemical Technology and Biotechnology" (Study Field) at Faculty of Materials Science and Applied Chemistry (FMSAC) includes five study programmes: academic bachelor study programmes "Chemistry and Chemical Technology" and "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”.

Fundamental changes in four directions - Equal Rights, Quality of Life, Knowledge Society, and Responsible Latvia are planned in the near future according to the National Development Plan for 2021-2027 of Latvia in an achievement for which a high quality study process, excellent research as well as sustainable innovation and commercialization activities play an important role. According to the Riga Technical University (RTU) Strategy for 2021-2025, 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 aim of the Study Field is to provide the Latvian economy with comprehensively trained specialists in chemistry, chemical technology, biotechnology, pharmacy, and materials science who will be able to work at various public and private sector institutions and to promote graduates entering the labor market and stimulate business or research, engaging in finding new job opportunities (SAR, Part II, 2.1.1, p. 16). Therefore, the aim of the study field is in accordance with the national and RTU strategic documents, it is clearly defined and it is feasible according to experts. The study programme “Industrial Pharmacy” is probably the best example of how FMSAC aim can be aligned with national and RTU strategies. It is a joint study programme with Riga Stradins University (RSU), in which RTU faculty participate to a lesser extent, providing the private sector with trained specialists in the field of pharmacy, who, in addition to theoretical knowledge, acquire skills and competencies in a real work environment by completing a part of the mandatory courses in the biggest Latvian pharmacy plants JSC Olainfarm and JSC Grindeks (SAR Annex, The curriculum of the study programme Industrial Pharmacy). Unfortunately, this study programme is the only one in the Study Field that is directly oriented towards and developed for the needs of industry/institutions. The complete absence of lifelong learning programmes that would be offered to graduated students employed in companies and institutions is surprising, and such programmes need to be developed in the future.

According to experts, the study programmes included in the Study Field are unique in the Latvian higher education system, as they are the only programmes that educate and train engineers to become experts in the fields of chemistry, materials science/engineering of materials and chemical technology/chemical engineering.

Academic bachelor study programme “Chemistry and Chemical Technology”, academic master study programme “Chemistry and Chemical Technology”, and doctoral study programme “Chemistry, Materials Science and Engineering” are clearly interrelated and follow the usual structure of engineering education, which includes bachelor, master, and doctoral studies. As the name suggests and the contents prove, these study programmes educate engineers for levels 6, 7 and 8 of the European Qualification Framework in the fields of chemistry, material science and chemical technology. The conditions for enrolling in these studies are clear and specific and correspond to the needs and goals of the study programmes (SAR, Part II, 2.1.4, p. 25-28). For example, 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. Such conditions for enrollment in the bachelor's study programme should result in a satisfactory passing of the students, which unfortunately is not the case, especially in the bachelor study programme (SAR, Part III, Chemistry and Chemical Technology (43528), 3.1.4, Fig. 3.1.4.3, p. 191). The vertical mobility of students in these study programmes is clear, but unfortunately the enrollment conditions for students who have completed undergraduate studies in other fields (horizontal mobility) is vague, and the meaning of the term “comparable education”, which is used when defining the admission requirements for master's and PhD programmes (SAR, Part III, Chemistry, Materials Science and

Engineering (51528), Study Programme Forms, p. 106-109 and SAR, Part III, Chemistry and Chemical Technology (45528), Study Programme Forms, p. 150-151) should be better specified. This is necessary to increase the potential interest of students who have completed "comparable education" at other higher education institutions, both at home and abroad, and, of course, to clearly define the admission requirements.

The situation is different with the other two study programmes. According to the RTU classification, the academic bachelor study programme Biotechnology and Bioengineering belongs to the Study Field although its completion leads to a diploma in the field of natural sciences (SAR, Part III, Biotechnology and Bioengineering (43421), Study Programme Forms, p. 214-215). It is also clear from the content of this programme that students acquire knowledge in biology and bioengineering (genetic engineering) during their studies, while biotechnology is underrepresented. Only four compulsory subjects from Part A - Compulsory courses (Electrical processes and equipment in biotechnology, Biological reactors, Fermentation - product identification and purification, Organization of biotechnological processes) and two optional subjects from Part B - restricted elective courses (Challenges in medical biotechnology and Introduction to industrial and environmental biotechnology) can be linked to biotechnology to a greater extent (SAR Annexes, Plan of the study programme "Biotechnology and Bioengineering" and Descriptions of the study courses of the study programme "Biotechnology and Bioengineering"). Although the logic that places this joint degree programme in the Study Field is clear, the additional connection should be better manifested with an increase in the proportion of subjects covering the field of biotechnology. In addition, in order to strengthen the connection in the Study Field, it is necessary to consider the establishment of a master's programme in biotechnology (and bioengineering). This is not only necessary for induced vertical mobility of students after graduation but also for development of a study programme that further strengthens the position of the discipline in the Study Field. At the same time, the focus of the master study should be in the field of biotechnology, i.e. technical sciences, in order to create a study programme that is aligned with the RTU strategy, especially in the part related to strengthening the connection of the study programme with industrial partners and the development of competencies necessary for the economy which is weak for bachelor study programme at the moment. Currently, the academic bachelor study programme Biotechnology and Bioengineering does not provide mandatory internship (SAR Annex, Plan of the study programme "Biotechnology and Bioengineering"), which is one of the most effective means of integrating students and graduates into industry/business and also of establishing scientific and professional collaboration between FMSAC staff and the business sector. The introduction of mandatory internships would certainly increase the recognition of the programme among the general public and facilitate students' entry into the labor market.

Currently, the Industrial Pharmacy professional study programme appears to be linked to the Study Field only through two mandatory courses - Part A (The Chemistry and Technology of Pharmaceuticals and Patents) and one restricted elective course - Part B (Nanotechnologies in Drug Delivery and Diagnostics) taught by staff from RTU, i.e. FMSAC (SAR Annex, Plan of the study programme "Industrial Pharmacy"). At the same time, the mentioned restricted elective course Nanotechnologies in Drug Delivery and Diagnostics subject is according to poorly elaborated selection criteria probably not enrolled to a large extent (meeting with students and the directors of the study programme "Industrial Pharmacy"). Although the programme of the study is aligned with strategic documents, there is a weak connection to the Study Field. This refers in particular to the fact that students pursuing the Master's degree in Chemistry and Chemical Technology cannot enroll in the Industrial Pharmacy programme (SAR Part III, Industrial Pharmacy (46725), Study Programme Forms, p. 87), which is unusual considering that it is a professional study programme. Comparable professional study programmes abroad allow students with a broader scientific background to enroll, especially if they come from an industrial sector related to the field of study.

Another connection between the study programmes that are carried out within the Study Field is the

one that allows students to take, in the optional part of the study programme, those subjects carried out in other studies of the Study Field or RTU (for example, 5 credit points is dedicated for free elective choice in the academic bachelor study programme Chemistry and Chemical Technology, SAR Part III, Chemistry and Chemical Technology (43528), 3.1.2, p. 188).

1.1.2. Strengths, weaknesses, opportunities and threats of the Study Field are analyzed, e.g. SWOT analysis was performed (SAR, Part II, 2.1.2, p. 20-24). Based on the SWOT analysis, the Study Field Development Plan is developed consisting of eight activities and corresponding implementation periods (SAR Annex, Plan for the development of the Study Field).

Part of the claims in the SWOT analysis are incorrectly linked to the elements of the analysis. Thus, for example, the decrease in the population and the related decrease in the number of students and the related need to optimize the study programme are now associated with weaknesses, and in fact should belong to threats. The improvement of equipment for the implementation of distance learning is certainly not a weakness, but depending on how it is interpreted, it can be a strength or an opportunity to ensure the necessary prerequisites for effective teaching, not only as a distance learning. Renewal of academic staff is not a weakness, it should be seen as an opportunity for the academic community. Legislative restrictions on training of foreign students in the same groups as local students and the relatively low recognition of Latvia in international education are not threats but weaknesses. Study programmes implemented by RTU as the only programmes providing higher education in chemical technology, material science, and in collaboration with other national universities, in biotechnology and industrial pharmacy is not an opportunity but a strength. Additionally, as one of the possibilities the following is stated: "Opportunity to earn additional income" (SAR Part II, 2.1.2, Opportunities, p. 22), which is unclear in itself because it does not define which category of persons associated with the Study Field it refers to, students, employees, management of RTU/FMSAC or administrative staff.

One of the major weaknesses of Study Field is the high dropout rate of students, particularly in the bachelor study programme (SAR, Part III, Chemistry and Chemical Technology (43528), 3.1.4, Fig. 3.1.4.3, p. 191), although the PhD programme also has an unusually high number of dropouts (SAR, Part III, Chemistry, Materials Science and Engineering (51528), 3.1.4, Fig. 3.1.4.3, p. 116). For some unknown reason this was not recognized in the SWOT analysis as a weakness. Consequently, the Study Field Development Plan does not include any activities that would lead to a reduction in the dropout rate which should be reconsidered.

In view of all this, it is necessary to carefully refine the SWOT analysis and expand the Study Field Development Plan to include activities that will lead to a reduction in the number of students who drop out, regardless the reasons.

1.1.3. The Study Field has five study programmes which are led by three study programme directors. Two RTU structural units are involved in the implementation of the study programmes within the study field, six FMSAC institutes and one institute of Faculty of Civil Engineering (FCE). Two out of the five study programmes are jointly implemented with the University of Latvia (UL) and RSU. The teaching staff and technical staff of the Study Field cooperate with other structural units of RTU as well (SAR, Part II, 2.1.3., p. 24-25).

The Study Field Committee supervises activities within the Study Field and is responsible for the content and quality of the study programmes of the Study Field, including preparation of the Study Field for external assessment and accreditation. The Study Field Committee carries out tasks and is constituted in the manner prescribed by the Regulations of the study field committee of RTU. The work of the Committee is led by the Director of the study field (SAR, Part II, 2.1.3., p. 24-25).

Internal quality control at the FMSAC and at the level of the Study Field is ensured by the vice dean for academic affairs. The quality of the study programmes is ensured by the director of the study programme and academic staff involved in the implementation of the programme (SAR, Part II,

2.1.3, p. 24-25). The responsibilities and duties of the director of the study programme are clearly defined. RTU Study Department and RTU programmes Management and Curriculum Design Unit are strongly involved in the development and implementation of the study programmes within the Study Field. Procedure for changes of the study programmes are clearly described and their implementation is carried out rigidly. Almost all stakeholders, academic staff, employers, students, student self-government as well as the trends in the national economy and labor market are involved in changes of the curriculum (SAR, Part II, 2.1.3, p. 24-25). Here, more importance should be given to suggestions from alumni associations or individuals who have graduated in the field and work in companies or institutions that are of interest to the Study Field.

The administrative and technical staff of FMSAC is responsible for the maintenance of the premises and equipment and for ensuring that conditions are created in a timely manner for the implementation of teaching, research and professional work (SAR, Part II, 2.1.3, p. 24-25).

There is strong evidence that the management structure of the Study Field and the corresponding study programmes is oriented towards the development of the Study Field. Decision-making takes place efficiently and according to rigid procedures. The support provided by the administrative and technical staff ensures all the needs of the study programmes corresponding to the study field.

The only potential shortcoming of the existing study field management system is the fact that the functions of FMSAC dean, Study Field director, and director of three study programmes are combined in one person (SAR, and meetings with the dean, Study Field director, and director of three study programmes, Chemistry and Chemical Technology (43528), Chemistry and Chemical Technology (45528), and Chemistry, Materials Science and Engineering (51528)). Although there are numerous advantages of such a management structure, it also runs the risk of concentrating a large number of responsibilities and authorities onto one person. Therefore, it is suggested that at least one of the study programmes, e.g., a PhD study programme, be directed by another distinguished FMSAC scientist.

1.1.4. Admission requirements for all levels of study programmes are described as a part of the RTU Admission Regulation and linked to the goals of the RTU Strategy (SAR, Annex, List of the governing regulatory enactments and regulations of the RTU, Appendixes 29-35). They are clearly and understandably described for all candidates admitted to the full-time study programme.

The admission requirements are described separately for candidates entering the bachelor study programme, for high school graduates who took the Central Examinations (CE) and for high school graduates who completed their high school education before 2009 (inclusive). The admission requirements are also defined for those candidates who have not passed the CE in Latvian (SAR, Part II, 2.1.4, p. 25-28).

The procedure by which candidates who have completed bachelor studies in the field relevant to the study programme are admitted to the master's programme is also described (SAR, Part II, 2.1.4, p. 25-28). Here it should be emphasized once again that the term "field of study relevant to the master's programme" is not well-defined and should be replaced by a clear list of study programmes that must be completed by candidates enrolling in the master's programme, or it is necessary to define the qualifications that candidates enrolling in the master's programme must have. For undergraduate study programmes the admission process has been improved by introducing an information system for study enrollment, although candidates still have to bring original documents in person. It would be much more efficient if a centralized information system is used for enrollment at all levels of study programmes in Latvia, which would allow applicants not to bring original documents in person to the higher education institution.

Admission requirements for PhD study programme are described correctly and in detail (SAR, Part II, 2.1.4, p. 25-28).

The application procedure for study places financed from the state budget is described clearly and in sufficient detail for all levels of study programmes (SAR, Part II, 2.1.4, p. 25-28). The possibility to

apply for state-funded study places via the RTU portal ORTUS, which is available for students who have completed their bachelor's degree, should be emphasized.

Recognition of previously acquired formal and non-formal education is resolved at the level of the entire RTU with appropriate regulations and procedures ("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_Competerencies_Developed_Outside_Formal_Education.pdf and in the file of Appendix 9 of the List of the governing regulatory enactments and regulations of the RTU). It should be noted here that the FMSAC has received a relatively small number of applications from applicants that relate to the recognition of study outcomes (eight in total) acquired in the period prior to the start of the bachelor programmes (SAR, Part II, 2.1.4, p. 28). In essence, these involve the recognition of subjects that the candidates have completed at other Latvian universities at the same level of education.

All procedures developed for student admission, recognition of study period, professional experience, prior formal and non-formal education and for the assessment of students' achievements and learning outcomes are public and easily accessible to all involved stakeholders through the RTU and FMSAC websites and other common ways of sharing this type of data in the academic community.

1.1.5. Assessment of student's learning outcomes is based on the summative system, meaning that the final grade is composed of different components. Corresponding procedures are clearly described in Regulation on the Assessments of Learning Outcomes of RTU (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 4 of the List of the governing regulatory enactments and regulations of the RTU).

Each course includes a description of the relevant knowledge, skills, and competencies and a corresponding assessment system, as well as a list of learning outcomes for which credit points are awarded (SAR, Part II, 2.1.5, p. 28). The pedagogical methods used and the forms and methods of assessment are consistent with the curriculum, the specifics of the course, and the needs of the students. Students should be informed about the assessment criteria during the first lecture (in most cases they are, although the student survey showed some exceptions, SAR, Part II, 2.2.3., p. 34).

Criteria of the assessment are published on ORTUS e-study system beforehand. Each home task, test, report, presentation, and all other assignments that are graded have a well-defined share of the final grade. At the same time, the grade the student receives on the exam itself may not exceed 50% of the final grade. In this way, students are encouraged to fulfill their obligations during the semester and to participate in all forms of teaching, which should lead to a higher success rate, especially in the lower years of the bachelor's study programmes.

Assessment forms and methods are selected by instructors responsible for the study courses in compliance with course curriculum and specifics of the programme, as well as student needs (SAR, Part II, 2.1.5., p. 28).

In order to further develop the pedagogical competence of the academic staff, various courses and seminars are regularly organized, for which the Center for Academic Excellence of RTU is responsible in addition to the FMSAC itself (SAR, Part II, 2.1.5, p. 29).

1.1.6. Principles of academic integrity and mechanisms for their observance are implemented in the RTU Code of Academic Integrity (SAR Annex, Appendix 19 of the List of the governing regulatory

enactments and regulations of the RTU). The goal of the RTU Code of Academic Integrity is to strengthen the academic culture and honesty in the RTU academic environment, clarify the concept of academic integrity and the related activities, and define the main procedures in consideration to the breaches of academic integrity. The RTU Code of Academic Integrity differentiates academic integrity in research work, academic integrity in behavior of students, academic and general staff, and specifically describes consideration of academic integrity breaches of students.

The RTU Code of Academic Integrity contains procedures that describe how the report on the violation of the student's academic integrity is filled, registered, reviewed, and appealed. Students are informed and educated about all procedures related to academic integrity within the study courses or special seminars related to that topic.

RTU has also published the book "Glossary for Academic Integrity" (available at <http://www.academicintegrity.eu/wp/glossary/>) and organizes Academic Integrity Week (<https://www.rtu.lv/en/university/for-mass-media/news/open/academic-integrity-week-explains-plagiarism-and-calls-for-ethical-behaviour?highlight=academic+integrity+week>) during which the RTU Student Parliament explains on social media why it is important to observe ethical principles and fight against dishonest behavior in the academic environment (SAR, Part II, 2.1.6, p. 29).

RTU and its constituents use two major plagiarism control tools in the study process - joint computerized plagiarism control system (which is used by numerous Latvian universities and colleges) and Turnitin which are both implemented at the ORTUS environment (SAR, Part II, 2.1.6, p. 29). Both systems are mainly used to check graduation papers. The generally accepted "good practice" at RTU shows that more attention should be paid to the papers showing 20 % or more matches (SAR, Part II, 2.1.6, p. 30). It should be considered that this percentage be reduced even more, especially for those papers that do not fall into the category of review papers, that is, for those papers that refer to graduation papers based on research results.

Students, teachers and representatives of employers are informed about principles of academic integrity and mechanisms for their observance, and anti-plagiarism tools. Thus, for example, students are informed about all elements of academic integrity within the framework of individual study courses and seminars that are specially organized and refer to this topic (SAR, Part II, 2.1.6, p. 30). Additionally, students and teachers during the Academic Integrity Week (<https://www.rtu.lv/en/university/for-mass-media/news/open/academic-integrity-week-explains-plagiarism-and-calls-for-ethical-behaviour?highlight=academic+integrity+week>) discuss plagiarism and ethical behavior in the academic environment.

Conclusions on this set of criteria, by specifying strengths and weaknesses

The aims of the Study Field are clearly defined and attainable. The Study Field and corresponding study programmes are in accordance with the strategic development of RTU and satisfy the needs of the society and national economy. The interconnection of the study programmes included in the Study Field is clear and logical especially for studies in the field of chemical technology. The SWOT analysis has been performed but it should be reconsidered and further developed. Some FMSAC weaknesses should be better recognized and included in the Study Field Development Plan. The management of the FMSAC is oriented towards the development of study programmes based on the field of sciences which are characteristic for the research performed at the individual institution. The support provided by the administrative and technical staff ensures all the needs of the study programmes corresponding to the Study Field. Procedures for student admission are clear and precise, and based on an excellent system developed at the level of RTU. A system has been set up for the recognition of the study period, professional experience, prior formal and non-formal education and for the assessment of students' achievements and learning outcomes. They are logical and effective, the involved stakeholders are informed about the system. The same applies for methods, principles and procedures for assessing achievements of students. The principles of

academic integrity and mechanisms for their observance, as well as effective anti-plagiarism tools were developed at the RTU level and are effectively applied in accordance with the needs of the FMSAC. Stakeholders involved are informed about principles of academic integrity and mechanisms for their observance, and about anti-plagiarism tools.

Strengths

1. Study programmes included in the Study Field are unique in the Latvian higher education system, as they are the only programmes that educate and train engineers to become experts in the fields of chemistry, materials science/engineering of materials and chemical technology/chemical engineering.
2. Academic bachelor study programme “Chemistry and Chemical Technology”, academic master study programme “Chemistry and Chemical Technology”, and doctoral study programme “Chemistry, Materials Science and Engineering” are clearly interrelated and follow the usual structure of engineering education, which includes bachelor, master, and doctoral studies. There is clear and understandable vertical mobility for students in these study programmes.
3. The professional study programme “Industrial Pharmacy” provides the private sector with trained specialists in the field of pharmacy, who, in addition to theoretical knowledge, have acquired skills and competencies in a real work environment by completing part of the mandatory courses in leading national pharmaceutical companies.

Weaknesses

1. The horizontal mobility for study programmes in the Study Field is not clearly defined and should be better specified.
2. Lack of master's study programme in the field of Biotechnology and Bioengineering.
3. Underrepresented content related to technologies for academic bachelor study programme “Biotechnology and Bioengineering” and for professional study programme “Industrial Pharmacy”.
4. Lack of lifelong learning programmes offered to graduates employed in companies and institutions.
5. Part of the claims in the SWOT analysis are incorrectly linked to the elements of the analysis.
6. High percentage of dropouts is not recognized in SWOT analysis and consequently is not included in the Study Field Development Plan.
7. The functions of FMSAC dean, Study Field director, and director of three study programmes are combined in one person.

1.2. Efficiency of the Internal Quality Assurance System

Analysis

1.2.1. According to SAR, Part II, 2.2.1., p. 31, RTU has established a quality policy which is publicly available on the homepage of the university and can be accessed on the webpage of RTU under documents section called “Kvalitātes politika”: <https://www.rtu.lv/lv/universitate/dokumenti/kvalitates-politika> in Latvian and under public files on the webpage there is also a file “Quality policy” in English which can be accessed here: https://www.rtu.lv/writable/public_files/RTU_quality_policy_of_rtu.pdf. As outlined in the SAR, Part II, 2.2.1., p. 31, RTU aims of internal quality assurance are centered towards scientific research, academic, infrastructural and organizational excellence, and recognizability. According to the opinion of the expert group, the aims of the RTU are in compliance with the learning outcomes of the Study Field and in direct relation of the relevant study programmes. During the onsite visit, the management pointed out that RTUs main focus is towards science and doing research while teaching forms only around 20 %. Although, as pointed out during the visit, academic work is also an important subdivision of the processes of the university. According to the survey made by the

Latvian Employers Confederation where around 2000 companies participated RTU has for 8 years been recognized as the most demanded and needed institution of higher education due to the skills and needs of the market. According to the information that has been gathered during the onsite visit, RTU is working on bringing in a significant amount of foreign students for full-time studies by offering study programmes in English. According to the SAR, Part II, 2.2.2., p. 33, and the information gathered from the management and other stakeholders met during the onsite visit, the main focus of the quality assurance system is to improve the study process, quality of the study courses and in case of any possible issues, eliminate those as effectively as possible for the purpose of better quality next year. RTU actively ensures the monitoring process of the study quality through survey procedure. As it was outlined from the meetings with the students, there are 2 surveys per semester - one in the middle of the study semester and one in the end. One of the students pointed out that this is the most effective way to anonymously and successfully give their feedback and resolve questions and possible issues arising within the study process. Overall, students also feel they can reach out to the lecturers and the Dean, if necessary, in case of problems. Students mentioned that there was a problem with one of the lecturers before as the study course was boring and the quality of the course was low so students reported that in the student surveys and the next year the lecturer was changed. When asked how active they actually are in filling in the surveys, they said that of course, they are more active when they dislike something or when something is very good and they wish to point it out. An aspect students pointed out was the reminders on the digital platform ORTUS which inform them that surveys need to be filled in. The information pops out when they log into the platform. During the onsite visit with the students, they pointed out that there are various questions included regarding specific study courses taken that semester, and lecturers that teach the course. One of the students pointed out that he/she enjoys the implemented award system where they can nominate a lecturer for an award based on the quality of lectures and other qualities they wish to point out. Overall, it is noticeable that the student feedback matters and is taken into account. Therefore, the system of quality assurance is effective and ensures continuous development of the study programmes.

1.2.2. It is clear from the onsite visit that students are actively involved in the procedure of study programme development and their quality maintenance. As already mentioned in 1.2.1. students are participating in surveys twice per semester. During the onsite meetings, persons responsible for implementation of quality assurance mechanism stated that summaries of survey results are made and uploaded onto the RTU homepage for open access to interested parties. The summaries per study year can be found here: <https://www.rtu.lv/lv/studijas/studiju-kvalitates-novertesana/studejoso-aptaujas> on the webpage of RTU under “Studiju kvalitātes nodrošināšana” in the subsection “Studējošo anketēšanas rezultāti”. Although, there are some inconsistencies identified regarding the involvement in quality assurance procedure of graduates and employers and no clear identification that they have been given feedback regarding the survey results. In fact, when questioned during the onsite visit, graduates stated that they do not specifically remember receiving surveys after graduation or maybe have missed them. While another graduate outlined that a few years ago when graduating, there was an invitation sent to join the RTU Alumni network but the graduate did not wish to join.

During the meeting with employers, it became clear that employers have more informal communication with RTU regarding the needs of the work market and when there are any necessary changes to be made within the study programmes due to the demands of the skills. One of the employer representatives stated that formal paperwork regarding quality assurance processes seems unnecessary and extra work with no real purpose. Employers pointed out that they participate at Board meetings and that is when they provide feedback on the priorities of the Study Field and what should be implemented in the study programmes. The expert group thinks that even though that is one of the ways to effectively update study programme content, all communication

cannot be limited to that. Employers also need to fill in the survey forms and be enrolled in a formal procedure of quality assurance. According to the SAR, Part II, 2.2.4., p. 38, RTU is planning to implement this procedure in the nearest future.

Employers are also a crucial part of internship provision for the students of RTU. One of the employers stated that he had an intern in their company who was a student at RTU at that time and who he described as a smart and capable person. According to the information that the employer shared, the key issue is that interns come for a rather limited time, usually during summer time and sometimes even only for a period of one month. Plus, at this point, the amount of students prepared is not sufficient. The employers are concerned that RTU is not balancing science and fun in the right proportion which scares the students during their first study year away which results in a low amount of graduates.

The information provided in the SAR, Part II, 2.2.2. p. 33 identifies that the needs of revision and development of study programmes can be based on results received in the student and graduate surveys. According to the SAR (Part I, 1.4., p. 15), student expectations and satisfaction with the curriculum and study process are identified in sequential and planned surveys at all stages of study. As stated by the RTU representatives, graduate surveys are collected during their last semester of studies shortly before graduation ceremony. However, as students have stated during onsite visits, they do receive the graduate surveys but fail to fill them. As stated by one of the graduates, the chemistry field is small here so that usually the feedback is given out personally but not a survey per se. To conclude, it means that there is a formal procedure in place, although in reality, the informal procedure seems to be more effective. Another cause is based upon proposals of the involved academic staff or structural units, with the aim of improving and updating the structure and content of a programme. The same approach is being implemented for the joint study programmes in accordance with the quality management systems of the participating universities, in this case, in the study programmes "Industrial Pharmacy" and "Biotechnology and Bioengineering". Such a procedure is conducted at least once a year.

Overall, it seems that employers are a substantial part of the RTU processes as aforementioned participation at Board meetings and also yearly invites to the so called "Science Festival" when Masters students defend their thesis.

1.2.3. For the purpose of continuous improvement maintenance, RTU has implemented complaints and suggestions mechanisms where students can describe and submit the existing issue in place, reaching out for help and finding possible solutions. The form of complaints and suggestions can be found on the webpage of the RTU under "Proposals and Complaints" and is available here: <https://www.rtu.lv/en/university/proposals-and-complaints>. The form includes various sections: 1. Theme; 2. Subject; 3. Description; 4. Attachments; 5. Connection with RTU; 6. Student ID number; 7. Faculty; 8. Department; 9. Name and Surname; 10. E-mail.

In the time period of the previous study year September 2021 to May 2022, there were 43 complaints/suggestions received and none was anonymously submitted according to the SAR, Part II, 2.2.3., p. 34. Out of 43, 32 were complaints and 11 were suggestions. In relation to the study process there were 13 complaints and 6 suggestions. 1 complaint was regarding maintenance of infrastructure, 3 complaints regarding accommodation, 8 complaints and 1 suggestion related to foreign students, 2 complaints to information flow, 9 complaints and 2 suggestions to IT issues.

In the SAR, Part II, 2.2.3., p. 34-35, RTU has provided detailed explanation on the issues related to the suggestions and complaints received from the students such as 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. Several complaints were 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' emails. There have been some specific examples of the complaints received, such as - some 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.

During an onsite meeting, management and academic staff outlined that there have been cases when students did not use the complaint and suggestion system and wrote letters to the Ministry of Education or even to the Minister when they wished to complain to someone outside the RTU. These cases rarely happen but one time it happened related to a quality assurance question when RTU implemented a mandatory survey system and students were not able to access ORTUS system materials until they had filled the survey and one student complained in the form of a letter addressed to the Minister.

When asking the students how safe they feel to discuss issues with the university that regards studies, students felt like they can openly address questions to the Dean or lecturers of the specific course. Mostly, the issues are solved shortly with the help of the RTU staff. As already mentioned in the example in 1.2.1., the lecturer of the course was changed because of the complaints of the students. Students are aware of the suggestion and complaint mechanism and know where to find the form in case of need. In situations when they complain, students do receive feedback and see the result of a change based on their complaint or suggestion made.

1.2.4. In the SAR, Part II, 2.2.4., p. 36, RTU has provided a detailed description of the existing mechanisms in place regarding statistical data collection mechanisms established. One of the examples is RTU quality reviews that are drawn up once a year. That is when the RTU analyzes processes and results summarizing data on performance indicators of RTU administration, core activities and support processes. As was stated in the SAR, Part II, 2.2.4., p. 36, there are 28 performance indicators characterizing the process quality that are set for one of the RTU core activity processes "Organization and Management of the Study Process". According to the information provided in the SAR, Part II, 2.2.4., p. 36-37, and the information that has been gathered during the onsite visit, the data are summarized once a year for the previous academic year by study level and study programme. After that, the data from the quality review are submitted to RTU administration for analysis by study level, by faculty and study field. Indicators for numerous study programmes are compared with the general average RTU level.

During the onsite visit, representatives of the management outlined that they are satisfied with the performance of the study programmes. As one of the key indicators, they outlined that 65% of graduates of Bachelor's programmes continue their studies at RTU at graduate level. In the SAR, Part II, 2.2.4., p. 36, RTU states that this is one of the reachable qualitative or quantitative aims.

RTU is working on the study programme quality visualization tool which at this point is at the development and test phase and in the future it is planned it will help to reflect Bachelor and Master study programme performance for each academic year with the help of a radar chart. A tool for data visualization is planned to be developed and improved as well within the framework of SSO 8.2.3 project. More detailed description is provided in the SAR, Part II, 2.2.4., p. 36-37.

According to the SAR, Part II, 2.2.4., p. 37 and the Cabinet Regulations No. 812 which can be accessed here: <https://likumi.lv/doc.php?id=287576>, 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". The statistical review includes a list of specific sources of information that are crucial indicators of the Study Field and study programme continuance, for example, summarized statistics on the number of students/graduates, distribution of students by study programme, allocation of financing, number of mobility students in the total number of students and others.

The mechanism of receiving feedback is based upon polling cycles where RTU gathers survey results from the involved stakeholders - students, graduates and employers as stated in the SAR, Part II, 2.2.4. p. 38.

Firstly, when students start their studies a survey for students is conducted about their expectations from studies, how easy or hard it is to find information, and how they found the admission process. The survey is conducted electronically on the portal ORTUS.

Secondly, as mentioned in 1.2.1., there are 2 surveys per semester where students evaluate study courses and lecturers. The mid-semester survey was introduced in the spring semester of academic year 2020/2021. The second survey is scheduled at the end of the semester when the study courses are finished. This form of polling/survey is also conducted electronically in portal ORTUS. Afterwards, the results are sent to each of the lecturers individually and to the head of the organizational unit.

Thirdly, RTU states in the SAR, Part II, 2.2.4., p. 38, that 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. During the onsite meeting as mentioned in the 1.2.1., none of the graduates could clearly state whether they received such an email sent by RTU or they just decided not to fill it in. This raises a question if such emails are sent out and/or whether graduates ignore them and are unwilling to participate. Either way, it raises a concern regarding how objective the existent data of the polling of the graduates really is.

Fourthly, as outlined in the SAR, Part II, 2.2.4., p. 38 and also confirmed during the onsite visit talking with doctoral students, annual polling for doctoral students and doctoral alumni has been introduced. The results are taken into consideration in the improvement of the Doctoral study process and the quality of support provided to doctoral students.

Fifthly, it is also planned to run regular centralized polling of RTU employers. Polling of employers now takes place at the end of an individual student's internship, as well as within the scope of developing the study programmes.

1.2.5. RTU has a website/homepage www.rtu.lv which provides detailed information on the higher education institution and the existing study programmes within each of the study fields. The home page is available in both languages - Latvian and English, in which the studies in the study field are offered. In Latvian it can be accessed under "Studijas" here: <https://www.rtu.lv/lv/studijas> and in English it can be accessed under "Studies" here: <https://www.rtu.lv/en/studies> All the relevant study programmes of the study field can be found there with descriptions of the necessary information - study length, budget places, study fee and other.

RTU also has established interactive web pages dedicated to RTU study fields, study programmes therein, as well as the detailed description of the offered study courses which can be found under "Kursu katalogs" in Latvian - <https://stud.rtu.lv/rtu/vaaApp/sprpub> and English - <https://stud.rtu.lv/rtu/discpub/list?english=true> languages. There is also a separate webpage designed for the foreign student target audience on RTU study programmes implemented in English and student mobility opportunities accessible here under the section "Studies" of International Cooperation and Foreign Students Department: <https://international.rtu.lv>.

There are study programmes that RTU decided not to include in this assessment and they will not be accredited at the end of this assessment based on their decision but still those programmes can be seen on the VIIS platform under "active study programme licenses". For example, 43440 - Chemistry (Ķīmija); 45440 - Applied Chemistry (Lietišķā Ķīmija); 45224 - Chemistry Technology (Ķīmijas Tehnoloģija); 51441 - Chemistry (Ķīmija).

The information published on the website of the higher education institution about the study programmes (<https://www.rtu.lv/en/studies>) corresponding to the study field corresponds to the information available in the official registers (VIIS and E-platform).

Conclusions on this set of criteria, by specifying strengths and weaknesses

RTU has an effective quality assurance system that assures academic, infrastructural and

organizational excellence, and recognizability. The quality assurance system is publicly available and actively involves students in the quality assurance processes. RTU regularly monitors student satisfaction on the study courses and lecturers. Students feel that their feedback matters and is taken into account. RTU summarizes the data collected and publishes the summary on their webpage. RTU has established complaints and suggestions mechanisms where students can submit their proposals and deliver complaints regarding various types of issues. The form is available on the website of the RTU. An effective statistical data collecting system has been established on the RTU. RTU has close cooperation with employers but at this point it is not through surveys but rather through more informal types of information delivery. It is unclear how often and how graduates are participating in quality assurance maintenance processes as none of the graduates during the onsite meeting recalled they have participated. Information about the study programmes is accessible on the RTU website in English and in Latvian. The information provided on VIIS and E-platform is in correspondence with the information published on the website of RTU.

Strengths:

1. Students are actively participating in surveys as they are mandatory to be filled.

Weaknesses:

1. Inclarity regarding graduate involvement in the quality assurance processes.

Assessment of the requirement [1]

- 1 R1 - Pursuant to Section 5, Paragraph 2.1 of the Law on Higher Education Institutions, the higher education institution/ college shall ensure continuous improvement, development, and efficient performance of the study field whilst implementing its internal quality assurance system:

Assessment of compliance: Fully compliant

RTU has managed to establish an effective, continuous improvement type of internal quality assurance system that fulfills all its functions towards students and their satisfaction but graduates seem to be left out from the mechanism while employers are involved through internship surveys and participation in Board meetings.

- 2 1.1 - The higher education institution/ college has established a policy and procedures for assuring the quality of higher education.

Assessment of compliance: Fully compliant

As mentioned in the analysis 1.2.1. - RTU has an established Quality Assurance Policy and has implemented surveys as the main form of monitoring and assuring quality of the study programmes.

- 3 1.2 - A mechanism for the development 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.

Assessment of compliance: Fully compliant

RTU has established a mechanism of development through 2 surveys per semester where students can review each of the study courses they have taken as well as the lecturer of the course. While, employers are formally participating in quality assurance processes through internship surveys of students that they have provided internships to and through board meetings where some of the employers participate. It is unclear to what extent and how graduates are involved in quality assurance.

- 4 1.3 - 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 published.

Assessment of compliance: Fully compliant

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).

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.

- 5 1.4 - Internal procedures and mechanisms for assuring the qualifications of the academic staff and the work quality have been developed.

Assessment of compliance: Fully compliant

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 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 (SAR Annex, Biographies of the teaching staff members); the direction of scientific research corresponds to the content of the study programme and/or study course (SAR Annex, Biographies of the teaching staff members); an appropriate level of knowledge of English to teach study courses in both Latvian and English (SAR Annexes, Confirmation - knowledge of the state language and Confirmation - knowledge of the foreign language).

- 6 1.5 - 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.

Assessment of compliance: Fully compliant

According to the SAR, Part II, 2.2.4., p. 38, RTU gathers and analyzes the information it gathers from the stakeholders regarding the questions of importance and interests for the quality assurance. According to the SAR, Part II, 2.2.4., p. 36, RTU pays large attention to key performance indicators, ensures the employment of the graduates (mostly all of them are employed by the time of graduation), and according to the SAR, Part II, 2.2.4., p. 36-37, twice per academic term, students evaluate the performance of the academic staff in the ORTUS environment by answering the survey questions.

- 7 1.6 - The higher education institution/ college ensures continuous improvement, development, and efficient performance of the study field whilst implementing its quality assurance systems.

Assessment of compliance: Fully compliant

RTU is constantly trying to improve the study field and ensure formation of study programmes that are needed in the industry. According to the analysis and information outlined above in the text with references, quality reviews are being made every year as well as study programmes are reviewed on an annual basis.

1.3. Resources and Provision of the Study Field

Analysis

1.3.1. The procedure for financing in RTU is determined by both the state legislation, the RTU Senate ("Methodology for Allocation and Application of Funds to RTU Units in Academic Year 2021/2021") and a series of internal normative documents, which are attached as the 16th appendix of the SAR (for example "On Approval of the Methodology for Allocation of Funds for Study Process Provision at the International Cooperation and Foreign Students Department in Academic Year 2021/2022"; "Regulation "on procedure of change of the source of study Financing and granting of tuition fee discount").

Base funding in RTU is implemented through state budget funded study places for full-time studies. The number of study places is allocated after discussions with the Ministry of Education and Science (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 order to increase the number of budget places in individual study programmes, including the Biotechnology and Bioengineering study programme, RTU has made changes in the Methodology in the 2020/2021 academic year which ensures the distribution of study places of the state budget's funding by study programmes and thematic areas of study courses. In fact, internal state budget places have been redistributed by study programmes according to the indicators with which RTU receives state budget funding (SAR, Part II, 2.3.1., 40-48).

In addition to the places financed by the state basic budget, the study programme financing also consists of tuition fee revenue - revenue from local fee-paying students and revenue from foreign fee-paying students (SSAR, Part II, 2.3.1., 40-48). Funding received from foreign fee-paying students is allocated in accordance with the RTU Senate's decision on "Approving the methodology for the allocation of funds for international cooperation and ensuring the study process of the department of foreign students in the relevant academic year", using "Methodology 2" ("Methodology for Allocation of Funds for Study Process Provision at the International Cooperation and Foreign Students Department" in the Respective Academic Year. Appendix 41 of the list of Internal regulations), which is reviewed and approved every year, taking into account the necessary changes. As a positive fact it can be mentioned that since the 2019/2020 academic year, additional funding from the study fees of foreign students goes to the deans of the faculties. Currently, the number of foreign students in the specific fields of studies is small - less than 3% of the total funding is made by foreign student tuition fees (SAR, Part II, 2.3.1., 40-48). RTU has a decentralized budget, and each organizational unit is allocated a separate budget (SAR, Part II, 2.3.1., p. 42).

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) (SAR, Part II, 2.3.1., p. 46) The existing financing procedure for the implementation of the study direction and relevant study programmes, scientific and applied research, as well as creativity has been implemented and experts evaluate it as effective.

1.3.2. The construction of the RTU student campus started in 1965 and continues today. The biggest development at RTU started again in 2013 with the commissioning of the new building of the Faculty of Energy and Electronics and the completion of the construction of the new library building in 2015 (RTU web page, section: Home/ University/ RTU Ķipsala Campus

<https://www.rtu.lv/en/university/rtu-kipsala-campus>) The RTU student campus in Ķīpsala is purposefully designed as a green campus. Paying great attention to sustainable, smart and environmentally friendly development. These principles have already been taken into account in the creation of RTU study and research infrastructure – by constructing and reconstructing buildings, furnishing and equipping them. RTU is working on reducing electricity consumption, heat energy consumption, water consumption, better waste management and implementation of environmentally friendly mobility. Developing RTU Green Concept 2018–2023, the goal of the University is to raise awareness of students, employees and the general public about the need to reduce the ecological footprint and to encourage the creation and use of environmentally-friendly technologies (RTU web page, section: Home/ University/ RTU Ķīpsala Campus/ Green campus <https://www.rtu.lv/en/university/rtu-kipsala-campus/green-campus#:~:text=Home,Green%20campus>; SAR, Part II, 2.3.2., p. 48-50).

During the onsite visit, information mentioned in the SAR (Part II, 2.3.2., p. 48-50), was confirmed, that the infrastructure of the campus includes everything necessary for both students and employees, as well as guests of the university. The infrastructure is also friendly for people with mobility impairments: easy access to classrooms and laboratories is ensured, braille texts are placed in several places in the buildings to provide essential information, for example, about the location. For the needs of students and lecturers, RTU's infrastructure also includes such elements as a library, hostel, canteens, cafes, a swimming pool, etc. RTU premises are also equipped with free water drinking points.

The Faculty of Materials Science and Applied Chemistry (FMSAC) building at Paula Valdena street 3 was put into operation in 1983 and Paula Valdena street 7 – in 1968, last renovation was carried out in 2013/2014. Study process of the study programmes is mainly organized on premises of this building (FMSAC) and on premises in Pulka Street and on the premises of the Institute of Water Systems and Biotechnology at 6A and 6B Ķīpsala Street. Complete renovation of buildings of Institute of Water Systems and Biotechnology at 6A and 6B Ķīpsalas Street, was finished this year (renovated in 2021 and 2022; SAR, Part II, 2.3.2., p. 48-50).

All buildings have suitable infrastructure where it is possible to carry out both teaching and research processes. Due to the epidemiological situation, which forced the introduction of distance learning, in 2021 the auditorium was appropriately equipped to ensure an interactive online learning process. Also, classrooms are equipped with modern multimedia equipment - a computer with an Internet connection, a speaker system, a projector, etc. Wi-Fi is provided in all study rooms of the university (onsite visit; SAR, Part II, 2.3.2., p. 48-50; SAR, Part II, 2.3.4., p. 54-56)

The equipment in the laboratories is sufficient both for the performance of various tasks in specific study courses, for the development of diploma theses, and for scientific research work. Part of the equipment is included in the UseScience online database (<https://scientificservices.eu/>) which provides wider access to this equipment (onsite visit, SAR, Part II, 2.3.2., p. 48-50).

RTU have a procedures for replenishment of library stocks and database subscription procedures, for example, in order to improve the operation of ZB and to ensure the informational needs of study and research work, the Library Council has been established, where it is decided to supplement the library collection with printed editions and to subscribe to the necessary databases. The "RTU ZB collection policy" has been approved by the library council, which defines the basic principles of the creation and development of the collection in accordance with the directions of studies and scientific activities of RTU (SAR, Part II, 2.3.2., p. 46-47).

From the interviews with RTU graduates, who have continued their studies abroad, several noted that the practical knowledge gained in the laboratories at RTU is at a very high level, which has allowed them to find work in laboratories at other universities easy, for example in France and Switzerland.

1.3.3. RTU Scientific Library (SL) is an academic library of national importance. SL provides the necessary information services for ensuring the study process and scientific activity of RTU students and academic staff (RTU web page <https://www.rtu.lv/lv/studijas/biblioteka>; SAR, Part II, 2.3.3., p. 50-53).

In 2016, significant investments were made in the development of SL infrastructure - by constructing new premises. The total area of SL premises is 6393 m², of which 3417 m² are reader service premises (SAR, Part II, 2.3.3., p. 50-53).

Experts observations in SL are in full agreement with information that is contained in the received RTU documentation, namely - there is a spacious reading room with free access to library collections, a reading room 24/7, group rooms, individual booths, a conference room and a small kitchenette. The library is equipped with self-service facilities, including the ability to return books outside of library hours. The 24-hour reading room can be accessed with a student ID. There are also self-service machines (five in total) where book loans can be registered.

The Scientific Library of RTU has a search tool PRIMO created by the company "ExLibris", which allows users to simultaneously search for information in the library's general catalog, online databases, and databases created by the Scientific Library of RTU (SAR, Part II, 2.3.3., p. 50-53).

Both the electronic catalog and the RTU portal ORTUS can be used to reserve library resources remotely. ONLINE CATALOGUE <http://ortus.rtu.lv> → Library → Book reservation and request status. Information about databases in English can be found: <https://www.rtu.lv/en/studies/scientific-library/electronic-resources>. If the corresponding books are not available in SL, they can be ordered in other scientific libraries of Latvia with delivery within 2-3 days. (RTU web page, section: Studies /scientific-library, RTU_general.information_september.2022.pdf, <https://www.rtu.lv/en/studies/scientific-library>, SAR, Part II, 2.3.3., p. 50-53).

Different services are available in library - such as Searching for information in Library catalog, PRIMO and online subscribed databases, bibliographical references and consultations, user training, interlibrary loan and document delivery, binding of books, theses, etc., restoring of books, printing, copying, scanning etc RTU web page, section: Studies /scientific-library, <https://www.rtu.lv/en/studies/scientific-library>, SAR, Part II, 2.3.3., p. 50-53).

Also rare books and publications are available. 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. During the visit experts looked at printed works in chemistry from the 18th century (onsite visit; SAR Part III, 3.3.1., p. 202).

Employers, as a positive feature in recent years, mentioned good knowledge of students in searching for scientific literature, and their ability to create literature reviews. This indicates the knowledge gained during the studies, using the available scientific databases and library resources for the performance of various study tasks.

The library collections are constantly replenished, both with printed editions and the necessary databases. After receiving funding from RTU, SL calculates funding for information resources for each study programme. The collection of the library is replenished taking into account the recommendations of study programme leaders and researchers (SAR, Part II, 2.3.3., p. 50-53). For example (SAR, Part II, 2.3.3., p. 50-53) at the request of the academic staff of the "Chemistry, Chemical Technologies and Biotechnology" field of study, in the period from 2013 to 2021 » SL purchased 155 new books for 14,070 euros. Editions that are not available in the SL are delivered through an interlibrary subscription or international subscription (AR, Part II, 2.3.3., p. 50-53).

Mandatory literature books in Latvian in case of compulsory study courses are available at the library in a sufficient amount. At least one hard-copy of one of the mandatory books of a course in English can be found at the Chemistry Branch of RTU scientific library. It is important to note that RTU possesses access to a collection of e-books in the electronic resources databases of the library, for example, ProQuest Ebook Central, eBook Open Access Collection or EBSCOHOST eBook

Academic Collection (from additional information requested by experts).

A unified system and procedures for the improvement and purchase of material provision are not described in SAR.

1.3.4. RTU has a centralized IT portal ORTUS (<https://ortus.rtu.lv>), where you can access the directory of all IT services in one place. The portal is intended for teaching staff, students, scientists and graduates. There users can find access to the library and its services. There is a news section, a news archive and information on current purchases. The portal contains links to, scientific equipment database "UseScience", strategic management system, study management system, RTU homepage, document and financial management systems, etc. sections (SAR, Part II, 2.3.4., p. 54-56; Screenshots of RTU IT systems.zip).

There users also can find the Centralized study management system, which is essentially a digitalized full study life cycle - starting with the electronic register of study programmes, preparing study contracts and enrolling students in study programmes, implementing study courses and the study process, registering grades, etc. sections, and ending with the awarding of qualifications (SAR, Part II, 2.3.4., p. 54-56; Screenshots of RTU IT systems.zip).

In order to ensure effective space management and lesson planning, the classrooms and timetables have been digitized. Every student and academic staff can access their schedule, which contains information about the venue, time, lecturer, room, name and type of lecture (SAR, Part II, 2.3.4., p. 54-56).

During the onsite visit, experts were introduced to the e-study environment (Moodle). The E-system contains current information about the progress of various courses, it is possible to communicate with students both in groups and with each one individually. This is the place where various learning materials are placed, homework is assigned and knowledge tests are conducted. Part of the tests can be checked by the computer system, but the entire test can also be corrected by the teaching staff himself. Students can access electronic learning resources at any time and place. RTU academic staff have the opportunity to use Zoom or Microsoft Teams video conference platforms for online distance learning. It follows from interviews with students that the e-environment is easy to understand and intuitive to use. There have also been no problems with completing the tests in an electronic environment.

Students said that there are problems with e-platforms for first-year students in the joint study programmes - study programmes "Biotechnology and Bioengineering" and "Industrial pharmacy". Students have to use 2 platforms, one at RTU, the other at either UL or RSU, respectively, which creates a certain amount of confusion, and it takes time to remember which study courses are in which e-environment.

All RTU IT users have access to the Microsoft Office 365 cloud computing platform with one terabyte of storage space per user and access to various additional tools - such as Microsoft Teams, SharePoint Online, Forms, OneNote, OneDrive, Outlook, etc., as well as the university email system (SAR, Part II, 2.3.3., p. 52).

Summarizing the above, we have gained confidence that the information and communication technology solutions used to ensure the study process are appropriate and effective.

1.3.5. There is electronic link for RTU requirements for academic staff elections - Professors, Associate Professors, Assistant Professors, Lecturers and Assistants: <https://www.rtu.lv/lv/universitate/vakances-rtu/personalatlates-dokumenti> (in Latvian).

In order to ensure high-quality and innovative implementation of the study programme, several criteria are used for the selection of RTU academic staff to be involved in the programmes, so that the study courses are conducted by qualified, scientifically and methodically prepared lecturers, who are professionals in the specified field of studies and use modern approaches and technologies in their work (SAR, Part II, 2.3.5., p. 56-58).

The mandatory criteria for the selection of teaching staff are: compliance of the qualifications of teaching staff with the requirements set by the regulatory enactments; the direction of scientific research corresponds to the content of the study programme; appropriate knowledge of the national language and foreign languages (SAR, Part II, 2.3.5., p. 56-58; SAR, Part II, 2.3.7., p. 61-62; List of internal regulations file 43." Procedure_for_Election_of_Docents,_Lecturers_And_Assistants.pdf"). The procedures described in the SAR for attracting qualified teaching staff (for the field of study and the corresponding study programmes) are followed, they are open and the stakeholders involved are informed about them.

1.3.6. At the end of 2018, the Center for Academic Excellence (teaching and learning center) was established in order to support RTU academic staff in the areas of pedagogical, intercultural communication and self-development (SAR, Part I, 1.4., p. 11-16; SAR, Part II, 2.3.6., p. 58-60). In order to raise the qualification of teaching staff, this center organizes: various educational events - seminars, guest lectures, conferences, discussions, etc. events with the participation of Latvian and foreign specialists; experience exchange events within faculties and other structural units; creates informational campaigns about the latest teaching and learning trends relevant to RTU; provides instructions to the academic staff in the use of teaching and learning methods, and in the assessment of students' knowledge, skills and competence; The Center of Academic Excellence organizes two methodological conferences a year (SAR, Part I, 1.4., p. 11-16; SAR, Part II, 2.3.6., p. 58-60).

Each semester, a set of basic 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 (SAR, Part II, 2.3.6., p. 58-60).

In the interviews with the academic staff, experts gained confidence that the RTU personnel have access to relatively wide opportunities for qualification and professional skills improvement. Each of the academic staff of RTU must dedicate 160 hours to qualification raising activities every year.

The materials of all events are available in ORTUS ("Materials of the Center of Academic Excellence") (SAR, Part II, 2.3.6., p. 59).

In order to monitor the improvement of the academic staff's competences, the assessment questionnaires of students for each semester are analyzed, there are conversations with representatives of faculties, representatives of student self-governments and the lecturers themselves (SAR, Part II, 2.3.4., p. 54).

1.3.7. 85 members of the academic staff are involved in the implementation of the study field. Most of them, 81 (95%), have been elected to academic positions at RTU. 54 (67%) of RTUs elected academic staff have a doctor's degree, the rest of the teaching staff have a master's degree. 42 (49%) have been elected to the position of professor or associate professor. Most of the staff elected to academic positions are also elected to research positions (75%) (SAR, Part II, 2.3.7., p. 61-62; SAR Annex, "Basic information about the academic staff involved in the implementation of the study direction.xlsx") .

If necessary, according to the specifics of each study course, high-level specialists (guest lecturers), mostly from the industry, are attracted to the study process. It should be noted that a large number of guest lecturers are cooperation partners of RTU, as well as its former graduates (SAR, Part II, 2.3.7., p. 61-62).

A large part of the elected academic staff performs both academic and research work, and in some cases also administrative work. Consequently, the workload of the academic staff often overlaps with the research workload. In addition, the workload is also related to the management of bachelor's and master's theses projects which in most cases are also related to scientific work (SAR, Part II, 2.3.7., p. 61-62).

In some cases, the workload, or at least the responsibility, seems too great for one person, for example, the dean of RTU Faculty of Materials Science and Applied Chemistry (FMSAC), the director of the Institute of Organic Chemistry Technology, the director of the study direction is one person who also leads theses and has lectures.

1.3.8. RTU provides support in studies, psychological support and support in career development. Students' knowledge level is assessed at the start of studies. In order for the student to be able to successfully participate in the study process, after the assessment, support is provided to those students who need to acquire additional knowledge (SAR, Part II, 2.3.8., p. 62-64).

Information about psychological support is freely available at RTU home page under the section student service: <https://www.rtu.lv/en/student-service/career-centre/psychological-support>. On the same website, users can find information and advice for career building, for example, various CV templates and recommendations for writing them, a direct link to the RTU Career Center vacancy portal, where students and graduates have the opportunity to view vacancies published by employers. As well as information about projects and seminars.

RTU supports persons with limited mobility in their studies; visually impaired people; with hearing issues; with learning disabilities; or autism spectrum disorders. In 2020, RTU issued guidelines with recommendations for effective communication and improving the learning environment for people with disabilities and special needs, they can be found: <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 web page in Latvian <https://www.rtu.lv/lv/universitate/vides-pieejamiba>; SAR, Part II, 2.3.8., p. 62-64).

Foreign students have academic advisors who help them with various study-related and also practical issues. If during the semester it is observed that the student is facing difficulties in the study process, the student is invited to an individual meeting with his academic advisor to discuss the best possible solutions of the problem (SAR, Part II, 2.3.8., p. 62-64).

Conclusions on this set of criteria, by specifying strengths and weaknesses

Based on the FMSAC SAR, as well as on the information received in the interviews with the management of the university, directors of study areas and teaching staff, the experts gained confidence that RTU has created a system for determining and redistributing financial resources. The established financing procedure for the implementation of the study direction and relevant study programmes, scientific and applied research, as well as creativity is effective.

The infrastructure is well developed, the rooms and laboratories are equipped according to the study field and learning process. The equipment of teaching laboratories ensures the successful completion of the practical part of a specific study course. There are good opportunities to develop bachelor's, master's and doctoral programmes in the existing institutes.

The RTU library building is comfortable, modern and well equipped. Library resources are available on-site 24/7 as well as remotely. Library stocks are replenished for each field of study with the involvement of academic teaching staff. Books and databases are available to students and meet the needs of the study field, both for studies in Latvian and studies in English.

The university's digitization level experts consider as high. Students can access electronic learning resources at any time and place.

A unified system and procedures for the improvement and purchase of material provision are not described in SAR.

RTU has identified the necessary support for students (for, students from abroad, part-time students, distance learning students, students with special needs, etc.) and created a functioning support system to meet the needs of students.

In order to ensure high-quality and innovative implementation of the study programme, several mandatory criteria are developed and used for the selection of RTU academic staff to be involved in the programmes, so that the study courses are conducted by qualified, scientifically and methodically prepared lecturers, who are professionals in the specified field of studies and use modern approaches and technologies in their work. The procedures developed for attracting qualified teaching staff are followed, they are open and the stakeholders involved are informed about them.

Center for Academic Excellence (teaching and learning center) was established in order to support RTU academic staff in the areas of pedagogical, intercultural communication and self-development. In order to monitor the improvement of the academic staff's competences, the assessment questionnaires of students for each semester are analyzed, there are conversations with representatives of faculties, representatives of student self-governments and the lecturers themselves.

A large part of the elected academic staff performs both academic and research work, and in some cases also administrative work. Consequently, the workload of the academic staff often overlaps with the research workload; therefore, the workload needs to be better balanced.

Strengths:

1. Good infrastructure, with a strong focus on a sustainable, smart and environmentally friendly environment.
2. Scientific library (SL) and databases are easily accessible.
3. IT tools are up-to-date.
4. Knowledge provided by RTU in practical laboratory work, laboratory equipment and instrumental analytical methods is at a high level.
5. RTU works to create an accessible environment where everyone (including people with special needs) feels respected and can learn with pleasure.

Weaknesses:

1. Students of joint study programmes “Biotechnology and Bioengineering” and “Industrial Pharmacy” must use two different IT tools and it creates a certain amount of confusion.
2. Workload should be better balanced for academic staff who carry out research work and teaching.

1.4. Scientific Research and Artistic Creation

Analysis

1.4.1. The directions of scientific research within the doctoral study programme correspond to the development goals of the higher education institution and are relevant to the study field, correspond to the development goals of RTU, are relevant for the study field and industry and prepare students for both academic work and the industry. The Study Field is based on and closely connected to the research focus of seven relevant institutes established at RTU: 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. Study field researchers are involved in several multidisciplinary and interdisciplinary projects, such as Horizon H2020 Teaming 2 BBCE project, collaboration with CERN (ARIES project), which are implemented at the level of above mentioned institutes. Each of the institutes contributes to the Study Field with their particular expertise based on their focus and line of research. The institutes have well-established international cooperation; the short list can be found in SAR, Part II, 2.4.3., p. 69-70. There are 6 main foci of research in the study field (SAR, Part II, 2.4.1., p. 65-67):

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).

The doctoral study programme “CHEMISTRY, MATERIALS SCIENCE AND ENGINEERING (51528)” is based fully on the research areas and therefore covers a very broad area of sciences. Apart from five general courses such as Academic writing or Scientific seminars, students go to the different institutes, gaining expertise in completely different areas of research. As a degree they gain PhD in Material Science, Chemistry or Chemical Engineering, however, close cooperation with other universities, above all University of Latvia, enables them to gain a PhD in natural sciences with a specialization in physics (PhD in Physics and Astronomy). Due to this fact, it seems more reasonable to establish a Doctoral School which would replace the study programme at the moment when the national legislation related to higher education will enable the establishment of doctoral schools (Personal interview with Head of PhD study programme).

The Study Field is closely supervised by industry representatives who have to a large degree influenced the content of all study programme, for instance as members of the Scientific Board. The study programmes are all closely connected to the industry which is documented by a large number of patents and spin-offs as well as by the number of students with industry connections in the form of apprentice positions, thesis topics and graduate placements. (Personal interview with Head of PhD study programme).

PhD students are well-established internationally in their respective field of research which is also documented by the large number of international cooperations and projects (SAR Part II, 2.4.3., p. 69-70).

1.4.2. All study programmes are closely connected with the scientific research ongoing at the institutes based on the fact that the lecturers are responsible for subjects they are experts in. 54 (67%) of RTUs elected academic staff have a doctor's degree. Most of the staff elected to academic positions are also elected to research positions (75%) (SAR Part II, 2.3.7., p. 61-62; Annex: “Basic information about the academic staff involved in the implementation of the study direction.xlsx”) . All academic staff involved in the implementation of the study field meet the requirements specified in Section 55, paragraph 1, 3 of the Law on Higher Education Institutions of the Republic of Latvia.

The teachers involved in the implementation of the bachelor and master study programmes “Chemistry and Chemical Technology” and the doctoral study programme “Chemistry, Materials Science and Engineering” work scientifically mainly in the fields of chemistry, chemical technology and materials science (SAR, Part III, 3.4.1., p. 173-178; SAR, Part III, 3.4.1., Figure 3.4.1., p. 174-175; SAR, Annex, Biographies of the teaching staff members; SAR, Annex, Basic information on the teaching staff involved in the implementation of the study field).

The focus of the courses is compliant with the research topics and the expertise of the lecturers. For example, professor of the study course Basics in materials science and engineering is expert of the Latvian Council of Science in the field of chemistry, chemical engineering, and material science, professor of the study course Mathematical basics of biotechnology is expert of the Latvian Council of Science in the area of natural sciences - mathematics, professor of the study course Electrical processes and equipment in biotechnology is expert of the Latvian Council of Science in the area of engineering and technology - electrical engineering, electronics, Information and communication technology; SAR, Part III, 3.4.1, p. 231-235; SAR Annex, Biographies of the teaching staff members). According to the student representatives who met with experts (Bc. MSc and PhD), they value the degree of involvement they are offered and the hands-on experience in the laboratory they gain during their studies at all study levels.

Many courses are practical with a high number of laboratory hours that gives the students good laboratory practice. The industry focus of the courses and close cooperation with industrial partners prepare the students for their respective careers in industry. Students acquire skills and competencies in a real work environment by completing a part of the mandatory courses in the biggest Latvian pharmacy plants JSC Olainfarm and JSC Grindeks (SAR Annex, The curriculum of the study programme Industrial Pharmacy) Companies such as Grindeks, Olainfarm, Riga Pharmaceutical Factory, MedPro, Silvanol and organic synthesis (PharmIdea, Bapeks, Syntagon Baltic) companies, Latvian Institute of Organic Synthesis, RTU Institute of Technology of Organic Chemistry, RTU Institute of Applied Chemistry are involved in the implementation of the Internship in Chemical Technology of Organic Compounds, SAR, Annex of the academic master study programme "Chemistry and Chemical Technology" - Descriptions of the study courses/modules) and sometimes in the preparation of students' graduation theses (SA,R Part II, 2.2.1., p. 31-33).

The low number of students in each course is to a great advantage as it enables very individual approach and close personal communication between the students and their lecturers. The students are asked to join various scientific research projects at an early stage of their studies (Bc.) based on the close communication established (onsite visit interview with students). Scientific research and the outcomes thereof are integrated in the study process in the study programmes of all levels.

1.4.3. International cooperation in the field of scientific research within the study field and the relevant study programmes is ensured and it is being purposefully developed. Institutes responsible for the Study Field have a large number of international cooperation partners (SAR, Part II, 2.4.3., p. 69-70). For instance, the Institute of Technical Physics (ITP) has strong collaboration with physicians in many EU and Asian countries and established collaboration with CERN (ARIES project). Institute of Materials and Surface Engineering [IMSE] has established close cooperation with Tartu University. Both PhD and Master students have been involved in all scientific projects implemented within the study field (FLPP, Horizon2020, ERDF, ESF, etc.). Most international cooperation is established for students enrolled in the PhD programme (according to interview with PhD students during onsite visit).

1.4.4. RTU has developed mechanisms for the involvement of the teaching staff in scientific research and/or applied research. These mechanisms are well-functioning and efficient. The teaching staff of this Study Field is closely involved in scientific research, most are only teaching a few, selected courses, while being fully occupied with their research projects (personal interview with course lecturers). According to the SAR (Part II, 2.4.1., p. 65-67) 26 professors and 16 associate professors work in the Study Field while they maintain a greater workload in research activities and research projects. Since 2011, the academic staff have published more than 1000 scientific publications in the abovementioned fields of science indexed in the international databases (SAR, Part II, 2.4.1. p. 65-67).

1.4.5. RTU has developed mechanisms to promote the involvement of the students in scientific research and applied research. Students are involved in the research at all levels of studies by participation on the ongoing research projects and/or working on their theses. They are usually offered to be involved in individual projects by their lecturers and they seem to select their focus and elective courses based on their interest and experience from the projects they are involved in (interview with students during onsite visit).

1.4.6. Students are involved in the cutting edge research ongoing at the individual institutes which possess all the modern equipment and tools necessary for such research activity. The facilities are also modern, currently being renovated, equipped with a wide range of scientific instrumentation,

students can use all the scientific equipment acquired for various research projects. Interactive lectures were necessary during covid, why a fully equipped interactive classroom was made available in 2019. (facility tour during onsite visit)

Students have a modern, fully functional library available at all times with online databases, scientific journals and books have been elected and purchased by the institutes, <https://www.rtu.lv/en/studies/scientific-library>. An interactive study platform ORTUS is available with study programmes and course information, study material, contact information, evaluations.

Conclusions on this set of criteria, by specifying strengths and weaknesses

The connection of scientific research of the study field with the study process is logical and justified. Scientific research and the outcomes thereof are integrated in the study process in the study programmes of all levels. The directions of scientific research correspond to the development goals of RTU and are relevant for the study field and industry and prepare students for both academic work and the industry. The directions of scientific research within the doctoral study programme correspond to the development goals of the higher education institution and are relevant for the study field and industry. Students are closely involved with the scientific research ongoing at the seven individual institutes involved in the study field. International cooperation is an intrinsic part of the ongoing research, it is ensured and is being purposefully developed. RTU has developed mechanisms for the involvement of the teaching staff in scientific research. They are well-functioning and efficient. The mechanisms to promote involvement of students in scientific research are well-functioning and efficient. Students are given the opportunity to participate in the individual projects. Innovative solutions are applied in the study field, which have a significant positive impact on the study process.

Strengths:

1. Involvement of students in research projects already during BSc studies.
2. Wide range of scientific instrumentation relevant to the Study Field is available to students during course studies.
3. Students gain a large degree of hand-on experience during studies.

Weaknesses:

None.

Assessment of the requirement [2]

- 1 R2 - Compliance of scientific research and artistic creation with the level of development of scientific research and artistic creation (if applicable)

Assessment of compliance: Fully compliant

Based on the amount of published papers and the scientific merit of individual researchers according to international databases (Scopus; SAR, Part II, 2.4.1., p. 65-67, SAR Annex, Biographies of the teaching staff members), the scientific research is fully compliant with international development.

1.5. Cooperation and Internationalisation

Analysis

1.5.1. 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) are involved in the activities of the FMSAC Advisory Board and thus have the opportunity to participate in the development of FMSAC study programmes and strategic guidelines (SAR Part II, 2.5.1., p. 74). In this way, the specific requirements of employers for the development of study programmes, as well as the research areas carried out within the framework of the FMSAC, can be taken into account to the greatest extent possible. Collaboration with scientific institutions and universities in the country (University of Latvia, Riga Stradiņš University, Latvian Institute of Organic Synthesis, Latvian State Institute of Wood Chemistry, Institute of Solid State Physics) is well described, and apart from the two joint programmes, is also evident in the preparation of theses, student internships and professional excursions of students and staff, as well as collaboration on scientific and professional projects (SAR Part II, 2.5.1., p. 75). This cooperation promotes the acquisition of knowledge, but above all of practical competences of students within the framework of all the courses carried out within the framework of the Study Field. The choice of cooperation partners is based on similar interests or work in similar scientific fields (SAR Part II, 2.5.1., p. 75).

1.5.2. The contribution to the achievement of the programme goals and learning outcomes through collaboration with various institutions from abroad within the Study Field is not described in SAR at all. Although there is evidence from the interviews with students and teaching staff and available documentation (SAR, Annex, Biographies of the teaching staff members) that this collaboration is realized through student internships (SAR, Annex, Statistics on outgoing student mobility of previous programmes) and various forms of teaching staff mobility (SAR, Annex, Statistical data on the incoming and outgoing mobility of the teaching staff), this area is not adequately described in sufficient detail. Only general and generic descriptions were used, which are insufficient for SAR. This chapter provided an overview of academic staff collaboration with foreign institutions (SAR, Part II, 2.5.2., p. 75-77), but lacked anything necessary to explain in detail the ways in which employers and foreign institutions are involved in the field of study and the mechanisms by which partners are recruited. The generalized phrases referring to “cooperation partners...related to the topics of scientific research within specific study programmes” (SAR, Part II, 2.5.2., p. 77) are not sufficient to justify this assessment criteria. It is not described in what way, in what specific situations and to what extent foreign institutions are involved in the activities and development of the Study Field. However, it should be noted that in September 2021, UL, RTU and Cartagena Polytechnic University (Spain) signed a trilateral agreement on academic background. The cooperation framework is intended to include the recruitment of guest lecturers in university courses from another university. For example, within 2022./2023. Academic year guest lectures from Cartagena Polytechnic University are planned in the study course “Basics in Microbiology” (SAR, Annex, 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). Although there is some progress, it should be noted that at the moment there is no significant involvement of institutions from abroad in the development of the Study Field.

1.5.3. The mechanisms of attracting foreign students at the RTU level are well developed and include a whole series of activities that are usually organized through the RTU International Cooperation and Foreign Students Department (ICFSD) (SAR, Part II, 2.5.3., p. 77-78). Of these activities, it should be highlighted participation in various educational exhibitions and seminars organized by educational agencies in targeted markets, information and study centers opened by RTU in specific countries, virtual seminars organized by ICFSD, on-line consultations conducted by ICFSD, regular communication with foreign students who have shown interest in enrolling in the study programme, the use of various RTU social media platforms (Facebook, WeChat, WhatsApp, YouTube) and RTU internal channels (ORTUS portal, email) and so on (SAR, Part II, 2.5.3., p. 77-78).

RTU foreign student enrolment rates are summarized in Table (SAR, Part II, 2.5.3., p. 78). From these data, a relatively large share of foreign students enrolled in the first year of various study levels is visible, considering the total number of students (SAR, Part III, Figures 3.1.4.1, p. 115, 157, 190).

In a period of eight years, there was negligible outgoing mobility of academic staff (during the reporting period of 8 academic years, 14 teaching staff members have used outgoing mobility on 21 occasions, SAR, Part II, 2.5.3., pp 77-78 and SAR, Anex, Statistical data on the incoming and outgoing mobility of the teaching staff) and students (during the reporting period of 8 academic years, 19 students used possibility for outgoing mobilities, SAR, Anex, Statistics on outgoing student mobility of previous programmes), which can only be partially justified for the last two years as a result of the global pandemic. The incoming mobility of both teachers (57 mobilities, SAR, Anex, Statistical data on the incoming and outgoing mobility of the teaching staff) and students (67 mobilities, SAR, Anex, Statistics on outgoing student mobility of previous programmes), especially considering the relatively small total number of students at all levels of study, is acceptable, although there is also room for improvement. Despite this, a relatively large number of teachers (five) participate in the execution of the study programmes that are carried out within the framework of Study Field, which is certainly an advantage (SAR, Anex, Statistical data on the teaching staff and the students from abroad). Regardless, a system and procedures for the attraction of the teaching staff from abroad are not developed. ERASMUS* Mobility Program and opportunities related to participation in joint international projects are only ways used for attracting guest lecturers. Additionally, most of the academic staff members from abroad were from neighbouring countries (SAR, Part II, 2.5.3., p. 78).

Students are actively offered shorter and longer stays abroad, both with the cooperation partners and as a part of the ERASMUS exchange programme. However, according to the students interviewed, few students (SAR, Anex, Statistics on outgoing student mobility of previous programmes), particularly at the bachelor level, are willing to participate in ERASMUS, mostly due to their involvement on projects, their studies or jobs.

Conclusions on this set of criteria, by specifying strengths and weaknesses

The FMSAC cooperates with the institutions from Latvia within the framework of the Study Field, and such cooperation contributes to the achievement of the aims and learning outcomes of the Study Field and the relevant study programmes. The choice of cooperation partners is based on similar interests or work in similar scientific fields. On the other hand, cooperation of FMSAC with the institutions from abroad is too generally described, mechanisms and criteria are not evident from the available data. Therefore, cooperation of FMSAC with the institutions from abroad should be expanded, developed and better described. RTU has excellently developed systems and procedures to attract foreign students. Unfortunately, same system is not used enough for outgoing mobility of FMSAC teaching staff and students which results in their low outgoing mobility during the reporting period.

Strengths

1. Good cooperation with representatives of state institutions and professional associations relevant to the Study Field.
2. Relatively high share of foreign students enrolled in study programmes considering the total, small number of enrolled students.
3. Good involvement of foreign teachers in existing study programmes.

Weaknesses

1. Too general description of the mechanisms and criteria by which foreign institutions and employers are involved in achieving the aims and learning outcomes of the Study Field, which

makes impossible to determine fulfillment of corresponding assessment criteria.

2. Low outgoing mobility of teaching staff and students (both, short and long term). Few bachelor students choose ERASMUS exchange programmes to gain international experience.

3. The system and procedures for the attraction of the teaching staff from abroad should be developed.

Assessment of the requirement [3]

- 1 R3 - The cooperation implemented within the study field with various Latvian and foreign organizations ensures the achievement of the aims of the study field.

Assessment of compliance: Partially compliant

To general description of the assessment criteria for cooperation with the institutions from abroad which makes impossible to determine its fulfillment. Low outgoing mobility of teaching staff and students (SAR, Annexes, Statistical data on the incoming and outgoing mobility of the teaching staff; Statistics on outgoing student mobility of previous programmes).

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

Analysis

1.6.1. In the report on the implementation of recommendations of the joint report of experts on the study direction "Chemistry, Chemical Technologies and Biotechnology" from December 8, 2011 (SAR, Annex, 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):

Experts recommended to revise study programmes in chemical technology (especially on Master's level) by choosing a more targeted approach for study programmes.

RTU activity: RTU has reviewed and consolidated study programmes in all education cycles. At the Bachelor's and Master's 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 Master's programme "Chemistry and Chemical Technology" allow uniting students of different years within the study course, thus optimizing resources.

Experts assess that recommendation has been implemented.

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.

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

Experts assess that recommendation has been implemented.

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

RTU activity: 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.

Experts assess that recommendation has been implemented.

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

RTU activity: 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 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 is a small number 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.

Experts assess that recommendation has been implemented.

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

RTU activity: Regulations on the number and type of publications and participation in the conferences are formulated in RTU PhD Study Regulations, as well as in the methodological guidelines of the PhD 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.

Experts assess that recommendation has been implemented.

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

RTU activity: RTU has established a joint Doctoral School for all programmes. Its main tasks are to promote the professional development of PhD students, to improve the quality of research work, to 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.

Experts assess that recommendation has been implemented.

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

RTU activity: 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. Experts assess that recommendation has been implemented.

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

RTU activity: Cooperation with the industry has been strengthened by introducing internships 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.

Experts assess that recommendation has been implemented.

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.

RTU activity: 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's 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's level. It should be noted that Master's students also face difficulties in acquiring the course in a foreign language. To promote students' skills in acquiring knowledge in English, foreign and Latvian students study together within several courses that are delivered in English.

Experts assess that recommendation has been implemented.

The legal possibilities for financial support from two ministries (Ministry of Education and Science and Ministry of Economy) and local municipalities should be explored, created and implemented for further development of OMTK.

RTU activity: OMTK reorganized and merged with RTU.

Experts assess that recommendation has been implemented.

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

RTU activity: The recommendation has been considered and the acquisition of the compulsory part course of the master's programme is mainly based on case studies. Problem-solving skills are also acquired during the internship course, when the 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.

Experts assess that recommendation has been implemented.

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.

RTU activity: 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 cooperate 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.

Experts assess that recommendation has been partly implemented. Experts opinion is that measures by RTU should be taken in the future.

In the report on the implementation of recommendations of the academic Bachelor's study programme "Chemistry and Chemical Technology" (SAR, Annex, 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):

Experts recommended until the meeting of the Study Quality Commission, in the description of the "Fundamentals of Graphic Communication" study course, indicate the criteria for evaluating the study results, expressed as a %.

RTU activity: Improved study course description submitted to QAHE.

Experts assess that recommendation has been implemented.

Submit a description of the study course KNK 001 Bachelor's thesis in English before the Study Quality Commission meeting.

RTU activity: Study course description in English submitted to QAHE.

Experts assess that recommendation has been implemented.

Until the start of the study programme, the descriptions of the study courses, which contain a very large list of compulsory literature sources, indicate specific chapters or pages that students must read.

RTU activity: Study courses with a large number of literature sources have been identified and their descriptions reviewed. For the courses planned for the first year of study, their descriptions were reviewed and accepted by the study direction committee until 2021/22. for the beginning of the academic year. Others are reviewed before the upcoming study year.

Experts assess that recommendation has been implemented.

Further develop curator and mentor programmes to reduce student dropout to the 30% threshold.

RTU activity: Every year, a curator (teaching staff of the programme) is assigned to the first year and supervises and supports the integration of students into the study process. In cooperation with the Student Council, first-year students are offered a mentor who is a senior student in the programme.

Experts assess that recommendation has been implemented.

To develop all specializations equally to attract students in all specializations and to ensure their profitability.

RTU activity: In cooperation with departments of the faculty, The Association of the Latvian Chemical and Pharmaceutical Industry and industry companies, students are informed of the content of all specializations and further job opportunities prior to choosing a specialization. Experts assess that recommendation has been implemented.

To establish uniform criteria for evaluating learning outcomes in a Course Paper for all specializations.

RTU activity: Part A of the study programme includes the Course KVT761 "Basic processes and apparatus of chemical technology (course project)" (2 CP), while Part B1 of the specialization "Sustainable Development Chemistry" includes the course KV735 "Course Paper in Chemistry" (3 CP). There are no course papers in other specializations. The above-mentioned are course papers of different levels, and only the course KVT761 is compulsory for all students, so there is no possibility to compare. In the course of approbation of the study programme, it will be assessed whether it is necessary to specify the criteria for evaluating learning outcomes for these courses.

Experts assess that recommendation has not been implemented. Experts opinion is that measures by RTU should be taken in the future.

To expand the internship opportunities for foreign students to specialize in industry companies.

RTU activity: Cooperation with industry companies is strengthened to attract more companies that will also welcome foreign students for internships. Internship for the first foreign students of this programme is scheduled for the 2024/2025 academic year, but entrepreneurs are already interested in attracting these students.

Experts assess that recommendation has been implemented.

In the report on the implementation of recommendations of the academic Master's study programme "Chemistry and Chemical Technology" (SAR, Annex, 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):

Experts recommended to develop at least to level B2 knowledge of English of the staff, who will teach the study courses in English, to continue to improve the level of knowledge to level C1 and higher.

RTU activity: RTU has carried out most study courses by a group of teachers, composed of the responsible teaching staff, together with the additional teaching staff. The teaching staff groups are designed in such a way that at least one of them has a certified knowledge of English at least at level B2. All the teaching staff of the programme is urged to continually develop their knowledge of English.

Experts assess that recommendation has been implemented.

To review internal arrangements and align the performance requirements and assessment system for Master's thesis for all specialties included.

RTU activity: The internal procedure and requirements for the achievement of results and the assessment system for Master's thesis have been aligned - methodological guidelines for developing and defending a Master's thesis have been developed. The defense of Master's theses takes place uniformly for all specializations in one final examination commission.

Experts assess that recommendation has been implemented.

To pay in-depth attention to similar study programmes in Lithuanian and Estonian higher education institutions, in particular in attracting foreign students. To take their experience into account when planning the number of students.

RTU activity: In-depth attention is paid to similar study programmes in Lithuanian and Estonian universities. The development working group also visited the Tallinn University of Technology during the development of the study programme. However, according to the type of structure specialization and proportions of the compulsory/limited elective courses, the new RTU study programme is closer to those carried out at the Vienna University of Technology and the Technical University of Munich. Universities in Austria and Germany also have a higher international ranking. Experts assess that recommendation has been implemented.

In the report on the implementation of recommendations of the academic Doctoral study programme “Chemistry, Materials Science and Engineering” (SAR, Annex, 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):

Experts recommended in the annotations of part A courses KTM108, KTM109 and KTM110 in Latvian and English should be complemented with information that the course is also intended for “students in the field of physics”

RTU activity: RTU has supplemented the annotations of the mentioned courses with the requested information.

Experts assess that recommendation has been implemented.

The following translation is recommended for the title of the study programme in English: “Chemistry, Materials Science and technologies”.

RTU activity: The title in Latvian and English must correspond in essence, but it does not have to be literal (“mechanical”) translations. The term “Chemical Technology” is more common in Latvian, although according to the catalog of scientific fields, it would be more accurate to use the term “Chemical Engineering”. When it comes to chemical technology in English, the term “Chemical Engineering” is basically used, but “Technology” is more of a more down-to-earth field of applied sciences. Therefore, we believe that the English title of the doctoral programme should be “Chemistry, Materials Science and Engineering”, which includes both Chemical Science and Chemical Engineering, and Materials Science and Engineering”.

Experts assess that recommendation has not been implemented. Experts think that recommendation is not valid anymore and no additional measures should be taken.

In the report on the implementation of recommendations of the academic Bachelor’s study programme “Biotechnology and Bioengineering” (SAR, Annex, 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):

Providing students with information from the first day of study that the courses to be studied require maximum attendance and the non-attendance of classes is not possible.

RTU activity: Before the beginning of each academic year, students have an informative meeting with the programme directors of the two participating universities, part of the teaching staff involved in the first semester. During the meeting, students are informed of the study programme, its objectives, the planned study courses, the general requirements, the opportunities offered for the resources available. At the same time, it should be stressed that students have the possibility, for justifiable reasons (such as medical indications), also to delay one of the practical or laboratory works and then do so at another time, agreed with the lecturer.

Experts assess that recommendation has been implemented.

Drawing attention to the possibilities for developing the language competencies of the teaching staff

involved, taking into account the plan of the planned programme on foreign learners from both the EU and non-EU countries.

RTU activity: Teaching staff continues to complement foreign language (English) knowledge in the framework of the specific support project 8.2.2 "Renewal of academic staff and capacity building at the University of Latvia". Since the licensing of the study programme, certificates on completion of English courses, passage of examinations and compliance of English knowledge with level C1 have been received by several lecturers of UL. For teaching staff of RTU, courses are offered by RTU Institute of Applied Linguistics and RTU Riga Business School.

Experts assess that recommendation has been implemented.

In response to what the study programme directors say about the fact that most of the leading professionals in the sector are involved in the programme and will be teaching staff, it is necessary for the sustainability of the study programme to ensure that all teachers have access to qualified substitutes.

RTU activity: Since licensing of the study programme, in 4 out of 11 study courses provided by RTU additional teaching staff has been attracted, thus, minimizing the workload for leading experts, as well as gaining experience in teaching specific courses, so that, if necessary, another lecturer can be used.

Experts assess that recommendation has been implemented.

In the context of the new study programme, increased attention should be paid to providing feedback from international students on the quality of the study programme to improve its implementation.

RTU activity: As international students have not been admitted during the first two years of the study programme, the implementation of the recommendation has not been started at this time. The main reason is to implement the study programme in the original Latvian to ascertain the relevance of the content to students' wishes and to clarify the cooperation between the two universities involved (UL and RTU). The second reason is linked to the COVID-19 pandemic, where most of the study time has been spent in remote studies. International students would have a much lesser interest in applying for a study programme that focuses on practical and laboratory work but cannot be visited. In the same way as for studies already being carried out in the Latvian language, following the commencement of the study programme in English, the students are scheduled to meet both at the beginning of the study process to inform about the requirements of the study programme, the content, the expected results, as well as to make regular appointments (mid-term and end of the semester) to obtain feedback on the progress of study courses, their content, and identify potentially improving things.

Experts assess that recommendation has not been implemented. Experts opinion is that measures by RTU should be taken in the future.

Consider the possibility of attracting a larger number of highly qualified guest lecturers, if not otherwise practicable, virtually.

RTU activity: In September 2021, University of Latvia, Riga Technical University and Cartagena Polytechnic University (Spain) signed a trilateral agreement on academic background. The cooperation framework is intended to include the recruitment of guest lecturers in university courses from another university. For example, within 2022./2023. Academic year guest lectures from Cartagena Polytechnic University are planned in the study course "Basics in Microbiology".

Experts assess that recommendation has been implemented.

Consider the possibility of supplementing the study programme in future with personality-forming courses, such as the history of philosophy, the history of art and literature, etc.

RTU activity: The evaluation of the existing content of the study programme and the inclusion of potential new study courses in the study programme is envisaged after the conclusion of the first entire cycle (since the students were admitted to graduation), when, in general, there will be feedback on all the courses currently offered, on the proposed changes from students and alumni. Already now students can choose personality courses from a wide range of elective courses. For example, in the autumn semester of 2021, students of the study programme have chosen elective courses such as the Basic Italian course I, French, Spanish I, German, Psychophysiology, Critical thinking and visual culture.

Experts assess that recommendation has not been implemented. Experts opinion is that measures by RTU should be taken in the future.

In the report on the implementation of recommendations second level higher education programme "Industrial Pharmacy" (SAR, Annex, 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):

Experts recommended inviting more guest lecturers.

RTU activity: Guest lecturers from Finland and Lithuania are involved in implementing some of the courses provided by RSU.

Experts assess that recommendation has been implemented.

To matriculate students with a chemist's education in the programme.

RTU activity: The "Industrial Pharmacist" standard specifies an industrial pharmacist's specific knowledge, skills, and competencies. Some of these skills at the basic level need to be acquired at a previous level of education that is not provided in chemistry and / or chemical technology programmes.

Experts assess that recommendation has not been implemented, although the implementation of this recommendation would significantly increase the number of students, since the small number of students is a weak point of this programme.

To matriculate international students.

RTU activity: The attraction of international students is also partially limited by the need to know the legislation of the particular country. It is planned to attract international students in the future.

Experts assess that recommendation has not been implemented. Experts opinion is that measures by RTU should be taken in the future.

Conclusions on this set of criteria, by specifying strengths and weaknesses

Most recommendations are implemented. Specifically recommendations from assessment of study field "Chemistry, Chemical Technologies and Biotechnology" are all implemented. There are some recommendations that are outdated at the moment, while some important recommendation implementations should be continued. This is particularly important for the further development of measures for decreasing the drop-out rate, for establishing of uniform criteria for evaluating learning outcomes in a Course Paper for all specializations and to matriculate international students. Recommendations which has not be implemented at all are: increased attention should be paid to providing feedback from international students on the quality of the study programme to improve its implementation, supplementing the study programme in future with personality-forming courses, such as the history of philosophy, the history of art and literature, etc, and to matriculate students with a chemist's education in the programme of Industrial Pharmacy.

For example, experts recommended to continue work on implementing of the second level higher education programme "Industrial Pharmacy" recommendation: "To matriculate students with a chemist's education into the programme". The implementation of this recommendation would significantly increase the number of students, since the small number of students is a weak point of this study programme.

Strengths:

1. Most of the recommendations for the study filed received during the previous assessment procedures have been implemented.

Weaknesses:

1. Measures for decreasing the drop-out rate are not fully developed.
2. Uniform criteria for evaluating learning outcomes in a Course Paper are not established for all specializations.
3. Measures should be developed so that a greater proportion of foreign students should be included in the matriculation.
4. Additional measures should be developed for providing feedback from international students on the quality of the study programme to improve its implementation
5. Study programs should be supplemented with personality-forming courses, such as the history of philosophy, the history of art and literature, etc.
6. Students with a chemist's education should be matriculated in the programme of Industrial Pharmacy.

Assessment of the requirement [4]

- 1 R4 - Elimination of deficiencies and shortcomings identified in the previous assessment of the study field, if any, or implementation of the recommendations provided.

Assessment of compliance: Partially compliant

Almost all deficiencies and shortcomings identified in the previous assessments of the study field and its study programmes have been eliminated, and the recommendations provided have been implemented. In case of non-implemented recommendations, clear explanations are given from RTU. Unfortunately, some important recommendations were not fully taken into account or not taken into account at all.

1.7. Recommendations for the Study Field

Short-term recommendations

The horizontal mobility for study programmes in the Study Field should be developed (until the beginning of the next academic year).

SWOT analysis should be revised and rewritten taking into account real weaknesses, strengths, opportunities and threats (until the beginning of the next academic year).

The functions of FMSAC dean, Study Field director, and director of three study programmes need to be distributed among multiple individuals to ensure more efficient and independent management of FMSAC, development of the Study Field and study programmes, and even distribution of administrative duties among experienced members of the academic staff (within 2 years).

Participation of graduates in quality assurance maintenance processes is not satisfactory developed and it should be expanded with the implementation of regular surveys and more significant involvement in FMSAC activities through the Alumni Association (within 2 years).

Students in the joint study programmes “Biotechnology and Bioengineering” and “Industrial Pharmacy” should be able to use only one student portal, either ORTUS or a system used at another university (RSU or UL), to manage the teaching process (until the beginning of the next academic year).

High percentage of dropouts should be recognized in SWOT analysis and consequently included in the Study Field Development Plan (until the beginning of the next academic year).

Measures for decreasing the drop-out rate should continue to be developed (within two years).

Uniform criteria for evaluating learning outcomes in a Course Paper should be established for all specializations (within two years).

Measures should be developed so that a greater proportion of foreign students should be included in the matriculation (within two years).

Additional measures should be developed for providing feedback from international students on the quality of the study programme to improve its implementation (until the beginning of the next academic year).

Students with a chemist's education should be matriculated in the programme of Industrial Pharmacy (within two years).

Long-term recommendations

It is necessary to develop a master's study programme in Biotechnology and Bioengineering to ensure the vertical mobility of students, to respond to the potential needs of the labor market for highly qualified specialists, and to offer a competitive study programme with a high content of high-tech concepts in the field of biotechnology and bioengineering, that will be recognized in the national and international framework (within 3 years).

More content related to technologies should be included in the academic bachelor study programme “Biotechnology and Bioengineering” and in the professional study programme “Industrial Pharmacy” (till next accreditation).

It is necessary to develop various forms of lifelong learning programmes in all scientific disciplines covered by the Study Field, which do not have to be primarily intended for former students of FMSAC. It is necessary to offer the developed lifelong learning programmes to national industrial partners and institutions (within 3 years).

Mechanisms and criteria by which foreign institutions are involved in achieving the aims and learning outcomes of the Study Field should be developed and better documented (within 3 years).

Outgoing mobility of teaching staff and students (both, short and long term) should be significantly improved. This weakness should be recognized in SWOT analysis and included in the Study Field Development Plan (till next accreditation).

According to the recommendation from the previous assessment, it is necessary to create prerequisites to enable enrollment in the second level professional higher education study programme "Industrial Pharmacy" for those students who have completed master's study programmes in the field of chemistry (and chemical technology), as well as for foreign students who have completed graduate studies in pharmacy in institutions abroad (till next accreditation).

Study programs should be supplemented with personality-forming courses, such as the history of philosophy, the history of art and literature, etc. (till next accreditation).

Workload should be better balanced for academic staff who carry out research work and teaching (till next accreditation).

II - "Biotechnology and Bioengineering" ASSESSMENT

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2.1. Indicators Describing the Study Programme

Analysis

2.1.1. The joint academic bachelor's study programme "Biotechnology and Bioengineering", which is carried out in cooperation with the University of Latvia (UL), complies with indicators, conditions and criteria of the study field of "Chemistry, Chemistry Technologies, and Biotechnology" (SAR, Part III, 3.1.2., p. 216). This joint study programme is unique as it combines the best experts of the field in one programme from two largest universities in the country. UL provides students with the necessary knowledge and understanding of biology in the study field Wildlife Sciences while RTU ensures the provision of technical basis and necessary tools of development in the study field Chemistry, Chemistry Technologies, and Biotechnology (SAR, Part III, 3.1.2., p. 216).

The length of the implementation of the study programme, which is 3 years, is evaluated as sufficient for acquiring the necessary skills, competencies and practical experience to enter the labor market (SAR, Part III, 3.1.1., p. 216).

2.1.2. The title of the study programme is "Biotechnology and Bioengineering" in the Study Field with education classification code 43421 with the last three numbers standing for biology according to the Cabinet Regulations No. 322 which can be found here: <https://likumi.lv/ta/id/291524-noteikumi-par-latvijas-izglitiba-klasifikaciju>. There is no qualification given after graduation as it is an academic bachelor's study programme while the degree obtained after graduation is to be Bachelor degree in natural sciences. According to the SAR, Part III, 3.1.2., p. 216, the aim of the 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. Of course, those who successfully graduate are also provided with a possibility to study further on Masters level and obtain more in depth knowledge of the chosen, more specific field of interest.

As stated in the SAR, Part III, 3.1.2., p. 217, the tasks of the study programme are 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 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; to develop skills related to critical thinking, analysis and argumentation.

According to the information provided within the SAR, Part III, 3.1.2., p. 217-218, Regulations on the State Academic Education Standard, the volume of the study programme 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 has a free choice part in the amount of six credit points. At the end of the study programme, students develop a Bachelor's thesis in the amount of 10 CP. For foreign students there is also a mandatory course that has to be taken in order to gain some basic knowledge of Latvian. One of the foreign students indicated that even though such a course is taught, it is not sufficient to gain the necessary understanding of the language for him to be able to find a job. It was pointed out that it is hard to find a job in Latvia without having the national language skills. 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.

According to the SAR, Part III, Study programme forms, p. 214, the programme is a full-time study programme. The admission requirements for the admission in the study programme is general or vocational secondary education. The language of implementation of the study programme is Latvian. At this point, the study programme cannot be open in English due to lack of applicants.

This study year there are 18 budget places provided for students that have been increased from 2 in the previous study year of 2021/22 (SAR, Part III, 3.1.4., p. 220). This study programme is mostly coordinated by the UL. Overall, the title, code, degree to be obtained of the study programme, aims, objectives, learning outcomes and admission requirements are interrelated. The duration and scope of the study programme implementation, as well as the implementation language, are reasonable and justified.

2.1.3. According to the SAR, Part III, 3.1.1., p. 216, the study programme "Biotechnology and Bioengineering" was licensed in 2020. No official changes have been made to the study programme since licensing.

2.1.4. According to the information provided within the SAR, Part III, Results of the study programme, p. 214 and information gathered during onsite visit, in Latvia, this programme is the only one that combines Biotechnology with Bioengineering by providing a unique set of knowledge to the students of this programme. Biotechnology by its definition covers a lot of subsections such as microbiology, biochemistry, genetics, genetic engineering, immunology, chemical technology, and machine building, and employs biological objects where students gain insight and understanding of all of these processes during their studies. The application of biotechnology can be found in such important fields as medicine, pharmacy, agriculture, environmental protection, food and chemical industry, energy so the graduates of this programme have a wide range of opportunities to find a workplace.

According to the data provided by the SAR, Part III, 3.1.3., p. 218, 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. 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. Thus, it is already necessary to provide new specialists with innovative ideas to solve these problems.

According to the SAR, Part III, p. 214-215, the implementation of the study programme in Latvian was started in the academic year of 2020/2021. In that joint admission it was possible to apply for two budget places and 28 tuition fee places. There were a total of 173 applications for the two budget places. A total of 27 students signed the study agreement. The number of students in

admission was close to the plan to have 30 students. By April 15, 2022, ten of all enrolled students have dropped out. In seven cases by their own will (personal reasons) and in three cases due to timely non-fulfillment of the requirements of the study programme. According to the information provided by the management of the study programme, this study year of 2022/23 there have been 30 students admitted. In the experts opinion, there is a certain level of dropout rate in the study programme but it is reasonable due to various possible reasons such as financial problems and academic debts. As it has been stated by the UL representative during the onsite visit, there is a significant increase of the budget places this study year and it has reached the number of 10 budget places.

According to SAR, Part III, 3.1.3., p .219, the first students were admitted to the study programme only in the autumn of 2020, at the time of submitting the report there is no data on the employment of graduates because they haven't graduated yet. During the visit students stated that they are employed in research projects at RTU and UL structural units, public administration institutions and independent institutes related to biotechnology.

2.1.5. According to the SAR, Part III, 3.1.1., p. 214, in 2020 the UL in cooperation with RTU established and started accepting students in the joint academic bachelor's study programme "Biotechnology and Bioengineering". These studies enable prospective students to simultaneously study natural sciences, mainly biology, and engineering, thus ensuring an investment in STEM fields. Overall, the development and implementation of the joint study programme seems relevant to experts as each of the universities have a specialty in their field and they can provide students with the best equipment and knowledge for the specific subjects. When experts asked the students, they were more than satisfied with the joint programme as they felt that they are learning from the best, they can use advanced equipment in both of the universities, they can use resources from both of the universities. Although, in the beginning, students stated that it was hard to adapt to the use of both study e-platforms of each of the universities, after a while they adapted.

According to the information stated by the administration representatives that participated in the meeting during the visit, the quality assurance processes are conducted by both of the universities separately based on the courses they are teaching and providing.

Conclusions on this set of criteria, by specifying strengths and weaknesses

All of the indicators of the study programme are in compliance with the existing preconditions of the implementation of the study programme. The study programme "Biotechnology and Bioengineering" complies with the study field of "Chemistry, Chemistry Technologies, and Biotechnology" indicators, conditions and criteria. The goals, objectives, learning outcomes are in line and in compliance. The title, code, degree to be obtained and admission requirements are interrelated. The duration and scope of the study programme implementation as well as the implementation language, are reasonable and justified. There are no corrections made within the study programme since licensing in 2020. The programme is in demand and there is a flow of incoming students every study year. There is a certain level of dropout rate in the study programme but it is reasonable due to various possible reasons such as financial problems and academic debts. There are no specific shortcomings of the current programme. As it is relatively new study programme it is hard to evaluate the employment indicators of the graduates of the study programme but it is believed that the graduates will have no problems to find an employment. Overall, the development and implementation of the joint study programme is justified and ensures a quality study process as both of the involved universities are providing courses of their specialty.

All other things are in compliance with the criteria.

Strengths:

1. A unique joint study programme.
2. Substantial increase of budget places.

Weaknesses:

1. The lack of a master's programme that would enable vertical mobility of students.

2.2. The Content of Studies and Implementation Thereof

Analysis

2.2.1. Study programme complies with the Cabinet of Ministers Regulations No. 240 "Regulations on the State Academic Education Standard" (<https://likumi.lv/doc.php?id=266187>).

Total amount of CP in the Study programme 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 (8 from these are provided by RTU) 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 includes seven study courses (3 from these are provided by RTU) with a total amount of 30 CP. In addition, the study programme has a free choice part in the amount of six credit points. 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 (SAR, Annexes for Study programme "Biotechnology and Bioengineering", "Annex compliance to higher education standard.docx", "Annex 9 study plan.docx").

The descriptions of the study courses are well prepared. In general, the course descriptions include all the required information: goals and objectives of the course in terms of competencies and skills, structure and tasks of independent studies, course content and planned hours, learning outcomes and assessment, recommended literature, and additional sources of information, evaluation criteria of study results and course value in credit points (SAR, Annexes for Study programme "Biotechnology and Bioengineering", "Annex 10 course descriptions_Full.pdf").

The content and description of the study courses are relevant, regularly updated, and fully complies with the goals of the study programme, and ensure the achievement of the learning outcomes. In addition, the content of the study programme is regularly updated to meet the needs of the labor market and the latest trends in the industry (SAR, Annexes for Study programme "Biotechnology and Bioengineering", "Annex 10 course descriptions_Full.pdf").

Content of the academic bachelor study programme "Biotechnology and Bioengineering" complies with national regulations - state education standard "Annex compliance to higher education standard.docx".

Additional elective courses dealing with different biotechnologies should be included in the restricted elective part of the programme which was pointed out in the interviews conducted with the students.

It should be pointed out that skills, practical experience and the establishment of contacts with potential employers from business and (scientific) institutions could be better developed if student internship will be mandatory as part of the study programme.

2.2.2. Not applicable.

2.2.3. The study methods, including the evaluation methods, contribute to the achievement of the aims and learning outcomes of the study courses and study programme overall. The study process is organized in the form of lectures, laboratory work, and practical work to provide both theoretical and practical knowledge to students. The study implementation methods are diverse: lectures, seminars,

laboratory, and practical work, presentation, individual and group work, discussion, case studies, guest lecturers, and study excursions to companies. Different methods are chosen depending on the study course content and specifics. In the study courses "Introduction to Industrial and Environmental Biotechnology", "Team Work in Business Design", "Vertically Integrated Projects" and "Mathematical Basics of Biotechnology" students develop a Course project, which helps to develop various skills (SAR, Annexes for Study programme "Biotechnology and Bioengineering", "Annex 10 course descriptions_Full.pdf").

According to the SAR, Part III, 3.2.3., p. 223-226, the implementation methods for the study process consider the principles of student-centered learning and teaching, such as (a) involvement of students in the study process and improvement; (b) respect for student abilities; (c) Examination of student complaints; (d) competence development of the academic staff; (e) promotion of students' independence; (f) integration of foreign students into the learning environment. This is also reflected in the descriptions of study courses. Every study year students have had an opportunity to listen to at least one guest lecture.

From SAR, Part III, 3.2.3., p. 223-226, and from interviews with students experts got information that most often studies are organized in such a way that the entire study day is only in one of the universities. But if necessary, 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.

During the onsite visit, students commented on the fact that the programme is combining the academic expertise of UL and the technological aspects taught at RTU. The technology oriented courses at RTU were particularly appreciated and students also expressed an interest in an increased ratio of such topical courses during their education.

2.2.4. Not applicable.

2.2.5. Not applicable.

2.2.6. Assessment of study results at RTU takes place in accordance with the Regulations on Assessment of Study Results

(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)

Regulations on Final Examinations (Appendix 08 of the List of Internal regulations) for RTU and for UL in accordance with the Procedure for Organizing Study Course Examinations

https://www.lu.lv/fileadmin/user_upload/LU.LV/www.lu.lv/Dokumenti/Dokumenti_LV/3._STUDIJU_UN_ZINATNES_PROCESU_REGLAMENTES/DOKUMENTI/9_STUDIJ_3.PDF (in Latvian).

According to SAR, 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 were 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 and Fungal/yeast microbiology (SAR, Part III, 3.2.6., p. 227).

Students are usually involved with a laboratory already during their studies and choose to do their thesis based on previous work and established connections (interview with study programme students during onsite visit).

Conclusions on this set of criteria, by specifying strengths and weaknesses

The content of the study programme is topical, the content of the study courses is interconnected and complementary, corresponds to the objectives of the programme and ensures the achievement of learning outcomes, as well as meets the needs of the industry, labor market and scientific trends. However, student internships should be mandatory so that students can gain additional skills and practical experience and establish contacts with potential employers from business and (scientific) institutions. The Study programme complies with national regulations standards. The study implementation methods contribute to the achievement of the aims and learning outcomes of the study courses and the joint study programme. The methods used for the implementation of a joint study programme are student-oriented and appreciate the fact that the program is conducted at two universities. Student-centered learning and teaching principles are considered. The topics of students' final theses are relevant to the field and correspond to the study programme according to the student surveys, since there were no defended theses at the time of submission of the SAR.

Strengths:

1. A unique study programme combining the academic expertise of UL and the technological aspects taught at RTU.

Weaknesses:

1. Student internships should be mandatory.
2. Additional elective courses dealing with different biotechnologies should be included in the elective part of the programme.

Assessment of the requirement [5] (applicable only to master's or doctoral study programmes)

- 1 R5 - The study programme for obtaining a master's or doctoral degree is based on the achievements and findings of the respective field of science or field of artistic creation.

Assessment of compliance: Not relevant

Not applicable.

2.3. Resources and Provision of the Study Programme

Analysis

2.3.1. The academic bachelor study programme "Biotechnology and Bioengineering" (43421) is a joint programme with UL. UL provides its own courses and RTU its own. In interviews with UL teaching staff of courses such as Biomolecules and cells, Data analysis and mathematical statistics, Cultivation and physiology of microorganisms and Metabolism experts got confirmation that the resources at UL are sufficient for implementation of study study programme.

In addition to the common infrastructure of RTU (auditoriums, classrooms, Scientific Library, portal ORTUS, Wi-Fi, canteens, cafes, etc. see also SAR, Part II, 2.3.2. p. 48-53) practical lessons and laboratory work in the study programme will basically take place in the renovated premises of the Institute of Water Systems and Biotechnology (renovation completed in 2022) (SAR, Part III, 3.3.1., p. 227-230). The Institute of Water Systems and Biotechnology provides the necessary equipment, for example, microscopes, bioreactors and materials for laboratory work and research in study courses such as "Fundamentals of Microbiology", "Biotechnological Reactors", "Introduction to Environmental and Industrial Biotechnology". The laboratory premises have been newly renovated, with modern microbiology boxes and an adequate ventilation system. Pathogenic microorganisms are not treated. Standard microorganisms are purchased from different collections. 25 students can work in the laboratories at the same time (Site visit, SAR, Part III, 3.3.1., p. 227-230).

To provide information resources for the bachelor's study programme "Biotechnology and Bioengineering", until the middle of 2022, more than 15,000 copies of printed editions were included in the collection of the Scientific Library (SAR, Part III, 3.3.1., p. 227-230). During experts visit in the chemistry branch library in RTU (Paula Valdena iela 3 - 465) experts made sure that there is a sufficient range of literature to ensure the implementation of the study programme. There is a separate section of books (shelf indexes: 577 BIOCHEMISTRY. Biophysics. Molecular biology and 60 Biotechnology) for the study programme "Biotechnology and bioengineering", mostly they are in English. Books in Latvian and Russian are also available (Site visit, RTU website RTU_vides_zinatne_kimija._zemes_zinatne_biologijas_ zinatnes_kopuma.pdf).

However, it follows from interviews with students that e-books and books in English are mostly used. E-books and scientific databases are easily accessible using the search tool Primo, which allows you to simultaneously search for literature: In the RTU Scientific Library catalog; In the general catalog; In the subscribed and library databases. For example - Web of Science the leading research platform for electronic resources, created by Clarivate Analytics. Web of Science contains the most relevant scientific information on more than 21,500 journals, 119,000 books and 220,000 conference proceedings in 250 disciplines in the natural sciences, social sciences and humanities or the eBook Academic Collection full-text database of e-books contains ~214,000 books in various branches of science, including natural sciences (RTU website <https://www.rtu.lv/lv/studijas/biblioteka/nozaru-informacija>; SAR, Part II, 2.3.3., p. 50-53).

In order to increase the number of budget places in individual study programmes, including the Biotechnology and Bioengineering study programme, RTU has made changes in the Methodology in the 2020/2021 academic year, which ensures the distribution of study places of the state budget's funding by study programmes and thematic areas of study courses. In fact, internal state budget places have been redistributed by study programmes, according to the indicators with which RTU receives state budget funding (SAR, Part II, 2.3.1., p. 40-48).

From the SAR, Part III, 3.3.1., p. 227-230, experts also got the following information about resources provided by UL - the study process in UL takes place in the House of Nature and the House of Sciences. The House of Nature was commissioned in 2015. The total indoor area is 18540 m², it has a total of 30 auditoriums, 45 student classrooms laboratories and 69 laboratory rooms for scientific research work. There are five computer classes (the largest capacity is for 20 students). Both Windows and Linux operating systems are available in computer classes. Available from Microsoft Office applications, statistical programmes (R, SPSS, PC-Ord), field-specific programmes. The House of Sciences was commissioned in 2019. Indoor total area is 20018 m², it has a total of 15 auditoriums, 8 seminar rooms, 78 scientific and educational laboratories. The studies provided for the implementation of the study programme laboratories have available microscopes connected to stationary computers, individual working sites with micropipette sets. Project no. 8.1.1.0/17/I/010 "STEM of the University of Latvia infrastructure modernization of study areas and concentration of resources" purchased within the framework equipment to provide opportunities for practical work in biotechnology, for example - fermentations equipment set Sartorius Biostat (8 fermenters with equipment); UHPLC ("Waters") and gasses chromatography ("SCION Instruments") system spectrophotometer, autoclave etc. In room 432 of the UL House of Nature, 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 learning fermentation processes for groups of up to 20-24 students. The teaching laboratories that are already in use will also be used for the purposes of the study programme biochemistry, molecular biology and microbiology laboratory works of the Biology studies within the programme.

According to experts' opinion (based on the information in the SAR and interviews with individual course leaders), the material and technical base, informative and financial support in both universities (RTU and UL) is more than sufficient for the qualitative implementation of the study programme.

2.3.2. Not applicable.

2.3.3. The study programme has the minimum number of students to ensure the profitability of the study programme. In the first year of the study programme (2020./2021.), there were 3 state budget places and 24 tuition fee places. For the year 2021./2022. there are 2 state budget places, and 24 tuition fee places but RTU, by internally redistributing the budget places for that academic year, has allocated altogether 10 budget places (Annex 5. Student statistics in the study programme; p.12 Additional information from RTU, "Budget places"). For this study program, the minimum number of students to ensure the profitability of the study program in each study year is 19 students (SAR, HEI Other Anexes, On_minimal_number_of_students_in_study_programmes.pdf).

Experts conclude that the study programme is compelling, which is indicated by the large number of students who are ready to pay for these studies themselves. In general, the costs of one student per year in a joint study programme are estimated (developed by the Department of Studies and the Department of Finance and Accounting of the UL) at 2,759.00 EUR (where direct costs are 60% per conditional student, indirect 40%), which does not exceed the cost for one student in a European countries in a similar specialty (SAR, Part III, 3.3.3., p. 230). According to the information given in SAR (Part III, 3.3.3., p. 230), the financial base of both partner institutions is sufficient to ensure the study process in the study programs implemented so far.

In addition, it is important to note the relatively low student-teacher ratio in the implementation of the study programme, which, according to available data, is three students per one teacher (SAR, Part III, 3.4.5, p. 237). Even if this number will increase in the future, since currently only two generations of students are involved in the three-year study programme, it should be noted that the low number of students per teacher could be a disadvantage in terms of economic sustainability of the study programme. However, it seems this is successfully compensated by the large number of students who pay for their studies themselves (SAR, Part III, 3.1.4., p. 220). For example, in the academic year 2021/2022 there were 24 students who paid tuition fee (SAR, Anexess of study programme Biotechnology and Bioengineering, Statistics on the students in the reporting period).

Conclusions on this set of criteria, by specifying strengths and weaknesses

UL and RTU already have the necessary equipment for the implementation of the study programme, which means that the "Biotechnology and Bioengineering" programme can be implemented without additional expenses for the purchase of equipment. The material and technical provision corresponds to the successful implementation of the study programme. All resources - funding, informative provision, equipment - are sufficient to ensure a qualitative learning process. The financial base of both partner institutions is sufficient to ensure the study process in the study programs implemented so far.

Strengths:

1. Renovated classrooms and laboratories.
2. Large number of self-funded students.
3. Substantial increase of budget places.

Weaknesses:

None.

Assessment of the requirement [6]

- 1 R6 - Compliance of the study provision, science provision (if applicable), informative provision (including library), material and technical provision and financial provision with the conditions for the implementation of the study programme and ensuring the achievement of learning outcomes

Assessment of compliance: Fully compliant

The resources and provision of the study programme are sufficient for high-quality studies. Infrastructure of RTU and UL (auditoriums, classrooms, Scientific Library, portal ORTUS, Wi-Fi, canteens, cafes, etc. see also SAR, Part II, 2.3.2. p. 48-53) is more than sufficient to ensure effective and sustainable practical lessons and laboratory work of the study programme (Site visit, SAR, Part III, 3.3.1., p. 227-230).

To provide information resources for the bachelor's study programme "Biotechnology and Bioengineering", until the middle of 2022, more than 15,000 copies of printed editions were included in the collection of the Scientific Library (SAR, Part III, 3.3.1., p. 227-230). E-books and scientific databases are easily accessible using the search tool Primo, which allows you to simultaneously search for literature: In the RTU Scientific Library catalog; In the general catalog; In the subscribed and library databases (RTU website

<https://www.rtu.lv/lv/studijas/biblioteka/nozaru-informacija>; SAR, Part II, 2.3.3., p. 50-53).

According to the information given in SAR (Part III, 3.3.3., p. 230), the financial base of both partner institutions is sufficient to ensure the study process in the study programs implemented so far.

2.4. Teaching Staff

Analysis

2.4.1. A total of 13 teachers employed at RTU are involved in the implementation of the joint academic bachelor study programme "Biotechnology and Bioengineering", of which 8 are professors, 1 associate professor, 2 assistant professors, 1 lecturer and 1 foreign visiting assistant professor. All RTU teachers involved in the implementation of the study programme hold doctoral degrees in engineering, economics, or mathematics. On the part of UL, 4 professors, 4 associate professors, 3 assistant professors and 4 lecturers are involved in the implementation of the study programme, all of whom have the appropriate knowledge and qualifications in the relevant scientific field necessary for the implementation of the study programme (SAR Part III, 3.4.1, p. 231).

All academic staff involved in the implementation of the study programme meet the requirements specified in Section 55, paragraph 1, 3 of the Law on Higher Education Institutions of the Republic of Latvia. More than five professors and associate professors altogether, who are elected to academic positions in the RTU and UL, take part in the implementation of the compulsory part and the limited elective part of academic study programme. On the RTU side, these are professors and associate professors who teach the following study courses of the compulsory part and the limited elective part of academic bachelor study programme "Biotechnology and Bioengineering": Information technology, Mathematical basics of biotechnology, Basics in materials science and engineering, Principals of entrepreneurship, Basics in microbiology, Electrical processes and equipment in biotechnology, Biological reactors, Fermentation - product identification and purification, Introduction to industrial and environmental biotechnology, Vertically integrated project and Teamwork for business design (SAR Part III, 3.4.1, p. 231-235; The curriculum of the academic bachelor study programme "Biotechnology and Bioengineering"). At the same time, all teaching staff involved in the implementation of the study programme meet at least the following three criteria:

compliance of the qualifications of the teaching staff with the requirements set forth in the legislation (SAR Part III, 3.4.1, p. 231-235; SAR Annex, Biographies of the teaching staff members), the orientation of scientific research corresponds to the content of the study programme and/or study course (for example, professor of the study course Basics in materials science and engineering is expert of the Latvian Council of Science in the field of chemistry, chemical engineering, and material science, professor of the study course Mathematical basics of biotechnology is expert of the

Latvian Council of Science in the area of natural sciences - mathematics, professor of the study course Electrical processes and equipment in biotechnology is expert of the Latvian Council of Science in the area of engineering and technology - electrical engineering, electronics, Information and communication technology; SAR Part III, 3.4.1, p. 231-235; SAR Annex, Biographies of the teaching staff members)

an adequate level of proficiency in Latvian and English to teach the study courses both in Latvian (with the exception of visiting assistant professor) and in English (SAR Annexes, Confirmation - knowledge of the state language and Confirmation - knowledge of the foreign language).

57% of the teaching staff involved in the implementation of the study programme are experts of the Latvian State Council in various fields such 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 (SAR Part III, 3.4.1, p. 231). These ensure the implementation of the study programme to the highest standards, with the curriculum based on relevant scientific knowledge.

The achievement of the aims and learning outcomes of the programme and the corresponding courses from the point of view of the scientific and professional competence of the teaching staff is guaranteed, taking into account all the above points.

2.4.2. Considering that there have been no significant changes in the composition of the teaching staff since the beginning of the study programme, i.e., from the academic year 2020/2021 (SAR Part III, 3.4.2, p. 235), it can be stated that until this date there has been no negative impact on the quality of the implementation of the study programme and the compliance of the study programme with the requirements established in the legislation as a result of the renewal or replacement of teaching staff. On the contrary, in order to additionally balance the workload and strengthen the competences of the teaching staff in the three subjects whose implementation is the responsibility of the RTU, additional teaching staff have been included in implementation of study courses (Electrical processes and Equipment in biotechnology, Vertically integrated project and Fermentation - product identification and purification). All additional teaching staff is scientifically oriented in areas related to studies/study courses. With their scientific and professional background, they increase the scope of knowledge and competences that are transferred to students (SAR PART III, 3.4.2, p. 235-236; SAR Annex, Biographies of the teaching staff members) In order to ensure high-quality and innovative implementation of the study programme, several criteria are used for the selection of RTU academic staff to be involved in the study programme, so that the study courses are conducted by qualified, scientifically and methodically prepared lecturers, who are professionals in the specified field of studies and use modern approaches and technologies in their work (SAR Part II, 2.3.5, p. 56-58).

2.4.3. Not applicable.

2.4.4. 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. The large number of high quality scientific papers published yearly as well as the academic merits available in online databases (SCOPUS) indicate research activity of the staff in accordance with the Law on Higher Education Institutions. Each member of the academic staff in the last six years has published in peer-reviewed editions, including international editions (SAR Annex, Biographies of the teaching staff members).

The teaching staff is closely involved in ongoing research at their respective institutes. For example senior researcher at the RTU Institute of Technology of Organic Chemistry and is also a docent at the

Department of RTU Chemical Technology of Biologically Active Compounds is responsible for study course "Fermentation - product identification and purification" for 2nd-year students of the study programme "Biotechnology and Bioengineering". A Senior Researcher with a Doctoral degree in electrical engineering, electrical technology, and automation, is engaged in scientific research at the Department of Industrial Electronics and Electrical Technologies and participates with teaching for study courses such as "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", or "Design of Adaptive Systems".

2.4.5. The cooperation of the teaching staff involved in the implementation of the study programme includes the following activities:

joint meetings of teaching staff and study programme director, held at least once a semester, in which perceived challenges are discussed and proposals are made for the improvement of the study programme (SAR Part III, 3.4.5, p. 237),

teaching staff jointly participates in different seminars and workshops where, in addition to the exchange of experiences on maintaining different forms of teaching and transferring knowledge and competences to students, they acquire didactic, pedagogical and psychological skills and methods necessary for further development of the study programme and achievement of learning outcomes (SAR Part II, 2.1.5, p. 29) , and

cooperation in scientific projects which results in acquiring of new knowledge and skills necessary for the continuous improvement of the study programme based on the latest scientific trends.

The low number of students per teacher (three students per one teacher, SAR Part III, 3.4.5, p. 237), is currently a great advantage for students, since it allows students to acquire knowledge, competencies and skills in small groups, and consequently allows the full dedication of the involved teacher to each student.

Conclusions on this set of criteria, by indicating strengths and weaknesses

The qualification of the teaching staff members involved in the implementation of the study programme complies with the requirements specified in Section 55, paragraph 1, 3 of the Law on Higher Education Institutions of the Republic of Latvia. The orientation of scientific research corresponds to the content of the study programme and/or study course. The teaching staff possess an adequate level of proficiency in Latvian and English to teach the study courses both in Latvian and in English. Therefore, the achievement of the aims and learning outcomes of the study programme and the corresponding courses from the point of view of the scientific and professional competence of the teaching staff is guaranteed. There have been no significant changes in the composition of the teaching staff since the beginning of the study programme. Several internal criteria are used for the selection of new RTU academic staff to be involved in the study programme. The teaching staff is closely involved in ongoing research at their respective institutes. Each member of the academic staff in the last six years has published in peer-reviewed editions, including international editions. The cooperation of the teaching staff in the implementation of the study programme is realized through the joint meetings and discussions, different education programmes carried out in the form of seminars and workshops, and through cooperation on the scientific projects. Consequently, mechanisms for mutual cooperation of the teaching staff in the implementation of the study programme were established and these mechanisms ensure the achievement of the aims of the study programme and the interconnection of study courses within the study programme.

Strengths

1. Scientific, professional and generic competences of teachers ensure the implementation of the study programme to the highest standards, with the curriculum based on relevant scientific knowledge.
2. Good cooperation of teaching staff in scientific projects which results in acquiring of new knowledge and skills necessary for the continuous improvement of the study programme based on the latest scientific trends.
3. Low student/teacher ratio which allows students to acquire knowledge, competencies and skills in small groups, and consequently allows the full dedication of the involved teacher to each student.

Weaknesses

None.

Assessment of the requirement [7]

- 1 R7 - Compliance of the qualification of the academic staff and visiting professors, visiting associate professors, visiting docents, visiting lecturers and visiting assistants with the conditions for the implementation of the study programme and the requirements set out in the respective regulatory enactments.

Assessment of compliance: Fully compliant

Scientific, professional and generic competences of teachers ensure the implementation of the study programme to the highest standards, with the curriculum based on relevant scientific knowledge. All RTU teaching staff involved in the implementation of the study programme meet the requirements specified in Section 55, paragraph 1, 3 of the Law on Higher Education Institutions of the Republic of Latvia. Each member of the academic staff in the last six years has published in peer-reviewed editions, including international editions (SAR Annex, Biographies of the teaching staff members). Each member of the academic staff has an adequate level of proficiency in Latvian and English to teach the study courses both in Latvian (with the exception of visiting assistant professor) and in English (SAR Annexes, Confirmation - knowledge of the state language and Confirmation - knowledge of the foreign language).

2.5. Assessment of the Compliance

Requirements

- 1 1 - The study programme complies with the State Academic Education Standard or the Professional Higher Education Standard

Assessment of compliance: Fully compliant

According to experts, study programme "Biotechnology and Bioengineering" fully complies to State academic Education Standard. For example, Volume of the study programme is 120 KP, duration of the study programme - six semesters, compulsory part - 82 CP, Number of contact hours for RTU courses - 50% (SAR, Annexes for Study Program "Biotechnology and Bioengineering", "Annex compliance to higher education standard.docx").

- 2 2 - The study programme complies with a valid professional standard or the requirements for the professional qualification (if there is no professional standard required for the relevant occupation) provided if the completion of the study programme leads to a professional qualification (if applicable)

Assessment of compliance: Not relevant

Not applicable.

- 3 3 - The descriptions of the study courses and the study materials have been prepared in all languages in which the study programme is implemented, and they comply with the requirements set forth in Section 561, Paragraph two and Section 562, Paragraph two of the Law on Higher Education Institutions.

Assessment of compliance: Fully compliant

The descriptions of the study courses and the study materials have been prepared in two languages - English and Latvian (SAR, Annexes for Study Program "Biotechnology and Bioengineering", "Annex 10 course descriptions_Full.pdf", "10 pielikums_kursu apraksti_visi.pdf"), and they comply with the requirements set forth in Section 561, Paragraph two and Section 562, Paragraph two of the Law on Higher Education Institutions. The following information is included in the descriptions of the study courses: volume; requirements for the commencement of the acquisition of the study course; aim of the implementation of the study course; intended learning outcomes; content of the study course required for achieving the learning outcomes; calendar of the study course; mandatory and supplementary literature and other sources of information; description of the organization and tasks for the independent work of students; criteria for the assessment of the learning outcomes.

- 4 4 - The sample of the diploma to be issued for the acquisition of the study programme complies with the procedure according to which state recognised documents of higher education are issued.

Assessment of compliance: Fully compliant

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. Experts conclusion - The sample of the diploma to be issued for the acquisition of the study programme complies with the procedure according to which state recognised documents of higher education are issued - complies to Regulations of Cabinet of Ministers No. 202."Kārtība, kādā izsniedz valsts atzītus augstāko izglītību apliecinošus dokumentus". (SAR, Annexes for Study Program "Biotechnology and Bioengineering", "Diploms_Biotehnologija_bioinženierija_BSP_ENG_precizets.docx").

- 5 5 - The academic staff of the academic study programme complies with the requirements set forth in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions.

Assessment of compliance: Fully compliant

The academic staff involved in the implementation of the study programme meet the requirements specified in Section 55, paragraph 1, Clause 3 of the Law on Higher Education Institutions of the Republic of Latvia. RTU has involved a total of 13 lecturers, of which 8 are professors, 1 associate professor, who are elected to academic positions in the higher education institution, and they take part in the implementation of the compulsory part and the limited elective part of the study programme (SAR, pp. 230-235).

- 6 6 - Academic study programmes provided for less than 250 full-time students may be implemented and less than five professors and associated professors of the higher education institution may be involved in the implementation of the mandatory and limited elective part of these study programmes provided that the relevant opinion of the Council for Higher Education has been received in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions.

Assessment of compliance: Fully compliant

Before the implementation of the joint bachelor's study programme "Biotechnology and Bioengineering" at UL and RTU on January 7, 2020, the Council of Higher Education received the

application, in which the UL requested an opinion regarding the joint bachelor's study programme in which less than 250 full-time students are planned. Decision of the Council of Higher Education was to support implementation of the joint study programme in the UL and RTU. (SAR, Annexes for Study Program "Biotechnology and Bioengineering", "AIC decision_translation in English.pdf").

- 7 7 - At least five teaching staff members with a doctoral degree are among the academic staff of an academic doctoral study programme, at least three of which are experts approved by the Latvian Science Council in the respective field of science. At least five teaching staff members with a doctoral degree are among the academic staff of a professional doctoral study programme in arts (if applicable).

Assessment of compliance: Not relevant

Not applicable.

- 8 8 - The teaching staff members involved in the implementation of the study programme are proficient in the official language in accordance with the regulations on the level of the official language knowledge and the procedures for testing official language proficiency for performing professional duties and office duties.

Assessment of compliance: Fully compliant

The level of official language knowledge of individual academic staff members is indicated in the biographies of the teaching staff accompanying the SAR of the study programme and it complies with the Cabinet of Ministers Regulation No. 733 of 7 July 2009 "Regulations Regarding the Extent of the Knowledge of the Official Language, the Procedures for Examining the Proficiency in the Official Language and the State Fee for Examining the Proficiency in the Official Language" for performing professional and office duties. (SAR, Annex, "CV, ENG.zip").

- 9 9 - The teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of a related foreign language, if the study programme or any part thereof is to be implemented in a foreign language (if applicable).

Assessment of compliance: Fully compliant

The teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of English (SAR Annexes, Confirmation - knowledge of the state language and Confirmation - knowledge of the foreign language).

- 10 10 - The sample of the study agreement complies with the mandatory provisions to be included in the study agreement.

Assessment of compliance: Fully compliant

The sample of the study agreement complies with the mandatory provisions that are included in the study agreement and it complies with regulations of Cabinet of Ministers No. 70. "Studiju līgumā obligāti ietveramie noteikumi". (SAR, Annex, "Study_agreements.zip").

- 11 11 - The higher education institution / college has provided confirmation that students will be provided with opportunities to continue their education in another study programme or another higher education institution or college (agreement with another accredited higher education institution or college) if the implementation of the study programme is terminated.

Assessment of compliance: Fully compliant

The RTU has provided confirmation (agreement Nr. 01000-4.1-e/11, dated 28.02.2020., SAR Annex, "Agreement.7z") that students will be provided with opportunities to continue their education in another study programme in RTU or UL if the implementation of the study programme is terminated. Alternative study programme will be on the same level and in the

same language - accordingly in Latvian or English.

Unfortunately, there is no direct indication of the study programme where the students will continue their education.

- 12 12 - The higher education institution / college has provided confirmation that students are guaranteed compensation for losses if the study programme is not accredited or the study programme's license is revoked due to the actions (actions or omissions) of the higher education institution or college and the student does not wish to continue studies in another study programme.

Assessment of compliance: Fully compliant

The RTU has provided confirmation Nr. 01000-2.2.1-e/130 dated 26.05.2022., (SAR Annex, "Confirmation - on compensation for losses.edoc"), that students are guaranteed compensation for losses if the study programme is not accredited or the study programme's license is revoked due to the actions (actions or omissions) of the higher education institution or college and the student does not wish to continue studies in another study programme.

- 13 13 - The joint study programmes comply with the requirements prescribed in Section 55.(1), Paragraphs one, two, and seven of the Law on Higher Education Institutions (if applicable)

Assessment of compliance: Fully compliant

The joint study programme complies with the requirements prescribed in Section 551, Paragraphs one, two, and seven of the Law on Higher Education Institutions. (SAR Annexes for Study Programme "Biotechnology and Bioengineering", "Annex 4 Compliance to the joint study programme.docx").

- 14 14 - Compliance with the requirements specified in other regulatory enactments that apply to the study programme being assessed (if applicable)

Assessment of compliance: Not relevant

Not applicable.

Assessment of the requirement [8]

- 1 R8 - Compliance of the study programme with the requirements set forth in the Law on Higher Education Institutions and other regulatory enactments.

Assessment of compliance: Fully compliant

The study programme fully complies with the requirements set forth in the Law on Higher Education Institutions and other regulatory enactments: According to experts, study programme "Biotechnology and Bioengineering" fully complies to State academic Education Standard. Study programme "Biotechnology and Bioengineering" complies to Regulations of Cabinet of Ministers No. 202."Kārtība, kādā izsniedz valsts atzītus augstāko izglītību apliecinošus dokumentus", Section 55, paragraph 1, Clause 3 of the Law on Higher Education Institutions of the Republic of Latvia.

General conclusions about the study programme, indicating the most important strengths and weaknesses of the study programme

According to experts, study programme "Biotechnology and Bioengineering" fully complies to State academic Education Standard. The descriptions of the study courses and the study materials have been prepared in two languages - English and Latvian, and they comply with the requirements set forth in Section 561, Paragraph two and Section 562, Paragraph two of the Law on Higher Education Institutions. The graduates of the study programme are awarded a Bachelor's degree in Natural

Sciences and a joint diploma from both partner institutions. The sample of the diploma to be issued for the acquisition of the study programme complies with the procedure according to which state recognised documents of higher education are issued. The academic staff involved in the implementation of the study programme meet the requirements specified in Section 55, paragraph 1, Clause 3 of the Law on Higher Education Institutions of the Republic of Latvia. The level of official language knowledge of individual academic staff members is indicated in the biographies of the teaching staff accompanying the SAR of the study programme and it complies with the Cabinet of Ministers Regulation No. 733 of 7 July 2009. The teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of English. The sample of the study agreement complies with the mandatory provisions that are included in the study agreement and it complies with regulations of Cabinet of Ministers No. 70.

The programme is in demand and there is a flow of incoming students every study year. There is a certain level of dropout rate in the study programme but it is reasonable due to various possible reasons such as financial problems and academic debts. As it is relatively new study programme it is hard to evaluate the employment indicators of the graduates of the study programme but it is believed that the graduates will have no problems to find an employment.

There are no serious shortcomings but experts can mention the student internship, which should be mandatory and should be considered to be included in the study programme. The lack of a master's programme that would enable vertical mobility of students is a potential threat in the event that students enrolling in a bachelor's study or nearing the end of their studies will not have a complete picture of their academic development through different levels of study. Additionally, elective courses dealing with different biotechnologies should be included in the elective part of the programme.

In the end, study programme "Biotechnology and Bioengineering" is a unique study programme combining the academic expertise of UL and the technological aspects taught at RTU. The study program is carried out in a renovated and well equipped classrooms and laboratories. Although the number of students who pay tuition fee by their own is large, it should be noted that from year to year number of budget places increases. Scientific, professional and generic competences of teachers ensure the implementation of the study programme to the highest standards, with the curriculum based on relevant scientific knowledge. Low student/teacher ratio allows students to acquire knowledge, competencies and skills in small groups, and consequently allows the full dedication of the involved teacher to each student.

Evaluation of the study programme "Biotechnology and Bioengineering"

Evaluation of the study programme:

Excellent

2.6. Recommendations for the Study Programme "Biotechnology and Bioengineering"

Short-term recommendations

Additional elective courses dealing with different biotechnologies should be included in the restricted elective part of the programme (within 2 years).

Long-term recommendations

Student internships should be mandatory (until the next accreditation).

II - "Chemistry and Chemical Technology" ASSESSMENT

II - "Chemistry and Chemical Technology" ASSESSMENT

2.1. Indicators Describing the Study Programme

Analysis

2.1.1. The academic bachelor's study programme "Chemistry and Chemical Technology" complies with the study field of "Chemistry, Chemistry Technologies, and Biotechnology" indicators, conditions and criteria.

The length of the implementation of the study programme, which is 4 years, is evaluated as sufficient for acquiring the necessary skills and practical experience to enter the labor market. In fact, 4 years for an academic study programme on Bachelor level even seems to be too long as it is followed by Masters studies of 2 years, thus, it would even seem sufficient if the Bachelor studies were 3 years.

2.1.2. According to the SAR (Part III, p. 182-184), the title of the study programme is "Chemistry and Chemical Technology" in the study field of "Chemistry, Chemistry Technologies, and Biotechnology" with education classification code 43528 with the last 3 numbers standing for chemistry technologies according to the classification of Latvian education which can be accessed here: <https://likumi.lv/ta/id/291524-noteikumi-par-latvijas-izglitiba-klasifikaciju>. 52 stands for Engineering and Technology. There is no qualification given as it is an academic bachelor's study programme. According to the SAR (Part III, 3.1.2., p. 187), the aim of the 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.

According to the information provided in the SAR, Part III, Study programme forms, p. 183-184, the admission requirements in the study programme implemented in Latvian is general or vocational secondary education while for the study programme implemented in English it is general or vocational secondary education and assessment of the level of English language proficiency under the requirements specified in regulatory enactments as well as pass exams 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.

It has been stated in the SAR (Part III, 3.2.4., p. 197), that 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 defense of a Bachelor's thesis to the Final Examination Commission.

According to the SAR (Part III, 3.1.2. p. 188), 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.

According to the SAR (Part III, Study programme forms, p. 183), the study programme is only provided full-time. 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. As this programme is being implemented also in English, there is a study course as part of the curriculum for foreign students to gain basic knowledge of Latvian language. A part of the study curriculum are also Civil Protection and Disaster Management Law and the Environmental Protection Law courses. 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. In the opinion of the experts, the preconditions and requirements of the study programme including the title, code and degree obtained are reasonable and in place and interrelated with the admission requirements. As indicated before in the analysis under 2.1.1., the duration of the study programme is reasonable to gain the necessary knowledge for the work market and the language of implementation of the study programmes are justified - one programme in Latvian for nationals in national language and English for some students that wish to study in English although are Latvian nationals and for those foreign students who wish to study here in Latvia their choice of study programme.

2.1.3. According to the SAR (Part III, 3.1.1., p. 185), 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.

According to the SAR (Part III, 3.1.1., p. 185), in 2019, it was decided to create a new Bachelor's academic study programme "Chemistry and Chemical Technology". 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 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".

During onsite visit, students outlined that the formation of a new study programme was a good decision as not only new study programme has a higher demand in the labor market but as well as the students who started to study in "Chemistry" programme, had an higher dropout rate which was bad indicator for a study programme. Expert group agrees that the formation of a new study programme was a reasonable and justified decision as the drop out levels increased in the Chemistry programme and the overall number of students who applied for admission decreased significantly every year. The numbers are provided further in the analysis under 2.1.4. In fact, also the information in the paragraph above shows that survey results from the employers and former and current students indicated that a reform of the programmes in place had to be made.

2.1.4. According to the SAR (Part III, 3.1.3., p. 188-189) the study programme conforms to the strategic development directions of the university, the needs of the public and the national economy and development trends. In Latvia there is a high demand and need of specialists with the knowledge and background in chemistry. Employers outlined during on site visits that there is a shortage of such experts. In fact, there are three universities that prepare such experts in Latvia and in the opinion of the employers RTU is better in preparation of specialists in relation to chemical technologies. The key employers mentioned in regard to this study programme are mentioned in the SAR (Part III, 3.1.3. p. 189) - Latvian pharmaceutical companies, manufacturers of construction materials and also manufacturers and recyclers of polymer materials. 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.

According to the SAR (Part III, 3.1.3., p. 189), the implementation of the study programme following the receipt of the license 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. Also 40 second-year students of the "Chemical

Technology" study programme moved to the new study programme.

According to the SAR (Part III, 3.1.4., p. 189-191), student count statistics clearly show the falling interest in the previous study programme "Chemistry". The number of dropouts during the reporting period was on average around 50. In the study year of 2016/17 the study programme "Chemistry" enrolled less than 10 students while "Chemical Technology" enrolled nearly 70. The data is similar for the following study years of the enrolled students per study year while the total number of students per study programme significantly decreased with every study year in the "Chemistry" programme. In the study years of 2019/20 and 2020/21 it decreased under 20 for students from all study years together which was a significant indicator that things must change.

According to the SAR (Part III, 3.1.4., p. 189-191), in the previous study programmes before the new study programme was implemented the dropout rates are seen as high. In the "Chemical Technology" programme in the study year of 2020/21 more than 65 students dropped out. In the study year 2019/20, the dropout number was two times less - around 30.

2.1.5. Not applicable.

Conclusions on this set of criteria, by specifying strengths and weaknesses

All of the indicators of the study programme are in compliance with the existing preconditions of the implementation of the study programme. The study programme "Chemistry and Chemical Technology" complies with the study field of "Chemistry, Chemistry Technologies, and Biotechnology" indicators, conditions and criteria. The title, code, degree to be obtained as well as the aims, objectives, learning outcomes and admission requirements are interrelated. The duration and scope of the study programme implementation, as well as the implementation language, are reasonable and justified. The study programme is implemented in Latvian and English. The goals, objectives, learning outcomes are in line and in compliance. There is a new study programme established due to the necessary changes of the study programmes. The programme is in demand and there is a flow of incoming students every study year. There was a significant level of dropout rate in the last study years due to various reasons. There has been a significant improvement since the so called reform of the study programmes. The graduates have no problems in finding a job placement in the labor market. Most of them are employed while studying.

Strengths:

1. Significant demand and inflow of students that are interested to study in the study field.
2. Unique study programme as there is a limited amount of study programmes in the study field in the country.

Weaknesses:

None.

2.2. The Content of Studies and Implementation Thereof

Analysis

2.2.1. Study programme complies with the Cabinet of Ministers Regulations No. 240 "Regulations on the State Academic Education Standard" (<https://likumi.lv/doc.php?id=266187>).

Study programme duration of studies is four years (eight semesters, students acquire 20 CP per semester). 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. After the completion of the study programme, the graduates of the study programme are awarded a Bachelor's degree of engineering science in

chemical technology (SAR, Annexes for Study Program "Chemistry and Chemical Technology (43528)", "Compliance with the standard, Annex 6, RKBM0 43528.pdf", "RKBM0 (43528) Planning, Annex 9.pdf").

The descriptions of the study courses are well prepared. In general, the course descriptions include all the required information: goals and objectives of the course in terms of competencies and skills, structure and tasks of independent studies, course content and planned hours, learning outcomes and assessment, recommended literature, and additional sources of information, evaluation criteria of study results and course value in credit points (SAR, Annexes for Study Program "Chemistry and Chemical Technology (43528)", "Course descriptions (43528), Annex 10.zip").

The content and description of the study courses are relevant, regularly updated, and fully complies with the goals of the study programme, and ensure the achievement of the learning outcomes. In addition, the content of the study programme is regularly updated to meet the needs of the labor market and the latest trends in the industry (SAR, Annexes for Study Program "Chemistry and Chemical Technology (43528)", "Course descriptions (43528), Annex 10.zip").

Content of the academic bachelor study programme "Chemistry and Chemical Technology" complies with national regulations - state education standard (SAR, "Annex compliance to higher education standard.docx").

It should be noted that there are a large number of compulsory elective study courses and specializations that are available to students. The above allows students a wide choice of specializations that match their interests and can direct them towards a narrow field related to the profession (SAR, Annexes for Study Program "Chemistry and Chemical Technology (43528)", The curriculum of the study programme).

2.2.2. Not applicable.

2.2.3. The study programme provides an equal opportunity for Latvian 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 (SAR, Part III, 3.2.3., p. 193-195).

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 (SAR, Part III, 3.2.3., p. 193-195).

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 (SAR, Part III, 3.2.3., p. 193-195).

2.2.4. 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. 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 (SAR, Part III, 3.2.4., p. 164-166). Main internship goals is gaining the professional experience conforming to the study programme and mastering a set of practical skill needed for the employees of the relevant professions in the field of chemistry, chemical technologies or material science, performing the research of the defined problem at the place of the internship and developing proposals for improvement the operational efficiency of the internship place, strengthening the skill of efficient planning and organization of own work, independent mastering of new knowledge, developing communication, independent working and team working skills, including the ability to publicly defend own ideas and justify own opinion (SAR, Annexes for Study Program "Chemistry and Chemical Technology (43528)", "Internship Management Procedure.zip").

From the interview conducted with the students, it was unequivocally established that there are difficulties in the implementation of professional practice in the industry for foreign students due to lack of knowledge of the Latvian language. Therefore, it is necessary to guarantee foreign students the possibility of conducting internships in English, and if the above is not possible in Latvian industrial companies, then this must be ensured abroad. At the same time, domestic students should be encouraged to go abroad for student internships.

2.2.5. Not applicable.

2.2.6. 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 is included in the study programme with 10 CP. The topics for the thesis are offered by faculty departments and are always related to the scientific directions of research. Topics of Bachelor's theses are selected according to the program's specialisation directions as described in SAR (Part III, 3.2.6., p. 197-199). The final work can also be conducted in a manufacturing company. In such a case, the second work supervisor is involved from the department, who supervises the quality of the paper and compliance with the objectives of the study programme and the learning outcomes (SAR, Part III, 3.2.1., p. 192). According to interview with students during onsite visit, students are closely involved with the scientific research ongoing at the institutes responsible for the study programme already during their studies participating in various scientific projects ongoing at the institutes. Students usually choose the topics of their theses based on their experience and interest gained during their studies. According to SAR (Part III, 3.2.6., p. 199) and related Graph (Part III, 3.2.6., p. 200), the average assessment of Bachelor's theses of previous study programmes has been consistently high and ranged from 8.2 to 9.8.

Conclusions on this set of criteria, by specifying strengths and weaknesses

The content of the bachelor study programme "Chemistry and Chemical Technology" is topical, the

content of the study courses is interconnected and complementary, and corresponds to the objectives of the programme. It ensures the achievement of learning outcomes, as well as meets the needs of the industry, labor market and scientific trends. Study programme is composed of a large number of compulsory elective study courses and specializations that are available to students. The study implementation methods contribute to the achievement of the aims and learning outcomes of the study courses and the study programme. Student-centred learning and teaching principles are considered. The content of the programme complies with national regulations. The opportunities and provision of internship offered to students, as well as the organization of work are effective. The tasks of the internship are related to the learning outcomes achievable. The internship complies with the requirements of regulatory enactments. Difficulties have been indicated regarding finding places for foreign students. The topics of bachelor theses are compliant with the research and the scientific focus of the institutes and correspond to the study programme.

Strengths:

1. Wide variety of compulsory elective study courses, good possibilities to gain high specialization.

Weaknesses:

1. The placement of foreign students in the internship in companies should be guaranteed, even in companies abroad.
2. Internships should be available in international companies for all students.

Assessment of the requirement [5] (applicable only to master's or doctoral study programmes)

- 1 R5 - The study programme for obtaining a master's or doctoral degree is based on the achievements and findings of the respective field of science or field of artistic creation.

Assessment of compliance: Not relevant

Not applicable.

2.3. Resources and Provision of the Study Programme

Analysis

2.3.1. The study programme is implemented by five scientific institutes: Institute of Organic Chemistry and Technology, Institute of Applied Chemistry, Institute of General Chemistry and Technology, Institute of Polymer Materials, Institute of Materials and Surface Technologies. All the mentioned institutes are engaged in the development of scientific projects, which allow to constantly renew and improve the existing scientific and technical base. Since 2013, the FMSAC has invested more than EUR 8.5 million in the renovation of buildings and more than EUR 9.5 million in the purchase of modern scientific equipment (SAR Part III, 3.3.1., p. 200).

The computer room, the conference room, various teaching and scientific laboratory rooms were visited during the on-site visit. Following laboratories are used for the teaching process of the study courses of the programme - laboratory of inorganic and analytical chemistry, laboratory of general and organic chemistry, laboratory of physical chemistry, laboratory of basic processes and apparatuses of chemical technology, laboratory of physics. The laboratory facilities are equipped with various modern analytical equipment, such as NMR, different chromatographs (some of them equipped with a mass spectrometer), spectrophotometers, reactors, different lab-scale process units, etc. (SAR, Annex "Main research equipment.pdf"). Taking into account the above, clear indications have been obtained that the material and technical provision for the study programme is sufficient.

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. Consequently all common infrastructure of RTU (auditoriums, classrooms, Scientific Library, portal ORTUS, Wi-Fi, canteens, cafes, etc. (see also 1.3.2 in part I Resources and Provision of the Study Field; RTU web page, section: Home/ University/ RTU Ķīpsala Campus <https://www.rtu.lv/en/university/rtu-kipsala-campus>)) are available for students of this study programme.

SL provides the necessary information services for ensuring the study process and scientific activity of students (RTU web page <https://www.rtu.lv/lv/studijas/biblioteka>; SAR Part II, 2.3.3., p. 50-53); 1.3.3 in analysis of Resources and provision of the Study field). 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 12,000 EUR in the period of 2013 – 2021. Electronic databases (Information about databases in English can be found: <https://www.rtu.lv/en/studies/scientific-library/electronic-resources>.) 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 (SAR, Part III, 3.3.1., p. 201) which indicates that the information provision (including the library) is sufficient.

After the opening of the new RTU Scientific Library building in 2016, there is only one branch - Chemistry Branch - of SL left, and it is located on the premises of the FMSAC (SAR, Part III, 3.3.1., p. 201). During the site visit experts also visited SL branch premises - reading room, with freely accessible workplaces for students, educational and scientific literature. 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 202 – these are editions of ACS, RCS, Wiley, Elsevier, Springer and the collection of journals issued in Russian. As indicated in the SAR it is the most complete collection of journals of the chemical sector in Latvia (SAR, Part III, 3.3.1., p. 202). 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 studies and scientific work of the RTU FMSAC. All editions in the branch are open access. The stock of the Branch contains 6,607 titles / 8,396 copies of books, which are reflected in the Electronic Catalog of the RTU Scientific Library (<https://kopkatalogs.lv/>) as at 10.03.2022. (SAR, Part III, 3.3.1., p. 202). The "Chemistry" database, which collects mostly popular press articles on various topics of chemistry, pharmacy, material science and technology, starting from 2014, is available in the electronic catalog. The full-text scanned material is available only on the computers of the Chemistry branch (SAR, Part III, 3.3.1., p. 202).

2.3.2. Not applicable.

2.3.3. The study programme was created by combining two academic bachelor's study programmes "Chemical Technology" and "Chemistry", which were accredited for six years in the 2013 accreditation process. Taking into account the reduction in the number of students and the needs of the industry, in 2019 a decision was made to create a new, academic bachelor's study programme "Chemistry and Chemical Technology" (SAR, Part III, 3.1.1., p. 185). According to the instructions of the employers, the study programme has a significant emphasis on in-depth learning of theoretical knowledge, and it is complemented by internship, during which the student should consolidate knowledge and acquire skills. After combining the study programmes, its implementation was started in the year 2021/2022. 70 students were enrolled in the study programme, of which 7 were foreign students (SAR, Part III, 3.1.4., p. 189)

In accordance with SAR (3.3.3., Table 3.3.3., p. 203-204) it can be seen that state budget grants for the study programme have decreased during the reporting period (from EUR 566,769.00 in 2013/2014 to EUR 474,580.19 in 2020/2021), but the costs per student have doubled (from EUR

4,266.00 to EUR 9,334.46 accordingly).

For this study program, the minimum number of local students to ensure the profitability of the study program in each study year is 19 students, and for foreign students 12 students (SAR, Anexess for the study programme "Chemistry and Chemical Technology (43528)", On_minimum_number_of_students_in_study_programmes.pdf). The cost-effectiveness of the program in training foreign students is achieved by combining classes for foreign and state-funded students (SAR, Part III, 3.3.3., p. 202-204).

Conclusions on this set of criteria, by specifying strengths and weaknesses

The provision of the study programme, informational, material-technical and financial, is appropriate for ensuring a high-quality study process. By creating one combined study programme instead of two, the fragmentation of RTU has been reduced and resources have been optimized. The programme has a sufficient number of students to ensure the profitability of the study programme.

Strengths:

1. Availability of material and technical base of scientific institutes for students.

Weaknesses:

None.

Assessment of the requirement [6]

- 1 R6 - Compliance of the study provision, science provision (if applicable), informative provision (including library), material and technical provision and financial provision with the conditions for the implementation of the study programme and ensuring the achievement of learning outcomes

Assessment of compliance: Fully compliant

The resources and provision of the study programme are sufficient for high-quality studies (SAR, Part III, 3.3.1., p. 200-202). Infrastructure of RTU (auditoriums, classrooms, Scientific Library, portal ORTUS, Wi-Fi, canteens, cafes, etc. see also SAR, Part II, 2.3.2. p. 48-53) is more than sufficient to ensure effective and sustainable practical lessons and laboratory work of the study programme (Site visit, SAR, Part III, 3.3.1., p. 200-202).

To provide information resources for the bachelor's study programme "Chemistry and Chemical Technology", 130 new books were purchased by the SL in the period of 2013-2021 as the request of the academic staff (SAR, Part III, 3.3.1., p. 200-202). E-books and scientific databases are easily accessible using the search tool Primo, which allows you to simultaneously search for literature: In the RTU Scientific Library catalog; In the general catalog; In the subscribed and library databases (RTU website <https://www.rtu.lv/lv/studijas/biblioteka/nozaru-informacija>; SAR, Part II, 2.3.3., p. 50-53). According to the information given in SAR (Part III, 3.3.3., p. 202-204), the financial base of the institution is sufficient to ensure the study process.

2.4. Teaching Staff

Analysis

2.4.1. A total of 63 teachers employed at RTU are involved in the implementation of the academic bachelor study programme "Chemistry and Chemical Technology", of which 19 are professors, 13 associate professors, 21 assistant professors, 6 lecturers and 7 assistants. A total of 66 teachers were involved in the implementation of the study programme (SAR, Part III, 3.4.1, p. 204) of which 63 have been elected to RTU (SAR, Part III, 3.4.1, p. 204). All RTU teaching staff involved in the

implementation of the study programme complies with the conditions for implementation of the study programme and the requirements of the regulatory enactments specified by the state. Namely, all academic RTU teaching staff involved in the implementation of the study programme meet the requirements specified in Section 55, paragraph 1, 3 of the Law on Higher Education Institutions of the Republic of Latvia. More than five professors and associate professors altogether, who are elected to academic positions in the RTU, take part in the implementation of the compulsory part of the academic bachelor study programme "Chemistry and Chemical Technology". Below is a list of study courses of the compulsory part of academic bachelor study programme "Chemistry and Chemical Technology" taught by professors and associate professors: Chemical safety and the environment, Analytical chemistry, Organic chemistry, Chromatography and mass spectrometry, Information literacy in chemistry and materials science, Basics of materials science, Biological chemistry, and Process automation and modeling (SAR, Part III, 3.4.1, p. 206-209; The curriculum of the academic bachelor study programme "Chemistry and Chemical Technology").

Since 2019, a visiting professor from Rostock University, Germany has been involved in teaching as part of the ESF project (8.2.2.0/18/A/017) (SAR, Part III, 3.4.2, p. 210).

The teachers involved in the implementation of the study programme work scientifically mainly in the fields of chemistry, chemical engineering and materials science (SAR, Part III, 3.4.1, p. 204-209; SAR, Part III, 3.4.1, Figure 3.4.1., p. 205-206; SAR, Annex, Biographies of the teaching staff members; SAR Annex, Basic information on the teaching staff involved in the implementation of the study field). Most of the participating teachers have published scientific papers in prestigious international journals, participated in scientific conferences in their research field during the last five years, while some of them were involved in the work of editorial boards of scientific journals and participated in the implementation of international scientific projects (SAR, Part III, 3.4.1, p. 204-209; SAR Annex, Biographies of the teaching staff members). In addition, they have participated in methodological seminars that enable the acquisition of general competencies necessary for the effective implementation of the teaching process (SAR Part II, 2.3.6, p. 58-60). In recent years, teachers involved in the implementation of the study programme have had the opportunity to improve their qualifications through various forms of internships within the framework of ESF project. Thus, 16 teachers completed 200 hours for internship in various Latvian companies, while 15 teachers improved their knowledge of the English language (SAR, Part III, 3.4.1, p. 206; SAR Annex, Biographies of the teaching staff members).

The orientation of scientific research corresponds to the content of the study programme and/or study course. For example, professor of the study course Analytical chemistry is expert of the Latvian Council of Science in the fields of chemistry and chemical engineering, professor of the study course Chemical safety and the environment is expert of the Latvian Council of Science in the fields of chemistry, chemical engineering and pharmacy, professor of the study course Biological chemistry is expert of the Latvian Council of Science in the field of chemistry, materials science and chemical engineering (SAR, Part III, 3.4.1, p. 204-209; SAR Annex, Biographies of the teaching staff members).

All teaching staff involved in the implementation of the study programme possess an adequate level of proficiency in Latvian and English to teach the study courses both in Latvian (with the exception of visiting professor from Rostock University) and in English (SAR Annexes, Confirmation - knowledge of the state language and Confirmation - knowledge of the foreign language).

According to the experts, all of the above ensure the implementation of the study programme to the highest standards, with the curriculum based on relevant scientific knowledge. The achievement of the aims and learning outcomes of the programme and the corresponding courses from the point of view of the scientific and professional competence of the teaching staff is guaranteed, taking into account all the above points.

2.4.2. New teachers are continuously introduced in the implementation of the study programme.

Most of the mandatory subjects are taught by experienced teachers, while younger teachers and doctoral students are involved in part of the lectures and in most of the practical work in laboratories and workshops (see for example description of the course “Chemical safety and the environment”, SAR, Anex of the academic bachelor study programme “Chemistry and Chemical Technology” - Descriptions of the study courses/modules). Younger teachers conduct most of the teaching in the restricted elective courses (for example Environmental engineering, Chemistry and technology of ceramics, Basics of biomaterials; SAR, Anex of the academic bachelor study programme “Chemistry and Chemical Technology” - Descriptions of the study courses/modules; SAR, Annex, Biographies of the teaching staff members; SAR Annex, Basic information on the teaching staff involved in the implementation of the study field). Some of the teaching is done by teachers from other RTU faculties who cover part of the courses content according to their scientific and professional competences (see for example study courses Mathematics, Physics, Engineering Mathematics; SAR, Anex of the academic bachelor study programme “Chemistry and Chemical Technology” - Descriptions of the study courses/modules; SAR, Annex, Biographies of the teaching staff members; SAR, Annex, Basic information on the teaching staff involved in the implementation of the study field). Since 2019, a visiting professor from Rostock University, Germany has been involved in teaching as part of the ESF project (SAR, Part III, 3.4.2, p. 210).

When younger teachers propose new subjects, the entire process is carried out under the supervision and control of the Study Field Committee and the Faculty Council in coordination with student representatives (SAR, Part III, 3.4.2, p. 209).

In order to ensure high-quality and innovative implementation of the study programme, several criteria are used for the selection of RTU academic staff to be involved in the study programme, so that the study courses are conducted by qualified, scientifically and methodically prepared lecturers, who are professionals in the specified field of studies and use modern approaches and technologies in their work (SAR, Part II, 2.3.5, p. 56-58).

Representatives of companies and institutes are involved as external stakeholders in the implementation of the teaching process, usually through internships (for example, representatives of polymer material recycling companies (incl. JSC PET Baltija, SIA Nordic Plast, SIA EcoBaltiaVide), polymer materials and composite processing/product manufacturing companies (incl., SIA Evopipes, SIA Izotermis, SIA Poliurs, SIA TENAPORS, SIA TENAX Panel, SIA TENACHEM, SIA PAA, SIA Biolar, SIA Troja, Kinetic Nail Systems Ltd), as well as testing laboratories (incl. RTU Polymer Materials Testing Laboratory, scientific laboratories of RTU Institute of Polymer Materials) are involved in the implementation of the Internship in Polymer Materials Chemistry and Technology, SAR, Anex of the academic bachelor study programme “Chemistry and Chemical Technology” - Descriptions of the study courses/modules) and sometimes in the preparation of students' graduation theses (SAR, Part II, 2.2.1, pp 31-33). Therefore, their influence on the teaching process and their participation in the study programme can be considered appropriate.

It can be concluded that the FMSAC is taking the necessary steps to involve new teachers in the implementation of the study programme. In the event that younger teachers are involved in the implementation of the study programme or in the proposal of new subjects, usually optional, a quality assurance system has been established to enable the maintenance of the high quality of the teaching process as well as the requirements specified in regulatory enactments (SAR, Part II, 2.3.5, pp 56-58).

2.4.3. Not applicable.

2.4.4. The scientific staff is closely involved in ongoing research at their respective institutes. The projects are relevant to the focus of the institute, internationally connected and often externally financed. The large number of high quality scientific papers published yearly as well as the academic merits available in on-line databases indicate research activity of the staff in accordance

with the Law on Higher Education Institutions. Each member of the academic staff in the last six years has published in peer-reviewed editions, including international editions (SAR Annex, Biographies of the teaching staff members).

2.4.5. The cooperation of the teaching staff involved in the implementation of the study programme could be divided into three parts:

cooperation of the academic staff in the preparation of the study programme. Study courses are composed on the basis of the previously acquired knowledge (for the first year of study on the basis of the competences of the high school) and in accordance with the learning outcomes. Each teacher was informed of the content of all other courses, thus avoiding overlap in content and reducing the amount of unlearned topics. Collaborative discussions were a fundamental tool to prepare study programme in which students are able to understand and experience the relationships between the different areas of chemistry and chemical technology (SAR, Part III, 3.4.5, pp 210-211),

teaching staff jointly participates in different seminars and workshops where, in addition to the exchange of experiences on maintaining different forms of teaching and transferring knowledge and competences to students, they acquire the didactic, pedagogical and psychological skills and methods necessary for further development of the study programme and achievement of learning outcomes (SAR, Part II, 2.1.5, p. 29), and analysis of student surveys at the end of each semester, followed by discussion of assessment criteria and how the course learning outcomes align with the overall study programme outcomes. 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 (SAR, Part III, 3.2.3, p. 194).

Additionally, assessment of learning outcomes is made by the teaching staff in accordance with the specifics of the study programme content (SAR, Anex, List of Internal Regulations, Appendix 4, Regulation on the assessment of learning outcomes, translation in english).

In addition, it is important to note the relatively low student-teacher ratio in the implementation of the study programme, which, according to available data, is just two students per one teacher (SAR, Part III, 3.4.5, p. 211). It should be noted that the low number of students per teacher, which is a disadvantage in terms of economy of the study programme, is currently a great advantage, since it allows students to acquire knowledge, competencies and skills in small groups, and consequently allows the full dedication of the involved teacher to each student.

Conclusions on this set of criteria, by indicating strengths and weaknesses

The qualification of the teaching staff members involved in the implementation of the study programme complies with the requirements specified in Section 55, paragraph 1, 3 of the Law on Higher Education Institutions of the Republic of Latvia. The orientation of scientific research corresponds to the content of the study programme and/or study course. The teaching staff possess an adequate level of proficiency in Latvian and English to teach the study courses both in Latvian and in English. Each member of the academic staff in the last six years has published in peer-reviewed editions, including international editions. Therefore, the achievement of the aims and learning outcomes of the study programme and the corresponding courses from the point of view of the scientific and professional competence of the teaching staff is guaranteed. New teachers are continuously introduced in the implementation of the study programme. Several internal criteria are used for the selection of new RTU academic staff to be involved in the study programme. When younger teachers propose new subjects, the entire process is carried out under the supervision and control of the Study Field Committee and the Faculty Council in coordination with student representatives. The teaching staff is closely involved in ongoing research at their respective institutes. The good cooperation of the teaching staff in the implementation of the study programme is realized through different education programmes carried out in the form of seminars and

workshops, analysis of student surveys at the end of each semester and at the Study Field Committee meetings. Consequently, mechanisms for mutual cooperation of the teaching staff in the implementation of the study programme were established and these mechanisms ensure the achievement of the aims of the study programme and the interconnection of study courses within the study programme.

Strengths

1. Scientific, professional and generic competences of teachers ensure the implementation of the study programme to the highest standards, with the curriculum based on relevant scientific knowledge.
2. Good cooperation of teaching staff in scientific projects which results in acquiring of new knowledge and skills necessary for the continuous improvement of the study programme based on the latest scientific trends.
3. Low student/teacher ratio which allows students to acquire knowledge, competencies and skills in small groups, and consequently allows the full dedication of the involved teacher to each student.

Weaknesses

None.

Assessment of the requirement [7]

- 1 R7 - Compliance of the qualification of the academic staff and visiting professors, visiting associate professors, visiting docents, visiting lecturers and visiting assistants with the conditions for the implementation of the study programme and the requirements set out in the respective regulatory enactments.

Assessment of compliance: Fully compliant

Scientific, professional and generic competences of teachers ensure the implementation of the study programme to the highest standards, with the curriculum based on relevant scientific knowledge. All RTU teaching staff involved in the implementation of the study programme meet the requirements specified in Section 55, paragraph 1, 3 of the Law on Higher Education Institutions of the Republic of Latvia. Each member of the academic staff in the last six years has published in peer-reviewed editions, including international editions (SAR Annex, Biographies of the teaching staff members). Each member of the academic staff has an adequate level of proficiency in Latvian and English to teach the study courses both in Latvian (with the exception of visiting assistant professor) and in English (SAR Annexes, Confirmation - knowledge of the state language and Confirmation - knowledge of the foreign language).

2.5. Assessment of the Compliance

Requirements

- 1 1 - The study programme complies with the State Academic Education Standard or the Professional Higher Education Standard

Assessment of compliance: Fully compliant

According to experts, study programme "Chemistry and Chemical Technology" fully complies to State academic Education Standard. For example, Volume of the study programme is 160 CP, duration of the study programme - eight semesters, compulsory part - 117 CP, Number of contact hours for courses - 50% (SAR, Annexes for Study Program "Chemistry and Chemical Technology (43528)", "Compliance with the standard, Annex 6, RKBM0 43528.pdf").

- 2 2 - The study programme complies with a valid professional standard or the requirements for the professional qualification (if there is no professional standard required for the relevant occupation) provided if the completion of the study programme leads to a professional qualification (if applicable)

Assessment of compliance: Not relevant

Not applicable.

- 3 3 - The descriptions of the study courses and the study materials have been prepared in all languages in which the study programme is implemented, and they comply with the requirements set forth in Section 561, Paragraph two and Section 562, Paragraph two of the Law on Higher Education Institutions.

Assessment of compliance: Fully compliant

The descriptions of the study courses and the study materials have been prepared in two languages - English and Latvian (SAR, Annexes for Study Program "Chemistry and Chemical Technology (43528)", "Course descriptions (43528), Annex 10.zip", "Studiju kursu moduļu apraksti (43528), 10.pielikums.zip"), and they comply with the requirements set forth in Section 561, Paragraph two and Section 562, Paragraph two of the Law on Higher Education Institutions. The following information is included in the descriptions of the study courses: volume; requirements for the commencement of the acquisition of the study course; aim of the implementation of the study course; intended learning outcomes; content of the study course required for achieving the learning outcomes; calendar of the study course; mandatory and supplementary literature and other sources of information; description of the organization and tasks for the independent work of students; criteria for the assessment of the learning outcomes.

- 4 4 - The sample of the diploma to be issued for the acquisition of the study programme complies with the procedure according to which state recognised documents of higher education are issued.

Assessment of compliance: Fully compliant

After the completion of the study programme, the graduates of the study programme are awarded a Bachelor degree of engineering science in chemical technology and a diploma. Experts conclusion - The sample of the diploma to be issued for the acquisition of the study programme complies with the procedure according to which state recognised documents of higher education are issued - complies to Regulations of Cabinet of Ministers No. 202. "Kārtība, kādā izsniedz valsts atzītus augstāko izglītību apliecinošus dokumentus". (SAR, Annexes for Study Program "Chemistry and Chemical Technology (43528)", "RKBM0 43528.zip").

- 5 5 - The academic staff of the academic study programme complies with the requirements set forth in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions.

Assessment of compliance: Fully compliant

The academic staff involved in the implementation of the study program meet the requirements specified in Section 55, paragraph 1, Clause 3 of the Law on Higher Education Institutions of the Republic of Latvia. RTU has involved a total of 63 lecturers, of which 19 are professors, 13 associate professor, who are elected to academic positions in the higher education institution, and they take part in the implementation of the compulsory part and the limited elective part of the study programme (SAR, Part III, 3.4.1., p. 204-209).

- 6 6 - Academic study programmes provided for less than 250 full-time students may be implemented and less than five professors and associated professors of the higher education institution may be involved in the implementation of the mandatory and limited elective part of these study programmes provided that the relevant opinion of the Council for Higher Education has been received in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions.

Assessment of compliance: Fully compliant

There is decision of the Council of Higher Education to support that RTU starts implementing the bachelor's study programme "Chemistry and Chemical Technology", which is intended for less than 250 full-time students. (SAR Annexes for Study Program "Chemistry and Chemical Technology (43528)", "AIP Conclusion KBM0.pdf").

- 7 7 - At least five teaching staff members with a doctoral degree are among the academic staff of an academic doctoral study programme, at least three of which are experts approved by the Latvian Science Council in the respective field of science. At least five teaching staff members with a doctoral degree are among the academic staff of a professional doctoral study programme in arts (if applicable).

Assessment of compliance: Not relevant

Not applicable.

- 8 8 - The teaching staff members involved in the implementation of the study programme are proficient in the official language in accordance with the regulations on the level of the official language knowledge and the procedures for testing official language proficiency for performing professional duties and office duties.

Assessment of compliance: Fully compliant

The level of official language knowledge of individual academic staff members is indicated in the biographies of the teaching staff accompanying the SAR of the study programme and it complies with the Cabinet of Ministers Regulation No. 733 of 7 July 2009 "Regulations Regarding the Extent of the Knowledge of the Official Language, the Procedures for Examining the Proficiency in the Official Language and the State Fee for Examining the Proficiency in the Official Language" for performing professional and office duties (SAR, Annex, "CV, ENG.zip").

- 9 9 - The teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of a related foreign language, if the study programme or any part thereof is to be implemented in a foreign language (if applicable).

Assessment of compliance: Fully compliant

The teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of English (SAR, Annexes, Confirmation - knowledge of the state language and Confirmation - knowledge of the foreign language).

- 10 10 - The sample of the study agreement complies with the mandatory provisions to be included in the study agreement.

Assessment of compliance: Fully compliant

The sample of the study agreement complies with the mandatory provisions that are included in the study agreement and it complies with regulations of Cabinet of Ministers No. 70. "Studiju līgumā obligāti ietveramie noteikumi". (SAR, Annex, "Study_agreements.zip").

- 11 11 - The higher education institution / college has provided confirmation that students will be provided with opportunities to continue their education in another study programme or another higher education institution or college (agreement with another accredited higher education institution or college) if the implementation of the study programme is terminated.

Assessment of compliance: Fully compliant

The RTU has provided confirmation (agreement dated 07.03.2022., SAR, Annex, "Agreement.7z") that students will be provided with opportunities to continue their education in UL if the implementation of the study programme is terminated and its students are admitted to the mentioned UL bachelor study programme "Chemistry" (43441) in the same languages - Latvian and English.

- 12 12 - The higher education institution / college has provided confirmation that students are guaranteed compensation for losses if the study programme is not accredited or the study programme's license is revoked due to the actions (actions or omissions) of the higher education institution or college and the student does not wish to continue studies in another study programme.

Assessment of compliance: Fully compliant

The RTU has provided confirmation Nr. 01000-2.2.1-e/130 dated 26.05.2022., (SAR, Annex, "Confirmation - on compensation for losses.edoc"), that students are guaranteed compensation for losses if the study programme is not accredited or the study programme's license is revoked due to the actions (actions or omissions) of the higher education institution or college and the student does not wish to continue studies in another study programme.

- 13 13 - The joint study programmes comply with the requirements prescribed in Section 55.(1), Paragraphs one, two, and seven of the Law on Higher Education Institutions (if applicable)

Assessment of compliance: Not relevant

Not applicable.

- 14 14 - Compliance with the requirements specified in other regulatory enactments that apply to the study programme being assessed (if applicable)

Assessment of compliance: Not relevant

Not applicable.

Assessment of the requirement [8]

- 1 R8 - Compliance of the study programme with the requirements set forth in the Law on Higher Education Institutions and other regulatory enactments.

Assessment of compliance: Fully compliant

The study programme fully complies with the requirements set forth in the Law on Higher Education Institutions and other regulatory enactments.

General conclusions about the study programme, indicating the most important strengths and weaknesses of the study programme

According to experts, the academic bachelor study programme "Chemistry and Chemical Technology" fully complies to State academic Education Standard. The descriptions of the study courses and the study materials have been prepared in two languages - English and Latvian, and they comply with the requirements set forth in Section 561, Paragraph two and Section 562, Paragraph two of the Law on Higher Education Institutions. The graduates of the study programme are awarded a Bachelor degree of engineering science in chemical technology and a diploma. The sample of the diploma to be issued for the acquisition of the study programme complies with the procedure according to which state recognised documents of higher education are issued. The academic staff involved in the implementation of the study programme meet the requirements

specified in Section 55, paragraph 1, Clause 3 of the Law on Higher Education Institutions of the Republic of Latvia. The level of official language knowledge of individual academic staff members is indicated in the biographies of the teaching staff accompanying the SAR of the study programme and it complies with the Cabinet of Ministers Regulation No. 733 of 7 July 2009. The teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of English. The sample of the study agreement complies with the mandatory provisions that are included in the study agreement and it complies with regulations of Cabinet of Ministers No. 70.

Although with regard to indicators, content, resources and teaching staff, the study programme can be considered excellent, there are also certain shortcomings that need to be addressed. The main disadvantage of the study programme is related to the placement of foreign students in the internship in companies which should be guaranteed even in companies abroad. Besides, internships should be available in international companies for all students.

In the end, academic bachelor study programme "Chemistry and Chemical Technology" is carried out in a renovated and well equipped classrooms and laboratories. Scientific, professional and generic competences of teachers ensure the implementation of the study programme to the highest standards, with the curriculum based on relevant scientific knowledge. Relatively low student/teacher ratio allows students to acquire knowledge, competencies and skills in small groups, and consequently allows the full dedication of the involved teacher to each student. The study program is characterised by a relatively large number of students that are interested to study a unique study programme as there is a limited amount of study programmes in the study field in the country. Study programme is composed of wide variety of compulsory elective study courses and specialisations important for the field, thus ensuring students good possibilities to gain high specialisation.

Evaluation of the study programme "Chemistry and Chemical Technology"

Evaluation of the study programme:

Excellent

2.6. Recommendations for the Study Programme "Chemistry and Chemical Technology"

Short-term recommendations

The placement of foreign students in the internship in companies should be guaranteed, even in companies abroad (until the beginning of the next academic year).

Internships should be available in international companies for all students (until the beginning of the next academic year).

Long-term recommendations

II - "Chemistry and Chemical Technology" ASSESSMENT

II - "Chemistry and Chemical Technology" ASSESSMENT

2.1. Indicators Describing the Study Programme

Analysis

2.1.1. The academic master's study programme "Chemistry and Chemical Technology" complies

with the study field of "Chemistry, Chemistry Technologies, and Biotechnology" indicators, conditions and criteria.

The length of the implementation of the study programme, which is 2 years, is evaluated as sufficient for acquiring the necessary skills and practical experience to enter the labor market.

2.1.2. According to the SAR (Part III, 3.1.2., p. 153-154), the title of the study programme is "Chemistry and Chemical Technology" in the study field of "Chemistry, Chemistry Technologies, and Biotechnology" with education classification code 45528 with the last 3 numbers standing for chemistry technologies according to the classification of Latvian education which can be accessed here: <https://likumi.lv/ta/id/291524-noteikumi-par-latvijas-izglitiba-klasifikaciju>. 52 stands for Engineering and Technology. There is no qualification given as it is an academic master's study programme. The aim of the 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.

According to the information provided in the SAR (Part III, Study programme forms, p. 151-152), the admission requirements in the study programme implemented in Latvian is Bachelor degree in chemistry, chemical technology, materials science while for the study programme implemented in English it is Bachelor degree in chemistry, chemical technology, materials science and assessment of the level of English language proficiency under the requirements specified in regulatory enactments.

The full study workload in the programme is 80 CP of which compulsory core subjects block constitutes 24 CP, compulsory elective part - 20 CP, free choice - 12 CP, Internship - 4 CP, Master's thesis - 20 CP (SAR, Part III, 3.2.1., p. 159). As this programme is implemented also in English, there is a study course as part of the curriculum for foreign students to gain basic knowledge of Latvian language. A part of the study curriculum are also Civil Protection and Disaster Management Law and the Environmental Protection Law courses.

According to the information received in the on site visit, the study programme is created for full-time studies. Its implementation started in the 2020/2021 academic year.

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. In the opinion of the experts, the preconditions and requirements of the study programme including the title, code and degree obtained are reasonable and in place and interrelated with the admission requirements. As indicated before in the analysis under 2.1.1., the duration of the study programme is reasonable to gain the necessary knowledge for the work market.

The implementation language choice of the programme is reasonable and justified.

2.1.3. According to the information in the SAR (Part III, 3.1.1., p. 152), 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 programme "Applied Chemistry" was opened and the admission of students to the programme "Chemistry" was discontinued. Analogous to the Bachelor's study programme, 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 (SAR, Part III, 3.1.1., p. 152).

According to the SAR (Part III, 3.1.1., p. 152), 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 and implementation started in the 2020/2021 academic year. At the request of industry representatives, the programme was supplemented with an internship, during which the student would get practical experience in performing the tasks of managing employees which is a reasonable practice. Following parameters were taken into account where a new study programme was developed: comprehensive knowledge, broader skills and competencies in the field of specialization, reduced share of the compulsory part of the programme and extended share of restricted elective courses.

Expert group believes that the changes made in the study programme are justified and experts support them.

2.1.4. The programme was newly formed in 2019 according to the SAR (Part III, 3.1.1., p. 152), with a purpose to prepare high-level specialists for the Latvian and international labor market with in-depth knowledge and practical skills in the management of the chemical industry and in the selected specialization of students choice.

During the onsite visit, students shared that they are happy to have various specializations to choose from and thus they can deepen their knowledge and focus on the specifically chosen specialization. Also the study courses are designed in such a way that they can be mastered by students of the first and second years together. For FMSAC it enables optimizing the costs of implementing the programme.

According to the data provided in the SAR (Part III, 3.1.4., p. 156-158), the statistics show that there has been a significant decrease of enrolled students of the previous programme of "Chemistry". Afterwards, when a new programme "Applied chemistry" was formed there was approximately the same amount of students enrolled which was less than 5 every year. Since the implementation of the programme "Chemical Technology" (2013/14), it has always had the larger demand compared to the two previous programmes with the lowest enrollment of 10 students in 2017/18 and 2019/20. In the previous study year, the programme enrolled 15 students.

According to the data provided in the SAR (Part III, 3.1.4., p. 156-158), in the last study years "Chemical Technology" programme in both study years on average had around 24-25 students while in "Applied Chemistry" programme there were around 4-5 students. The numbers of dropouts of the programmes are decreasing compared to previous study years. In 2020/21, there were 2 students from the "Chemical Technology" programme while in 2019/20 it was 2 students from "Applied Chemistry" programme and 1 student from the "Chemical Technology" programme dropping out.

According to the SAR (Part III, 3.1.3., p. 156), graduates of the programme can use their set of skills in various different kinds of the companies, laboratories, research institutes of their choice and as close to their chosen specialization. For example, Latvian pharmaceutical companies, manufacturers of construction materials and manufacturers and recyclers of polymer materials are the largest employers of graduates in Latvia. 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 and the Latvian State Institute of Wood Chemistry.

The graduates of the programme have no problems finding employment options. As it has been stated during the meeting by the employers, there is even a shortage of graduates. Companies and institutions are waiting for the new specialists that graduate every year and also for those who start their studies in Masters in order to provide them with at least a part-time work place while they are studying.

2.1.5. Not applicable.

Conclusions on this set of criteria, by specifying strengths and weaknesses

All of the indicators of the study programme are in compliance with the existing preconditions of the implementation of the study programme. The study programme "Chemistry and Chemical Technology" complies with the study field of "Chemistry, Chemistry Technologies, and Biotechnology" indicators, conditions and criteria. The title, code, degree to be obtained as well as the aims, objectives, learning outcomes and admission requirements are interrelated. The duration and scope of the study programme implementation as well as the implementation language, are reasonable and justified. The study programme is implemented in Latvian and English. The goals, objectives, learning outcomes are in line and in compliance. The programme is in demand and there is a flow of incoming students every study year. It is seen as a significant improvement that the number of students dropping out has decreased since the implementation of the new study programme. It is believed by the experts that the demand of the study programme and inflow of the students are in good amount. The graduates have no problems in finding a job placement in the labor market. Most of them are employed while studying. The corrections made to the study programme's parameters within the assessment of the study field are analyzed, justified and would be supported.

Strengths:

1. Demand and inflow of students every year;
2. Decreased dropout rates.

Weaknesses:

None.

2.2. The Content of Studies and Implementation Thereof

Analysis

2.2.1. Study programme complies with the Cabinet of Ministers Regulations No. 240 "Regulations on the State Academic Education Standard" (<https://likumi.lv/doc.php?id=266187>).

Study programme duration is four years (eight semesters, students acquire 20 CP per semester). The full study workload in the study programme is 160 credit points (CP) of which compulsory core subjects block constitutes 24 CP, compulsory elective part – 20 CP, free choice – 12 CP, Internship – 4 CP, Master's thesis – 20 CP. After the completion of the study programme, the graduates of the study programme are awarded a Master degree of engineering science in chemical technology (SAR, Annexes for Study Program "Chemistry and Chemical Technology (45528)", "Compliance with the standard, Annex 6, RKMM0 45528.pdf", "RKMM0 (45528) Planning, Annex 9.pdf").

The descriptions of the study courses are well prepared. In general, the course descriptions include all the required information: goals and objectives of the course in terms of competencies and skills, structure and tasks of independent studies, course content and planned hours, learning outcomes and assessment, recommended literature, and additional sources of information, evaluation criteria of study results and course value in credit points (SAR, Annexes for Study Program "Chemistry and Chemical Technology (45528)", "Course descriptions (45528), Annex 10.zip").

The content and description of the study courses are relevant, regularly updated, and fully comply with the goals of the study programme, and ensure the achievement of the learning outcomes. In addition, the content of the study programme is regularly updated to meet the needs of the labor market and the latest trends in the industry (SAR, Annexes for Study Program "Chemistry and Chemical Technology (45528)", "Course descriptions (45528), Annex 10.zip").

Content of the academic master study programme “Chemistry and Chemical Technology” complies with national regulations - state education standard (SAR, “Annex compliance to higher education standard.docx”).

2.2.2. This is a unique study programme with a broad and balanced choice of elected courses that prepares students well for their future careers both in industry and academia. The theoretical and practical part of the study programme is based on the scientific developments of the sector. Each specialization includes at least one course on the latest achievements in the selected sector or a project work, in which a student carries out small research work, analyzing 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 (SAR, Part III, 3.2.2., p. 160-162).

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 a list of research domains 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;
- Production Technology and Environmental Aspects;
- Chemistry and Technology of Inorganic Materials;
- Chemistry and Technology of Biologically Active Compounds;
- Chemistry and Technology of Polymer Materials;
- Sustainable Chemistry (SAR, Part III, 3.2.2., p. 160-162).

2.2.3. 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, and practical and laboratory classes. The study courses, internship and the development of the graduation paper are divided proportionally into semesters of the study programme, 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 optimize 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 the fulfillment of the learning outcomes of the programme (SAR, Part III, 3.2.3., p. 162-164).

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 (SAR, Part III, 3.2.3., p. 162-164).

The study programme is based on the student-centered principles of education. The academic staff responsible for study courses, based on the specifics of study course content, as well as on the needs of students, choose the methods of structuring, teaching and evaluating study courses. Students are able to take part in the improvement of the curricula and methods of the study courses in two ways. Directly, expressing their aspirations to academic staff, department chair, the programme director, or by representatives of student self-government. As already mentioned, students can express their thoughts on the course during an anonymous survey at the end of semester (SAR, Part III, p. 162-164).

2.2.4. 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 (SAR, Part III, 3.2.4., p. 165). Main internship goals is gaining the professional experience conforming to the study programme and mastering a set of practical skill needed for the leading experts in the field of chemistry, chemical technologies or material science, performing the research of the defined problem at the place of the internship and developing proposals for improvement the operational efficiency of the internship place, strengthening the skill of efficient planning and organization of own work, independent mastering of new knowledge, developing communication, independent working and team working skills, including the ability to publicly defend own ideas and justify own opinion (SAR, Annexes for Study Program "Chemistry and Chemical Technology (45528)", "Internship Management Procedure.zip").

The tasks of the internship are closely related to the learning outcomes to be achieved in the study program (SAR, Anex, Description of the academic master study programme "Chemistry and Chemical Technology").

According to the SAR (Part III. 3.2.4., p. 165) all foreign students have successfully had internships in scientific institutes. Companies have shown interest in accepting foreign students for internships. A foreign student can choose a place of internship in Latvia, abroad or in his/her country of residence.

2.2.5. Not applicable.

2.2.6. 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. The 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 is included in the study programme with 20CP. The topics for the thesis are offered by faculty departments and are always related to the scientific directions of research. Topics of Master's theses are selected according to the program's specialisation directions as described in SAR, Part III, 3.2.6., p. 166-168). The final work can also be conducted in a cooperation with industry on topics such as Solutions of polymer anti-corrosion coatings, Lignocellulosic fibers reinforced polymer composites or Utilization of forestry and industrial byproducts for development of polymer composites (SAR, Part III, 3.2.6., p. 167). 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. (SAR, Part III, 3.2.6., p. 168). According to interviews with students during onsite visit, students are closely involved with the scientific research ongoing at the institutes responsible for the study programme already during their Bc. studies participating in various scientific projects ongoing at the institutes. Students usually choose their master study focus as well as topics of their theses based on their experience and interest gained during their studies.

According to SAR (Part III, 3.2.6, p. 168) and related Graph (SAR, Part III, 3.2.6., Fig. 3.2.6., p. 169), the average assessment of the Master's theses of previous programmes has been consistently high

and was about 9.0.

Conclusions on this set of criteria, by specifying strengths and weaknesses

Study programme Chemistry and Chemical Technology (45528) complies with the Cabinet of Ministers Regulations. The descriptions of the study courses are well-prepared. The content and description of the study courses are relevant, regularly updated, and fully complies with the goals of the study programme. The study implementation methods contribute to the achievement of the aims and learning outcomes of the study courses and the study programme. Student-centred learning and teaching principles are considered. The theoretical and practical part of the study programme is based on the scientific developments of the sector. Based on a recommendation by industry representatives the study programme includes a study internship which helps students to gain the professional experience conforming to the study programme and mastering a set of practical skills needed for the leading experts in the field of chemistry, chemical technologies or material science. The topics of students' final theses are relevant to the field and correspond to the study programme.

Strengths:

1. Unique study programme.
2. Broad and balanced choice of elected courses.
3. Prepares students well for their future careers both in industry and academia.

Weaknesses:

1. Difficulties with the internship placement of foreign students.

Assessment of the requirement [5] (applicable only to master's or doctoral study programmes)

- 1 R5 - The study programme for obtaining a master's or doctoral degree is based on the achievements and findings of the respective field of science or field of artistic creation.

Assessment of compliance: Fully compliant

The study programme is to a high degree based on the ongoing research and knowledge of the teaching staff involved (SAR, Part III, 3.4.1, pp 173-178; SAR, Part III, 3.4.1., Figure 3.4.1., p. 174-175; SAR, Annex, Biographies of the teaching staff members; SAR, Annex, Basic information on the teaching staff involved in the implementation of the study field). For example, professor of the study course Analytical chemistry is expert of the Latvian Council of Science in the fields of chemistry and chemical engineering, professor of the study course Chemical safety and the environment is expert of the Latvian Council of Science in the fields of chemistry, chemical engineering and pharmacy, professor of the study course Biological chemistry is expert of the Latvian Council of Science in the field of chemistry, materials science and chemical engineering (SAR, Part III, 3.4.1, p. 204-209; SAR Annex, Biographies of the teaching staff members).

2.3. Resources and Provision of the Study Programme

Analysis

2.3.1. All RTU infrastructure at Campus (auditoriums, classrooms, Scientific Library, portal ORTUS, Wi-Fi, canteens, cafes, etc) is available to students studying in this programme, especially all the resources mentioned in bachelor studies (see point 2.3.4. in analysis of Resources and Provision of the Study Programme of bachelor studies "Chemistry and Chemical Technology (43528)").

The master's study programme in Chemistry and Chemical Technology (45528) similarly to the

bachelor's study programme is 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. These institutes 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), provide supervision and defense of the graduate papers, and other activities related to research work (SAR, Part III, 3.3.1., p. 169) See also 2.3.1. in analysis of Resources and Provision of the Study Programme of bachelor studies "Chemistry and Chemical Technology (43528)". It is important that FMSAC infrastructure provides students with the opportunity to familiarize themselves with the latest methods and equipment in chemistry and chemical technology, and to gain practical experience in using them during their studies (SAR, Part III, 3.3.1., p. 169).

The computer room, the conference room, various teaching and scientific laboratory rooms were visited during the on-site visit. Following laboratories are used for the teaching process of the study courses of the programme - laboratory of inorganic and analytical chemistry, laboratory of general and organic chemistry, laboratory of physical chemistry, laboratory of basic processes and apparatuses of chemical technology, laboratory of physics. The laboratory facilities are equipped with various modern analytical equipment, such as NMR, different chromatographs (some of them equipped with a mass spectrometer), spectrophotometers, reactors, different lab-scale process units, etc. (SAR, Part II, 2.3.2., p. 48-50; SAR, Other Annexes - "Main research equipment.pdf"). In general, it can be concluded that the material and technical provision base is good and sufficient for the implementation of the study programme.

SL provides the necessary information services for ensuring the study process and scientific activity of students (RTU web page <https://www.rtu.lv/lv/studijas/biblioteka>; SAR Part II, 2.3.3., p. 50-53; 1.3.3. in analysis of Resources and provision of the Study field). The RTU SL central building is attached to the FMSAC and it provides the FMSAC students with a unique opportunity to use study rooms in both FMSAC and SL. At the request of the academic staff of the study programmes "Chemistry", "Applied Chemistry" and "Chemistry Technology", 43 new books were purchased by the SL amounting to 3,000 EUR in the period of 2013 - 2021 (SAR, Part III, 3.3.1., p. 170). The reading rooms of the Chemistry branch of RTU Scientific Library provide students with freely accessible workplaces, study and scientific literature. 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 like editions of ACS, RSC, Wiley, Elsevier, Springer and the collection of journals issued in Russia. (SAR, Part III, 3.3.1., p. 170). From student interviews, on-site visits and information from SAR, experts have been convinced that the literature provision and databases are suitable for the study programme for studies in Latvian and English.

State budget grants and foreign student funds are used for the implementation of the study program. Financial security meets the conditions of program implementation and creates prerequisites for ensuring a quality study process (SAR, Part III, 3.3.3., 171-172).

2.3.2. Not applicable.

2.3.3. State budget grants and funds from foreign students are used for the implementation of the study programme. In accordance with SAR (Part III, 3.3.1., Table 3.3.1., p. 170) it can be seen that state budget grants for the study programme have decreased during the reporting period (from EUR 149,627.00 in 2013/2014 to EUR 127,641.03 in 2020/2021), but costs per student have increased (from EUR 6,399 to EUR 7,387 accordingly).

29 students have been admitted to the programme for the 2020/2021 academic year, 5 of whom are foreign students - from China, Sri Lanka and India (SAR, Part III, 3.1.4., p. 158). In order to ensure the profitability of the study programme, RTU determines the following minimum number of students in

the study programme in each study year: For full-time intramural local students in first-level, bachelor's and master's level studies – 19 students; For full-time intramural foreign students in bachelor's and master's level studies – 12-20 students depending on the country of origin (i.e. paid tuition fees (European Union, Commonwealth of Independent States, others)) (SAR, Other Annexes - Appendix of the self-evaluation report "On the minimal number of students in study programmes.pdf"). In accordance with the above - the minimum number of local students is satisfactory, but the number of foreign students is not sufficient. In order to achieve the programme's profitability in the training of foreign students, the faculty combines classes for foreign and state budget students (SAR, PART III, 3.3.3., p. 172).

Conclusions on this set of criteria, by specifying strengths and weaknesses

The study provision, scientific provision, informative provision (including library), material and technical provision and financial provision comply with specific features and the conditions for the implementation of the study programme, create prerequisites for the achievement of the learning outcomes and indicate the possibility to ensure a high-quality study process. The funding available to the study programme, funding sources and the use of funding ensures full implementation of the study process, the study programme has the minimum number of students to ensure the profitability of the study programme and facilitates the development of the study programme. The resource and provision base meets the conditions for the implementation of the study programme and the achievement of study results.

Strengths:

1. Availability of material and technical base of scientific institutes for students.

Weaknesses:

1. Insufficient number of foreign students.

Assessment of the requirement [6]

- 1 R6 - Compliance of the study provision, science provision (if applicable), informative provision (including library), material and technical provision and financial provision with the conditions for the implementation of the study programme and ensuring the achievement of learning outcomes

Assessment of compliance: Fully compliant

The resources and provision of the study programme are sufficient for high-quality studies (SAR, Part III, 3.3.1., p. 169-171). Infrastructure of RTU (auditoriums, classrooms, Scientific Library, portal ORTUS, Wi-Fi, canteens, cafes, etc. see also SAR, Part II, 2.3.2. p. 48-53) is more than sufficient to ensure effective and sustainable practical lessons and laboratory work of the study programme (Site visit, SAR, Part III, 3.3.1., p. 169-171). To provide information resources for the master's study programme "Chemistry and Chemical Technology", 43 new books were purchased by the SL in the period of 2013-2021 as the request of the academic staff (SAR, Part III, 3.3.1., p. 169-171). E-books and scientific databases are easily accessible using the search tool Primo, which allows you to simultaneously search for literature: In the RTU Scientific Library catalog; In the general catalog; In the subscribed and library databases (RTU website <https://www.rtu.lv/lv/studijas/biblioteka/nozaru-informacija>; SAR, Part II, 2.3.3., p. 50-53). According to the information given in SAR (Part III, 3.3.3., p. 171-172), the financial base of the institution is sufficient to ensure the study process. The minimum number of local students is satisfactory, but the number of foreign students does not meet the minimum number of students determined by RTU, which would ensure the profitability of the study programme. It is

co-financed from RTU by other means. For example, in order to achieve the programme's profitability in the training of foreign students, the faculty combines classes for foreign and state budget students (SAR, PART III, 3.3.3., p. 172).

2.4. Teaching Staff

Analysis

2.4.1. A total of 47 teachers elected at RTU are involved in the implementation of the academic master study programme "Chemistry and Chemical Technology", of which 15 are professors, 9 associate professors, 14 assistant professors, 4 lecturers and 4 assistants. With the exception of the teaching staff of the course "Chemical Industry and Sustainability" and two foreign visiting professors (from Queen Mary University of London and University of Belgrade; SAR, Part III, 3.4.2., p. 178-179), all other teaching staff belong to the scientific staff of FMSAC. A total of 49 teachers were involved in the implementation of the study programme (SAR, Part III, 3.4.1., p. 178). All RTU teaching staff involved in the implementation of the study programme complies with the conditions for implementation of the study programme and the requirements of the regulatory enactments specified by the state. Namely, all academic RTU teaching staff involved in the implementation of the study programme meet the requirements specified in Section 55, paragraph 1, 3 of the Law on Higher Education Institutions of the Republic of Latvia. More than five professors and associate professors altogether, who are elected to academic positions in the RTU, take part in the implementation of the compulsory part of the academic master study programme "Chemistry and Chemical Technology". Bellow is a list of study courses of the compulsory part of academic master study programme "Chemistry and Chemical Technology" taught by professors and associate professors: Chemical industry and sustainability, 1st part, Chemical industry and sustainability, 2nd part, Biotechnological processes and equipment, The Control and automation of chemical processes, Quantum chemistry, Colloidal chemistry, Environmental sustainability, Chemistry and technology of polymer materials, Polymers physical chemistry, Identification and analysis of polymer materials, Organic synthesis, Chemistry and technology of pharmaceuticals, Organotransition metal chemistry Drug delivery systems and nanotechnologies, Biomaterials as drug delivery systems, Biocompatibility of biomaterials, Chemistry and technology of traditional and modern inorganic materials, Chemistry and technology of modern ceramics Chemistry and physics of solids and Silicates chemistry and physical chemistry (SAR, Part III, 3.4.1., p. 173-178; SAR, Annex of the academic master study programme "Chemistry and Chemical Technology" - The curriculum of the study programme and Descriptions of the study courses/ modules).

Since 2021, visiting professors from Queen Mary University of London and University of Belgrade have been involved in teaching as part of the ESF project (8.2.2.0/18/A/017) (SAR, Part III, 3.4.2., p. 178-179).

The teachers involved in the implementation of the study programme work scientifically mainly in the fields of chemistry, chemical technology and materials science (SAR, Part III, 3.4.1, pp 173-178; SAR, Part III, 3.4.1., Figure 3.4.1., p. 174-175; SAR, Annex, Biographies of the teaching staff members; SAR, Annex, Basic information on the teaching staff involved in the implementation of the study field). Most of the participating teachers have published scientific papers in prestigious international journals, participated in scientific conferences in their research field during the last five years, while some of them were involved in the work of editorial boards of scientific journals and participated in the implementation of international scientific projects (SAR, Part III, 3.4.1., p. 173-178; SAR, Annex, Biographies of the teaching staff members). In addition, they have participated in methodological seminars that enable the acquisition of general competencies necessary for the effective implementation of the teaching process (SAR, Part II, 2.3.6., p. 58-60). In recent years, teachers involved in the implementation of the study programme have had the opportunity to improve their qualifications through various forms of internships within the framework

of ESF project. Thus, 16 teachers completed 200 hours for internship in various Latvian companies, while 15 teachers improved their knowledge of the English language (SAR, Part III, 3.4.1., p. 206; SAR, Annex, Biographies of the teaching staff members).

The orientation of scientific research corresponds to the content of the study programme and/or study course. For example, professor of the study course Chemical industry and sustainability, 1st part is expert of the Latvian Council of Science in the fields of chemistry and chemical engineering, professor of the study course Quantum chemistry is expert of the Latvian Council of Science in the field of chemistry, professor of the study course Organic synthesis is expert of the Latvian Council of Science in the field of chemistry, chemical engineering and pharmacy (SAR, Part III, 3.4.1., p. 173-178; SAR, Annex, Biographies of the teaching staff members).

All teaching staff involved in the implementation of the study programme possess an adequate level of proficiency in Latvian and English to teach the study courses both in Latvian (with the exception of visiting professors from Queen Mary University of London and University of Belgrade) and in English (SAR, Annexes, Confirmation - knowledge of the state language and Confirmation - knowledge of the foreign language).

According to the experts, the achievement of the aims and learning outcomes of the programme and the corresponding courses from the point of view of the scientific and professional competence of the teaching staff is guaranteed, taking into account all the above points.

2.4.2. New teachers are continuously introduced in the implementation of the study programme. Most of the mandatory subjects are taught by experienced teachers, while younger teachers and doctoral students are involved in part of the lectures and in most of the practical work in laboratories and workshops (see for example description of the course "Silicates Chemistry and Physical Chemistry", SAR, Annex of the academic master study programme "Chemistry and Chemical Technology" - Descriptions of the study courses/modules). Younger teachers conduct most of the teaching in the restricted elective courses (for example Soil and groundwater treatment technologies, Functional materials and devices with light-emitting and photovoltaic properties, and Chemistry and technology of fibre materials; SAR, Annex of the academic master study programme "Chemistry and Chemical Technology" - Descriptions of the study courses/modules; SAR, Annex, Biographies of the teaching staff members; SAR, Annex, Basic information on the teaching staff involved in the implementation of the study field). 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 are scientific staff of the FMSAC. Since 2021, visiting professors from Queen Mary University of London and University of Belgrade have been involved in teaching as part of the ESF project (8.2.2.0/18/A/017) (SAR, Part III, 3.4.2., p. 178-179).

When younger teachers propose new subjects, the entire process is carried out under the supervision and control of the Study Field Committee and the Faculty Council in coordination with student representatives (SAR, Part III, 3.4.2., p. 209).

In order to ensure high-quality and innovative implementation of the study programme, several criteria are used for the selection of RTU academic staff to be involved in the study programme, so that the study courses are conducted by qualified, scientifically and methodically prepared lecturers, who are professionals in the specified field of studies and use modern approaches and technologies in their work (SAR, Part II, 2.3.5., p. 56-58).

Representatives of companies and institutes are involved as external stakeholders in the implementation of the teaching process, usually through internships (for example, pharmaceutical (Grindeks, Olainfarm, Riga Pharmaceutical Factory, MedPro, Silvanol) and organic synthesis (PharmIdeas, Bapeks, Syntagon Baltic) companies, Latvian Institute of Organic Synthesis, RTU Institute of Technology of Organic Chemistry, RTU Institute of Applied Chemistry are involved in the implementation of the Internship in Chemical Technology of Organic Compounds, SAR, Annex of the academic master study programme "Chemistry and Chemical Technology" - Descriptions of the

study courses/modules) and sometimes in the preparation of students' graduation theses (SAR, Part II, 2.2.1., p. 31-33). Therefore, their influence on the teaching process and their participation in the study programme can be considered appropriate.

It can be concluded that the FMSAC is taking the necessary steps to involve new teachers in the implementation of the study programme. In the event that younger teachers are involved in the implementation of the study programme or in the proposal of new subjects, usually optional, a quality assurance system has been established to enable the maintenance of the high quality of the teaching process as well as the requirements specified in regulatory enactments (SAR, Part II, 2.3.5., p. 56-58).

2.4.3. Not applicable.

2.4.4. 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. (SAR, Part III, 3.2.2., p. 161). The faculty academic staff of the study programme is primarily involved in research areas of chemistry, chemical technology, and materials science and a large number of national and international projects are listed in SAR (Part III, 3.2.2., p. 161-162). Each member of the academic staff in the last six years has published in peer-reviewed editions, including international editions (SAR Annex, Biographies of the teaching staff members). 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. The scientific competence of the academic staff involved in the academic Master'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. 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 (SAR, Part III, 3.2.1., p. 162).

2.4.5. The cooperation of the teaching staff involved in the implementation of the study programme could be divided into three parts:

cooperation of the academic staff in the development of the study programme. Study courses are composed on the basis of the previously acquired knowledge (for the first year of study on the basis of the academic bachelor study programme in fields of chemistry and chemical technology) and in accordance with the learning outcomes. Each teacher was informed of the content of all other courses, thus avoiding overlap in content and reducing the amount of unlearned topics. Collaborative discussions were a fundamental tool to prepare study programme in which students are able to understand and experience the relationships between the different areas of chemistry and chemical technology (SAR, Part III, 3.4.5., p. 179-180),

teaching staff jointly participates in different seminars and workshops where, in addition to the exchange of experiences on maintaining different forms of teaching and transferring knowledge and competences to students, they acquire the didactic, pedagogical and psychological skills and methods necessary for further development of the study programme and achievement of learning outcomes (SAR, Part II, 2.1.5., p. 29; SAR, Part III, 3.2.3., p. 162-164), and

analysis of student surveys at the end of each semester, followed by discussion of assessment criteria and how the course learning outcomes align with the overall study programme outcomes. 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 (SAR, Part III, 3.2.3., p. 162-164).

Additionally, assessment of learning outcomes is made by the teaching staff in accordance with the specifics of the study programme content (SAR, Anex, List of Internal Regulations, Appendix 4, Regulation on the assessment of learning outcomes, translation in english).

In addition, it is important to note the relatively low student-teacher ratio in the implementation of the study programme, which, according to available data, is just 0.6 students per one teacher (SAR, Part III, 3.4.5., p. 180). It should be noted that the low number of students per teacher, which is a disadvantage in terms of economy of the study programme, is currently a great advantage, since it allows students to acquire knowledge, competencies and skills in small groups, and consequently allows the full dedication of the involved teacher to each student.

Conclusions on this set of criteria, by indicating strengths and weaknesses

The qualification of the teaching staff members involved in the implementation of the study programme complies with the requirements specified in Section 55, paragraph 1, 3 of the Law on Higher Education Institutions of the Republic of Latvia. The orientation of scientific research corresponds to the content of the study programme and/or study course. The teaching staff possess an adequate level of proficiency in Latvian and English to teach the study courses both in Latvian and in English. Each member of the academic staff in the last six years has published in peer-reviewed editions, including international editions. Therefore, the achievement of the aims and learning outcomes of the study programme and the corresponding courses from the point of view of the scientific and professional competence of the teaching staff is guaranteed. New teachers are continuously introduced in the implementation of the study programme. Several internal criteria are used for the selection of new RTU academic staff to be involved in the study programme. When younger teachers propose new subjects, the entire process is carried out under the supervision and control of the Study Field Committee and the Faculty Council in coordination with student representatives. The teaching staff is closely involved in ongoing research at their respective institutes. The good cooperation of the teaching staff in the implementation of the study programme is realized through different education programmes carried out in the form of seminars and workshops, analysis of student surveys at the end of each semester and at the Study Field Committee meetings. Consequently, mechanisms for mutual cooperation of the teaching staff in the implementation of the study programme were established and these mechanisms ensure the achievement of the aims of the study programme and the interconnection of study courses within the study programme.

Strengths

1. Scientific, professional and generic competences of teachers ensure the implementation of the study programme to the highest standards, with the curriculum based on relevant scientific knowledge.
2. Good cooperation of teaching staff in scientific projects which results in acquiring of new knowledge and skills necessary for the continuous improvement of the study programme based on the latest scientific trends.
3. Low student/teacher ratio which allows students to acquire knowledge, competencies and skills in small groups, and consequently allows the full dedication of the involved teacher to each student.

Weaknesses

None.

Assessment of the requirement [7]

- 1 R7 - Compliance of the qualification of the academic staff and visiting professors, visiting associate professors, visiting docents, visiting lecturers and visiting assistants with the conditions for the implementation of the study programme and the requirements set out in the respective regulatory enactments.

Assessment of compliance: Fully compliant

Scientific, professional and generic competences of teachers ensure the implementation of the study programme to the highest standards, with the curriculum based on relevant scientific knowledge. All RTU teaching staff involved in the implementation of the study programme meet the requirements specified in Section 55, paragraph 1, 3 of the Law on Higher Education Institutions of the Republic of Latvia. Each member of the academic staff in the last six years has published in peer-reviewed editions, including international editions (SAR Annex, Biographies of the teaching staff members). Each member of the academic staff has an adequate level of proficiency in Latvian and English to teach the study courses both in Latvian (with the exception of visiting assistant professor) and in English (SAR Annexes, Confirmation - knowledge of the state language and Confirmation - knowledge of the foreign language).

2.5. Assessment of the Compliance

Requirements

- 1 1 - The study programme complies with the State Academic Education Standard or the Professional Higher Education Standard

Assessment of compliance: Fully compliant

According to experts, study programme "Chemistry and Chemical Technology" fully complies to State academic Education Standard. For example, Volume of the study programme is 80 KP, duration of the study programme - four semesters, compulsory part - 24 CP, Number of contact hours for courses - 30% (SAR, Annexes for Study Program "Chemistry and Chemical Technology", "Compliance with the standard, Annex 6, RKMM0 45528.pdf").

- 2 2 - The study programme complies with a valid professional standard or the requirements for the professional qualification (if there is no professional standard required for the relevant occupation) provided if the completion of the study programme leads to a professional qualification (if applicable)

Assessment of compliance: Not relevant

Not applicable.

- 3 3 - The descriptions of the study courses and the study materials have been prepared in all languages in which the study programme is implemented, and they comply with the requirements set forth in Section 561, Paragraph two and Section 562, Paragraph two of the Law on Higher Education Institutions.

Assessment of compliance: Fully compliant

The descriptions of the study courses and the study materials have been prepared in two languages - English and Latvian (SAR, Annexes for Study Program "Chemistry and Chemical Technology (45528)", "Course descriptions (45528), Annex 10.zip", "Studiju kursu_modulu apraksti, 45528, 10.pielikums.zip"), and they comply with the requirements set forth in Section 561, Paragraph two and Section 562, Paragraph two of the Law on Higher Education Institutions. The following information is included in the descriptions of the study courses: volume; requirements for the commencement of the acquisition of the study course; aim of the implementation of the study course; intended learning outcomes; content of the study course

required for achieving the learning outcomes; calendar of the study course; mandatory and supplementary literature and other sources of information; description of the organization and tasks for the independent work of students; criteria for the assessment of the learning outcomes.

- 4 4 - The sample of the diploma to be issued for the acquisition of the study programme complies with the procedure according to which state recognised documents of higher education are issued.

Assessment of compliance: Fully compliant

After the completion of the study programme, the graduates of the study programme are awarded a Master degree of engineering science in chemical technology and a diploma. Experts conclusion - The sample of the diploma to be issued for the acquisition of the study programme complies with the procedure according to which state recognised documents of higher education are issued - complies to Regulations of Cabinet of Ministers No. 202."Kārtība, kādā izsniedz valsts atzītus augstāko izglītību apliecinošus dokumentus". (SAR, Annexes for Study Program "Chemistry and Chemical Technology (45528)", "Diploms, RKMM0 LV+EN.zip").

- 5 5 - The academic staff of the academic study programme complies with the requirements set forth in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions.

Assessment of compliance: Fully compliant

The academic staff involved in the implementation of the study programme meet the requirements specified in Section 55, paragraph 1, Clause 3 of the Law on Higher Education Institutions of the Republic of Latvia. RTU has involved a total of 47 lecturers, of which 15 are professors, 9 associate professor, who are elected to academic positions in the higher education institution, and they take part in the implementation of the compulsory part and the limited elective part of the study programme (SAR, Part III, 3.4.1., pp 173-178).

- 6 6 - Academic study programmes provided for less than 250 full-time students may be implemented and less than five professors and associated professors of the higher education institution may be involved in the implementation of the mandatory and limited elective part of these study programmes provided that the relevant opinion of the Council for Higher Education has been received in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions.

Assessment of compliance: Fully compliant

There is decision of the Council of Higher Education to support that RTU starts implementing the master's study programme "Chemistry and Chemical Technology", which is intended for less than 250 full-time students. (SAR, Annexes for Study Program "Chemistry and Chemical Technology (45528)", "AIP Conclusion KMM0.pdf").

- 7 7 - At least five teaching staff members with a doctoral degree are among the academic staff of an academic doctoral study programme, at least three of which are experts approved by the Latvian Science Council in the respective field of science. At least five teaching staff members with a doctoral degree are among the academic staff of a professional doctoral study programme in arts (if applicable).

Assessment of compliance: Not relevant

Not applicable.

- 8 8 - The teaching staff members involved in the implementation of the study programme are proficient in the official language in accordance with the regulations on the level of the official language knowledge and the procedures for testing official language proficiency for performing professional duties and office duties.

Assessment of compliance: Fully compliant

The level of official language knowledge of individual academic staff members is indicated in the biographies of the teaching staff accompanying the SAR the study programme and it complies with the Cabinet of Ministers Regulation No. 733 of 7 July 2009 "Regulations Regarding the Extent of the Knowledge of the Official Language, the Procedures for Examining the Proficiency in the Official Language and the State Fee for Examining the Proficiency in the Official Language" for performing professional and office duties. (SAR, Annex, "CV, ENG.zip").

- 9 9 - The teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of a related foreign language, if the study programme or any part thereof is to be implemented in a foreign language (if applicable).

Assessment of compliance: Fully compliant

The teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of English (SAR Annexes, Confirmation - knowledge of the state language and Confirmation - knowledge of the foreign language).

- 10 10 - The sample of the study agreement complies with the mandatory provisions to be included in the study agreement.

Assessment of compliance: Fully compliant

The sample of the study agreement complies with the mandatory provisions that are included in the study agreement and it complies with regulations of Cabinet of Ministers No. 70. "Studiju līgumā obligāti ietveramie noteikumi". (SAR, Annex, "Study_agreements.zip").

- 11 11 - The higher education institution / college has provided confirmation that students will be provided with opportunities to continue their education in another study programme or another higher education institution or college (agreement with another accredited higher education institution or college) if the implementation of the study programme is terminated.

Assessment of compliance: Fully compliant

The RTU has provided confirmation (agreement dated 07.03.2022., SAR, Annex, "Agreement.7z") that students will be provided with opportunities to continue their education in UL if the implementation of the study programme is terminated and its students are admitted to the mentioned UL master study programme "Chemistry" (45441) in the same languages - Latvian and English.

- 12 12 - The higher education institution / college has provided confirmation that students are guaranteed compensation for losses if the study programme is not accredited or the study programme's license is revoked due to the actions (actions or omissions) of the higher education institution or college and the student does not wish to continue studies in another study programme.

Assessment of compliance: Fully compliant

The RTU has provided confirmation Nr. 01000-2.2.1-e/130 dated 26.05.2022., (SAR, Annex, "Confirmation - on compensation for losses.edoc"), that students are guaranteed compensation for losses if the study programme is not accredited or the study programme's license is revoked due to the actions (actions or omissions) of the higher education institution or college and the student does not wish to continue studies in another study programme.

- 13 13 - The joint study programmes comply with the requirements prescribed in Section 55.(1), Paragraphs one, two, and seven of the Law on Higher Education Institutions (if applicable)

Assessment of compliance: Not relevant

Not applicable.

- 14 14 - Compliance with the requirements specified in other regulatory enactments that apply to the study programme being assessed (if applicable)

Assessment of compliance: Not relevant

Not applicable.

Assessment of the requirement [8]

- 1 R8 - Compliance of the study programme with the requirements set forth in the Law on Higher Education Institutions and other regulatory enactments.

Assessment of compliance: Fully compliant

The study programme fully complies with the requirements set forth in the Law on Higher Education Institutions and other regulatory enactments.

General conclusions about the study programme, indicating the most important strengths and weaknesses of the study programme

According to experts, the academic master study programme "Chemistry and Chemical Technology" fully complies to State academic Education Standard. The descriptions of the study courses and the study materials have been prepared in two languages - English and Latvian, and they comply with the requirements set forth in Section 561, Paragraph two and Section 562, Paragraph two of the Law on Higher Education Institutions. The graduates of the study programme are awarded a Bachelor degree of engineering science in chemical technology and a diploma. The sample of the diploma to be issued for the acquisition of the study programme complies with the procedure according to which state recognised documents of higher education are issued. The academic staff involved in the implementation of the study programme meet the requirements specified in Section 55, paragraph 1, Clause 3 of the Law on Higher Education Institutions of the Republic of Latvia. The level of official language knowledge of individual academic staff members is indicated in the biographies of the teaching staff accompanying the SAR of the study programme and it complies with the Cabinet of Ministers Regulation No. 733 of 7 July 2009. The teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of English. The sample of the study agreement complies with the mandatory provisions that are included in the study agreement and it complies with regulations of Cabinet of Ministers No. 70. Students are closely connected to the ongoing research and participate in scientific projects together with research teams established at the individual institutes. The resources and provision of the study programme are sufficient for good and high-quality studies. Scientific, professional and generic competences of teachers ensure the implementation of the study programme to the highest standards, with the curriculum based on relevant scientific knowledge.

It can be concluded that according to all measurable criteria taken into account, this study programme can be considered excellent. As practically the only drawback, the small number of foreign students should be highlighted.

Evaluation of the study programme "Chemistry and Chemical Technology"

Evaluation of the study programme:

Excellent

2.6. Recommendations for the Study Programme "Chemistry and Chemical Technology"

Short-term recommendations

Long-term recommendations

Additional measures should be developed to attract a greater number of candidates from abroad who will enroll in the study programme (until the next accreditation).

II - "Industrial Pharmacy" ASSESSMENT

II - "Industrial Pharmacy" ASSESSMENT

2.1. Indicators Describing the Study Programme

Analysis

2.1.1. The joint second level professional higher education study programme "Industrial Pharmacy" complies with the study field of "Chemistry, Chemistry Technologies, and Biotechnology" indicators, conditions and criteria.

The length of the implementation of the study programme, which is 1 year and 6 months, is evaluated as sufficient for acquiring the necessary skills and practical experience to enter the labor market. The programme is considered to be a short programme (SAR, Part III, 3.1.1., p. 88).

2.1.2. According to the information provided in the SAR (Part III, p. 86-87), the title of the study programme is "Industrial Pharmacy" in the study field of "Chemistry, Chemistry Technologies, and Biotechnology" with education classification code 46725. The last 3 numbers according to the classification of Latvian education stand for pharmacy. The law can be found here: <https://likumi.lv/ta/id/291524-noteikumi-par-latvijas-izglitiba-klasifikaciju>. There is a qualification given after graduation of the programme as it is a second level professional higher education programme. The qualification received is "industrial pharmacist" and professional standard can be found here:

https://registri.visc.gov.lv/profizglitiba/dokumenti/standarti/20170614_Profesiju_standarti_5.pdf. The aim of the 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.

The study programme is implemented only in Latvian to prepare the specialists of pharmacy specifically for the local work market. The admission requirements of the programme to be enrolled is Second level professional higher education in pharmacy (degree in pharmacy) or comparable education (SAR, Part III, Study programme forms, p. 87). During the meeting with the directors (RTU and RSU) of the study programme Industrial Pharmacy, experts asked what is meant by "comparable education"? According to the study programme directors, "As the programme focuses specifically on the preparation of the pharmacists with a professional qualification, it is specifically needed that they have previous education that is directly related to the studies of pharmacy".

The studies are full-time with the duration of the study programme in the amount of 1 year and 6 months which corresponds to 60 CP. The study programme is separated into 2 main parts - theoretical courses and real work experience - internships. The theoretical courses are in the first term of the studies and then during the second and third term, students develop and apply their knowledge in a real work environment. The full study workload in the programme is 60 CP of which compulsory core subjects block constitutes 22 CP, compulsory elective part - 2 CP, Internship

(Placement in Industrial Pharmacy) – 26 CP, and Research Project and National Degree Examination – 10 CP (SAR, Anex, Plan of study courses for the second level professional higher education study programme “Industrial Pharmacy”). Study course Civil Defence and Environmental Protection is part of the compulsory elective part of the study programme (Part B) and for it's amount is 2 CP, i.e. all the points belonging to this group of study courses. Therefore, students cannot under any circumstances choose other study course from this group in case only one student from generation haven't taken study course Civil Defence and Environmental Protection earlier.

2.1.3. According to the SAR (Part III, 3.1.1., p. 88), 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 RTU and RSU.

According to the SAR (Part III, 3.1.1., p. 88-89), several changes have been made in the study programme 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 defense issues is compulsory. Due to that, a study course RSU008 “Civil Defence and Environmental Protection” (2 CP) has been incorporated as a part B (restricted elective) study course since the academic year 2018/2019.

2. The study course “The Chemistry and Technology of Medicinal Substances” (2 CP) has been removed from the subjects of the mandatory part of the study programme because RTU has removed it from the list of offered courses since 2021.

3. The study course “Preparation of Scientific Papers” (2 CP) has been included in the mandatory part of the study programme since 2021.

4. The study course “Drug Development” (2 CP) has been included in the restricted elective part of the study programme since 2021.

The corrections made to the study programme’s parameters within the assessment of the study field are analyzed, justified and supported by experts.

2.1.4. Pharmaceutical products are highly needed all over the world to treat people with different kinds of diseases or health problems. The professionals with in-depth knowledge in pharmacy are highly needed. In fact, the pharmaceutical industry is constantly expanding which requires more specialists to work in the market. As data shows in the SAR (Part III, 3.1.3., p. 91), pharmaceutical companies from Latvia exported goods worth more than 560 million euros in 2021. According to the SAR (Part III, 3.1.3., p. 91) demand for graduates is confirmed by regular job offers from various pharmaceutical companies looking for experts with knowledge and skills in the production of pharmaceutically active substances and the preparation of the documentation.

Additionally, according to the SAR (Part III, 3.1.5., p. 92), the study programme “Industrial Pharmacy” was initiated by the Association of Employers, namely, the Latvian Association of Chemical and Pharmaceutical Entrepreneurs, together with RSU creating an opportunity to train the necessary specialists for the industry.

According to the SAR (Part III, 3.1.4., p. 92), since 2018, recruiting of students for the study programme is not organized every year. There are 6 budget places per study year when students are enrolled and 5 tuition fee financed places. On average, five applicants start their studies every year (if there has been recruiting for the studies in the given year). In 2021, 7 applicants started their studies. So far, since the implementation of the programme approximately 70% of all students who have started their studies in the corresponding academic year have graduated. Throughout the study programme, 3 students have been deducted from the studies without completing their studies: 2 of them at their personal request, but 1 - for not attending classes. Since 2019/2020 2-3 students are on academic leave.

According to the SAR (Part III, 3.1.5., p. 92), the study programme “Industrial Pharmacy” prepares specialists who can prepare a dossier of drug registration documents for pharmaceutical companies.

It has also been proven that graduates of the study programme “Industrial Pharmacy” work as industrial pharmacists in the industry's leading companies. The demand for graduates is present and almost all of the students are employed during the studies in the programme.

2.1.5. According to the SAR (Part III, 3.1.5., p. 92-93), the joint study programme focuses on preparation of health care professionals - industrial pharmacists. Therefore, naturally, this study programme is developed in close cooperation with RSU, which provides several different programmes that prepare health care professionals, including pharmacists. RTU and RSU universities provide those study courses for the teaching of which it has the necessary competencies.

RTU provides study courses related to chemical engineering processes, chemical industry aspects, and issues related to the synthesis of biologically active compounds which make up 27% of mandatory part subjects (calculated based on CP). In addition, RTU also provides the subject of the restricted elective part “Nanotechnologies in Drug Delivery and Diagnostics”. Study courses related to pharmacy, including both research and marketing, and the production of finished forms, are provided by the teaching staff of RSU. According to the experts, it seems as a justified decision to make a joint study programme as both universities specialize in their own subjects and in combination they can provide the best of their knowledge, resources and skills and transfer that to the students. As each university is conducting quality assurance within the university regarding the taught study courses, the quality assurance maintenance also is ensured effectively (SAR, Part III, 3.1.5., p. 92-93).

Conclusions on this set of criteria, by specifying strengths and weaknesses

All of the indicators of the study programme are in compliance with the existing preconditions of the implementation of the study programme. The study programme “Industrial Pharmacy” complies with the study field of "Chemistry, Chemistry Technologies, and Biotechnology" indicators, conditions and criteria. The title, code, degree to be obtained as well as the aims, objectives, learning outcomes and admission requirements are interrelated. The study programme is implemented in Latvian. The goals, objectives, learning outcomes are in line and in compliance. The duration and scope of the study programme implementation as well as the implementation language, are reasonable and justified. The programme is in demand according to the needs of the work market. Students are not admitted every year. There is a reasonable dropout rate, although the total number of students is small. The corrections made to the study programme's parameters within the assessment of the study field are analyzed, justified and would be supported. The development and implementation of the joint study programme is justified and ensures a quality study process.

Strengths:

1. A unique joint study programme developed for the needs of the pharmaceutical industry.

Weaknesses:

None.

2.2. The Content of Studies and Implementation Thereof

Analysis

2.2.1. The study programme fully complies with the requirements of the state education standard regarding “short professional programmes implemented after the acquisition of academic (bachelor or master) education or second level professional higher education”. The content of the study programme fulfills the achievable tasks set for such a programme. As a result of graduating from the

study programme, specialists are skillful for work in pharmaceutical companies - an essential exporting part of the Latvian economy. It should be noted that the programme 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 programme prepares specialists - industrial pharmacists with in-depth knowledge of the development and production of finished dosage forms, quality control, and preparation and circulation of registration documents. Graduates of the study programme 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 programme 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 (SAR, Annexes for Study Program "Industrial Pharmacy", "kursu-apraksti-1fails-en.pdf").

Content of the second level professional higher education study programme "Industrial Pharmacy" complies with Professional Higher Education Standard MK Nr. 512 "Noteikumi par otrā līmeņa profesionālās augstākās izglītības valsts standartu" (SAR, Annex of the second level professional higher education study programme "Industrial Pharmacy", Compliance of the study programme with the State Education Standard). Total amount of CP in the Study programme is 60 CP and the duration of studies is 1.5 years (three semesters, students acquire 20 CP per semester). The compulsory part of the study programme includes 7 study courses (2 from these are provided by RTU) with a total amount of 22 CP. The amount of the limited elective part includes for study courses (one from these is provided by RTU) with a total amount of 2 CP. In addition, the study programme has a Placement in Industrial Pharmacy in the amount of 26 credit points. At the end of the study programme, students develop a Research Project in the amount of 10 CP. After the completion of the study programme, the graduates of the joint second level professional study programme "Industrial Pharmacy" and a joint diploma from both partner institutions (SAR, Annexes for Study programme "Industrial Pharmacy", "8en-labots-pielikums-programmas-plans.pdf").

Additionally, content of the second level professional higher education study programme "Industrial Pharmacy" complies with professional (occupational) standard (SAR, Annex of the second level professional higher education study programme "Industrial Pharmacy", Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification compliance to higher education standard.docx").

During onsite visit, students were asked about the B elective courses and they didn't like that they had to double take basically the same content just for the purpose of gaining the necessary CP for the completion of the study programme. There was no other option to choose another study course if at least one of coursemates needed to take this study course because study course "Civil Protection and Disaster Management Law" is mandatory for students if they haven't taken it during their previous studies. Then a study course RSU008 "Civil Defence and Environmental Protection" that was in the restricted elective part became mandatory for all students in the study group. In most of the cases students are forced to take this course from the list of restrictive elective study courses which according to the opinion of experts doesn't correspond to the purpose of this group of courses. Expert group agrees that students shouldn't be obliged to take the same content course with no added value to their knowledge just to gain the necessary amount of CP. It would be of

higher value if students were offered different courses with significantly various content. Therefore, the restrictive elective part should be changed to be truly elective. In addition to this, the students also emphasized the request to expand the content related to the various technologies essential for the pharmaceutical industry.

A review of the description of the study programme revealed a lack of consistency in the grading system between courses (different evaluation systems for study courses provided by RTU and RSU; SAR, Anex, Descriptions of the study courses/modules). Evaluation (grading) of students should include different evaluation criteria, not just exams.

2.2.2. Not applicable.

2.2.3. The Faculty of Materials Science and Applied Chemistry of RTU 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 (SAR, Part III, 3.2.3., p. 95-96).

Regarding the practical implementation of studies, when planning lessons, it is considered that students may need time to move between the campus of RTU and RSU. 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 RTU, they are not scheduled at RSU (SAR, Part III, 3.2.3., p. 95-96).

The rules of Riga Technical University foresees that students' questionnaire is implemented twice per term (in the middle 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 (SAR, Part III, 3.2.3., p. 95-96).

2.2.4. Internships in leading Latvian pharmaceutical companies JSC Olainfarm and JSC Grindeks are covered by 26 CP in the frame of the study programme (SAR, Part III, 3.2.4., p. 97; SAR, Annexes for Study Program "Industrial Pharmacy", "8en-labots-pielikums-programmas-plans.pdf").

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) (SAR, Annexes for Study Program "Industrial Pharmacy", "11en-pielikums-Prakses-programma.pdf").

The progress of the internship is governed by the internal regulations "RSU Faculty of Pharmacy Council February 3, 2022, Protocol No. 5-FF-1/1/2022" adopted by the RSU Senate, internal regulations and methodological guidelines of the Faculty of Pharmacy (SAR, Annexes for Study Program "Industrial Pharmacy", "11en-pielikums-Prakses-programma.pdf").

2.2.5. Not applicable.

2.2.6. The study program "Industrial Pharmacy" aims 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. All the knowledge gained through the theoretical courses is strengthened by a study placement and research project implemented in leading pharmaceutical companies such as JSC Olainfarm and JSC Grindeks. The graduate is granted the title "Professional qualification of the industrial pharmacist" (SAR, Part III, 3.1.2., p. 89).

Students defend their research project before graduating from the study program "Industrial Pharmacy". The Research Project is organized and administered by RSU. The Research Project is developed in a manufacturing company as an integral part of the practice in industrial pharmacy. Thus, it is ensured that the Research Project is implemented on topical issues for the industry (SAR, Part III, 3.2.6., p. 97). Two supervisors, one from each, industry and academia, cooperate on the leadership of each student to ensure the necessary quality, relevance to the study field and compliance with the study programme of the Research Project (onsite visit, interview with head of the programme).

Conclusions on this set of criteria, by specifying strengths and weaknesses

The content of the study programme "Industrial Pharmacy" is topical, the content of the study courses is interconnected and complementary, corresponds to the objectives of the programme and ensures the achievement of learning outcomes, as well as meets the needs of the industry, labor market and scientific trends. The programme complies with national regulations and professional qualification requirements. The study implementation methods contribute to the achievement of the aims and learning outcomes of the study courses and the study programme. Student-centered learning and teaching principles are considered. Internship is an intrinsic part of the study programme, the opportunities and provision of internship offered to students, as well as the organization of work are effective. The tasks of the internship are related to the learning outcomes achievable. The internship complies with the requirements of regulatory enactments. The topics of students' Research Project are relevant to the field and correspond to the study programme.

Strengths:

1. Unique study programme developed according to the needs of professional association and industry.

Weaknesses:

1. Evaluation (grading) of students for some courses includes only exams.
2. The restrictive elective part should be changed to be truly elective.
3. The content related to the various technologies essential for the pharmaceutical industry in restrictive elective part should be expanded.

Assessment of the requirement [5] (applicable only to master's or doctoral study programmes)

- 1 R5 - The study programme for obtaining a master's or doctoral degree is based on the achievements and findings of the respective field of science or field of artistic creation.

Assessment of compliance: Not relevant

Not applicable.

2.3. Resources and Provision of the Study Programme

Analysis

2.3.1. The joint study programme is implemented in collaboration between RTU and RSU. Such collaboration ensures that the best academic staff in the particular area are involved in implementing the study programme (SAR, Part III, 3.3.1., p. 88). The implementation of the second-level professional higher education study programme "Industrial Pharmacy" at RTU is provided by the Institute of Technology of Organic Chemistry (ITOC), Department of Chemical Technology of Biologically Active Compounds (SAR, Part III, 3.3.1., p. 98). ITOC specializes in fundamental research on organic chemistry, preparative organic synthesis, natural product and medicinal chemistry, pharmaceutical chemistry and pharmaceutical process chemistry R&D. ITOC also studies natural antioxidants for pharmaceutical and cosmeceutical applications, and novel synthetic antioxidants for broad spectrum industrial applications. It develops patent-free synthesis technologies for generic active pharmaceutical ingredients as a contract research (SAR, Part II, 2.4.1., p. 67).

RTU is not involved in the development of students' scientific Research Project (SAR, Part III, 3.3.1., p. 98). However, RTU has all the necessary infrastructure and state-of-the-art scientific equipment, for example, Bruker NMR 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, if it will be needed in the future (SAR, Part III, 3.3.1., p. 98; SAR, Other Annexes - "Main research equipment.pdf"; site visit).

The RTU courses "Pharmaceutical chemistry and technology", "Preparation of scientific works", except the optional course "Nanotechnology in drug delivery and diagnostics", which includes laboratory work, are theoretical courses. Appropriate auditoriums are provided for the lectures, which are equipped with multimedia equipment and Internet connection (site visit). The experts' opinion is that the material and technical base at RTU is fully sufficient to be able to conduct a qualitative study courses in "Industrial Pharmacy".

Students have access to scientific databases e.g., Scopus, Web of Knowledge, ScienceDirect, Wiley, etc., scientific library, e-platform ORTUS, as well as the entire infrastructure of RTU (see points 1.3.2. - 1.3.4. in analysis of Resources and Provision of the Study Field).

Following information about resources provided by RSU are available (SAR, Part III, 3.3.1., p. 98): RSU library fully provides students and academic staff access to five e-book databases

(AccessPharmacy, ebook Academic Collection (EBSCO), Ebook Central (Proquest), AccessMedicine and ClinicalKey) and seven full-text databases of journals, including the unique e-book database in the pharmaceutical industry - AccessPharmacy. 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). Two databases contain drug information: DynaMed, ClinicalKey. In search tool PRIMO 593 journal titles appear in the subfield "Pharmacy and Pharmacology" in the unified search engine. Part of the subscribed databases, for example, PRIMO, ProQuest and EBSCO is available in the libraries of both universities (SAR, Part II, 2.3.3., p. 51; SAR, Part III, 3.3.1., p. 98; SAR, Part III, 3.3.1., p. 229).

RSU Department of Applied Pharmacy allows acquiring skills related to the development and analysis of finished dosage forms. 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 (SAR, Part III, 3.3.1, p. 98).

Mandatory literature books in Latvian in case of compulsory study courses are available at the library in a sufficient amount. At least one hard-copy of one of the mandatory books of a course in English can be found at the Chemistry Branch of RTU scientific library. It is important to note that RTU possesses access to a collection of e-books in the electronic resources databases of the library, for example, ProQuest Ebook Central, eBook Open Access Collection or EBSCOHOST eBook Academic Collection (from additional information requested by experts).

As this programme is a joint study programme, it gives a great benefit for its students to freely use all the materials, resources, literature available in both of the universities - RTU and RSU. The FMSAC has the infrastructure and equipment needed to master the synthesis and manufacturing of medicine. In turn, the infrastructure and equipment of RTU allows acquiring skills related to the development of finished drug forms.

Since part of the study courses provided by RTU are also studied by RTU students, due to cost optimization, these courses are provided simultaneously to students of different programs (SAR, Part III, 3.3.3., p. 99).

Admission of students to the "Industrial Pharmacy" study program is carried out by Riga Stradins University. The 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. Financial security meets the conditions of program implementation and creates prerequisites for ensuring a quality study process (SAR, Part III, 3.3.3., p. 99).

2.3.2. Not applicable.

2.3.3. Although the study programme "Industrial Pharmacy" has a relatively small number of students (up to 6 students every second year), the financial calculations of RSU show that the study programme with the current number of students can be considered profitable. Depending on the plan of the study programme, the amount of study courses in credit points, and the number of students, payment is made for the study courses implemented by RTU. The fee for one credit point in the year 2021/2022 is EUR 116.00 (SAR, Part III, 3.3.3., Fig. 3., p. 100). Since the study courses offered by the "Industrial Pharmacy" study programme at RTU are also studied by RTU students, these courses are offered simultaneously to students of different programmes, thereby optimizing resources (SAR, Part III, 3.3.3., p. 99).

Courses that are implemented within the framework of the study programme "Industrial pharmacy" are also included in the programmes implemented by RTU FMSAC. As the study programme "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 programmes and universities (SAR, Part III, 3.1.3., p. 91).

The experts' opinion is that the joint implementation of the study programme ensures effective use of the resources, infrastructure and academic staff capacity and time resources of both universities (RTU and RSU).

Conclusions on this set of criteria, by specifying strengths and weaknesses

The study provision, scientific provision, informative provision (including library), material and technical provision and financial provision comply with specific features and the conditions for the implementation of the study programme, create prerequisites for the achievement of the learning outcomes and indicate the possibility to ensure a high-quality study process. The funding available to the study programme, funding sources and the use of funding ensures full implementation of the study process, the study programme has the minimum number of students to ensure the profitability of the study programme and facilitates the development of the study programme. Information provision of studies, material and technical provision and financial provision to ensure a high-quality study process. The study programme has an appropriate minimum number of students.

Strengths:

1. Excellent material, technical and informative base.

Weaknesses:

None.

Assessment of the requirement [6]

- 1 R6 - Compliance of the study provision, science provision (if applicable), informative provision (including library), material and technical provision and financial provision with the conditions for the implementation of the study programme and ensuring the achievement of learning outcomes

Assessment of compliance: Fully compliant

The resources and provision of the study programme are sufficient for high-quality studies. Infrastructure of RTU and RSU (auditoriums, classrooms, Scientific Library, portal ORTUS, Wi-Fi, canteens, cafes, etc. see also SAR, Part II, 2.3.2. p. 48-53) is more than sufficient to ensure effective and sustainable practical lessons and laboratory work of the study programme (Site visit, SAR, Part III, 3.3.1., p. 98-99).

To provide information resources for the second level professional higher education study programme "Industrial Pharmacy", five e-book databases and seven full-text of journals, including the unique e-book database in the pharmaceutical industry -AccessPharmacy are available for students and academic staff at RSU library (SAR, Part III, 3.3.1., p. 98-99).

Additionally, e-books and scientific databases are easily accessible in the RTU SL using the search tool Primo, which allows you to simultaneously search for literature: In the RTU Scientific Library catalog; In the general catalog; In the subscribed and library databases (RTU website <https://www.rtu.lv/lv/studijas/biblioteka/nozaru-informacija>; SAR, Part II, 2.3.3., p. 50-53).

According to the information given in SAR (Part III, 3.3.3., p. 99), the study programme with the current number of students (up to 6 students in the generation) can be considered profitable.

2.4. Teaching Staff

Analysis

2.4.1. A total of 3 teachers employed at RTU are involved in the implementation of the joint second level professional higher education study programme “Industrial Pharmacy”, of which two are professors and one is lecturer. Two RTU professors involved in the implementation of the study programme hold doctoral degrees in chemistry. On the part of RSU, one professor emeritus, 2 professors and 2 assistant professors are involved in the implementation of the study programme as responsible instructors. Most of the teaching staff are employees of the RSU. All teachers involved in the implementation of the joint second level professional higher education study programme “Industrial Pharmacy” have the appropriate knowledge and qualifications in the relevant scientific field necessary for the implementation of the study programme (SAR, Part III, 3.4.1., p. 100-101).

Two visiting professors from University of Helsinki and Kaunas University of Health Sciences have been involved in teaching (SAR, Part III, 3.4.1., p. 101). It should be noted that 12 teachers were involved in the implementation of the study programme, two of whom are visiting professors. It represents almost 20% of the total number of teaching staff who were visiting teachers which is far above the average for all study programmes within the Study Field.

RTU teaching staff involved in the implementation of the study programme meet the requirements specified in Section 55, paragraph 1, 3 of the Law on Higher Education Institutions of the Republic of Latvia. More than five professors and associate professors altogether, who are elected to academic positions in the RTU and RSU, take part in the implementation of the compulsory part and the limited elective part of the academic study programme. On the RTU side, these are professors and associate professors who teach the following study courses of the compulsory part and the limited elective part of second level professional higher education study programme “Industrial Pharmacy”: The chemistry and technology of pharmaceuticals, Patents and Nanotechnologies in drug delivery and diagnostics (SAR, Part III, 3.4.1., p. 100-101; SAR, Annex of the joint second level professional higher education study programme “Industrial Pharmacy” - The curriculum of the study programme). At the same time, all teaching staff involved in the implementation of the study programme meet at least the following three criteria:

compliance of the qualifications of the teaching staff with the requirements set forth in the legislation (SAR, Part III, 3.4.1., p. 100-101; SAR, Annex, Biographies of the teaching staff members), the orientation of scientific research corresponds to the content of the study programme and/or study course (for example, professor of the study course Patents is expert of the Latvian Council of Science in the field of chemistry, chemical engineering, and pharmaceuticals, professor of the study course The chemistry and technology of pharmaceuticals is expert of the Latvian Council of Science in the field of chemistry; SAR, Part III, 3.4.1., p. 100-101; SAR, Annex, Biographies of the teaching staff members)

an adequate level of proficiency in Latvian and English to teach the study courses both in Latvian (with the exception of visiting professor from University of Helsinki and Kaunas University of Health Sciences) in which study programme is implemented and in English if needed in future (SAR, Annexes, Confirmation - knowledge of the state language and Confirmation - knowledge of the foreign language).

Most of the teaching staff involved in the implementation of the study programme are experts of the Latvian State Council in various fields such as chemistry, basic medical sciences (including pharmacy), and medical and health sciences (clinical medicine) (SAR, Part III, 3.4.1., p. 101; SAR, Annex, Biographies of the teaching staff members SAR, Annex, Basic information on the teaching staff involved in the implementation of the study field). All RTU professors involved in the implementation of the joint second level professional higher education study programme “Industrial Pharmacy” have published scientific papers in prestigious international journals, participated in scientific conferences in their research field during the last five years, while some of them were involved in the work of editorial boards of scientific journals and participated in the implementation of international scientific projects (SAR, Part III, 3.4.1., p. 100-101; SAR, Annex, Biographies of the teaching staff members). In addition, they have participated in methodological seminars that enable

the acquisition of general competencies necessary for the effective implementation of the teaching process (SAR, Part II, 2.3.6., p. 58-60).

These ensure the implementation of the study programme to the highest standards, with the curriculum based on relevant scientific knowledge.

2.4.2. There have been no significant changes in the composition of the teaching staff since establishing the study programme. The only change is connected to the lecturer in the study course "Patents", where a new lecturer with practical experience as a patent attorney at the Latvian Institute of Organic Synthesis joined the teaching staff as a substitute. Since the new lecturer is a leading expert of the Patent Office of the Republic of Latvia, with extensive experience and competence in the field of intellectual property protection for the pharmaceutical industry, this change cannot affect the implementation of the corresponding study course as well as study programme in total in any way (SAR, Part III, 3.4.2., p. 102).

Therefore, it can be stated that there has been no negative impact on the quality of the implementation of the study programme and the compliance of the study programme with the requirements established in the legislation as a result of the renewal or replacement of teaching staff.

2.4.3. Not applicable.

2.4.4. More than five professors and associate professors altogether, who are elected to academic positions in the RTU and RSU, take part in the implementation of the compulsory part and the limited elective part of the academic study programme. Implementation of the study program "Industrial Pharmacy" includes three lecturers from RTU (from total of 12). The scientific staff is closely involved in ongoing research at their respective field of expertise as indicated in SAR (Part III, 3.4.1., p. 100-101) and SAR Annex, Biographies of the teaching staff members. The large number of high quality scientific papers published yearly as well as the academic merits available in online databases (SCOPUS) indicate research activity of the staff in accordance with the Law on Higher Education Institutions. More precisely, each member of the academic staff in the last six years has published in peer-reviewed editions, including international editions (SAR Annex, Biographies of the teaching staff members).

2.4.5. The cooperation of the teaching staff involved in the implementation of the study programme starts with avoiding overlap in content keeping study courses complemented to each other. Theoretical study courses are implemented in the first semester of the study programme, which enables students to have sufficient theoretical knowledge at the moment when they start with the practical work and preparation of the final thesis in order to successfully complete these activities (SAR Part III, 3.4.5., p. 102-103).

Teaching staff jointly participates in different seminars and workshops where, in addition to the exchange of experiences on maintaining different forms of teaching and transferring knowledge and competences to students, they acquire the didactic, pedagogical and psychological skills and methods necessary for further development of the study programme and achievement of learning outcomes (SAR Part II, 2.1.5., p. 29).

During the development of the study programme, the teachers had time to become familiar with the content of other study courses, which, in addition to avoiding duplication, led to mutual contact and a synergistic approach to the development of study courses and the study programme itself.

At the end of each semester, an analysis of student surveys is conducted, followed by a discussion of assessment criteria and how study course learning outcomes align with overall study programme outcomes (SAR Part III, 3.4.5., p. 102-103). Additionally, assessment of learning outcomes is made by the teaching staff in accordance with the specifics of the study programme content (SAR, Anex,

List of Internal Regulations, Appendix 4, Regulation on the assessment of learning outcomes, translation in english).

It is important to note the relatively low student-teacher ratio in the implementation of the study programme, which, according to available data, is just 3 students per teacher (SAR Part III, 3.4.5., p. 103). This is a great advantage for students, since it allows students to acquire knowledge, competencies and skills in small groups, and consequently allows the full dedication of the involved teacher to each student.

Conclusions on this set of criteria, by indicating strengths and weaknesses

The qualification of the teaching staff members involved in the implementation of the study programme complies with the requirements specified in Section 55, paragraph 1, 3 of the Law on Higher Education Institutions of the Republic of Latvia. The orientation of scientific research corresponds to the content of the study programme and/or study course. The teaching staff possess an adequate level of proficiency in Latvian and English to teach the study courses in Latvian, in which study programme is implemented, and in English, should this be necessary in the future. Therefore, the achievement of the aims and learning outcomes of the study programme and the corresponding courses from the point of view of the scientific and professional competence of the teaching staff is guaranteed. New lecturer is involved in the implementation of a study programme based on extensive experience and competence in the field of intellectual property protection for the pharmaceutical industry. The teaching staff is closely involved in ongoing research at their respective institutes. Each member of the academic staff in the last six years has published in peer-reviewed editions, including international editions. The good cooperation of the teaching staff in the implementation of the study programme is realized through different education programmes carried out in the form of seminars and workshops and analysis of student surveys at the end of each semester. Consequently, mechanisms for mutual cooperation of the teaching staff in the implementation of the study programme were established and these mechanisms ensure the achievement of the aims of the study programme and the interconnection of study courses within the study programme.

Strengths

1. Scientific, professional and generic competences of teachers ensure the implementation of the study programme to the highest standards, with the curriculum based on relevant scientific knowledge.
2. Involvement of two foreign visiting professors in the implementation of the study programme.
3. Good cooperation of teaching staff in scientific projects which results in acquiring of new knowledge and skills necessary for the continuous improvement of the study programme based on the latest scientific trends.
4. Low student/teacher ratio which allows students to acquire knowledge, competencies and skills in small groups, and consequently allows the full dedication of the involved teacher to each student.

Weaknesses

None.

Assessment of the requirement [7]

- 1 R7 - Compliance of the qualification of the academic staff and visiting professors, visiting associate professors, visiting docents, visiting lecturers and visiting assistants with the conditions for the implementation of the study programme and the requirements set out in the respective regulatory enactments.

Assessment of compliance: Fully compliant

Scientific, professional and generic competences of teachers ensure the implementation of the study programme to the highest standards, with the curriculum based on relevant scientific knowledge. All RTU teaching staff involved in the implementation of the study programme meet the requirements specified in Section 55, paragraph 1, 3 of the Law on Higher Education Institutions of the Republic of Latvia. Each member of the academic staff in the last six years has published in peer-reviewed editions, including international editions (SAR Annex, Biographies of the teaching staff members). Each member of the academic staff has an adequate level of proficiency in Latvian and English to teach the study courses both in Latvian (with the exception of visiting assistant professor) and in English (SAR Annexes, Confirmation - knowledge of the state language and Confirmation - knowledge of the foreign language).

2.5. Assessment of the Compliance**Requirements**

- 1 - The study programme complies with the State Academic Education Standard or the Professional Higher Education Standard

Assessment of compliance: Fully compliant

According to experts, study programme "Industrial Pharmacy" fully complies to Professional Higher Education Standard MK Nr. 512 "Noteikumi par otrā līmeņa profesionālās augstākās izglītības valsts standartu". For example, Volume of the study programme is 60 KP, duration of the study programme - three semesters, theoretical and professional specialization courses - 22 CP, Number of contact hours for courses - more than 40% (SAR, Annexes for Study Program "Industrial Pharmacy", "A7en-pielikums-atbilstiba-profesijas-standartam.pdf" "6en-labots-pielikums-atbilstibu-valsts-izglitiba-standartam.pdf").

- 2 - The study programme complies with a valid professional standard or the requirements for the professional qualification (if there is no professional standard required for the relevant occupation) provided if the completion of the study programme leads to a professional qualification (if applicable)

Assessment of compliance: Fully compliant

There is compliance of the study programme "Industrial Pharmacy" to the professional standard - the study programme corresponds to the professional standard 1.90 "Industrial pharmacist" that is published here:

https://registri.visc.gov.lv/profizglitiba/dokumenti/standarti/20170614_Profesiju_standarti_5.pdf.

For example, knowledge required for the performance of the basic tasks of professional activity "Principles of business economics and intellectual property rights, basic principles of patent interpretation" is covered by two study courses: "Pharmaceutical Marketing" 2 CP and "Patents" 2 CP. (SAR, Annexes for Study Program "Industrial Pharmacy", "A7en-pielikums-atbilstiba-profesijas-standartam.pdf").

- 3 - The descriptions of the study courses and the study materials have been prepared in all languages in which the study programme is implemented, and they comply with the requirements set forth in Section 561 , Paragraph two and Section 562 , Paragraph two of the Law on Higher Education Institutions.

Assessment of compliance: Fully compliant

The descriptions of the study courses and the study materials have been prepared in two languages - in Latvian in which study programme is implemented and additionally in English

(SAR, Annexes for Study Program "Industrial Pharmacy", "kursu-apraksti-1fails-en.pdf", "kursu-apraksti-1-faila-lv.pdf"), and they comply with the requirements set forth in Section 561, Paragraph two and Section 562, Paragraph two of the Law on Higher Education Institutions. The following information is included in the descriptions of the study courses: volume; requirements for the commencement of the acquisition of the study course; aim of the implementation of the study course; intended learning outcomes; content of the study course required for achieving the learning outcomes; calendar of the study course; mandatory and supplementary literature and other sources of information; description of the organization and tasks for the independent work of students; criteria for the assessment of the learning outcomes.

- 4 4 - The sample of the diploma to be issued for the acquisition of the study programme complies with the procedure according to which state recognised documents of higher education are issued.

Assessment of compliance: Fully compliant

After the completion of the study programme, the graduates of the study programme are awarded a qualification "Industrial pharmacist" and a joint diploma from both partner institutions. Experts conclusion - The sample of the diploma to be issued for the acquisition of the study programme complies with the procedure according to which state recognised documents of higher education are issued - complies to Regulations of Cabinet of Ministers No. 202. "Kārtība, kādā izsniedz valsts atzītus augstāko izglītību apliecinošus dokumentus" (SAR, Annexes for Study Program "Industrial Pharmacy", "diploms-un-pielikums-en.pdf").

- 5 5 - The academic staff of the academic study programme complies with the requirements set forth in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions.

Assessment of compliance: Not relevant

Not applicable.

- 6 6 - Academic study programmes provided for less than 250 full-time students may be implemented and less than five professors and associated professors of the higher education institution may be involved in the implementation of the mandatory and limited elective part of these study programmes provided that the relevant opinion of the Council for Higher Education has been received in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions.

Assessment of compliance: Not relevant

Not applicable.

- 7 7 - At least five teaching staff members with a doctoral degree are among the academic staff of an academic doctoral study programme, at least three of which are experts approved by the Latvian Science Council in the respective field of science. At least five teaching staff members with a doctoral degree are among the academic staff of a professional doctoral study programme in arts (if applicable).

Assessment of compliance: Not relevant

Not applicable.

- 8 8 - The teaching staff members involved in the implementation of the study programme are proficient in the official language in accordance with the regulations on the level of the official language knowledge and the procedures for testing official language proficiency for performing professional duties and office duties.

Assessment of compliance: Fully compliant

The level of official language knowledge of individual academic staff members is indicated in the

biographies of the teaching staff accompanying the SAR of the study programme and it complies with the Cabinet of Ministers Regulation No. 733 of 7 July 2009 "Regulations Regarding the Extent of the Knowledge of the Official Language, the Procedures for Examining the Proficiency in the Official Language and the State Fee for Examining the Proficiency in the Official Language" for performing professional and office duties. (SAR, Annex, "CV, ENG.zip").

- 9 9 - The teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of a related foreign language, if the study programme or any part thereof is to be implemented in a foreign language (if applicable).

Assessment of compliance: Not relevant

Not applicable.

- 10 10 - The sample of the study agreement complies with the mandatory provisions to be included in the study agreement.

Assessment of compliance: Fully compliant

The sample of the study agreement complies with the mandatory provisions that are included in the study agreement and it complies with regulations of Cabinet of Ministers No. 70. "Studiju līgumā obligāti ietveramie noteikumi" (SAR, Annex, "Study_agreements.zip").

- 11 11 - The higher education institution / college has provided confirmation that students will be provided with opportunities to continue their education in another study programme or another higher education institution or college (agreement with another accredited higher education institution or college) if the implementation of the study programme is terminated.

Assessment of compliance: Non-compliant

The RTU has provided confirmation (agreement Nr. 01000-2.21/62 dated 18.03.2015., SAR, Annex, "Agreement.7z") that students will be provided with opportunities to continue their education in RSU if the implementation of the study programme is terminated and its students are admitted to the mentioned RTU master study programme "Clinical Pharmacy" in the same languages - Latvian. The above is neither justified nor logical, since the professional study program "Industrial Pharmacy" and the master study program "Clinical Pharmacy" are study programs at different levels.

- 12 12 - The higher education institution / college has provided confirmation that students are guaranteed compensation for losses if the study programme is not accredited or the study programme's license is revoked due to the actions (actions or omissions) of the higher education institution or college and the student does not wish to continue studies in another study programme.

Assessment of compliance: Fully compliant

The RTU has provided confirmation Nr. 01000-2.2.1-e/130 dated 26.05.2022., (SAR, Annex, "Confirmation - on compensation for losses.edoc"), that students are guaranteed compensation for losses if the study programme is not accredited or the study programme's license is revoked due to the actions (actions or omissions) of the higher education institution or college and the student does not wish to continue studies in another study programme.

- 13 13 - The joint study programmes comply with the requirements prescribed in Section 55.(1), Paragraphs one, two, and seven of the Law on Higher Education Institutions (if applicable)

Assessment of compliance: Fully compliant

The joint study programme complies with the requirements prescribed in Section 551, Paragraphs one, two, and seven of the Law on Higher Education Institutions (SAR, Annexes for

Study Program "Industrial Pharmacy", "4en-labots-pielikums-atbilstiba-augstskolu-likumam.pdf").

- 14 14 - Compliance with the requirements specified in other regulatory enactments that apply to the study programme being assessed (if applicable)

Assessment of compliance: Not relevant

Not applicable.

Assessment of the requirement [8]

- 1 R8 - Compliance of the study programme with the requirements set forth in the Law on Higher Education Institutions and other regulatory enactments.

Assessment of compliance: Partially compliant

The study programme fully complies with the requirements set forth in the Law on Higher Education Institutions and other regulatory enactments. Confirmation that students will be provided with opportunities to continue their education in another study programme or another higher education institution or college (agreement with another accredited higher education institution or college) if the implementation of the study programme is terminated is neither justified nor logical, since the professional study program "Industrial Pharmacy" and the master study program "Clinical Pharmacy" are study programs at different levels.

General conclusions about the study programme, indicating the most important strengths and weaknesses of the study programme

According to experts, study programme "Industrial Pharmacy" fully complies to Professional Higher Education Standard MK Nr. 512. The study programme "Industrial Pharmacy" fully complies with the requirements of the professional standard 1.90 "Industrial pharmacist". The descriptions of the study courses and the study materials have been prepared in two languages - in Latvian in which study programme is implemented and additionally in English. After the completion of the study programme, the graduates of the study programme are awarded a qualification "Industrial pharmacist" and a joint diploma from both partner institutions. The sample of the diploma to be issued for the acquisition of the study programme complies with the procedure according to which state recognised documents of higher education are issued. The level of official language knowledge of individual academic staff members is indicated in the biographies of the teaching staff accompanying the SAR of the study programme and it complies with the Cabinet of Ministers Regulation. The joint study programme "Industrial Pharmacy" complies with the requirements prescribed in Section 551, Paragraphs one, two, and seven of the Law on Higher Education Institutions

The programme is in demand according to the needs of the work market. Students are not admitted every year. There is a reasonable dropout rate, although the total number of students is small. Students are closely connected to the ongoing research and participate in scientific projects together with research teams established at the individual institutes. The resources and provision of the study programme are sufficient for a high-quality studies.

The study programme "Industrial Pharmacy" is unique joint study programme developed for the needs of the pharmaceutical industry. When all the measurable criteria are taken into account, this study programme can be considered as excellent. The analysis identified shortcomings that need to be corrected in the upcoming period, which primarily relate to the limited amount of B restrictive elective courses, which consequently results that restrictive elective part is not truly elective. Analysis of the study programme, as well as meetings with alumni and employers, shows that the content of the study programme insufficiently covers technologies essential and important for the

pharmaceutical industry. Also, evaluation (grading) of students for some courses includes only exams which should be expanded with other forms of assessment.

Evaluation of the study programme "Industrial Pharmacy"

Evaluation of the study programme:

Excellent

2.6. Recommendations for the Study Programme "Industrial Pharmacy"

Short-term recommendations

Evaluation (grading) of students for some courses includes only exams which should be expanded with other forms of assessment (until the next academic year).

Long-term recommendations

The way in which study courses are selected from part B (restrictive elective study courses) must be changed in order to ensure the choice of students through this group of study courses, which is now practically formal and limited to the almost mandatory choice of the study course RSU008 Civil Defense and Environmental Protection (until the next accreditation).

The content of the study programme in the part that refers to restrictive elective courses must be expanded with contents/study courses that refer to technologies essential and important for the pharmaceutical industry (until the next accreditation).

II - "Chemistry, Materials Science and Engineering" ASSESSMENT

II - "Chemistry, Materials Science and Engineering" ASSESSMENT

2.1. Indicators Describing the Study Programme

Analysis

2.1.1. The doctoral study programme complies with the study field of "Chemistry, Chemistry Technologies, and Biotechnology" indicators, conditions and criteria.

The length of the implementation of the study programme, which is 4 years, is evaluated as sufficient for acquiring the necessary skills and finishing dissertation.

2.1.2. According to the SAR (Part III, p. 105-109), the title of the study programme is "Chemistry, Materials Science and Engineering" in the study field of "Chemistry, Chemistry Technologies, and Biotechnology" with education classification code 51528 with the last 3 numbers standing for chemistry technologies according to the classification of Latvian education which can be accessed here: <https://likumi.lv/ta/id/291524-noteikumi-par-latvijas-izglitiba-klasifikaciju>. While the two numbers 52 stands for Engineering and Technology. According to the annex of LZP atzinums, the doctoral study programmes and degrees provided after graduation are seen as in accordance with the law and good.

There is no qualification given after graduation of the programme as it is a doctoral study programme. The aim of the programme is 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.

The preconditions to get enrolled in the study programme are the following according to the SAR

(Part III, Study programme forms, p 106-109):

1. For those choosing to study in Latvian, the requirements are Master of engineering or natural sciences, or comparable education. It is not exactly clear what is meant with “comparable education”.

2. For those choosing to study in English, the entry requirements are 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.

In addition to these aforementioned preconditions, according to the SAR (Part III, 3.1.2., p.112), there are other 5 evaluation criteria based on admission methodology which are: 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.

According to the SAR (Part III, 3.1.2. p. 113), the study programme is implemented in 2 languages - Latvian and English. The length of the studies is 4 years which constitute 192 CP (288 ECTS) of which mandatory study courses constitute 20 credit points (30 ECTS), restricted electives – 18 credit points (27 ECTS), and Scientific work – 154 credit points (231 ECTS). The PhD Thesis research amounts to 154 CP (231 ECTS).

There are 4 different specialization options of doctoral students: 1. Doctor of Science (Ph.D.) in Chemical Engineering; 2. Doctor of Science (Ph.D.) in Chemistry; 3. Doctor of Science (Ph.D.) in Materials Science; 4. Doctor of Science (Ph.D.) in Physics and Astronomy. All of them are offered in both languages of their choice.

From an expert's point of view, it seems slightly confusing that in the RTU it is possible in the study field of “Chemistry, Chemistry Technologies, and Biotechnology” to have doctoral studies in physics as it is a separate study field. As it has been indicated during onsite visits with the management and academics, chemistry is closely related to physics but it does not necessarily mean that it makes a valid basis of reasoning.

2.1.3. As aforementioned in the analysis of 2.1.2., it seems interesting that PhD programmes can be accredited in two different study fields. It is rather specific taking into account that RTU also has a separate study field of physics.

According to the SAR (Part III, 3.1.1., p. 110), since the previous accreditation back in 2013, some significant changes have been made in the study programmes. The major one has been the implementation of the new PhD study programme of “Chemical Technology” in 2021. The changes introduced have resulted in the formation of the whole different structure of the PhD studies offered by RTU in the study field “Chemistry, Chemistry Technologies, and Biotechnology”.

According to the SAR (Part III, 3.1.1., p. 110), the changes in the parameters of the study programme since the the previous accreditation are made as follows:

1. The title of the programme 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 for admission were changed to “Master of engineering or natural sciences, or comparable education.

According to the SAR (Part III, 3.1.1., p. 110), in addition to that, there has been a closure of the study programmes of “Chemistry” and “Materials Science”. Admission to these programmes was discontinued in 2022. First and second year PhD students enrolled in these programmes were transferred to the new study programme “Chemistry, Materials Science and Engineering”.

The corrections made to the study programme’s parameters within the assessment of the study field are analyzed, justified and supported by experts.

2.1.4. According to the SAR (Part III, 3.1.3., p. 114), there is an existing high-need for developed professionals and specialists in Latvian labor market. As the study programme is offered in Latvian and English, it allows for the foreign students to study at RTU as well. Thus, RTU is also preparing specialists with a doctoral degree for the international labor market.

According to the SAR (Part III, 3.1.3., p. 114), a crucial indicator of the need of the specialists is the fact that all of the graduates of the programme are employed even before graduation. In most of the cases, the employers are scientific institutes.

According to the SAR (Part III, 3.1.4., p. 114), during the reporting period, 36 PhD students were admitted to the programme, 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 programme. The number of students enrolled varies significantly from year to year, mainly due to the availability of funding for research projects.

According to the SAR (Part III, 3.1.4., p. 115-116), the numbers per study year are different from 1 to 7 per study year. In the study year of 2018/19 there was 1 student admitted while in 2020/21 it was 7. Overall, it seems to have a trend of declining the total number of students altogether. If in 2013/14 it was around 28 students, then in 2020/21 it was approximately 17. The average number of dropouts per study year is 2-3 students. In 2013/14 it was 2, in 2014/15 and 2015/16 - 1, 2016/17 - 2018/19 it was 3 and then it increased to 4 students in 2019/20. In 2020/21 it was 2.

According to the SAR (Part III, 3.1.4., p. 115-116), 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 a 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 high number of dropouts, which is quite unusual for PhD studies, should be additionally noted (SAR, Part III, 3.1.4., Fig. 3.1.4.3, p. 116).

2.1.5. Not applicable.

Conclusions on this set of criteria, by specifying strengths and weaknesses

All of the indicators of the study programme are in compliance with the existing preconditions of the implementation of the study programme. The study programme complies with the study field of "Chemistry, Chemistry Technologies, and Biotechnology" indicators, conditions and criteria. The study programme is implemented in English and Latvian. The goals, objectives, learning outcomes are in line and in compliance. The title, code, degree to be obtained as well as the aims, objectives, learning outcomes and admission requirements are interrelated. The duration and scope of the study programme implementation as well as the implementation language, are reasonable and justified. The programme is in demand according to the needs of the labor market. As this is a doctoral programme that provides advances specialists in the study field, it is of necessity to maintain it and it brings great benefit to the labor market. The corrections made to the study programme's parameters within the assessment of the study field are analyzed, justified and would be supported. There is a rather high number of dropouts of the students and also a rather high number of academic leave students.

Strengths:

1. Necessity of this programme for the labor market.

Weaknesses:

1. Large dropout rates.

2.2. The Content of Studies and Implementation Thereof

Analysis

2.2.1. The study programme 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 full study workload in the programme is 192 CP of which compulsory core subjects block constitutes 20 CP, free choice – 18 CP, and Scientific work – 154 CP. The duration of full-time studies is four years. The programme 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 programme (SAR, Part III, 3.2.1., p. 117-118).

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) and Academic Writing (2 CP). 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 methodological guidelines of the programme, 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 (SAR, Part III, 3.2.1., p. 117-118).

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 for each of 2 articles: 8 CP in total) The results obtained during the PhD research must be published. 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. 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. 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 (SAR, Part III, 3.2.1., p. 117-118; Annexes for Study Program “Chemistry, Materials Science and Engineering”, “RKDI0 (51528) Planning, Annex 9.pdf”).

2.2.2. The theoretical and practical parts of the study programme 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 (SAR, Part III, 3.2.2., p. 118-121).

All faculty academic staff involved in the implementation of the study programme 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 main research domains of national and international projects are as follows:

Chemistry and Technology of Biomaterials;

Production Technology and Environmental Aspects;

Chemistry and Technology of Inorganic Materials;

Chemistry and Technology of Biologically Active Compounds;
Chemistry and Technology of Polymer Materials;
Sustainable Chemistry (SAR, Part III, 3.2.2., p. 118-121).

2.2.3. The study implementation methods contribute to the achievement of the aims and learning outcomes of the study courses and the study programme. The study programme 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 programme 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 (SAR, Part III, 3.2.3., p. 121-123).

The structure and curriculum of the study programme allows 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 programme (SAR, Part III, 3.2.3., p. 121-123).

The study programme is based on the student-centered principles of education. The academic staff responsible for study courses, based on the specifics of study course content, as well as on the needs of students, choose the methods of structuring, teaching and evaluating study courses. Students are able to take part in the improvement of the curricula and methods of the study courses in two ways. Directly, expressing their aspirations to academic staff, department chair, the programme director, or by representatives of student self-government. As already mentioned, students can express their thoughts on the course during an anonymous survey at the end of semester (SAR, Part III, 3.2.3., p. 121-123).

The study programme is implemented equally in both languages, Latvian and English, respectively.

2.2.4. Not applicable.

2.2.5. Master students are actively offered opportunities to proceed with the PhD programme. Most work on scientific projects already during their master studies and if the project constitutes they are able to work on the same project also during their PhD studies. There is also a possibility for them to continue on other ongoing or starting projects (personal interview with PhD students during onsite visit).

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 (SAR, Part III, 3.2.5., p. 124).

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. 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 UL (SAR, Part III, 3.2.5., p. 123-124).

Thanks to the broad range of international corporations established at individual institutes, PhD students have many possibilities for both shorter and longer stays abroad.

On the other hand and also due to the established international cooperations, students from universities abroad with similar study programmes are viable for this PhD programme. During the reporting period, 6 international students were admitted into the programme from countries such as China, India, Iran, Greece, or Serbia (SAR, Part III, 3.1.4., p. 114).

2.2.6. The students are closely involved with the scientific research ongoing at the institutes responsible for the study programme. According to the students, the close connection to a particular project can cause problems with financing when the project ends before the student has finished the programme (interview with PhD students during onsite visit). The content of the study programme is based on the research topics and expertise of the teaching staff. The topics of the theses (SAR, Part III, 3.2.6., p. 125) are compliant with the research and the scientific focus of the institutes. During the reporting period, 28 PhD Theses were publicly defended within the study program https://ortus.rtu.lv/science/en/publications/doctoral_thesis/.

Conclusions on this set of criteria, by specifying strengths and weaknesses

The study programme Chemistry, Materials Science and Engineering (51528) complies well with all requirements. The programme is implemented in Latvian and English. It provides the students 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. The theoretical and practical parts of the study programme are based on the current scientific developments in the field. All faculty and academic staff are involved in the implementation of the study programme. The study implementation methods contribute to the achievement of the aims and learning outcomes of the study courses and the study programme. Student-centred learning and teaching principles are considered. Students have clearly defined promotion (doctoral thesis defence) opportunities. The topics of students' final theses are relevant to the field and correspond to the study programme. Thanks to the broad range of international corporations established at individual institutes, PhD students have many possibilities for both shorter and longer stays abroad.

Strengths:

1. Students are involved in ongoing scientific projects
2. Students have excellent opportunities to gain international experience.

Weaknesses:

1. Problems with financing and chosen research topics can arise when a project ends.

Assessment of the requirement [5] (applicable only to master's or doctoral study programmes)

- 1 R5 - The study programme for obtaining a master's or doctoral degree is based on the achievements and findings of the respective field of science or field of artistic creation.

Assessment of compliance: Fully compliant

The study programme is to a high degree based on the ongoing research and knowledge of the teaching staff involved (SAR, Part III, 3.4.1, pp 131-138; SAR, Part III, 3.4.1., Figures 3.4.1.1.-3.4.1.7, p. 131-138; SAR, Annex, Biographies of the teaching staff members; SAR, Annex, Basic information on the teaching staff involved in the implementation of the study field). The faculty academic staff of the study programme is primarily involved in research areas of

chemistry, chemical technology, and materials science and a large number of national and international projects are listed in SAR (Part III, 3.2.1., p.119-120). All professors and associate professor involved in the implementation of the academic doctoral study programme "Chemistry, Materials Science and Engineering" have published scientific papers in prestigious international journals, participated in scientific conferences in their research field during the last five years, were involved in the work of editorial boards of international and Latvian scientific journals and participated in the implementation of international scientific projects (SAR, Part III, 3.4.1., p. 131; SAR, Annex, Biographies of the teaching staff members).

2.3. Resources and Provision of the Study Programme

Analysis

2.3.1. 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. All RTU infrastructure at Campus (auditoriums, classrooms, Scientific Library, portal ORTUS, Wi-Fi, canteens, cafes, etc) is available to students studying in this programme, see points 1.3.3. - 1.3.4. in analysis of Resources and Provision of the Study Field.

The academic PhD study programme "Chemistry, Materials Science and Engineering" is implemented by five FMSAC scientific institutes: Institute of Technology of Organic Chemistry; Institute of Applied Chemistry; Institute of General Chemical Engineering; Institute of Polymer Materials; and Institute of Materials and Surface Engineering. In these institutes, relevant study courses are implemented, study works, PhD thesis and research-related activities are carried out. All the mentioned institutes are engaged in the development of scientific projects, which allow to constantly renew and improve the existing scientific and technical base. Since 2013, the FMSAC has invested more than EUR 8.5 million in the renovation of buildings and more than EUR 9.5 million in the purchase of modern scientific equipment. (SAR, Part III, 3.3.1., p. 127).

The laboratory facilities are equipped with various modern analytical equipment - during the visit, experts were able to get acquainted with the range of existing equipment. In the laboratories of the Institute of Technology of Organic Chemistry was various liquid chromatography equipment (some of them equipped with mass spectrum, UV or FID detectors), two NMR units (with solution and solid state probe heads), spectrophotometers, titrators, lyophilization equipment reactors, etc. Laboratories of the Institute of Applied Chemistry had autoclaves, different spectrometers, including Raman spectrometer, liquid and gas chromatography equipment (some of them equipped with mass spectrum, UV or FID detectors), microwave synthesis workstation, etc. In the laboratories of Institute of General Chemical Engineering experts saw X-ray powder diffractometer, optical and scanning electron microscopes, stereomicroscope, different spectrometers (FT-IR, UV/VIS), synthesis and bioreactors, laboratory freeze dryer, different lab-scale process units, etc. Laboratories of the Institute of Polymer Materials had mills, extruders, molding machines, 3D printers, various thermal analysis systems, various testing machines (up to 20 and 25 kN), microscopes, etc. And in Materials and Surface Engineering laboratories experts found High temperature furnaces, mills, clay blending and extruding equipment, viscosimeter, particle size and Zeta potential analyzers, microscopes, spectrometers, porosimeters, etc. (SAR, Other Annexes - "Main research equipment.pdf").

The experts' opinion is that studying at these institutes gives students good opportunities to familiarize themselves with the latest equipment and work methods in their chosen field, as well as to gain practical experience. For sure, the material and technical provision base is good and sufficient for the implementation of the study programme.

Students have access to scientific databases, library, e-platform ORTUS. The chemistry branch of the science library is located in the FMSAC premises, which is connected to the SL central building, thus providing students with the opportunity to use the study rooms of both FMSAC and SL. The database "Chemistry", which collects mostly popular press articles on various topics of chemistry, pharmacy,

material science and technology, starting from 2014, is available in the electronic catalog, but the full-text scanned material is available only on the computers of the Chemistry branch (SAR, Part III, 3.3.1., p.128) 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 like editions of ACS, RSC, Wiley, Elsevier, Springer and the collection of journals issued in Russia. 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 (SAR, Part III, 3.3.1., p. 128). Experts have been convinced that the literature provision and databases are suitable for the implementation of the study programme. State budget grants are used for the implementation of the study program. All training for foreign students is covered by the relevant institute from scientific funding. Grants from the state budget cover teaching costs and basic infrastructure costs for laboratories for the use of premises. It should be noted that the state budget grant does not cover the wages of doctoral students who work as research assistants and/or researchers. The latter is carried out from the funds of national and international grants. Specialty chemicals and materials are also provided from research projects (SAR, Part III, 3.3.3., p. 130-131).

According to the experts, the financial security meets the conditions for the implementation of the study program and creates prerequisites for the implementation of a quality study process.

2.3.2. RTUFMSAC has good cooperation with external Latvian scientific institutes such as the Latvian Institute of Organic Synthesis, the Latvian State Institute of Wood Chemistry and the Institute of Solid State Physics. Since 2013, research work for 9 theses has been implemented in the above-mentioned institutes (SAR, Part III, 3.3.2., p. 129)

FMSAC has recruited several full-time researchers as part-time faculty members. As a result, cooperation projects have been created, which allow the use of research infrastructures in both places at RTU and the relevant scientific institute, as well as co-authorship in publications. Starting from the 4th quarter of 2021, doctoral students of the doctoral study programme "Chemistry, Materials Science and Engineering" are involved in the research employment project "Growth and Employment" (3rd round) supported by the European Social Fund (ESF). The project is implemented in close cooperation with such Latvian research institutions as the Latvian Institute of Organic Synthesis, the Latvian State Institute of Wood Chemistry, the Institute of Solid State Physics of the University of Latvia, etc. (SAR Part II, 3.3.2. p.129). Within the framework of the project, the participating doctoral students develop a task related to the topic of the doctoral thesis for 12 months at one of the RTU or external research institutions, receiving an ESF-funded employment grant. PhD students, within the framework of the BBCE project, have several opportunities to spend some time (1-12 months) on foreign mobility/training visits in countries such as Switzerland (AO Research Institute Davos), Germany (Friedrich-Alexander University Erlangen-uremberg/Johann Wolfgang Goethe University Frankfurt am Mains), France (Institute National Polytechnique de Toulouse) and in other research centers where they can gain new knowledge under the scientific guidance of world-class researchers in specific fields (SAR, Part III, 3.3.2., p.130).

Good cooperation with external scientific institutes of Latvia is the strength of the study programme.

2.3.3. The study programme is provided from the state budget. The studies of foreign students are covered by the relevant institute from the means of scientific funding (SAR, Part III, 3.3.3., p.130).

In accordance with SAR (Part III, 3.3.3., Table 3.3.3., p.130-131) it can be seen that state budget grants for the study programme have significantly decreased during the reporting period (from EUR 129,436.00 in 2013/2014 to EUR 74,617.69 in 2020/2021), but the costs per student have increased (from EUR 11,598.00 to EUR 14,773.44 accordingly).

In accordance with the SAR (Other Annexes - "On the minimal number of students in study programmes.pdf") minimum number of full-time intramural local students to ensure profitability of

the study programme for Doctoral studies is 10 students and for part-time 8 students. For full-time intramural foreign students due to the specific objective (primarily – scientific research) the minimum number of students is not defined and is evaluated on a case-by-case basis. In December of the 2021/2022 academic year, first- and second-year doctoral students of programmes "Chemistry" and "Chemical Technology" were transferred to the programme "Chemistry, Materials Science and Technologies", which is 18 students in total, if the data for 2020/2021 are taken into account.

Conclusions on this set of criteria, by specifying strengths and weaknesses

The study provision, scientific provision, informative provision (including library), material and technical provision and financial provision comply with specific features and conditions for the implementation of the study programme, create prerequisites for the achievement of the learning outcomes and indicate the possibility to ensure a high-quality study process. The study and science provision, including resources provided within the framework of cooperation with other scientific institutions and higher education institutions, meets the conditions for the implementation of the doctoral study programme and creates preconditions for achieving learning and research outcomes. The funding available to the study programme, funding sources and the use of funding ensures full implementation of the study process, the study programme has the minimum number of students to ensure the profitability of the study programme (by separately indicating the different implementation options of the study programme) and facilitates the development of the study programme. Doctoral students have excellent opportunities to develop scientific research work, which can lead to a doctoral thesis or a set of published scientific articles. There are all opportunities to acquire both the necessary theoretical knowledge in the chosen branch of science and to perform the practical, experimental part based on the development of original methods, methodologies or technologies.

Strengths:

1. Availability of material and technical base of scientific institutes for students.
2. Good cooperation with external Latvian scientific institutes.
3. Participation in EU funded grants.

Weaknesses:

None.

Assessment of the requirement [6]

- 1 R6 - Compliance of the study provision, science provision (if applicable), informative provision (including library), material and technical provision and financial provision with the conditions for the implementation of the study programme and ensuring the achievement of learning outcomes

Assessment of compliance: Fully compliant

The resources and provision of the study programme are sufficient for high-quality studies (SAR, Part III, 3.3.1., p. 127-129). Infrastructure of RTU (auditoriums, classrooms, Scientific Library, portal ORTUS, Wi-Fi, canteens, cafes, etc. see also SAR, Part II, 2.3.2. p. 48-53) is more than sufficient to ensure effective and sustainable practical lessons and laboratory work of the study programme (Site visit, SAR, Part III, 3.3.1., p. 127-129). To provide information resources for the doctoral study programme "Chemistry, Material Science and Engineering", the stocks of the Chemistry Branch of the RTU SL contains 6607 titles/8396 copies of books, most of them in English (SAR, Part III, 3.3.1., p. 127-129). E-books and scientific databases are easily accessible

using the search tool Primo, which allows you to simultaneously search for literature: In the RTU Scientific Library catalog; In the general catalog; In the subscribed and library databases (RTU website <https://www.rtu.lv/lv/studijas/biblioteka/nozaru-informacija>; SAR, Part II, 2.3.3., p. 50-53). According to the information given in SAR (Part III, 3.3.3., p. 130-131), the state budget and foreign students' tuition fee covers the teaching costs and basic infrastructure costs for the use of laboratory space, while the speciality chemicals and materials are provided by research projects.

2.4. Teaching Staff

Analysis

2.4.1. Since 2021, 9 teachers elected at RTU are directly involved in the implementation of the doctoral study programme "Chemistry, Materials Science and Engineering", of which 8 professors and one associate professor (SAR, Part III, 3.4.1., p. 131-132). Other senior researchers at FMSAC, holding expert rights of the Latvian Council of Science, are also involved in implementation of the study programme through supervising or co-supervising PhD students. All teachers involved in the implementation of the doctoral study programme "Chemistry, Materials Science and Engineering" have the appropriate knowledge and qualifications in the relevant scientific field necessary for the implementation of the study programme (SAR, Part III, 3.4.1., p. 131-138).

The absence of visiting professors from abroad participating in the implementation of the study programme should be highlighted as a certain disadvantage. According to SAR (Part III, 3.4.2., p. 138) visiting professors from abroad and industry experts will be involved in the implementation of the study programme if necessary. Considering the requirements of the doctoral study programme, this "if necessary" should be changed into permanent participation of visiting professors from abroad and experts from industry and scientific institutions. It should be point out that in SAR there is no information on how often the aforementioned happens and which of the foreign professors or experts from the industry has been involved in the implementation of the study programme so far.

RTU teaching staff involved in the implementation of the study programme meet the requirements specified in Section 55, paragraph 1, 3 of the Law on Higher Education Institutions of the Republic of Latvia. More than five persons (all 9 teachers) with a doctoral degree participate in the implementation of an academic doctoral study programme "Chemistry, Materials Science and Engineering" of which more than three persons (all 9 teachers) are experts approved by the Latvian Council of Science in the relevant sector (SAR, Part III, 3.4.1., p. 131-138). All 9 teachers are involved in the implementation of compulsory study courses of the doctoral study programme "Chemistry, Materials Science and Engineering" (Scientific seminars, Academic writing, and Original research article; SAR, Part III, 3.4.1., p. 131-138; SAR, Annexes of the doctoral study programme "Chemistry, Materials Science and Engineering" - The curriculum of the study programme and Descriptions of the study courses/ modules). Additionally, all teaching staff involved in the implementation of the study programme meet the following criteria:

compliance of the qualifications of the teaching staff with the requirements set forth in the legislation (SAR, Part III, 3.4.1., p. 131-138; SAR, Annex, Biographies of the teaching staff members), an adequate level of proficiency in Latvian and English to teach the study courses both in Latvian and in English (SAR, Annexes, Confirmation - knowledge of the state language and Confirmation - knowledge of the foreign language).

The teaching staff involved in the implementation of the study programme are experts of the Latvian State Council in various fields such as chemistry, materials science and chemical engineering (SAR, Part III, 3.4.1., p. 131-138; SAR, Annex, Biographies of the teaching staff members SAR, Annex, Basic information on the teaching staff involved in the implementation of the study field). All professors and associate professor involved in the implementation of the academic doctoral study programme "Chemistry, Materials Science and Engineering" have published scientific

papers in prestigious international journals, participated in scientific conferences in their research field during the last five years, were involved in the work of editorial boards of international and Latvian scientific journals and participated in the implementation of international scientific projects (SAR, Part III, 3.4.1., p. 131; SAR, Annex, Biographies of the teaching staff members). In addition, they have participated in methodological seminars that enable the acquisition of general competencies necessary for the effective implementation of the teaching process (SAR, Part II, 2.3.6., p. 58-60).

These ensure the implementation of the study programme to the highest standards, with the curriculum based on relevant scientific knowledge.

2.4.2. The last significant change in the composition of the academic staff involved in the implementation of the study programme, made in 2021, resulted in the introduction of new teachers who have demonstrated their scientific competence at the international level, and also increased the representation of teachers with competence in the field of physics (SAR, Part III., 3.4.2., p. 138). These changes were made based on the results of a survey of graduates, taking into account the overall renewal of the FMSAC teaching staff (SAR, Part III., 3.4.2., p. 138). In order to ensure high-quality and innovative implementation of the study programme, several criteria are used for the selection of RTU academic staff to be involved in the study programme, so that the study courses are conducted by qualified, scientifically and methodically prepared lecturers, who are professionals in the specified field of studies and use modern approaches and technologies in their work (SAR, Part II, 2.3.5., p. 56-58). Described changes are expected to have a positive impact on the quality of doctoral studies, especially when foreign visiting professors and experts from industry and scientific institutions will be involved in the implementation of the study programme (which is not the case now).

It can be stated that FMSAC is taking the necessary steps to involve new, competitive and motivated teachers in the implementation of the study programme. Visiting professors from abroad and representatives of industry and scientific institutes are currently not adequately involved in the implementation of the study programme.

2.4.3. The scientific publications and the involvement in research-related projects of the academic staff involved in the implementation of the doctoral study programmes contribute to the implementation of a high-quality doctoral study programme. The orientation of scientific research corresponds to the content of the study programme and/or study course (for example, professor of the study course Academic writing is co-author of 150 scientific papers, professor of the study course Original research article is expert of the Latvian Council of Science in the fields of chemistry and chemical engineering and co-author of more than 120 scientific publications; SAR, Part III, 3.4.1., p. 131-138; SAR, Annex, Biographies of the teaching staff members)

According to students (interview during onsite visit), PhD students are fully involved in the research projects ongoing at the institutes. Problems seem to arise when the individual projects are finished, particularly when a student is involved in a project already during MSc studies and continues on the same project during his/her PhD studies. The definition of four years for the PhD studies is in such case unfortunate.

2.4.4. All faculty teaching staff involved in the implementation of the programme are scientifically active in their respective research fields, and 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. (SAR, Part III, 3.2.2., p. 118). The faculty academic staff of the study programme is primarily involved in research areas of chemistry, chemical technology, and materials science and a large number of national and international projects are listed in SAR (Part III, 3.2.2., p.119-120). The scientific competence of the academic staff involved in the academic PhD study programme

“Chemistry, Materials Science and Engineering” 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. 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 (SAR, Part III, 3.2.2., p. 120). Each member of the academic staff in the last six years has published in peer-reviewed editions, including international editions (SAR Annex, Biographies of the teaching staff members).

2.4.5. The cooperation of the teaching staff involved in the implementation of the study programme could be divided into three parts:

cooperation of the academic staff in the development of the study programme. Study courses are composed on the basis of previously acquired knowledge and in accordance with the learning outcomes. When designing study courses for part C, teachers were informed of the content of all other courses, thus avoiding overlap in content and reducing the number of unlearned topics. General discussions on study programmes are carried out during the annual attestation of PhD students and during the preparation of the plans for the next academic year. This allows students to experience and understand the interrelation among different fields of chemistry, materials science and chemical engineering (SAR, Part III, 3.4.5., p 147),

teaching staff jointly participates in different seminars and workshops where, in addition to the exchange of experiences on maintaining different forms of teaching and transferring knowledge and competences to students, they acquire the didactic, pedagogical and psychological skills and methods necessary for further development of the study programme and achievement of learning outcomes (SAR, Part II, 2.1.5., p. 29),

analysis of the questionnaire on the performance of the academic staff was performed at the end of each academic year, examples of good practice were exchanged, and further cooperation paths were discussed. Important part of the discussion is the relevance of the assessment criteria and the course learning outcomes to the overall learning outcomes of the study programme (SAR, Part III, 3.4.5., p. 147), and

academic staff collaborate in conducting research activities which contributes to the continuous development of the study process and the scientific level of PhD students.

Additionally, assessment of learning outcomes is made by the teaching staff in accordance with the specifics of the study programme content (SAR, Anex, List of Internal Regulations, Appendix 4, Regulation on the assessment of learning outcomes, translation in english).

Student-teacher ratio of the study programme is acceptable and sustainable. According to available data, on average 5 students are distributed to one teacher (SAR, Part III, 3.4.5., p. 147).

Conclusions on this set of criteria, by indicating strengths and weaknesses

The qualification of the teaching staff members involved in the implementation of the study programme complies with the requirements specified in Section 55, paragraph 1, 3 of the Law on Higher Education Institutions of the Republic of Latvia. More than five persons (all 9 teachers) with a doctoral degree participate in the implementation of an academic doctoral study programme “Chemistry, Materials Science and Engineering” of which more than three persons (all 9 teachers) are experts approved by the Latvian Council of Science in the relevant sector. The orientation of scientific research corresponds to the content of the study programme and/or study course. The teaching staff possess an adequate level of proficiency in Latvian and English to teach the study courses both in Latvian and in English. Therefore, the achievement of the aims and learning outcomes of the study programme and the corresponding courses from the point of view of the scientific and professional competence of the teaching staff is guaranteed. New teachers who have

demonstrated their scientific competence at the international level are continuously involved in the implementation of the study programme. Also, the representation of teachers with competence in the field of physics is increased. The teaching staff is closely involved in ongoing research at their respective institutes. Each member of the academic staff in the last six years has published in peer-reviewed editions, including international editions. The good cooperation of the teaching staff in the implementation of the study programme is realized through the joint meetings and discussions, different education programmes carried out in the form of seminars and workshops, through cooperation on the scientific projects and analysis of questionnaires on the performance of the academic staff at the end of each academic year. Consequently, mechanisms for mutual cooperation of the teaching staff in the implementation of the study programme were established and these mechanisms ensure the achievement of the aims of the study programme and the interconnection of study courses within the study programme.

Strengths

1. Scientific, professional and generic competences of teachers ensure the implementation of the study programme to the highest standards, with the curriculum based on relevant scientific knowledge.
2. Renewal of academic staff involved in the study programme.
3. Good cooperation of the teaching staff during the development of the study programme and during the improvement of the teaching process based on the results of the questionnaire.
4. Acceptable and sustainable ratio student/teacher.

Weaknesses

1. Visiting professors from abroad and domestic experts from industry and other scientific institutions are insufficiently involved in the implementation of the study programme.

Assessment of the requirement [7]

- 1 R7 - Compliance of the qualification of the academic staff and visiting professors, visiting associate professors, visiting docents, visiting lecturers and visiting assistants with the conditions for the implementation of the study programme and the requirements set out in the respective regulatory enactments.

Assessment of compliance: Fully compliant

Scientific, professional and generic competences of teachers ensure the implementation of the study programme to the highest standards, with the curriculum based on relevant scientific knowledge. All RTU teaching staff involved in the implementation of the study programme meet the requirements specified in Section 55, paragraph 1, 3 of the Law on Higher Education Institutions of the Republic of Latvia. Each member of the academic staff in the last six years has published in peer-reviewed editions, including international editions (SAR Annex, Biographies of the teaching staff members). Each member of the academic staff has an adequate level of proficiency in Latvian and English to teach the study courses both in Latvian (with the exception of visiting assistant professor) and in English (SAR Annexes, Confirmation - knowledge of the state language and Confirmation - knowledge of the foreign language).

2.5. Assessment of the Compliance

Requirements

- 1 1 - The study programme complies with the State Academic Education Standard or the Professional Higher Education Standard

Assessment of compliance: Not relevant

Not applicable.

- 2 2 - The study programme complies with a valid professional standard or the requirements for the professional qualification (if there is no professional standard required for the relevant occupation) provided if the completion of the study programme leads to a professional qualification (if applicable)

Assessment of compliance: Not relevant

Not applicable.

- 3 3 - The descriptions of the study courses and the study materials have been prepared in all languages in which the study programme is implemented, and they comply with the requirements set forth in Section 561, Paragraph two and Section 562, Paragraph two of the Law on Higher Education Institutions.

Assessment of compliance: Fully compliant

The descriptions of the study courses and the study materials have been prepared in two languages - English and Latvian (SAR, Annexes for Study Program "Chemistry, Materials Science and Engineering", "Course descriptions, 51528.zip", "Studiju kursu moduļu apraksti, 51528.zip"), and they comply with the requirements set forth in Section 561, Paragraph two and Section 562, Paragraph two of the Law on Higher Education Institutions. The following information is included in the descriptions of the study courses: volume; requirements for the commencement of the acquisition of the study course; aim of the implementation of the study course; intended learning outcomes; content of the study course required for achieving the learning outcomes; calendar of the study course; mandatory and supplementary literature and other sources of information; description of the organization and tasks for the independent work of students; criteria for the assessment of the learning outcomes.

- 4 4 - The sample of the diploma to be issued for the acquisition of the study programme complies with the procedure according to which state recognised documents of higher education are issued.

Assessment of compliance: Fully compliant

After the completion of the study programme, the graduates of the study programme are awarded a doctoral degree in science (Doctor of Science Ph.D.) and a diploma. Experts conclusion - The sample of the diploma to be issued for the acquisition of the study programme complies with the procedure according to which state recognised documents of higher education are issued - complies to Regulations of Cabinet of Ministers No. 202."Kārtība, kādā izsniedz valsts atzītus augstāko izglītību apliecinošus dokumentus". (SAR, Annexes for Study Program "Chemistry, Materials Science and Engineering", "Diploms, RKDI0 (51528), LV+EN.pdf").

- 5 5 - The academic staff of the academic study programme complies with the requirements set forth in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions.

Assessment of compliance: Fully compliant

The academic staff involved in the implementation of the study programme meet the requirements specified in Section 55, paragraph 1, Clause 3 of the Law on Higher Education Institutions of the Republic of Latvia. Since 2021, 9 teachers elected at RTU are directly involved in the implementation of the doctoral study programme "Chemistry, Materials Science and Engineering", of which 8 professors and one associate professor (SAR, Part III, 3.4.1., pp. 131-138).

The academic staff of the academic doctoral study programme "Chemistry, Materials Science

and Engineering” which is approved by RTU Senate on 25 April 2022 also complies with the provisions set out in Section 55, Paragraph one, Clause three of the Law on Higher Education Institutions because more than five persons with a doctoral degree are involved in the implementation of this academic doctoral study programme and among them more than 10 experts are approved by the Latvian Council of Science. (SAR, Annexes for Study Program "Chemistry, Materials Science and Engineering", "Confirmation - on compliance of the academic staff of the doctoral study programmes.edocf").

- 6 6 - Academic study programmes provided for less than 250 full-time students may be implemented and less than five professors and associated professors of the higher education institution may be involved in the implementation of the mandatory and limited elective part of these study programmes provided that the relevant opinion of the Council for Higher Education has been received in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions.

Assessment of compliance: Fully compliant

There is decision of the Council of Higher Education to support that RTU starts implementing the doctoral study programme "Chemistry, Materials Science and Engineering", which is intended for less than 250 full-time students. (SAR, Annexes for Study Program "Chemistry, Materials Science and Engineering", "AIP Conclusion KDI0.pdf").

- 7 7 - At least five teaching staff members with a doctoral degree are among the academic staff of an academic doctoral study programme, at least three of which are experts approved by the Latvian Science Council in the respective field of science. At least five teaching staff members with a doctoral degree are among the academic staff of a professional doctoral study programme in arts (if applicable).

Assessment of compliance: Fully compliant

The academic staff of the academic doctoral study programme "Chemistry, Materials Science and Engineering" which is approved by RTU Senate on 25 April 2022 complies with the provisions set out in Section 55, Paragraph one, Clause three of the Law on Higher Education Institutions because more than five persons with a doctoral degree are involved in the implementation of this academic doctoral study programme and among them more than 10 experts are approved by the Latvian Council of Science (SAR, Annexes for Study Program "Chemistry, Materials Science and Engineering", "Confirmation - on compliance of the academic staff of the doctoral study programmes.edocf").

- 8 8 - The teaching staff members involved in the implementation of the study programme are proficient in the official language in accordance with the regulations on the level of the official language knowledge and the procedures for testing official language proficiency for performing professional duties and office duties.

Assessment of compliance: Fully compliant

The level of official language knowledge of individual academic staff members is indicated in the biographies of the teaching staff accompanying the SAR of the study programme and it complies with the Cabinet of Ministers Regulation No. 733 of 7 July 2009 "Regulations Regarding the Extent of the Knowledge of the Official Language, the Procedures for Examining the Proficiency in the Official Language and the State Fee for Examining the Proficiency in the Official Language" for performing professional and office duties. (SAR, Annex, "CV, ENG.zip").

- 9 9 - The teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of a related foreign language, if the study programme or any part thereof is to be implemented in a foreign language (if applicable).

Assessment of compliance: Fully compliant

The teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of English (SAR Annexes, Confirmation - knowledge of the state language and Confirmation - knowledge of the foreign language).

- 10 10 - The sample of the study agreement complies with the mandatory provisions to be included in the study agreement.

Assessment of compliance: Fully compliant

The sample of the study agreement complies with the mandatory provisions that are included in the study agreement and it complies with regulations of Cabinet of Ministers No. 70. "Studiju līgumā obligāti ietveramie noteikumi". (SAR, Annex, "Study_agreements.zip").

- 11 11 - The higher education institution / college has provided confirmation that students will be provided with opportunities to continue their education in another study programme or another higher education institution or college (agreement with another accredited higher education institution or college) if the implementation of the study programme is terminated.

Assessment of compliance: Fully compliant

The RTU has provided confirmation (agreement dated 07.03.2022., SAR, Annex, "Agreement.7z") that students will be provided with opportunities to continue their education in UL if the implementation of the study programme is terminated and its students are admitted to the mentioned UL doctoral study programme "Natural Sciences" (51421) in the same languages - Latvian and English.

- 12 12 - The higher education institution / college has provided confirmation that students are guaranteed compensation for losses if the study programme is not accredited or the study programme's license is revoked due to the actions (actions or omissions) of the higher education institution or college and the student does not wish to continue studies in another study programme.

Assessment of compliance: Fully compliant

The RTU has provided confirmation Nr. 01000-2.2.1-e/130 dated 26.05.2022., (SAR, Annex, "Confirmation - on compensation for losses.edoc"), that students are guaranteed compensation for losses if the study programme is not accredited or the study programme's license is revoked due to the actions (actions or omissions) of the higher education institution or college and the student does not wish to continue studies in another study programme.

- 13 13 - The joint study programmes comply with the requirements prescribed in Section 55.(1), Paragraphs one, two, and seven of the Law on Higher Education Institutions (if applicable)

Assessment of compliance: Not relevant

Not applicable.

- 14 14 - Compliance with the requirements specified in other regulatory enactments that apply to the study programme being assessed (if applicable)

Assessment of compliance: Not relevant

Not applicable.

Assessment of the requirement [8]

- 1 R8 - Compliance of the study programme with the requirements set forth in the Law on Higher Education Institutions and other regulatory enactments.

Assessment of compliance: Fully compliant

The study programme fully complies with the requirements set forth in the Law on Higher Education Institutions and other regulatory enactments.

General conclusions about the study programme, indicating the most important strengths and weaknesses of the study programme

The descriptions of the study courses and the study materials have been prepared in two languages - English and Latvian and they comply with the requirements of the Law on Higher Education Institutions. After the completion of the study programme, the graduates of the study programme are awarded a doctoral degree in science (Doctor of Science Ph.D.) and a diploma (the sample of the diploma to be issued for the acquisition of the study programme complies with the procedure according to which state recognised documents of higher education are issued). The academic staff involved in the implementation of the study programme meet the requirements specified by the Law on Higher Education Institutions of the Republic of Latvia. The study programme complies with the Study Field indicators, conditions and criteria. The level of official language knowledge of individual academic staff members is indicated in the biographies of the teaching staff accompanying the SAR of the study programme and it complies with the Cabinet of Ministers Regulation (the teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of English). The programme is in demand according to the needs of the labor market. Students are closely connected to the ongoing research and participate in scientific projects together with research teams established at the individual institutes. Through good cooperation with external Latvian scientific institutes and participation in EU funded grants, students have excellent opportunities to gain international experience.

Although this study programme deserves the highest marks according to the indicators, content, resources and teaching staff involved in its implementation, there are also certain minor shortcomings that need to be removed in the upcoming period. First of all, there is a relatively large drop-out rate, which is a feature of practically all programmes that are carried out within the Study Field. Drop-out rate requires a systematic analysis and the implementation of appropriate measures in the Study Field Development Plan. An additional disadvantage is the relatively low involvement of visiting professors from abroad and domestic experts from industry and other scientific institutions in the implementation of the study programme. Finally, students are fully dependent on ongoing projects, which could be a problem when the individual projects are finished, particularly when a student is involved in a project already during MSc studies and continues on the same project during his/her PhD study.

It can be concluded that according to all measurable criteria taken into account, this study programme can be considered excellent. Scientific, professional and generic competences of teachers ensure the implementation of the study programme to the highest standards, with the curriculum based on relevant scientific knowledge. Good cooperation of the teaching staff with partners from a broad, acceptable and sustainable ratio student/teacher and necessity of programme for the labor market are the strongest guarantees of the success of this study programme.

Evaluation of the study programme "Chemistry, Materials Science and Engineering"

Evaluation of the study programme:

Excellent

2.6. Recommendations for the Study Programme "Chemistry, Materials Science and Engineering"

Short-term recommendations

Long-term recommendations

The drop-out rate should be decreased and additional measures for it should be developed (until the next accreditation).

Visiting professors from abroad and domestic experts from industry and other scientific institutions should be more involved in the implementation of the study programme (until the next accreditation).

The conditions for the completion of the doctoral dissertation must also be ensured for those students who work on projects that end before the completion of the doctoral training (continuously).

III - Assessment of the Requirements for the Study Field and the Relevant Study Programmes

III - Assessment of the Requirements for the Study Field and the Relevant Study Programmes

Assessment of the Requirements for the Study Field

Requirements	Requirement Evaluation		Comment
R1 - Pursuant to Section 5, Paragraph 2.1 of the Law on Higher Education Institutions, the higher education institution/ college shall ensure continuous improvement, development, and efficient performance of the study field whilst implementing its internal quality assurance system:	Fully compliant		RTU has managed to establish an effective, continuous improvement type of internal quality assurance system that fulfills all its functions towards students and their satisfaction but graduates seem to be left out from the mechanism while employers are involved through internship surveys and participation in Board meetings.
R2 - Compliance of scientific research and artistic creation with the level of development of scientific research and artistic creation (if applicable)	Fully compliant		Based on the amount of published papers and the scientific merit of individual researchers according to international databases (Scopus; SAR, Part II, 2.4.1., p. 65-67, SAR Annex, Biographies of the teaching staff members), the scientific research is fully compliant with international development.

Requirements	Requirement Evaluation		Comment
R3 - The cooperation implemented within the study field with various Latvian and foreign organizations ensures the achievement of the aims of the study field.		Partially compliant	To general description of the assessment criteria for cooperation with the institutions from abroad which makes impossible to determine its fulfillment. Low outgoing mobility of teaching staff and students (SAR, Annexes, Statistical data on the incoming and outgoing mobility of the teaching staff; Statistics on outgoing student mobility of previous programmes).
R4 - Elimination of deficiencies and shortcomings identified in the previous assessment of the study field, if any, or implementation of the recommendations provided.		Partially compliant	Almost all deficiencies and shortcomings identified in the previous assessments of the study field and its study programmes have been eliminated, and the recommendations provided have been implemented. In case of non-implemented recommendations, clear explanations are given from RTU. Unfortunately, some important recommendations were not fully taken into account or not taken into account at all.

Assessment of the Requirements for the Relevant Study Programmes of the Study Field

No.	Study programme	R5	R6	R7	R8	Evaluation of the study programme (excellent, good, average, poor)
1	Biotechnology and Bioengineering (43421)	Not relevant	Fully compliant	Fully compliant	Fully compliant	Excellent
2	Chemistry and Chemical Technology (43528)	Not relevant	Fully compliant	Fully compliant	Fully compliant	Excellent

No.	Study programme	R5	R6	R7	R8	Evaluation of the study programme (excellent, good, average, poor)
3	Chemistry and Chemical Technology (45528)	Fully compliant	Fully compliant	Fully compliant	Fully compliant	Excellent
4	Industrial Pharmacy (46725)	Not relevant	Fully compliant	Fully compliant	Partially compliant	Excellent
5	Chemistry, Materials Science and Engineering (51528)	Fully compliant	Fully compliant	Fully compliant	Fully compliant	Excellent

The Dissenting Opinions of the Experts

None.