

# Expert group joint opinion

Evaluation Procedure: Assessment of Study Field

Higher Education Institution: Daugavpils University

Study field: Chemistry, Chemistry Technologies, and Biotechnology

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

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Within the study field Chemistry, Chemical Technology and Biotechnology (Study field), Daugavpils University (DU) offers two study programmes, the Academic Bachelor's Study Programme (BSP) in Chemistry and the Academic Master's Study Programme (MSP) in Chemistry. There is a clear and logical connection between these study programmes. The enrollment requirements for both study programmes are clear, and the assessment of student performance includes methods and procedures that are logical, effective and publicly accessible. DU has a well-functioning quality assurance system in place, although it has minor shortcomings.

As fundamental challenges in the further development of the Study field and study programmes, the outdated strategy of DU should be highlighted, which results in the Study field and study programmes not being aligned with the main directions of DU's new strategic development; an inadequate SWOT analysis that did not take into account the main shortcomings of Study field such as the questionable organizational sustainability, the insufficient number of academic staff (especially with PhD degree in chemistry) and the lack of appropriate lifelong learning programmes; an inappropriate management structure for sufficient, effective and objective decision-making; the lack of appropriate software to detect plagiarism in English theses/scientific papers; an insufficient frequency of surveys among students, graduates and employers.

Teaching staff work in the field of chemistry and publish in scientific journals closely related to their scientific interests in different areas of chemistry. The number of teaching staff participating in international scientific projects is relatively low. In view of the relatively low level of scientific cooperation with national and foreign institutions and the low level of participation in congresses with invited and plenary lectures as well as the almost complete lack of longer mobilities, it is clear that the area of internationalization and cooperation needs to be significantly improved. Added to this is the insufficient involvement of students in research projects and the corresponding dissemination of research results in which students are involved.

One of the main reasons for the insufficient cooperation and internationalization and thus for the relatively low scientific productivity is probably the aforementioned insufficient number of chemistry teaching staff with PhD in chemistry. One of the most important measures to improve all conditions in the Study field is therefore the creation of new permanent teaching positions for persons with a PhD degree in chemistry.

Unfortunately, in the time since the last accreditation, the opportunity to implement the recommendations made at that time has not been fully taken. In addition to the core problem of the low number of PhD chemists already mentioned, the opportunity to increase the mobility of students and staff (especially in the long term) by developing English-language study programmes/learning modules has also been missed.

In general, mobility is another key disadvantage that has not improved since the last accreditation and that continues to weigh on the development of Study field (and study programmes).

Both study programmes are up to date and based on the guidelines developed by the European Chemistry Thematic Network (ECTN). The BSP Chemistry fully complies with the State Education Standard, the requirements of the Law on Higher Education Institutions and other legal regulations, as well as the requirements of the Study field. The only shortcoming is the lack of elective study courses (Part C), as only one study course is offered at a time.

On the other hand, the MSP Chemistry partially meets the State Education Standard, the requirements of the Law on Higher Education Institutions and other legal regulations, and the requirements of the Study field, as it does not have a sufficient number of fully employed professors and associate professors necessary to deliver the study programme. In addition, the MSP Chemistry does not have a sufficient number of elective study courses (Part C) for students to choose from

within this portion of the study programme.

## **I - Assessment of the Study Field**

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#### **1.1 Management of the Study Field**

##### **Analysis**

1.1.1. The aims of the Study field are clearly defined and attainable. At the DU there are currently only two study programmes in the Study field, the BSP Chemistry and the MSP Chemistry (SAR, Part 2, Chapter 2.1., p. 15). In view of the fact that there are two study programmes in the Study field, the purpose of the Study field must be broader, since the study programmes that make it up are intended to ensure the continuation of higher education at the doctoral level (and not only at the master's degree level, as is now stated in SAR - Part 2, Chapter 2.1.1., p. 14). SAR's assertion that DU study programmes, which are an integral part of the Study field, makes a significant contribution to the training of qualified professionals in the field of chemistry, chemical technology and biotechnology is also false. It is clear from the curriculum of the both study programmes (SAR, Annexes of the BSP and MSP, The curriculum of the study programme) and the descriptions of the study courses (SAR, Annexes of the BSP and MSP, The descriptions of the study courses) that the study programmes conducted in the Study field can only train professionals in the field of chemistry. Regardless of the fact that, according to the SAR, both study programmes are in line with the DU strategy and the medium-term goals stated there (SAR, Part 2, Chapter 2.1.1., p. 14), it should be noted that the strategy stated in the SAR is outdated (valid for the period 2015-2020) and as such has been extended until the start of the new approved strategy (2023), which has not yet been adopted at this time (SAR, Part 1, Chapter 1.1., p. 6). Therefore, after the adoption of the new DU strategy, it is necessary to align the Study field and study programmes with the main directions of the new strategic development of the DU.

Both study programmes are aligned with national level planning documents such as "Latvia's sustainable development strategy until 2030", "National Development Plan 2021-2027" and "Environmental Policy Guidelines 2021-2027". In addition, both study programmes with their subfields are aimed at the use of renewable (energy) sources and applied bioanalytics, which is in line with the European Commission's strategic guidelines aimed at environmental protection and prevention of climate change, focusing on the use of renewable energy sources.

It should be highlighted that the BSP Chemistry provides all the necessary skills and competencies for continuing higher education in the MSP Chemistry.

1.1.2. All weaknesses, risks, opportunities and threats in relation to the Study field and the study programmes were examined in more detail in the SWOT analysis (SAR, Part 2, Chapter 2.2.2, pp. 15-17). Weaknesses related to the small number of study programmes and associated risks related to the questionable economic and organizational sustainability of study programmes with such a small number of students are not included. Similarly, the insufficient number of academic staff needed to deliver study courses was not identified as a weakness, as part of the teaching staff is involved in the delivery of a large number of study courses, which can also affect the delivery of study courses when teaching staff are absent, i.e. it prevents the teaching staff concerned from attending congresses, participating in longer (any) outgoing mobility, but also from performing other tasks, such as scientific work or collaborating with industry partners on professional projects. Another weakness that was not considered in the SWOT analysis is the insufficient number of teaching staff with PhD in the field of chemistry. According to the available data (SAR, Annexes, Biographies of the teaching staff members), only two assistant professors and one associate professor have a PhD in chemistry. Finally, the complete lack of appropriate lifelong learning

programmes is not recognized as either a weakness or an opportunity, and the development of these programmes should definitely be dedicated to the future.

Plan for the Development of the Study field (SAR, Mandatory Annexes, Plan for the development of the study field) exists and has been adopted for a six-year period (2023-2029). In the Plan for the development of the Study field it is necessary to (i) include the continuous development of the transversal competences of teachers and students, especially with regard to the knowledge of the English language, (ii) develop measures to increase the number of domestic students enrolled in both study programmes, (iii) develop new study programmes, whereby as a first step the number of study courses in English should be increased in order to increase the attractiveness of the study programmes with regard to attracting foreign students, (iv) involve employers and alumni in the further development of existing (and new) study programmes, and (v) develop new lifelong learning programmes.

Finally, the SWOT analysis and Plan for the Development of the Study field should be aligned with the new DU strategy once it has been approved by the Ministry of Education and Science.

1.1.3. The management structure of the Study field and corresponding study programmes is carried out following the corresponding legal framework, primarily Constitution of the DU, Law on Higher Education Institutions, and Regulations on the state standard of academic education (SAR, Part 2, Chapter 2.1.3, pp. 18-19). DU Study Council, the Council of Faculty of Natural Sciences and Health Care (DVAF), the Department of Environment and Technology and the Study Field Council are in charge of the management of the Study field and corresponding study programmes.

Director of the Study field and director of the study programmes are key positions that ensure the organization and coordination of the implementation of the study programmes and ensure the quality of the delivery of the study programmes in consultation with all stakeholders, including students, teachers and administrative staff. The directors prepare the annual self-assessment report for the Study field in such a way that they collect and evaluate all available information related to the implementation of the study programmes, including the results of student surveys. The collection of all necessary data related to the delivery of the study programme, including information on students, exams, final exams, lectures, preparation of diplomas and diploma supplements, is done by the DU Students Service Center (SSC) administrative staff using the DU Information System (DUIS). Students, teachers, and Study field and study programme directors are supported with information by the DU SSC specialists.

All changes related to study programmes based on surveys, student interviews and performance indicators of the teachers proposed by the director of Study field and the directors of study programmes are discussed at the level of the Study Field Council and presented to the DU Study Council for approval.

Based on discussions with the rector and vice-rector of DU, the director of the Study field and study programmes, the teaching staff, the person responsible for the quality assurance system and the students (corresponding meetings carried out during on-site visit, January 29 and 30, 2024), experts believe that the Study field and corresponding study programmes are managed in an efficient and structured manner, the roles of all stakeholders in this process are clear, and the support provided by the administrative staff and the relevant platform (DUIS) used to collect all relevant data on study programmes, students and teachers, is adequate to the needs. The only drawback is the fact that the director of the Study field and the study programmes is one and the same person, so while his work can be given high marks (highlighting the opinion of the students expressed in the on-site meetings with the students, January 30, 2024), it is clear that this type of solution is not organizationally appropriate and in the case of a prolonged absence of this person can lead to numerous problems and challenges. In extreme situations, it can lead to subjectivity and irrationality in decisions that are important for the development of Study field and corresponding study programmes. In addition, the current director of the Study field and the study programmes has a

high teaching load, he is actively involved in scientific research and cooperation with other institutions, which according to the experts makes his position even more unfavorable and difficult. Therefore, it is necessary to take measures in the shortest possible time to include at least one more person in these two key positions for the management of the Study field and the corresponding study programmes, either as a Study field director or as study programme(s) director.

1.1.4. The DU Senate approves the “DU admission process”, the enrollment fee, the tuition fees in study programmes and the number of study places for admission. Admission to DU study programmes is handled by the DU Admission Commission which determines and approves the results of the admissions process and approves and distributes admission places if needed (SAR, Part 2, Chapter 2.1.4., p. 20). The responsibilities of DU Admission Commission are publicly available through DU website (<https://du.lv/gribu-studet/uznemsana/>).

As stated previously, Admission rules (described in “Admission rules for full-time and part-time undergraduate studies” and “Admission rules for full-time and part-time higher level studies”) for students of the both study programmes are developed, approved annually by the DU Senate and available for the graduates of secondary schools and graduates of bachelor study programmes through DU website. Admission rules are in accordance with Law on Higher Education Institutions and adopted to the different study levels (SAR, Part 2, Chapter 2.1.4., p. 19).

Admission to the bachelor’s study programme is competitive and based on the results of the centralized examinations and grades achieved during the secondary education. Exceptions are persons received secondary education before 2004, persons received secondary education abroad, persons with special needs or persons not taking centralized exams according to the procedures specified in the regulatory acts. Particularly successful candidates who have achieved remarkable success in the Republic of Latvia or international competitions, in the DU scientific work for students "On the way to science" in the field of chemistry, and candidates who have achieved exceptional success in the open competition for scientific work in biology and chemistry, exercise the right to direct enrollment in full-time budget places for BSP Chemistry (SAR, Part 2, Chapter 2.1.4., pp. 19-20).

To enroll in MSP Chemistry, applicants must have an academic bachelor's degree in chemistry or higher professional or equivalent education in the field of chemistry. Applicants who have completed a bachelor's degree or have completed second-level higher professional or equivalent education in other fields may also enroll in MSP Chemistry, in which case their application will be reviewed by the DU Admissions Committee In consultation with the study programme director, such a candidate may earn up to 10 additional credit points (CP) in the first year of study, which will provide the necessary knowledge in the field of chemistry for further study (SAR, Part 2, Chapter 2.1.4., p. 20).

The procedures to be followed in case of appeals against the decisions of the DU Admissions Committee have also been developed (available in Latvian on the DU website). In addition, all issues related to admissions can be discussed via DU's social media.

Procedures for the recognition of previously acquired education are also being developed and are publicly available on the DU website (in Latvian). Over the last seven years, the procedure for recognition of prior learning has been carried out for seven students (6 in BSP Chemistry and 1 in MSP Chemistry) who had started their earlier education at other institutions in Latvia (University of Latvia and Riga Technical University) (SAR, Part 2, Chapter 2.1.4., p. 21). These procedures take into account the applicant's study period, professional experience and previous formal and informal education in the area covered by the Study field.

In the event of the termination of study programmes in the Study field, DU has concluded two agreements with the University of Latvia, which allow students to continue their education at this institution in corresponding study programmes (SAR, Annexes, A document certifying that the higher education institution or college will provide students with opportunities to continue their education in another study programme or another higher education institution/college if the implementation of

the study programme is terminated). The mutual rights and obligations of DU and students are set out in the relevant contract (SAR, Annexes, Standard sample of study agreement). There is also a declaration in which DU undertakes to compensate the student for any losses incurred if the studies are discontinued (if the study programme is not accredited or study programme license is revoked) and there is no possibility of continuing the studies in the desired study programme (SAR, Annexes, A document certifying that the higher education institution or college guarantees compensation for losses to students if the study programme is not accredited or the study programme license is revoked due to actions (actions or omissions) of the higher education institution or college and the student does not wish to continue studies in another study programme).

Procedures for the assessment of students' achievements and learning outcomes are publicly available through DU webpage and described in detail in the "Regulations on studies at Daugavpils University" (SAR, Part 2, 2.1.5., pp. 22-23). In addition, the assessment of student's achievements and learning outcomes is explained by the teaching staff for each study course at the beginning of the semester and discussed with the students (SAR, Part 2, 2.1.5., pp. 22-23). Students have the opportunity to express their opinions on the assessment methods in direct contact with the teaching staff, study programme director, Study field director and the student representatives in the Student Council (SAR, Part 3, 3.2.2, pp. 72-73).

According to the experts, all procedures for the admission of students, 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, are developed, they are logical and effective, and the involved stakeholders (students, teaching and administrative staff) are informed.

1.1.5. Assessment methods, principles and procedures for the assessment of student performance are developed for the Study field and described in detail in the "Regulations on studies at Daugavpils University" (available on DU webpage). Various methods such as tests, colloquia, written and oral examinations, reports and presentations are used to assess students. Ex-cathedra lectures and laboratory work are the main forms of study programme delivery (SAR, Part 2, 2.1.5., pp. 22-23). Further discussions with the director of the Study field and study programmes, the teaching staff, the person responsible for the quality assurance system and the students (corresponding meetings carried out during on-site visit, January 29 and 30, 2024), indicate that modern teaching techniques such as design thinking and flipped learning, which should be introduced due to the small number of students and the insufficient number of teaching staff (especially those with PhD in chemistry), are not used in the higher extent.

Two types of assessments have been used, formative and summative. Summative assessments are more widely used and include various forms of assessment such as homework, tests, reports and presentations that are carried out continuously throughout the semester. These forms of assessment are appropriately taken into account when forming the final grade, although the final examination grade cannot account for 100% of the final grade. The final examination takes place at the end of the semester and can be oral and/or written. The assessment methods are communicated to the students in the description of each study course (SAR, Study Programmes Annexes, Descriptions of the study courses/ modules for BSP Chemistry; Descriptions of the study courses/ modules MSP Chemistry) and are available in DUIS. In addition, lecturers present the assessment methods to students at the beginning of the study course, along with other information about the study course.

The way in which the examination is conducted is determined by the teaching staff, taking into account the specific features of the study course and the results to be achieved by the students. In addition, the results of student surveys and the success of the students in the examination are also taken into account when determining the form of assessment. If the form of assessment needs to be changed, the same principle is applied as when changing the content of the study course. After discussion and approval by the DVAF Council, the changes are submitted to the Study Council of DU

for approval (SAR, Part 2, 2.1.5., pp. 22-23).

In the opinion of the experts, the assessment of students' achievements and the assessment methods and procedures are developed, clear and comprehensible, previously published and accessible to all stakeholders.

1.1.6. The assessment of the principles of academic integrity and the mechanisms for compliance with these principles are described in the guidelines for the ethical behaviour of employees and students of the DU - "Ethical Code of Daugavpils University Employees and Students" (Ethical Code). The Ethical Code is publicly available in Latvian on the DU website (<https://ieej.lv/F8WUA>) (SAR, Part 2, 2.1.6., p. 23).

Additionally, study programmes of Study field follow the principles of academic honesty in accordance with "Regulations on studies at Daugavpils University" (available on DU website). For example, students who take unauthorized help in the examination, or plagiarism in their theses is found, will be suspended, the examination will be affected, and the above incidents will be recorded in the DUIS system.

In addition, DU has developed and applies procedures to control possible plagiarism in the thesis. The procedure includes the mandatory submission of the electronic version of the thesis and its storage in the DUIS system. All theses are checked for possible plagiarism before the defense. The PlagLV software is used for this purpose, which compares the thesis with the theses defended in previous years. If possible plagiarism is detected, the dean appoints a committee of experts to examine the plagiarism. The committee of experts should submit its report to the dean for review within three working days (SAR, Part 2, 2.1.6., p. 24).

According to the experts, the principles of academic integrity and the mechanisms for upholding them should be further developed. For English-language theses, which will certainly be the case in the near future as part of the further development of DU, one should consider using additional tools that enable plagiarism checking. This includes the possibility of comparing theses with all texts available in English (including scientific papers, books, conference proceedings, but also theses of all kinds from different universities worldwide). In addition, this software can be used to detect plagiarism in writing of scientific papers by students and teaching staff.

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

Conclusions:

The aims of the Study field are clearly defined and achievable. Study field consists of only two study programmes, BSP Chemistry and MSP Chemistry. Although they are in line with the DU strategy and the medium-term goals stated therein, the strategy is outdated. Therefore, the Study field and the study programmes should be adapted to the main directions of DU's new strategic development. Both study programmes are based on the planning documents at national level and on the strategic guidelines of the European Commission on environmental protection and climate change prevention. The BSP Chemistry provides all the necessary skills and competencies for further higher education in the MSP Chemistry. The SWOT analysis and Plan for the Development of the Study field should be aligned with the new DU strategy once it is approved. Weaknesses related to the small number of study programmes, to the questionable economic and organizational sustainability of study programmes, the insufficient number of academic staff needed to deliver study courses, the insufficient number of teaching staff with PhD in chemistry, and the complete lack of appropriate lifelong learning programmes are not identified as weaknesses or risks (or opportunities). Therefore, the SWOT analysis should be completely rewritten. Although the management structure is focused on the development of the Study field and study programmes and the administrative and technical staff provides adequate support, the decision-making is not sufficient and efficient. The director of the Study field and the study programmes is one and the same person and this type of management

structure is not organizationally appropriate and can lead to many problems and challenges in case of a prolonged absence of this person. According to the experts, all procedures for the admission of students, for the recognition of study time, professional experience, prior formal and non-formal education and for the assessment of students' achievements and learning outcomes are developed, they are logical and effective, and the stakeholders involved (students, teaching and administrative staff) are informed. The assessment of students' achievements and the assessment methods and procedures are developed, clear and comprehensible, have been previously published and are accessible to all stakeholders. The principles of academic integrity and the mechanisms to uphold them are developed and applied, but need to be expanded in the part related to the use of appropriate software that can be used to detect possible plagiarism in English language theses/papers.

#### Strengths:

- 1) The clear and logical link between the BSP and MSP study programme;
- 2) Developed, logical, effective and publicly accessible student admission procedures;
- 3) Developed, clear, comprehensible and publicly accessible assessment of students' achievements with appropriate methods and procedures.

#### Weaknesses:

- 1) Outdated DU strategy, the Study field and study programmes are not aligned with the main directions of DU's new strategic development;
- 2) Inappropriate SWOT analysis, which should be rewritten taking into account the small number of study programmes and their questionable economic and organizational sustainability, the insufficient number of academic staff (especially PhD chemists) and the lack of appropriate lifelong learning programmes;
- 3) Inappropriate management structure for sufficient, effective and objective decision making; the position of the Study field director and study programmes director should be distributed among more people;
- 4) Lack of modern teaching techniques such as design thinking and flipped learning;
- 5) Lack of suitable software to detect plagiarism in English theses/scientific papers.

## **1.2. Efficiency of the Internal Quality Assurance System**

### **Analysis**

1.2.1. The DU has established an Internal quality assurance policy for studies at DU, which is outlined both in the SAR (Part 1, 1.3., p. 9) and during onsite visit and meetings with higher education institution (HEI) management and the group responsible for the preparation of the Self-Assessment Report and Quality Assurance (QA) system (January 29, 2024). The Internal quality assurance policy of studies at DU when checked is available for access on the website of the DU as well (see: <https://du.lv/par-mums/dokumenti/>). On the SAR (Part 1, 1.3., p. 9) the University outlined that the Internal quality assurance policy of studies at DU has been elaborated in accordance with The Standards and guidelines for quality assurance in the European Higher Education Area (ESG), "Daugavpils University development strategy for 2015 – 2020" and other national regulations and inner normative acts. Overall, the policy promotes the achievement of the aims and learning outcomes, indicating the need for developing student-oriented study programmes and involving all stakeholders in quality assessment. However, during the onsite meeting with HEI management (January 29, 2024), management stated that a new strategy for DU has been developed and is currently in the process of approval. Based on this fact, it can be concluded that the Internal quality assurance policy of studies at DU will also need to be revised according to the new strategy after its



approval and currently is based on an outdated strategy. On the SAR (Part 1, 1.3., pp. 9-10) the DU also outlined that they have improved and updated existing normative documents and procedures as a part of the ESF project and all these documents are available from the DU internal network in Latvian, for instance, "DU Study Quality Policy and Study Quality Monitoring Strategy" and "Procedures for Ensuring the Effectiveness of DU Study Internal Quality Assurance System".

Regarding the development and maintenance of the quality assurance system, all the necessary quality-ensuring instruments are in place and are implemented within the process. For instance, the DU organizes surveys for students, graduates, and employers. Furthermore, DU has established Study direction council, whose main purpose according to SAR (Part 1, 1.3., p. 11) is to assess the process of studies within a study programme, and its outcomes, and propose to the head of the study direction and study programme directors measures for the study programme improvement and integration of recent ideas in the study content and process. The overall management of the Study field is provided by the DU Study Council, the resolution of specific issues is under the responsibility of the Council of the Faculty of Natural Sciences and Health Care (DVAF), the Department of Environment and Technology, and the Council of the Study field (SAR, Part 2, 2.1.3., p. 18). During on-site meetings (January 29, 2024), HEI management, responsible for the QA system, and the director of Study field and study programmes were asked about the system established regarding continuous improvement, development, and efficient performance of the Study field in the existing study programmes. Responsible for the QA system outlined that only 50-60% of students fill out annual surveys. Based on these surveys conducted and the feedback provided, changes within the study programmes are made according to the recommendations received. However, during the on-site visit, the Study field and study programmes director also outlined that mostly he receives feedback, complaints, and recommendations from students on one-to-one conversations, phone calls, and emails. These recommendations are reviewed by the Study field and study programmes director. During the on-site visit, the role of the Study field Council was not clear. After the visit, in additional questions, DU stated that the Study field Council meeting is held twice a semester and the last recommendation from the Study field Council meeting was to expand the range of books on the subject of chemistry with nine new books (SAR, AIC coordinator added annexes: Answers to Q8\_Study Field Council.docx). Overall it can be concluded that the processes of the DU quality assurance system are well developed and clear, however, the experts did not gain confidence that these processes are qualitatively implemented and fulfilled in real life.

1.2.2. All of the groups - students, employers, and graduates - are involved in the feedback mechanism. During the on-site visit, responsible for the QA system outlined that student surveys for bachelor first-year students are performed twice an academic year. After the first study year (including master studies) surveys are conducted once per academic year. Student surveys are performed electronically (see: <https://aptaujas.du.lv/index.php/253299/lang-lv>). Surveys for employers are conducted once per six years. The last survey was performed in 2023 and 7 employers participated in it, according to additional information given by the QA system responsible after the on-site visit (SAR, AIC coordinator added annexes: During visit\_Questions 2-6.docx). However, during on-site meeting (January 30, 2024), employers indicated that their surveys usually happen after students have done their internships at the specific laboratory. Then they provide personal feedback on the student, the skills, knowledge, and overall performance and growth during the internship. Regarding general surveys done once per six years, none of the employers who participated in the on-site meeting had participated in the general survey for employers. Employer surveys are also conducted electronically and an example of the survey is available here - <https://aptaujas.du.lv/index.php/544412>. Graduates are also involved in the feedback mechanism. Surveys for graduates are performed once per six years. The last survey was performed in 2023 and 23 bachelor study programme and 4 master study programme graduates participated in it, according to additional information given by the QA system responsible after the on-site visit (SAR,

AIC coordinator added annexes:: During visit\_Questions 2-6.docx). Graduate surveys are available here - <https://aptaujas.du.lv/index.php/764263/lang-lv>. In case of proposals, suggestions, and recommendations by the involved groups, they are reviewed and addressed by the Study field and study programmes director. During the onsite visit, the Study field and study programmes director was asked to name the last changes made to the study programmes based on student feedback. Unfortunately, the director could not name the last changes and stated that the changes are not necessary at this time.

During the meeting with HEI management (January 29, 2024), management stated that there are also student surveys organized by the Student Council each semester. Results from the Student Council surveys are presented to HEI management and faculty deans. Afterwards, deans communicate this information to the study programme directors involved.

Overall, it can be stated that the existing feedback mechanisms are logical, but only partially effective. All of the stakeholders – employers, graduates, and students – are involved in the feedback mechanisms. However, employers and graduates give feedback only once per six years and students once per academic year and only 50-60% of students fill out annual surveys.

1.2.3. There is a mechanism in place for the submission of student complaints and suggestions. As indicated during on-site meetings, there is an opportunity for students to submit any proposals or complaints to the Study field and study programme director. There are various forms of how students can submit their thoughts – in written form, orally, or in electronic form. Students can also choose whether they feel comfortable enough to reach out in person or submit these complaints anonymously through DU website (see: <https://du.lv/en/about-us/study-quality-assessment-centre/>). Additionally, the Student Council can represent the students regarding the complaint submitted and participate in the review process. During on-site meetings with students and the Study field and study programmes director, they indicated that the formal procedure is rarely used as students are a small number and it is easier for them to freely approach academic staff, and the Study field and study programmes director in case of problems both personal and related to studies. If the person delivers the complaint directly, the approach is straightforward and open. The student comes to the Study field and study programme director and informs them of the specific situation and tries to resolve it right away. In the case of anonymous submissions that are delivered electronically, the procedure is a bit longer. As indicated in SAR (Part 2, 2.2.3., p. 28), students can fill out a trust questionnaire created by the Student Council (see: <https://ej.uz/1jgg>) or submit complaints and proposals on the DU website (see: <https://du.lv/en/about-us/study-quality-assessment-centre/>). During onsite visit, both – the Study field and study programmes director and students – indicated that students are aware that they can approach the Study field and study programmes director any time to give feedback, and ask for help and assistance if needed.

Overall, students are aware that they can submit proposals and complaints that arise during their study process. For instance, during the on-site visit one student mentioned that he used this opportunity to approach the Study field and study programmes director regarding additional exam times due to personal reasons. In cases of individual complaints received, students receive direct answers and are involved in the process of resolution of the situation so that the issue arising is addressed correctly and any problems within the process are not left behind unaddressed. So, it can be concluded that the feedback of the outcome is also provided to the parties involved.

1.2.4. During the on-site meeting, DUIS system was presented (January 29, 2024), which holds statistical data and information on study programmes, students, and academic staff members. The system is accessible only from DU's inner network. According to SAR (Part 2, 2.2.1., p. 25), at the end of the study year, academic staff add their data to the DUIS and discuss the year's results and directions for improvement in discussions with the director of the Study field and study programmes. The DU has a mechanism in place to obtain the necessary information from the students regarding

various processes to ensure that the quality of the studies is good and that every shortcoming is eliminated. As mentioned above in Parts 1.2.1. and 1.2.2., the main tool of QA in DU are various surveys and feedback gained from students, graduates, and employers that are conducted to monitor the quality of study courses and the study process. The results obtained during surveys are analyzed and discussed at the meetings of the Study Field Council. The information obtained is passed on to the director of Study field and study programmes and the academic staff implementing the study programme. Evaluating the quality of the study programmes of the study field and certain study courses provides for deciding on necessary changes in the content of the study courses or the organization of the study process. The data gained in surveys are collected in the DU survey system. All the summaries of surveys of students, graduates, and employers are available under SAR Annexes (Analysis of the results of surveys of students, graduates and employers). However, during on-site meetings, it was not clear where the information on the survey results was seen and provided for students.

1.2.5. The DU has its official website (see: <https://du.lv/>). It includes the necessary information for students, lecturers, potential students, and other stakeholders. The DU website includes an in-depth outlook for the interested potential students for all of the study programmes. The information is provided both in Latvian and English and can be accessed here:

Bachelor	study	programme	"Chemistry"	(43441)	-
<a href="https://du.lv/studijas/studiju-programmas/akademiska-bakalaura-studijas/kimija/">https://du.lv/studijas/studiju-programmas/akademiska-bakalaura-studijas/kimija/</a>					
Master	study	programme	"Chemistry"	(45441)	-
<a href="https://du.lv/studijas/studiju-programmas/akademiska-magistra-studijas/kimija/">https://du.lv/studijas/studiju-programmas/akademiska-magistra-studijas/kimija/</a>					

Additionally, DU has an e-study Moodle environment. Students and academic staff use Moodle e-environment as the platform for the exchange of information and communication. In Moodle, students can also see changes in study course schedules, exam plans, and other necessary types of information. Every student and academic personnel have their Moodle login and password. Information is also available on the VIIS official register (see: [https://www.viis.gov.lv/registri/izglitibas\\_programmas](https://www.viis.gov.lv/registri/izglitibas_programmas)) and the provided information is in correspondence with the information provided on the website and E-platform.

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

### **Conclusions:**

The DU has established a well-functioning quality-assurance system, however, regarding the evaluated Study field it is only partially effective. The DU has an Internal quality assurance policy and it is available for all stakeholders. There is a Moodle e-environment in place where all the necessary information is being provided for an effective study process. Students, graduates, and employers are all involved in QA. Student surveys are conducted only once per academic year, however, student suggestions and recommendations are taken into account. Information regarding study courses and study programmes offered and their detailed descriptions are accessible on the website of the DU. There is a complaint/suggestion system in place where students can express their concerns or problems freely.

### **Strengths:**

- 1) Publicly available Internal quality assurance policy and information regarding study courses and study programmes offered and detailed descriptions for all stakeholders;
- 2) Student, graduate, and employers surveys are conducted;
- 3) Complaint and suggestion mechanism is in place;
- 4) Student suggestions are taken into consideration.

Weaknesses:

- 1) Internal quality assurance policy is based on outdated DU strategy;
- 2) Student surveys are conducted only once per academic year;
- 3) Graduates and employers surveys are conducted only once per six years;
- 4) It is not exactly clear where the information of the survey results is seen and provided for students;
- 5) Unclear role of the Study field Council in the Quality Assurance System of study quality.

**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:** Partially compliant

It is not clear where students, graduates and employers receive a summary of feedback on the results of the surveys they have participated in. During onsite meetings, the responsible for the QA system outlined that only half of the students participates in surveys.

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

**Assessment of compliance:** Partially compliant

Policy and procedures are developed and accessible (SAR, Part 1, 1.3., pp. 9-10). However, it is important to note that Policy is based on an outdated DU strategy.

- 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:** Partially compliant

In accordance with the "Regulation on Studies at Daugavpils University" (see: <https://du.lv/par-mums/dokumenti/>) and "Regulations on Opening and Managing Daugavpils University Study Directions and Study Programmes" (see: <https://du.lv/par-mums/dokumenti/>) available in Latvian there are established mechanisms for the development, internal approving of study programmes, their monitoring and periodic examination. However, there is a very unclear role of the Study field Council in the Quality Assurance system.

- 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

"Regulation on Studies at Daugavpils University" (see: <https://du.lv/en/about-us/documents/>) and study course descriptions of each study programme state the criteria, conditions, and procedures of the assessment of student's academic performance that attests to reaching the intended outcomes of studies. The Regulation and study course descriptions are freely available to students. Students have an opportunity to give proposals for the criteria, conditions, and procedures of the assessment of students' academic performance in surveys.

- 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

The DU has elaborated internal normative acts and mechanisms that regulate the ensuring of the qualification and work quality of the academic staff - "Regulation on elections to academic positions in Daugavpils University" (provided additionally after the on-site visit, SAR, AIC coordinator added annexes, visit\_Nolikums-par-velesanam-akademiskajos-amatos-DU\_APSTIPRINATAIS.pdf). The self-assessment report includes the results of surveys. However, the academic staff did not mention any mentorship activities of the new staff and there is no evaluation process for academic staff and researchers satisfaction rate.

- 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:** Partially compliant

Surveys of students, alumni, and employers are performed. However, student surveys are conducted only once per academic year, and graduates and employer surveys - only once per six years. In the onsite meeting, employer representatives outlined that they do not have any information about these surveys performed once per six years. There is regular cooperation with the Student Council, exchange of opinions, and examination of proposals.

- 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:** Partially compliant

DU study quality management system observes compliance with ISO 9001:2017 quality standards (SAR, Part 1, 1.3., p. 9). Compliance with this standard testifies to the fact that DU tends to the quality of its education services by maintaining a quality management system. However, some elements of the system won't work properly (e.g. Study field Council).

### 1.3. Resources and Provision of the Study Field

#### Analysis

1.3.1 The main sources of funding for the implementation of the Study field and the BSP and MSP Chemistry are state budget funds and tuition fees. DU's Department of Finance and Accounting is responsible for calculating the cost of the implementation of study programmes per student based on all relevant income and costs (SAR, Part 2, 2.3.1., p. 32). Students have the opportunity to apply for a reduction in tuition fees via the relevant procedure (available through DU webpage).

Funds financed by the Ministry of Education and Science are available for the development of science. These funds are allocated to the academics of the DU on the basis of an evaluation procedure that takes into account scientific achievements and other performance indicators (SAR, HEI Other Annexes Procedure for evaluating the effectiveness of the academic staff of the University of Daugavpils). In order to motivate the academic staff of the DU to publish scientific papers in journals cited in the Web of Science and Scopus databases, two procedures have been developed, one of which is used to pay royalties based on the number of published papers (SAR, HEI Other Annexes Procedure for reimbursement of scientific publications and monographs of DU academic staff) and the other is based on the Hirsch index (SAR, HEI Other Annexes Procedure in which the academic staff of Daugavpils University receives compensation for the Hirsch index).

As an additional incentive for the development of scientific activity at DU, academic staff have the opportunity to apply for the annual DU research project competition (SAR, Part 2, 2.3.1., pp. 32-33). These projects have relatively small budgets (up to EUR 3,000.00) and cannot be considered sufficient for serious research. A similar competition allows students to apply for competitive

scientific projects as part of DU's call for proposals. Again, these are relatively small funds (up to EUR 2,000.00), considering that the student receiving the funds is required to publish at least one scientific paper in journals cited in the Web of Science and Scopus databases (SAR, Part 2, 2.3 .1., p. 33).

The resources for the improvement of teaching materials and activities carried out in classes are mainly realised through projects financed by EU funds such as the ERDF and the ESF (SAR, Annex List of cooperation agreements, including the agreements for providing internship).

According to the experts, the funds provided for the implementation of research and teaching activities represent the minimum required for the implementation of the Study field and the corresponding study programmes.

1.3.2. The studies take place in the DU study building at Parades street 1a, where the laboratory building is also located. Lecture halls and laboratories serve to ensure the study process.

The necessary technical equipment (computers, projectors, laboratory equipment and materials) ensures the implementation of lectures, seminars and lab exercises in the learning process. Lecture hall is equipped with 100 seats and is used for both study programmes. Lecture hall is equipped with electronically controlled multimedia projectors, screens and laptops. Eight laboratories are available for the study courses of both study programmes. The laboratories are equipped with modern equipment, including analytical balances, pH metres, Karl Fischer titrators, thermostats, spectrometers and other devices. The only deficiency identified during the on-site visit to the laboratories was insufficient information on the safety data sheets of the chemicals used in the laboratory (January 29, 2024).

Over the past 10 years, DU has invested funds to improve study and research and has created a modern teaching and scientific infrastructure that improves study and research opportunities (SAR, Part 2, 2.3.2., pp. 33-34). The infrastructure modernization project (ERDF project) "STEM, modernization of healthcare and arts study programmes at Daugavpils University", implemented by DU, has improved study and research opportunities for students (The project implementation period: 2017 - 2020, total funds available for DU: 1,425,138.00 EUR). As part of the project, a material-technical information base of the study programmes was developed, materials, inventory and library collections were purchased to ensure a high-quality, competitive education that meets international standards (SAR, Part 2, 2.3.2., p. 34).

In addition, as part of the ERDF project "Improving the quality of Daugavpils University study programmes and ensuring environmental accessibility of the environment" (project implementation period: 2010 to 2015, total funds available for DU: 16,715,991.00 EUR), the lecture halls at Parades iela 1 were renovated for adaptation for people with functional disabilities, while also increasing energy efficiency and modernising equipment, devices and information technology. The existing building was modernised and the new DU Life Science and Technologies building was built with modern equipped teaching and science laboratories. The library was also modernised and equipped as part of this project (SAR, Part 2, 2.3.2., p. 34).

All DU students are offered a study environment that meets modern requirements and access to modern living infrastructure (renovated dormitories, a sports complex with swimming pool, etc.). The study and research process is equipped with the necessary modern photo and audio equipment. Students and lecturers have access to the Internet and to DU's local network, to the e-study environment Moodle as well as the possibility to use email and teleconferencing, online platforms such as ZOOM or MSTeams (SAR, Part 2, 2.3.2., p. 34).

The acquired devices and equipment are available and are used both in the students' teaching laboratories and in research done by students and teaching staff. The DU library collection is regularly updated with the latest teaching and scientific literature (SAR, Part 2, 2.3.2., p. 34). There is a clear procedure for the acquisition of textbooks and literature and for subscribing to the databases, which is applied every academic year and involves a request from the teaching staff that

is reviewed and approved by the DU Budget Commission, on the basis of which the library acquires the requested material (SAR, Part 2, 2.3.3., p. 35).

1.3.3. The replenishment of library stocks and the subscription of databases is carried out at the request of the teaching staff. Requests for the purchase of books for each academic year are reviewed and approved by the DU Budget Commission. Diploma theses of DU students are uploaded in the library information system, but the library does not digitise its collection. The library regularly informs the faculties about the latest literature, databases and subscription options.

Subscribed databases are available in the library reading room (SAR, Part 2, 2.3.3., pp. 35-36). There are ten electronic databases that DU students have access to, such as EBSCO, Science Direct, Scopus, Web of Science, Letonika and others.

In line with DU's development strategy, the library is purposefully increasing the proportion of electronic resources and developing remote access to electronic resources. The number of subscribed databases is evaluated every year. The DU library is registered in the library register of the Ministry of Culture. The library uses the integrated information system ALISE (Advanced Library Information Services), to which the DU library is connected and can cooperate with the LU Academic Library. DU members and students have access to the services offered by the DU library: electronic catalogue, book ordering, reservation and renewal via the Internet. During the on-site visit (January 24, 2024), the experts made sure that the opening hours of the DU library meet the needs of the students and teaching staff.

The total area of the library is 1000 m<sup>2</sup>, users have access to a reading room with 60 workstations, 15 of which are computerised, as well as a bibliography and information area. There are more than 258,820 books and more than 29,692 periodicals. The library's collections are constantly being expanded. More than 21,938 books are available in the natural sciences subscription and reading room, including 2410 books in chemistry, 3225 books in biology and 3462 in environmental sciences (SAR, Part 2, 2.3.3., p. 35).

There are known problems with specialised literature published abroad in related sciences for the study programmes. Each year the library looks for ways to find funds to purchase new books and periodicals published in Western Europe and the USA.

The experts are of the opinion that the library is adequately equipped with books, journals and electronic resources for the needs of the Study field.

1.3.4. DU has developed an e-study environment (Moodle) that enables direct communication between students and teaching staff (e-mail, consultations) in every study course. The lecturers at DU use the Moodle e-study environment (<https://estudijas.du.lv/>) and post teaching materials there: lectures, seminar materials, descriptions of laboratory work, practical lessons. This is important for the independent work of students when it is not possible to attend all courses due to certain circumstances. The use of an e-study environment reduces the risk of students dropping out and promotes the maintenance of a critical mass of students.

According to SAR (Part 2, 2.3.4., p. 37), DU plans to expand the Moodle e-study environment (for the submission of homework, tests, work reviews) by integrating modern IT solutions (e-mail, Moodle, Zoom, Facebook). It can be concluded from this that the study programmes will offer flexible conditions for e-study in the future.

During the on-site visit (January 29, 2024), the experts were shown how the Moodle e-learning environment works. It should be noted that the Moodle e-learning environment is synchronised with the DUIS. The study courses are entered there, including the timetable, and students can view their academic achievements there.

It can therefore be concluded that the information and communication technology solutions used at DU are appropriate and sufficiently effective.

1.3.5. As per the regulations (Law on Higher Education Institutions), the academic positions of DU are professor, associate professor, leading researcher, assistant professor, lecturer, researcher, assistant, and assistant researcher.

DU has established and implemented several procedures for the recruitment of qualified teaching staff. The number of positions for assistants, lecturers and assistant professors is determined by the rector on the recommendation of the faculty council according to the amount of course work. The number of positions for researchers, leading researchers and scientific assistants is determined by the rector on the basis of the needs and funding possibilities on the recommendation of the institute/scientific council. The number of associate professors and professors is determined by the rector according to need and funding possibilities after approval by the DU Senate (SAR, Part 2, 2.3.5., p. 38).

Elections to academic positions are conducted in accordance with the "Regulations on elections to academic positions at Daugavpils University" (available in Latvian at <https://ieej.lv/9hTri>).

Information on academic vacancies and announcements is published on the DU website (<https://du.lv/par-mums/vakances/>) and/or in the official publication of the Republic of Latvia "Latvijas Vēstnesis" (SAR, Part 2, 2.3.5., pp. 38-39). Both Latvian and foreign citizens can apply and be elected to academic positions within DU. Applicants must have appropriate academic education and professional qualifications and meet the requirements of the science sector, study and research work at DU. Applicants must be proficient in Latvian and professional English.

According to the experts, DU has established a clear and effective procedure for elections to academic positions, and all related information is public and accessible to all interested parties.

1.3.6. In order to continuously monitor the qualification and quality of work of academic staff, DU has developed two internal regulations: "Regulations on elections in academic positions at Daugavpils University" and "The procedure for evaluating the effectiveness of scientific work of the academic staff of Daugavpils University" (available in Latvian on the DU website).

The DU academic staff is encouraged to participate in various activities related to the development of their professional and didactic skills and competences. The improvement of teaching staff's professional and didactic skills and competences is achieved through various activities, such as short-term exchanges under the ERASMUS+ programme, participation in conferences, writing scientific publications, working on projects, organising various scientific events, etc. For example, teaching staff actively use the opportunities offered by Erasmus+ and other mobility programmes to improve their teaching skills and to enhance and extend their professionalism. According to the statistical data on incoming and outgoing mobility of teaching staff (2017-2023), they have participated in short-term mobilities to academic institutions in various countries such as the Czech Republic, Lithuania, Denmark, Portugal, Finland, Turkey, Poland and Cyprus (SAR, Annex Statistical data on the incoming and outgoing mobility of the teaching staff).

As part of the ESF project "Reducing the fragmentation of study programmes and strengthening the sharing resources at Daugavpils University" various seminars were organised on the development and integration of support materials for study programmes. In addition, the improvement of skills related to remote work is realised through various trainings connected with the use of the e-platform Moodle.

Newly acquired knowledge and experience, together with the latest findings from related scientific disciplines, are incorporated into the content of the study courses and offered to students. This way of improving the study courses is recognized and supported by the students through students' surveys (SAR, Part 2, 2.3.6., p. 41).

In view of the above, the experts consider that the needs for professional and didactic development of teaching staff have been specifically identified, for which appropriate improvement measures are foreseen. In addition, an effective system has been developed to evaluate the measures implemented and to monitor the professional development of teaching staff.



1.3.7. 21 teaching staff members are involved in the implementation of both study programmes. The teaching staff members include 3 professors, 4 associate professors, 6 assistant professors, 4 lecturers, 1 assistant, 2 leading researchers, and 1 researcher. 16 teaching staff members (76%) have a PhD and 24% have a master's degree. 71% of the teaching staff employed at DU and 29% of the visiting lecturers/professors are involved in teaching within the Study field (SAR, Part 2, 2.3.7., Figures 2.2., 2.3. and 2.4., p. 42).

The workload of teaching staff in teaching, research and administration is unbalanced. For example, one and the same person performs the duties of Study field director and director of both study programmes, and is also involved in teaching in 23 study courses of both study programmes (SAR, Annex Basic information on the teaching staff involved in the implementation of the study field). It is completely unclear how this person can participate in scientific research, dissemination of research results and collaboration with industry in addition to these duties. It should be noted that the workload of lecturers is determined in accordance with the "Procedures for recording the workload of academic staff at Daugavpils", and in the case a person is overloaded with teaching work an appropriate remuneration is paid.

Nevertheless, this is not sufficient to motivate individuals to fulfil their tasks while maintaining the required level of expertise and developing their competences. According to the experts, there is therefore an urgent need to address the issue of balancing the teaching load and it is clear that the most efficient way to do this is to recruit new teachers with an appropriate qualification, i.e. a PhD in chemistry. Otherwise, it is impossible to expect a high-quality implementation of the study programmes, but also an adequate implementation of other activities (administration, science, popularisation of higher education, etc.).

According to available data, the experts from the industrial sector are involved in the implementation of the BSP Chemistry through the study courses Internship in an industry laboratory I and Internship in an industry laboratory II (SAR, Annex Descriptions of the study courses/ modules). This is not the case with the MSP Chemistry, but visiting professors from other institutions are involved in the implementation, so in this context it can be said that this study programme includes experts from other institutions.

1.3.8. The DU offers different types of support that students need. The most important seems to be support with the organisation of the everyday study process where the Student Service Centre, the Study field and the study programmes director are very helpful. Students receive individual support from the Study field and the study programmes director if it comes to the study process. It must be mentioned that during the on-site visit, the students all appreciated the responsiveness and support of the DU teaching staff (January 30, 2024).

There are certain criteria that must be met if a masters student wishes to receive a tuition fee discount. The Student Council's social support programme is also active at DU. The nursery rooms are opened to keep students' children occupied while their parents attend lectures. DU's infrastructure has been modernised and adapted to improve the accessibility of the environment for people with functional disabilities.

Students can use various facilities at DU: the computer rooms, auditoriums for consultations and meetings, library premises, as well as specially equipped rooms for holding conferences, study and extracurricular activities (SAR, Part 2, 2.3.8., p. 44).

The Department of International and Public Relations provides support functions for international students studying at DU.

From this it can be concluded that a functioning support system is in place and meets the needs of students (on-site meetings with students, January 30, 2024).

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

#### Conclusions:

DU has the necessary infrastructure and facilities to ensure the smooth implementation of the study process. A uniform system and procedure has been established for the development and acquisition of the necessary equipment. The main sources of funding for the implementation of the Study field and the BSP and MSP Chemistry are state budget funds and tuition fees. The funds for the improvement of teaching materials and activities carried out in classes are mainly realised through projects financed by EU funds. DU has invested funds for the improvement of studies and research in order to provide a modern teaching and scientific infrastructure. The information and communication technology solutions used at DU are appropriate and sufficiently effective. According to the experts, the funds allocated for the implementation of research and teaching activities represent the minimum necessary for the implementation of the Study field and the corresponding study programmes. DU has established and implemented several procedures to attract qualified teaching staff. DU academic staff are encouraged to participate and actively take advantage of the opportunities offered by Erasmus+ to improve their teaching skills and enhance and broaden their professionalism. The DU offers various types of support to students and they seem to be satisfied and appreciate the support from teaching staff.

#### Strengths:

- 1) Effective and respectful communication and dialogue between students and teaching staff;
- 2) Lecture hall and laboratories equipped appropriately for the needs of Study field and study programmes;
- 3) Qualified teaching staff;
- 4) Established support system for students.

#### Weaknesses:

- 1) Low recruitment of visiting lecturers;
- 2) Workload of teaching staff not balanced;
- 3) Insufficient information on safety data sheets for chemicals used in laboratories.

### 1.4. Scientific Research and Artistic Creation

#### Analysis

1.4.1. The scientific and applied research directions of the Study field are consistent with the objectives of DU and the Study field. However, the data presented in the SAR (Part 2, 2.4.1., p. 45) show that scientific and teaching staff engaging in various activities related to professional development in fields corresponding to their scientific interests are quite narrowly involved in the education process. The research directions of academic staff participating in study programmes are mainly as follows: analytical chemistry, chemistry of renewable resources, biotechnology and synthesis of organic compounds. Research conducted by academic staff contributes to the development of these narrow scientific fields, as well as to the development of the field of study, improvement and updating of the content of studies. The research covers both theoretical aspects and industry news and novelties that are used in the course of lecturers' studies, thus promoting the interaction of the research process and studies and significantly improving the quality of the studying process. Basically, 2-3 people participate in dissemination of experimental results through publications in scientific journals, whose contribution is not significant, because many times they are either local publications or with a low impact factor (IF), which is why they are quite poorly cited, as evidenced by the employees' h-index (SAR, Annex Biographies of the teaching staff members; SARAnnex List of the publications, patents, and artistic creations of the teaching staff over the reporting period; Scopus and Web of Science databases).

1.4.2. As part of the research process, DU constantly follows the latest developments in the industry (SAR, Part 2, 2.4.2., p. 46), but academic staff rarely participate in research projects (especially external ones). There is no information about scientific conferences in the assessed period, only numerical information is provided in the Summary of quantitative data\_EN. There is no information whether it was a poster, a statement, a lecture or an invited lecture. Scientific research is partially connected to the teaching process because it is niche and very narrowly located in the teaching process. The academic staff cooperates not enough to improve study processes, which does not have a positive impact on the interdisciplinary nature of studies and the improvement of skills of both employees and students. This point lacks any examples to clearly demonstrate the connection between scientific research and education. All the more so because in a rather laconic way there is information about the popularization of science through, among others, the Science Festival in Daugavpils, Scientists' Night, events of the DU Science School, conducting trainings, lectures, interactive events for various age groups, as well as engaging in consulting and evaluation of the development of students' scientific works (SAR, Part 2, 2.4.2., p. 46).

Scientific activity and research papers are strongly connected with the study process in the study programmes, but this activity is very narrow and concerns the research of a few teaching staff. Scientific activity is visible, but very limited and does not complete the full learning process at all levels.

1.4.3. The competences of DU academic staff are improved through participation in the mobility of the European Union support programme in the area of education and training of students and employees under "ERASMUS+". Cooperation agreements have been signed with over 90 universities in 22 countries (SAR, Part 2, 2.4.3. p. 46, SAR Annex List of cooperation agreements, including the agreements for providing internship). It is basically one mobility programme for employees and students, which unfortunately students rarely use due to study obligations and personal reasons (SAR, Annex Statistical data on the incoming and outgoing mobility of students; on-site meeting with the students, January 30, 2024). The scientific cooperation of DU researchers is very modest and does not correspond to the activities of internationalization of studies. There are also only a few international projects that would indicate the activity of DU teaching staff or students in research and teaching projects. Moreover, listed projects (2017-2023 and ongoing) are not fully connected with chemistry. Only several projects both international and local are in the field of chemistry (SAR, AIC coordinator added annexes, Answers to Q9\_Projects\_ongoing and completed.docx).

1.4.4. As presented in the SAR (Part 2, 2.4.4., pp. 47-48), the teaching staff publish in journals from the JCR list. DU researchers are assessed every year on their scientific, teaching and organizational activities. In the assessed period, research workers (including visiting professors) published 281 publications, of which Q1-38%, Q2 - 26%, Q3 - 14%, and in journals from Q4 - 10%. Over the years, publishing dynamics have not changed much towards Q1 releases (SAR, AIC coordinator added annexes, Answers to Q10\_Number of publications in Web of Science Scopus journals.xlsx).

The participation of academic staff in scientific conferences is not impressive, but as presented in the SAR (Part 2, 2.4.3., pp. 46) and SAR Annex (Biographies of the teaching staff members and Summary of quantitative data on scientific and/ or applied research and / or artistic creation activities corresponding to the Study field in the reporting period), it is an important point of scientific development and communication with other academic staff and exchange of research results. In addition, scientists and students actively participate in the Science Festival, Scientists Night, DU Science School events, and DU is a member of the European Science Engagement Association (SAR, p. 46).

There are no examples of presentations at conferences that clearly coincided with scientific activity in the form of publications (either in the form of a lecture, a statement or even a poster) at a domestic or foreign conference. The scientific activity of teaching staff is very narrow and does not

cover the entire study programmes, which undoubtedly limits the development of the study programmes, innovation and interdisciplinarity. This significantly limits the promotion of chemistry as a science and does not create appropriate conditions for development in such a wide range as presented in the study programmes, and is currently limited only to a narrow scope of analytical chemistry and organic chemistry (SAR, Annex Biographies of the teaching staff members).

1.4.5. The SAR did not define how thesis defenses are carried out procedurally and did not provide sample reports on the assessment of these theses, as well as reviews of diploma theses and a sample protocol on the defense of the diploma thesis.

DU carries out internal research projects financed by DU, although these funds are small for financing research, and students are involved in these projects, which is undoubtedly beneficial for DU students and DU academic staff. Nevertheless, the SAR (Part 2, 2.4.5., p. 49) states that: The number of students participating in the research process will be increased; The project leader (student) will be involved in scientific activity and its research development will be achieved during the implementation of the project; Human resources will be attracted to science by creating a new interdisciplinary group. The number of publications placed in Scopus databases will be increased. The project assumes the development of new methods and technologies, therefore its implementation will promote e-learning and develop cooperation between DU and business.

Such a characterization of the main directions of development of DU (academic staff and students) does not bring anything new to the development of the Study field, therefore it does not promote or motivate activities for the development of chemistry as a field of study. Basically, anything could be written at this point that could support the development of the main fields of research, which could undoubtedly be more numerous, and should also be developed more broadly, not only towards the partial scientific development of 2-3 academic staff related to the Study field and scientific development.

1.4.6.

All types of innovations stated in the SAR (Part 2, 2.4.6., pp. 49-50) were incorrectly defined, and product, process, marketing and organizational innovations were not characterized better. It is difficult to clearly define what type of innovation has been implemented in the field of chemistry studies. None of the presented forms of innovation have been properly defined. For example: it says "Product innovation. For students' involvement in research, study work, final work and independent work, the following may be used: environmental chemistry, chromatography, renewable resources, fluorescence analysis methods and organic synthesis laboratories specialized laboratory equipment". These are not product innovations, but routine teaching.

Tasks covering broadly understood e-learning have been defined in a rather complicated way. On the one hand, staff have a positive attitude towards online classes, but on the other hand, teaching staff are unable to share teaching materials. It is similar with the Moodle system, which is basically used to host content for students, but does not perform the other key function for which it was created. The Moodle system is not fully used by employees, which is undoubtedly to the detriment of students.

Moreover, the marketing innovation mentioned the scientists' night, open doors, which does not correspond directly to "innovation", but it is the popularization of science, i.e. promotion, not innovation. There are many ambiguities in this part of the SAR (Part 2, 2.4.6., pp. 49-50) and the assessment in this criterion is very limited.

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

Conclusions:

The directions of scientific research are too narrow to be related to the scientific work of academic

staff and are not fully defined in the study process, are not logical and are not fully justified. The very narrow use of scientific knowledge by DU academic staff does not allow for full coverage of the study programme at both the bachelor's and master's level. Moreover, very modest scientific cooperation with foreign centers does not have a positive impact on the development of both scientific staff and student mobility. Despite ensuring the development of staff, mobility and interdisciplinarity, DU did not meet the requirements for the development of scientific research due to insufficient scientific staff in the field of chemistry. Despite the opportunities, students do not take advantage of mobility, and Erasmus+ trips last several days, which is also not conducive to mobility due to the lack of a mobility mechanism for students and employees. It is also strongly related to "attachment" to the field of study and to teaching staff, which undoubtedly does not allow for the development and creation of innovations and new research and scientific solutions, and does not contribute to the development of the study process.

#### Strengths:

- 1) Teaching staff aim to publish in journals from the JCR list;
- 2) Teaching staff are involved in the educational process closely related to their scientific interests.

#### Weaknesses:

- 1) The teaching staff published in journals on the JCR list, but these have a low impact factor;
- 2) Teaching staff do not participate in international scientific projects;
- 3) Very poor scientific cooperation, mobility and scientific activity at domestic and foreign conferences;
- 4) Very poor scientific cooperation with centers in Latvia and abroad;
- 5) Insignificant participation of students in scientific research and participation in conferences and seminars.

### 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:** Partially compliant

The scientific and applied research directions of the teaching staff are consistent with the objectives of DU and the Study field. The scientific research is partly in line with the study programmes, as only a small part of the teaching staff is active in the field of chemistry. In addition, the lack of broader activity, both academic and international, is not conducive to the development of teaching staff and the internationalisation of studies. Measures are needed to promote the internationalisation of research. The number of publications and participation in conferences must be increased, while student exchanges and international cooperation must be intensified.

### 1.5. Cooperation and Internationalisation

#### Analysis

1.5.1. Cooperation with the institutions from Latvia is mainly limited to the agreement with the University of Latvia (UL) (SAR, Annex List of cooperation agreements, Cooperation between UL and DU in the field of studies and research). Teaching staff from UL are involved as visiting professors and lecturers in the implementation of the BSP Chemistry and MSP Chemistry (SAR, Annex Basic information on the teaching staff involved in the implementation of the study field). Although there

is collaboration, the number of joint projects and publications resulting from this collaboration in the field of chemistry is small (SAR, Annex List of the publications, patents, and artistic creations of the teaching staff over the reporting period, SAR, AIC coordinator added annexes Ongoing and completed projects). Moreover, in the SAR (Part 2, 2.5.1., p. 51) it is written that DU cooperates with employers, which does not entirely correspond to the actual situation, because none (except one) employs students from DU in their enterprises (on-site meeting with employers, January 30, 2024), but only uses the services of DU as a scientific unit. Employers have no idea about the opinions of DU as an entity and have no influence on activities at DU and do not contribute to the development of DU in terms of both education and cooperation with the economy. The cooperation described is of a business nature, not an institutional one, and has no connection with science or teaching, which excludes these employers from the cooperation criterion, because only the business aspect is binding (on-site meeting with employers, January 30, 2024). Cooperation agreements are concluded, but they are only of a formal nature, with insignificant impact on the development of the Study field or assistance in developing graduates' skills (SAR, Annex List of cooperation agreements, including the agreements for providing internship).

1.5.2. Partners for foreign cooperation in the Study field are most often selected as part of the Erasmus+ programme with DU. The exchanges are short and there do not appear to be fruiting bodies, as evidenced by, among other things, the lack of joint publications or secondary exchanges (SAR, Annex List of cooperation agreements, including the agreements for providing internship, Annex Statistical data on the incoming and outgoing mobility of the teaching staff, Annex List of the publications, patents, and artistic creations of the teaching staff over the reporting period). The Erasmus+ programme procedures only work in terms of short scientific exchanges, but this does not translate into longer scientific activities, whether in terms of cooperation, writing joint projects or international publications. Collaboration partners are selected in view of the specific features of the Study field and corresponding study programmes. Unfortunately, the influence of partners from foreign institutions is not recognisable, and according to the available data, not a single visit by visiting professors from abroad was registered in the period 2017-2023 (SAR, Annex Statistical data on the incoming and outgoing mobility of the teaching staff). There is no cooperation with industry abroad (SAR, Annex List of cooperation agreements, including the agreements for providing internship).

1.5.3. Indeed, during the reporting period, faculty and staff trips took place for both professional development and teaching at cooperating partner universities. Teaching activities were carried out in Poland at the University of Gdańsk, and the University of Warmia and Mazury in Olsztyn, Vytautas Magnus University in Lithuania, in Israel at Ben Gurion University (Ben-Gurion University of the Negev), in North Macedonia at Ss.Kiril and Methodius University in Skopje, in Portugal at the University of Beira (Universidade da Beira Interior), in Greece at the National Technical University of Athens (National Technical University of Athens), in Turkey at the Akdeniz University (Akdeniz Üniversitesi)(SAR, Annex List of cooperation agreements, including the agreements for providing internship, Annex Statistical data on the incoming and outgoing mobility of the teaching staff, Annex List of the publications, patents, and artistic creations of the teaching staff over the reporting period). Nevertheless, the problem is conducting classes with students in English, which is undoubtedly quite a serious barrier for DU academic staff, as well as conducting classes and preparing classes in English (which is not required by Latvian law in teaching). A serious problem is the excessive workload of DU research staff. There is also a lack of motivation for people who could visit DU from both EU and non-EU countries (on-site meeting with teaching staff January 30, 2024).

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

#### Conclusions:

Cooperation between other units and joint scientific activities towards internationalization are in serious doubt. Teaching staff do not have time to act on this issue, which undoubtedly negatively affects this process. It should also be added that scientific and didactic involvement in the unit does not hinder the scientific development of teaching staff and does not provide opportunities for conversation.

DU does not sufficiently motivate teaching staff, e.g. through additional benefits that could increase the attractiveness of the mobility of scientific staff. On the other hand, the teaching staff is too burdened with teaching tasks, which means that it is not possible to go for a longer stay in a unit, either domestic or foreign. Restrictions resulting from the family situation of teaching staff mean that mobility is at a very low level and is basically limited to trips lasting several days. This situation is not conducive to internationalization and does not allow for the expansion of possible long-term cooperation. Additionally, DU does not support the arrival of employees of other domestic and foreign universities for research stays or internships as part of cooperation (e.g. by inviting guests from abroad). Moreover, on-site meeting conversations with teaching staff show that research internships and research trips under any programme do not contribute much to their development (this is primarily due to too short stay in the host unit) and are often due to the language barrier. Furthermore, cooperation with foreign institutions (including industry) is practically non-existent and its influence on the development of the Study field and the corresponding study programmes is not evident from the available documentation.

#### Strengths:

- 1) Erasmus+ programme and its opportunities.

#### Weaknesses:

- 1) Limited cooperation with institutions from Latvia, which is generally restricted to the participation of visiting professors and lecturers in the implementation of the study programmes;
- 2) The influence of partners from foreign institutions (both from higher education and industry) on the Study field and corresponding study programmes is not discernible;
- 3) Apart from the active Erasmus+ programme, there is no other form of cooperation with institutions from abroad (also outside the European Union) (in the form of research trips, student exchange to another scientific unit for a research internship, research grant, teaching grant);
- 4) Mobility trips under the Erasmus+ programme for teachers are usually short-term;
- 5) Lack of action to develop internationalization;
- 6) Weak international cooperation as well as lack of projects and publications in international teams;
- 7) Low incoming and outgoing student mobility.

### 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

Cooperation with the institutions from Latvia is mainly limited to the agreement with the University of Latvia. Although there is cooperation with industry in the form of an agreement, its influence on the Study field and corresponding study programmes is practically non-existent. Therefore, actions are necessary on the part of DU to increase cooperation with scientific and teaching units in Latvia and the internationalization and scientific and teaching exchange of teaching staff with centers in the EU and outside the EU. In addition, creating opportunities for

long-term trips is necessary in order to improve the achievement of the aims of the Study field.

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

### **Analysis**

1.6.1. Review of the implementation of recommendations received during the accreditation of the study field "Chemistry, Chemical Technologies and Biotechnology", December 18, 2013.

1. Research should be expanded and the number of publications in internationally cited journals specifically in the chemical industry should be increased.

Fulfilled. The number of the cross disciplinary research topics (e.g., development and research of new optical materials with innovative microscopy methods; research and application possibilities of energy obtained from biomass) increased that, in turn, gave the opportunity to increase the number of publications in internationally cited journals (SAR, Part 2, Chapter 2.6.1., p. 54; SAR Annex List of the publications, patents, and artistic creations of the teaching staff over the reporting period; 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 (hereinafter Review of the implementation of recommendations)). At this point, it should be noted that despite the fact that the number of publications has increased and some new areas of scientific research have been opened up, scientific research partly corresponds to the study programmes, as a relatively small proportion of the teaching staff work in the field of chemistry.

2. The attraction of project funds for solving regional problems should be promoted.

Partially fulfilled. According to the information that was provided by DU, the academic staff is involved in the realization of the projects, applied research and contractual work (SAR, Part 2, Chapter 2.6.1., p. 54; SAR Annex Review of the implementation of recommendations) as well as in the cooperation with local enterprises (Institute for Environmental Solutions, AXON' CABLE, Scientific Institute of Food Safety, Animal Health and Environment "BIOR", Oniors) in the field of research (SAR, Annex List of cooperation agreements, including the agreements for providing internships). However, reviewing the list of projects (SAR, AIC coordinator added annexes List of ongoing and completed projects) limited availability of project funding for solving regional problems was revealed.

3. Learning modules that can be offered to exchange students should be developed. Student and lecturer exchange programme plan should be created for cooperation with other Latvian and foreign universities.

Partially fulfilled. It is postulated (SAR, Part 2, Chapter 2.6.1., p. 54; Annex 2.6.1. Review of implementation of recommendations) that the study module "Chemistry of renewable resources" has been developed (20 CP; 30 ECTS) for exchange students and/or specialists. The cooperation agreement in the field of studies and research was concluded between DU and University of Latvia. Additionally, students and teaching staff mobility agreements (Erasmus +, KA103) were signed with a few European/non-European universities as well as cooperation agreements between DU and local enterprises were made (SAR, Annex List of cooperation agreements, including the agreements for providing internship). However, a single study module (30 ECTS) that is available in Latvian has very limited opportunities to attract exchange students to the study programme. It was postulated during the on-site visit (January 29-30, 2024) that exchange students can have individual classes in the selected study courses (in English).

4. A personnel recruitment and development strategy should be developed.

Fulfilled. It was postulated (SAR, Part 2, Chapter 2.6.1., p. 54; SAR Annex Review of implementation of recommendations) that the development of personnel recruitment and development strategy are in line with the outdated DU strategy (DU strategy was under review at the Ministry of Education and



Science according to the information collected during on-site visit, January 29-30, 2024). It is stated that the increase in the number of students in the "Chemistry, chemical technologies and biotechnology" study field at DU is not expected in the next decade due to the demographic situation in the country, as the result, the significant rise of the academic staff is not predicted. Additionally, to provide generational change the department involves the postgraduate researchers in academic work in a timely manner.

5. The technical support and laboratory facilities for the basic courses of chemistry programmes must be improved.

Fulfilled. The construction of a new laboratory building was carried out (SAR, Part 2, Chapter 2.6.1., p. 54); as a result, students have access to the teaching and scientific laboratories with modern equipment that meets the requirements for the basic study courses in chemistry study programmes (SAR, Annex Review of implementation of recommendations; on-site visit January 29, 2024).

Review of the implementation of the recommendations received during accreditation of the academic bachelor's study programme "Chemistry", December 18, 2013.

1. The development and publicity of academic staff's scientific research in internationally cited journals in the field of chemistry should be promoted.

Fulfilled. The total number of publications of the academic staff's scientific research increased from 2016 to 2023 (SAR, Part 2, Chapter 2.6.1., p. 54; SAR Annex Summary of quantitative data on scientific and/ or applied research and / or artistic creation activities corresponding to the Study field in the reporting period) as well as the increased range of research directions was postulated (SAR Annex Review of implementation of recommendations).

2. The infrastructure of basic course laboratories should be improved (implementation deadline – 2020).

Fulfilled. The infrastructure of basic study course laboratories is improved (SAR, Part 2, Chapter 2.6.1., p. 54), and modern equipment in the teaching laboratories is available for use by students (SAR Annex Review of implementation of recommendations; on-site visit on January 29, 2024).

3. Opportunities for students and lecturers to participate in international exchange programmes should be provided (implementation deadline – 2019).

Fulfilled. Representatives of the academic staff regularly participate in short-term mobility programmes (SAR, Annex Statistical data on the incoming and outgoing mobility of the teaching staff). Students of both levels (bachelor and master study programmes) are well informed about the opportunity to participate in the international exchange programmes (e.g., "Erasmus+" mobilities); however, the number of incoming and outgoing exchange students is low (SAR Annex Statistical data on the incoming and outgoing mobility of students; on-site visit on January 29-30, 2024).

4. It is necessary to analyse the scope of the course "Mathematics for natural scientists" (2 CP) as well as the course "Physics" (2 CP) and to look for opportunities to expand the courses (implementation deadline – 2020).

Partially fulfilled. Two study courses were added to part A of the study plan: "Mathematical data processing and statistics in chemistry" (2 CP; 3 ECTS) and "Chemical physics" (2 CP; 3 ECTS) from 2023/2024 study year (SAR, Part 2, Chapter 2.6.1., p. 55; SAR Annex to BSP study programme The curriculum of the study programme). The programmes of the introduced study courses describe the important topics in the fields of mathematical data processing and physical chemistry/spectroscopy (SAR Annex to BSP study programme Descriptions of the study courses/ modules) but do not improve or expand the content of the basic study courses of physics (General physics) and, especially, mathematics (Mathematical methods in natural sciences).

5. Teaching methods in chemistry courses should be improved (implementation deadline – 2021).

Fulfilled. It is postulated that the recommendation to improve the teaching methods was considered and a problem-solving method was introduced in the learning process (SAR, Part 2, Chapter 2.6.1., p. 55; SAR Annex Review of implementation of recommendations).

Review of the implementation of the recommendations received during of the licensing of the academic master's study programme "Chemistry", June 16, 2015

1. In the future, more lecturers should be attracted with dr. chem. qualification (in 2018: 5 lecturers with dr. chem. degree should be elected to an academic position at DU) in order to ensure long-term and high-quality development of the programme.

Partially fulfilled. At the moment of the assessment only three lecturers with PhD in chemistry were elected to an academic position at DU (SAR, Part 2, Chapter 2.6.1., p. 55, SAR Annex Review of implementation of recommendations). Additionally, one visiting lecturer with PhD in Chemistry is involved in the study process in a timely manner (Annexes, Basic information about teaching staff and AMSP Study plan). At the moment of the licensing of the MSP Chemistry (June 16, 2015) two lecturers with PhD in chemistry were elected for the positions at the DU and were involved in the implementation of the master's programme. The number of the academic staff members with PhD in chemistry is increased, however, the level recommended previously is not achieved. The combination of three permanent positions and one visiting position for the academic staff with PhD in chemistry does not ensure the long-term and high-quality development of the study programme.

2. In the future, it can be recommended to join a consortium with LU, RTU, RSU, LOSI and other chemistry-related institutions to subscribe to the Chemical Abstracts Service database or SciFinder.

Fulfilled. Scopus, ScienceDirect and Web of Science databases are available for teaching staff and students through DU library access (SAR, Part 2, Chapter 2.6.1., p. 55, on-site visit on January 29, 2024). The available databases vary, but can be used effectively for study and/or research purposes.

3. It is advised to supplement the library with following books:

1) Carey F.A., Sundberg R.J. Advanced Organic Chemistry: Part B: Reaction and Synthesis, 5th Edition, 2010.

2) Carey F.A., Sundberg R.J. Advanced Organic Chemistry: Part A: Structure and Mechanisms, 5th Edition, 2010.

3) O. D. Sparkman, Z. Penton, F. G. Kitson. Gas Chromatography and Mass Spectrometry: A Practical Guide: A Practical Guide 2nd Revised edition, 2011.

4) E. V. Anslyn, D. A. Dougherty. Modern Physical Organic Chemistry, 2005

5) D.L. Nelson, M.M. Cox. Lehninger Principles of Biochemistry, 5th ed., W.H. Freeman, 2008

6) D. Voet, J.G. Voet. Biochemistry, 3rd ed., Wiley, 2004.

Fulfilled. The collection of the library was expanded by the books recommended during the previous assessment (SAR, Part 2, Chapter 2.6.1., p. 56; on-site visit on January 29, 2024).

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

Conclusions:

The provided recommendations (Recommendations of accreditation experts, December 18, 2013; Recommendations of the accreditation experts of the academic Bachelor's study programme "Chemistry", December 18, 2013, and Recommendations of the licensing experts of the academic Master's study programme "Chemistry", June 16, 2015) were analyzed by DU staff and the greater part of recommendations was implemented. It should be noted that the construction of a new laboratory building with teaching and research laboratories and the access of the students to modern equipment improve the learning experience of students at both levels. The academic staff and students are actively involved in the scientific research process, as a result, the total number of publications in internationally recognized journals increased during the last seven years.

The analysis of the implementation of the previous Recommendations identified some problems such as:

- a low number of the academic staff with PhD in chemistry that can affect the long-term and high-quality development of the study programmes in field of chemistry;
- a low number of the study courses/learning modules in chemistry available for exchange students;

- the teaching staff is insufficiently involved in the implementation of the projects, applied research and contractual work focused on the solution of the regional problems related to the field of chemistry;
- the insufficient number of the outgoing/incoming students and academic staff (especially long-term mobility);
- the revision of the content of some study courses (such as Mathematical methods in natural sciences and General physics) is still actual.

#### Strengths:

- 1) The construction of a new laboratory building as well as the access of the students to modern equipment;
- 2) Agreement with the University of Latvia in the field of studies and research;
- 3) A range of diverse scientific research directions resulted in the increase of the number of publications in international journals;
- 4) The involvement of the academic staff in the implementation of the projects and interdisciplinary applied research.

#### Weaknesses:

- 1) Small number of academic staff with a PhD in chemistry;
- 2) A low number of study courses/learning modules in chemistry available for exchange students, and consequently an insufficient number of the outgoing/incoming students;
- 3) Insufficient involvement of teaching staff in implementation of the projects, applied research and contractual work focused on the solution of the regional problems related to the field of chemistry.

### 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

The provided recommendations (Recommendations of accreditation experts, December 18, 2013; Recommendations of the accreditation experts of the academic bachelor's study programme "Chemistry", December 18, 2013, and Recommendations of the licensing experts of the academic master's study programme "Chemistry", June 16, 2015) were analyzed by DU staff and the greater part of recommendations were implemented in the study courses at the bachelor's and master's study programme levels (SAR, Part 2, Chapter 2.6.1., pp. 54-56; SAR Annex Review of implementation of recommendations; SAR Annex List of the publications, patents, and artistic creations of the teaching staff over the reporting period; SAR Annex List of cooperation agreements, including the agreements for providing internship, SAR BSP Chemistry Annex, The curriculum of the study programme, SAR Annex Descriptions of the study courses/modules).

Some of the recommendations are fulfilled partly. A low number of the academic staff with PhD in chemistry potentially can have an important impact on quality of the studies, long-term and high-quality development of the study programmes, particularly, in case of the MSP Chemistry.

### 1.7. Recommendations for the Study Field

#### Short-term recommendations

- 1) The Study field, the study programmes and the internal quality assurance policy should be aligned with the main directions of DU's new strategic development (up to a period of 2 years).
- 2) The SWOT analysis should be rewritten taking into account the small number of study programmes and their questionable economic and organisational sustainability, the insufficient number of academic staff (especially teachers with PhD in chemistry) and the lack of appropriate lifelong learning programmes (within three months).
- 3) The management structure should be improved to enable sufficient, effective and objective decision-making. As a first step, the position of the Study field director and study programmes director should be distributed to more people (within 1 year).
- 4) Modern teaching techniques such as design thinking and flipped learning should be incorporated in teaching within the study programmes (from academic year 2024/2025).
- 5) Software to detect plagiarism in English-language theses/scientific papers should be purchased (within 1 year).
- 6) Student surveys should be conducted after each semester for all study courses (from academic year 2024/2025).
- 7) Graduate and employer surveys should be conducted every 2 years (from academic year 2024/2025).
- 8) The results of all surveys (student, alumni and employer surveys) should be publicly available via the DU website and distributed among stakeholders (within 2 years).
- 9) Study field Council must have a clear role in the quality assurance system (within 2 years).
- 10) The number of permanently employed teaching staff with PhD in Chemistry should be increased (within 2 years).
- 11) Information on safety data sheets for chemicals used in laboratories should be updated and extended (from academic year 2024/2025).

### Long-term recommendations

- 1) The number of publications in Q1 scientific journals in the field of chemistry should be increased (until the next accreditation).
- 2) The number of lecturers from the Department of Chemistry participating in scientific projects must be increased (until the next accreditation).
- 3) The indicators for the success of scientific cooperation with national and international institutions, which relate to the incoming and outgoing mobility of lecturers and researchers, the publication of papers with colleagues from other institutions and participation in conferences with invited and plenary lectures, must be increased (until the next accreditation).
- 4) The indicators for student participation in the research work of the institution, which include participation in projects, co-authorship of scientific articles in scientific journals and participation in (especially international) conferences, must be increased (until the next accreditation).

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| 5) Various forms of cooperation outside the active Erasmus+ programme and also outside the European Union in the form of research trips, student exchange to another scientific unit for a research internship, research fellowship and teaching fellowship should be established (until the next accreditation). |
| 6) Teaching staff mobility must include long-term stays (until the next accreditation).   |
| 7) Initiatives to promote internationalization should be developed, in particular through international cooperation with recognized high-level educational and research institutions and through joint projects and publications with international teams (until the next accreditation).                         |
| 8) The mobility of incoming and outgoing students should be intensified (until the next accreditation).   |
| 9) English-language study courses/learning modules in chemistry should be developed in order to attract students from abroad (until the next accreditation).  |
| 10) At a minimum, several lifelong learning programmes must be developed to meet the needs of employers and external stakeholders and include topics that emerge from surveys of employers and graduates (until the next accreditation).  |
| 11) It is necessary to intensify cooperation with institutions and industry, which will at least lead to several projects, applied research and contractual work aimed at solving regional problems in the field of chemistry (until the next accreditation).   |

## II - "Chemistry" ASSESSMENT

### II - "Chemistry" ASSESSMENT

#### 2.1. Indicators Describing the Study Programme

##### Analysis

2.1.1. In the scope of the BSP Chemistry (43441) students get introduced to basic areas of chemistry. Study course descriptions are available in SAR (BSP Chemistry Annex Descriptions of the study courses/ modules). Study programme code belongs to the educational programmes – chemistry according to the Cabinet of Ministers regulations No.322 “Latvian education classification” (only in Latvian, see: <https://likumi.lv/ta/id/291524#piel1>). The first and second level of classification, denoted by the first two digits in code 43, is academic education (bachelor's degree). The third, fourth, and fifth levels of classification (educational thematic groups, thematic areas, and programme groups) denoted by the next three digits 441 are Chemistry. The study programme complies with the Study field.

2.1.2. The BSP Chemistry (43441) is only a full-time study programme implemented in the Latvian language. The degree to be obtained after 3-year (6 semesters) studies is a bachelor's degree in Natural Science in Chemistry. The total amount of the study programme is 120 CP (credit points) (180 ECTS), including the mandatory part is 76 CP (114 ECTS), the limited elective part is 28 CP (42 ECTS), the elective part is 4 CP (6 ECTS), the bachelor's thesis is 12 CP (18 ECTS) (SAR, Part 3, 3.1.2., p. 90). Since this is an academic study programme there is no professional qualification to be obtained. The goals and objectives of the study programme correspond to Level 6 of the Latvian Qualifications Framework (LKI) and it is oriented towards students with general secondary education or vocational secondary education without additional admission rules. Admission to the full-time undergraduate study programme takes place after the results of the centralized exams (in Latvian,

in foreign language, in chemistry, and with year grades in individual subjects in the secondary education document). Enrolment criteria are appropriate for this study programme. The aim of the study programme according to SAR (Part 3, 3.1.2., pp. 88-89) is to prepare highly qualified LKI Level 6 specialists in chemistry, chemical technology, biotechnology, applied chemistry for the field of chemistry and chemical technology, as well as to ensure the acquisition of high-quality theoretical knowledge and research skills and abilities in the field of chemistry, theoretical and practical training corresponding to the needs of the state, which gives the opportunity to successfully engage in solving economic problems, compete in the Latvian and foreign markets, as well as further professional and academic education. This goal should be achieved with the tasks set by the study programme (SAR, Part 3, 3.1.2., p. 89). However, after onsite visit, the experts agreed that tasks correspond to the Study field but not to the study programme (Chemistry) (SAR, Part 3, 3.1.2., pp. 88-89): provide a competitive education in chemistry corresponding to the bachelor's study level and the EFCE (European Federation of Chemical Engineering) Bologna recommendations, as well as in chemical technology and biotechnology. The part about chemical technology and biotechnology is not supported by the study plan of the respective programme. It is not clear how specialists are prepared in the chemical technologies and biotechnologies and why it is mentioned in the SAR. The aim of the study programme should be reviewed.

During the study period, students can obtain theoretical knowledge and skills in the basic areas of chemistry, learn practical and research skills in laboratories, learn how to cooperate not only locally but internationally, and understand professional ethics (BSP Chemistry, Annex Descriptions of the study courses/ modules). By learning and fulfilling these tasks students can obtain study programme results, regarding knowledge of inorganic, organic, physical, analytical, and biological chemistry. They have learned skills to apply theoretical knowledge in practical research activities and present their own results. Since this is an academic study programme, closely related to research activities, students also can select and evaluate scientific information, solve problems in the field of chemistry, and make decisions based on scientific research. Overall study programme goals, tasks, and results are interrelated and justified, however as previously mentioned there are gaps in the SAR, as the aim mentioned in SAR is wider than in reality.

According to the experts, a full-time study programme duration of 3 years (6 semesters, equivalent to 120 CP or 180 ECTS) is sufficient and appropriate to meet study programme goals and learning outcomes, although the goals mentioned in SAR are not reasonable and should be revised. The study programme is being implemented only in the Latvian language, and since enrollment criteria do not include the English language and all of the staff members are proficient in the Latvian language, the study programme implementation is reasonable and justified.

2.1.3. Within the previous reporting period, the study programme has undergone significant changes, taking into account student feedback and development trends in the field of chemistry (SAR, Part 3, 3.1.1., pp. 85-86). The main points of change include the introduction of new study courses, reorganization and optimization of the study plan of the BSP Chemistry, updated study materials, increased use of the electronic environment Moodle in the study process, and improved student involvement and feedback processes. According to the experts, generally, such changes are appropriate and ensure that the study programme stays relevant and develops to provide students with the necessary knowledge to enter the labour market after graduation. However, it is important to note that both the SAR and the onsite meetings lacked information about examples of the various changes made. The director of the study programme could not name the latest changes made in accordance with the interests of the students.

2.1.4. The BSP Chemistry is related to STEM. At the national level, the study direction "Chemistry, chemical technologies, and biotechnology" is strategically very important for the implementation of such national-level planning documents as "Latvia's sustainable development strategy until 2030",

"National Development Plan 2021-2027" and "Environmental Policy Guidelines 2021-2027" (SAR, Part 2, 2.1.1., p. 14). This study programme provides specialists in chemistry and, therefore, can help achieve the National goal to increase graduates in the field of natural sciences. During the on-site visit, graduates confirmed that there are no issues with entering the labour market after graduation. Students during the on-site interviews also confirmed that in most cases they already have an opportunity to participate in a project or research. Analyzing the employment of graduates of previous study programmes, it should be noted that a large number of graduates already start working during their studies. Some of them deal with production processes and product quality control, and the other parts are employed as scientific collaborators (SAR, Part 3, 3.1.3., p. 91). Regarding study programme graduates' employment, the employment rate is relatively high. Based on the analysis of the survey results of BSP Chemistry graduates (SAR, Part 3, 3.1.3., p. 91), 75% of graduates (15 persons) work in a job related to or corresponding to received education, 20% (4 persons) work in a field not related to chemistry and 1 respondent (5%) is not working at all. Chemistry specialists are needed in different fields such as pharmaceuticals, environmental science, etc. (SAR, Part 3, 3.1.2., p. 88). Taking this into account there still is long-term future perspective and room for this study programme graduates in the labour market. However, each year the number of enrolled students fluctuates and in the past 7 years there have not been more than 12 enrolled students (SAR Part 3, 3.1.4., p. 92-93). The total number of students in this study programme is slowly growing. The number of expelled students in the reporting period (past 7 years) is due to the COVID-19 pandemic and various restrictions in the assessment of students in the 2019/2020 study year. There is a drop in the statistics of expelled students, which will level off at the expense of the next study year. According to SAR (Part 3, 3.1.4., p. 93), the main reasons for students dropping out of the BSP Chemistry are related to student failure, the inadequate knowledge gained during the course of study, the chosen study programme does not meet expectations, family reasons, or financial considerations. Due to the epidemiological situation, the reason for student dropout was also the inability to study remotely. According to the experts, overall the study programme graduates are in demand in the field. Important to note, however, that those graduates, who participated in the onsite meeting were all employed in the pedagogical field, teaching chemistry.

2.1.5. Not applicable.

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

Conclusions:

The study programme complies with the Study field. Aims, objectives, learning outcomes, and admission requirements generally are interrelated and logically connected. However, the aim of the study programme mentioned in SAR is too broad, including chemical technologies and biotechnologies that are not actually related to this study programme. The study programme leads to the achievement of learning outcomes. The degree obtained upon graduation (Bachelor's degree of natural sciences in chemistry) is appropriate and compatible with the contents of the study programme. The corrections made to the study programme's parameters within the assessment of the Study field were mostly major. And there was a lack of examples to analyze all changes done, so it is hard to conclude whether changes are appropriate to ensure the development of the study programme. Although the enrolled student count decreased last year, the study programme is economically justified and graduates of chemistry bachelor's study programme are needed for the labor market.

Strengths:

1) Relatively high demand for graduates in the labour market;

2) Total number of students in the study programme increases.

Weaknesses:

- 1) The aims for the study programme mentioned in SAR are too broad and unreasonable;
- 2) High dropout rate of students.

## **2.2. The Content of Studies and Implementation Thereof**

### **Analysis**

2.2.1. The BSP Chemistry is conducted in Latvian, lasts three years, is conducted in 6 semesters and includes mandatory (Part A), limited elective (Part B) and elective (Part C) study courses. A total of 120 CP (180 ECTS) are earned upon completion of the BSP Chemistry (SAR, BSP Chemistry Annex Descriptions of the study courses/ module; BSP Chemistry Annex The curriculum of the study programme).

Mandatory study courses (Part A) include all basic subjects that are essential for the undergraduate study of chemistry and cover the fields of general, inorganic, organic, physical and analytical chemistry. The compulsory study courses also cover knowledge and skills related to higher education in the fields of mathematics, physics and environmental sciences. Occupational health and safety as well as state civil and environmental protection are also covered by compulsory study courses. In total, the compulsory study courses comprise 76 credits (114 ECTS) (SAR, BSP Chemistry Annex Descriptions of the study courses/ module; BSP Chemistry Annex The curriculum of the study programme).

There are two specializations that can be chosen in the second year of study: "Chemistry of Renewable Resources" and "Practical Bioanalytics". The content of the specialization is defined by limited elective study courses (Part B), and a total of 28 CP (42 ECTS) are credited towards these study courses. The specialization "Chemistry of renewable resources" covers environmental aspects, use of resources and energy as well as chemical technologies and ecology. This specialization is more related to the field of chemistry, in contrast to the specialization "Practical bioanalytics", which includes biological principles, bioanalytical methods, laboratory management as well as research and legislation and can be regarded as more interdisciplinary, i.e. involving biology as a scientific discipline to a greater extent (SAR, BSP Chemistry Annex Descriptions of the study courses/ module; BSP Chemistry Annex The curriculum of the study programme).

Elective study courses (Part C) are represented by 4 CP (6 ECTS), whereby one elective study course can be chosen in the first and one in the second year of study. The problem is that students have no choice because they are only offered one optional study course in both years. The range of electives should therefore be expanded to include (mandatory, limited elective or elective) study courses from other study fields at DU (SAR, BSP Chemistry Annex Descriptions of the study courses/ module; BSP Chemistry Annex The curriculum of the study programme).

The studies end with a final thesis, which is completed in the third year of study and it comprises 12 CP (18 ECTS). The theoretical work on the chosen topic is planned in the winter semester, while the experimental part of the thesis is carried out in the summer semester (SAR, BSP Chemistry Annex Descriptions of the study courses/ module; BSP Chemistry Annex The curriculum of the study programme).

The main directions of research of students in the Study field include (SAR, Part 2, 2.4.5., pp. 48-49):

- research on gasification and pyrolysis of certain types of biomass;
- analysis of producer gas produced in the biomass gasification process; determination of tar content in producer gas;
- hydrochemical, hydrological and hydrobiological studies of the surface water complex
- synthesis of fluorescent compounds and study of their fluorescent properties
- analysis, detection of environmental pollution and biomedical purposes;



- application of environmental chemistry and bioindication methods in air quality research and environmental pollution control;
- approval of biological monitoring methods and testing of new bioindicators in the assessment of the state of the environment;
- research and monitoring of groundwater quality;
- assessment of the state of the environment, assessment of the risk of environmental impact;
- development and research of new optical materials using innovative microscopic methods;
- animal parasitology;
- tissue and cell cultures, their use in genetics and breeding;
- biodiversity research.

Bachelor's theses are thematically assigned to students, without the possibility of changing the topics, because basically only 2-3 academic staff members conduct them as supervisors. Students are predetermined by the topic of the work, with no possibility of changes resulting primarily from the scientific interest of the supervisors. Moreover, it is difficult, based on the information contained in the SAR (Part 2, 2.4.5., pp. 48-49), to clearly define the quality of these works and what procedures are intended to assess these works. Anyway there are standard procedures related to the formal assessment of works in terms of plagiarism (SAR, Part 2, 2.1.6., pp. 23-24).

In the opinion of the experts, and taking into account the guidelines developed by the European Chemistry Thematic Network (ECTN) (<http://www.ectn-lc.eu/assets/files/Eurobachelor-Book010609FI.pdf>), the content of the BSP Chemistry fully meets the requirements for chemistry education at the undergraduate level. It can be seen from the above that the BSP Chemistry fully meets the ECTN criteria, as of the 180 ECTS available,  $\geq 90$  ECTS are allocated to the core chemistry subjects,  $\geq 15$  ECTS to the bachelor's thesis and  $\geq 15$  ECTS to the semi-optional modules. The remaining ECTS (30 of which can come from modules that do not deal with chemistry, mathematics, physics or biology) can be freely distributed. Therefore, the BSP Chemistry fully meets the conditions defined by the ECTN and it is recommended that DU initiates the appropriate procedure for the study programme to obtain the appropriate EuroBachelor label and thus be recognized by other European institutions as a standard that automatically provides the right of access (though not the right of admission, which is the prerogative of the receiving institution) to chemistry master study programmes.

From discussions with graduates and employer representatives (on-site visit, January 30, 2024) and taking into account the content of the study programme (SAR, BSP Chemistry Annex Descriptions of the study courses/ module), the experts are of the opinion that the BSP Chemistry meets the needs of the economy and the labour market.

Based on the analysis of the content of the study courses (SAR, BSP Chemistry Annex Descriptions of the study courses/ module) and Mapping of the study courses/modules for the achievement of the learning outcomes of the study programme (SAR, BSP Chemistry Annex), the experts are of the opinion that the study courses are interrelated and complementary, correspond to the objectives of the study programme and ensure the achievement of the learning outcomes.

Since it is a study programme that covers all the requirements for training chemists at the undergraduate level and ends with a thesis that relates to the current scientific research of the teaching staff in the field of chemistry (SAR, Annex Biographies of the teaching staff members), it can be said that the BSP Chemistry is aligned with the scientific trends.

According to the experts, the BSP Chemistry corresponds to the the State Academic Education Standard (SAR, BSP Chemistry Annex Compliance with the study programme with the State Education Standard).

2.2.2. Not applicable.

2.2.3. Three forms of study are used, namely ex-cathedra lectures, that serve to acquire knowledge,

and seminars and laboratory work to acquire practical skills. In addition, there is the preparation of a final thesis, which is usually based on a theoretical problem analysis using relevant literature and research work in the laboratory. Although study courses are generally theoretical in nature, research elements carried out by the students are also included in the teaching, based on various forms of reports, studies and other forms of independent work done by the students. Students carry out the practical part of the work independently within the framework of the subject area defined by the content of the study course. Participation in seminars and laboratory exercises is compulsory for all students throughout their studies. Students can only take the examination if they have fulfilled all the requirements prescribed by the lecturer, which are determined at the beginning of the study courses in the semester and are publicly available. The forms of teaching and assessment of student achievements are determined by the lecturers. They depend on the content of the study courses and are adapted to the needs and possibilities of the students, all with the aim of acquiring the required knowledge and skills. Due to the small number of students, it can be said that the implementation of the entire study programme is student-centered and the learning methods are selected accordingly. Students have the opportunity to influence the design of the study, provide feedback on the study and align all of this with their professional interests. The study courses Internship in an industry laboratory I and Internship in an industry laboratory II should be highlighted as a special form of acquiring practical knowledge and skills, that are carried out on the premises of industrial partners. In addition to the direct influence of the industrial partners on the study programme, these study courses provide practical teaching methods that are not possible or available at DU. It should be noted that modern teaching techniques such as design thinking and flipped learning, which should be introduced due to the small number of students and the insufficient number of teaching staff (especially those with PhD in chemistry), are not used to the highest extent. Although there is evidence that various forms of problem-solving methods are implemented in the study programme and used to describe the current challenges in the field of chemistry (SAR, Part 3, 3.2.3., pp. 96-99).

According to the experts, the methods of BSP Chemistry implementation, although traditional, contribute to the achievement of the aims and learning outcomes of the study courses and the study programme (SAR, BSP Annex Descriptions of the study courses/modules).

2.2.4. Not applicable.

2.2.5. Not applicable.

2.2.6. In the opinion of the experts, the topics of the students' final theses are relevant to the Study field of chemistry and correspond to the BSP Chemistry. The theses relate to the scientific field of interest of the teaching staff and are divided into two areas - specializations chosen by the students within the Part B study courses: Chemistry of Renewable Resources and Practical Bioanalysis. The process for the selection, preparation and defense of theses is clear and open to the public. The average grades that students receive for their thesis are usually above 8, with the exception of the pandemic year.

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

Conclusions:

The BSP Chemistry corresponds to the State Academic Education Standard. The study programme is up to date and based on the guidelines developed by the European Chemistry Thematic Network (ECTN). The BSP Chemistry meets the requirements of the economy and the labour market. Students have the opportunity to write their final thesis in the various areas of chemistry on relevant topics in collaboration with the teaching staff. The only disadvantage of the study programme is that

no additional courses can be chosen in the elective study courses (Part C), as only one study course is offered at a time. Although the methods of implementing the BSP Chemistry are traditional, they contribute to achieving the aims and learning outcomes of the study courses and study programme. The topics of the students' final theses are relevant to the Study field of chemistry and correspond to the BSP Chemistry.

**Strengths:**

- 1) The study programme is based on the guidelines developed by the European Chemistry Thematic Network (ECTN);
- 2) Traditional methods of implementing the BSP Chemistry that contribute to the achievement of the aims and learning outcomes of the study courses and the study programme.

**Weaknesses:**

- 1) Only one study course is offered in Part C - elective study courses, and students do not have the opportunity to choose between several study courses.

**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

**2.3. Resources and Provision of the Study Programme**

**Analysis**

2.3.1. The implementation of the BSP Chemistry mainly takes place in the new DU Life Sciences and Technologies building (SAR, Part 3, 3.3.1., p. 101) which, according to experts, is equipped with modern classrooms and laboratories that ensure efficient and appropriate teaching. The teaching staff of two organizational units of DU, the DU Department of Environment and Technology and the DU Institute of Life Sciences and Technology, are involved in teaching in the BSP Chemistry (SAR, BSP Annex The curriculum of the study programme). The teaching staff involved in the implementation of the BSP Chemistry participates in the implementation of scientific projects and cooperation with industry (SAR, Annex Biographies of the teaching staff members; SAR, Annex List of cooperation agreements, including the agreements for providing internship; SAR, AIC coordinator added annexes Ongoing and completed projects), which is the basis for the systematic renewal of material resources and equipment used in addition to scientific work and the implementation of study courses related to laboratory exercises and the preparation of practical work. Through the study courses Internship in an industry laboratory I and Internship in an industry laboratory II (SAR, BSP Annex Descriptions of the study courses/ modules), students are given the opportunity to acquire additional skills and gain experience in the use of various equipment and devices used in chemical laboratories and in some chemical industry processes.

Teaching takes place mainly in the following rooms: a classroom (112.5 m<sup>2</sup>) adequately equipped for all forms of teaching, including distance learning, a laboratory for the preparation of lectures and demonstration exercises (16.9 m<sup>2</sup>), a laboratory for general and inorganic chemistry (61.2 m<sup>2</sup>), a laboratory for analytical, physical and colloidal chemistry (66.4 m<sup>2</sup>), a laboratory room for the preparation of work in the aforementioned laboratories (16.9 m<sup>2</sup>), a laboratory for organic chemistry and biochemistry (66.3 m<sup>2</sup>) with a corresponding additional laboratory room for preparatory work

(16.9 m2) (SAR, Part 3, 3.3.1., pp. 101-102). According to the experts, all of these laboratories are equipped with devices and consumables that enable effective and appropriate chemistry teaching at undergraduate study level while complying with safety standards.

Students also have access to laboratories that are used primarily for research work (Environmental Chemistry Laboratory - 63.9 m2, Chromatography Laboratory - 43.4 m2, Renewable Resources Laboratory - 40.9 m2, Fluorescence Analysis Laboratory - 19.5 m2 and Organic Synthesis Laboratory - 32.0 m2), where students usually work while preparing their theses (SAR, Part 3, 3.3.1., pp. 102-103).

Students have access to a 1,000 m2 DU library with more than 258,820 books and 29,692 journals, including approx. 2,400 books from the field of chemistry (SAR, Part 3, 3.3.1., p. 103). In addition to books and journals, the library has a freely accessible reading room with 60 workstations, including 15 computers with freely accessible subscriptions to various databases, of which Web of Science, Scopus and Science direct are of particular importance for students when preparing theses and seminars and when working on research projects in which they may be involved during their studies. The library's opening hours are tailored to the needs of students and are available to them on working days (9 AM to 8 PM) as well as Saturdays (10 AM to 4 PM) (SAR, Part 2, 2.3.3., pp. 34-37). Considering the above and the visit to the library during the on-site visit (January 29, 2024), the experts are of the opinion that the library is adequately equipped with books, journals and electronic resources for the needs of studying chemistry at undergraduate level.

The experts are of the opinion that the existing resources and provisions, which include study provision, library and materials, are sufficient for the implementation of the BSP Chemistry and the acquisition of corresponding learning outcomes within the framework of an undergraduate study in the field of chemistry. As no data is available on the support of technical staff in the delivery of the study programme, it is not possible to assess this. Financial issues in connection with the implementation of the study programme are dealt with in chapter 2.3.3.

#### 2.3.2. Not applicable.

2.3.3. A total of 31 students were enrolled in the BSP Chemistry in the academic year 2022/2023, which is the highest number of enrolled students in the assessment period (SAR, Part 3, 3.1.4., Figure 3.1.4.1., p. 92). The number of enrolled students also corresponds to the resolution of the DU Senate, according to which the minimum number of students in academic bachelor's study programmes is 5 (SAR, Part 3, 3.3.3., p. 104). According to the available data (SAR, Part 3, 3.3.3., pp. 104-105), the implementation of the study programme is largely financed by the state budget through funding via full-time study places. In addition to funding from the state, some of the costs associated with the implementation of the study programme are financed from the funds of projects carried out at DU, such as ERDF and ESF projects (SAR, Part 3, 3.3.3., pp. 104-105). The cost structure includes the salary fund, employer taxes, costs for business trips, services, costs for materials, energy resources, water and inventory, costs for the purchase of books and journals, costs for the purchase of equipment and investments as well as social security costs for students (SAR, AIC coordinator added annexes About costs). The total costs of running the BSP Chemistry amount to 3113.87 EUR (SAR, AIC coordinator added annexes About costs) per student, while the recognized costs paid per student from the state budget (including the minimum study cost factor 1.9 and the bachelor's study programme factor 1) amount to 3548.44 EUR (SAR, Part 3, 3.3.3., p. 104). It can be concluded from this that the BSP Chemistry is economically sustainable and that after all costs have been paid, some of the funds remain and can be used for the further development of the study programme.

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

#### Conclusions:

Existing resources and provisions, which include study provision, library and materials, are sufficient for the implementation of the BSP Chemistry and the acquisition of corresponding learning outcomes within the framework of an undergraduate study in the field of chemistry. As no data is available on the support of technical staff in the delivery of the study programme, it is not possible to assess this. BSP Chemistry is economically sustainable and after all costs of the implementation of the study programme have been paid, some of the funds remain and can be used for the further development of the study programme.

#### Strengths:

- 1) The study programme is carried out in well-equipped classrooms and laboratories that meet the requirements of an undergraduate study in chemistry;
- 2) The costs of the study programme are covered by the state budget and partly by projects, which enables its further development.

#### Weaknesses:

- 1) 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

According to the experts, the existing resources and provisions, which include study provision, library and materials, and financial provision are sufficient for the implementation of the BSP Chemistry and the acquisition of corresponding learning outcomes within the framework of an undergraduate study in the field of chemistry.

## 2.4. Teaching Staff

### Analysis

2.4.1. The SAR (Part 3, 3.4.1., p. 104) states that all academic staff of the study programme meet the requirements set out in the 3 paragraph of the first part of Article 55 of the Law on Higher Education Institutions. Teaching is carried out by staff who constitute the pillars of scientifically active DU employees.

The information contained in the SAR (Part 3, 3.4.1., pp. 104-105) shows that there are 17 teaching staff, including two full-time professors, four associate professors, six assistant professors, two lecturers, one assistant, one leading researcher and one researcher. Six professors and associate professors are involved in the implementation of the BSP (mandatory and limited elective study courses). All of them are elected to positions at DU. From the information contained in SAR (Annex Basic information on the teaching staff involved in the implementation of the Study field), it is possible to extract five people with a PhD in chemistry, of which two are visiting professors and lecturers and three DU professors employed in permanent positions (one associate professor and two assistant professors). In such a situation, it is also difficult to determine whether the staff is sufficient due to the lack of precise qualifications of the employees (no details of positions held and specialties were provided). It is necessary to employ at least 2-3 permanent positions for candidates with a PhD in chemistry.

2.4.2. In the period from 2013, the number of teaching staff increased to the extent that one visiting assistant professor and two lecturers were additionally involved in the implementation of study programmes. Nevertheless, it should be noted that only five professors and lecturers from the field of chemistry are still involved in the implementation of the entire BSP Chemistry, which is not sufficient for the effective implementation of the study programme and its further development. Namely, this places a very heavy burden on these employees and generates a very heavy teaching load.

Although information was obtained during the interview with DU management (on-site meeting with the HEI management) about the planned increase in the number of employed PhD chemistry in the Study field who will be involved in the implementation of corresponding study programmes, no further evidence of this strategy and development policy of DU can be found in the available documents. It is recommended to employ additional teaching staff with PhD in chemistry and include them in the implementation of the study programme in order to carry out the study programme properly and with high quality.

2.4.3. Not applicable.

2.4.4. Over the last six years, research workers have published in journals from the JCR list.

In the analyzed data period in publishing scientific papers in 2017-2023, teaching staff published scientific publications from the JCR list: year (number): 2017 (23); 2018 (49); 2019 (41); 2020 (37); 2021 (34); 2022 (52) and 2023 (45), of which the number of publications in Q1 was as follows in 2017-2023: 2-29-13-12-12-23-18. Over the years, teaching staff have published similar amount of manuscripts, but it is difficult to find the reason in the strategy of publishing in journals with a wider international reach and a wider scientific audience from other countries (SAR, Annex List of the publications, patents, and artistic creations of the teaching staff over the reporting period; SAR, AIC coordinator added annexes Number of publications in Web of Science Scopus journals; Scopus database).

2.4.5. According to the content related to SAR (Part 3, 3.4.5., p. 106-107), the teaching staff of the study objectives are related and ensure wholeness, are correlated and have the nature of deepening knowledge, which may help in the use of practical objectives in the study programme. The mobility of teaching staff is low, and there is a lack of both international and domestic cooperation.

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

Conclusions:

The scientific and teaching staff is very burdened by classes with students due to the too small number of teaching staff with PhD. The teaching and research staff, despite the teaching load for key personnel, publish in journals from the JCR list and have key knowledge to conduct the research. This does not directly affect the acquisition of international research projects and participation in international scientific conferences. Teaching staff mobility is low, and international and domestic cooperation is very limited. Apart from the minimum specified by DU, which a teaching staff member must fulfill, and given the enormous amount of work involved in the teaching process, it is difficult to talk about any additional development. Nevertheless, at the current stage, the teaching and research staff fulfills their teaching and publishing obligations and, to a minimal extent, those related to mobility, international cooperation and research projects (domestic and international).

Strengths:

1) Teaching staff publish their research results in journals from the JCR list, and their number is

constantly increasing.

#### Weaknesses:

- 1) Research and teaching staff are heavily burdened with teaching activities due to the too low number of research workers;
- 2) There should be more staff with PhD in chemistry for Study field in chemistry;
- 3) Research workers do not have international projects and do not apply for them (this is not stated in the SAR);
- 4) The teaching staff does not effectively and with a minimum impact participate in international scientific conferences;
- 5) The lack of longer mobility results in a lack of change towards a fresh approach to education and scientific research.

### 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:** Partially compliant

All academic staff of the study programme meet the requirements set out in the 3 paragraph of the first part of Article 55 of the Law on Higher Education Institutions (SAR, Part 3, 3.4.1., p.104). Too few teaching staff members with PhD in chemistry and too much workload for five teaching staff members with chemistry degree.

### 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 the information provided in the SAR (Part 3, 3.2.1., pp. 93-95) and SAR BSP Annex The curriculum of the study programme, the BSP Chemistry is fully compliant to the State Academic Education Standard. The amount of credit points (120 CP, 180 ECTS) is in line with the State Academic Education Standard (<https://likumi.lv/doc.php?id=266187> (in force from 16.05.2014); <https://likumi.lv/ta/id/346042-grozijumi-ministru-kabineta-2014-gada-13-maija-noteikumos-nr-24-0-noteikumi-par-valsts-akademiskas-izglitiba-standartu> (in force from 05.10.2023.)). The study programme consists of the mandatory part, the limited elective and the elective parts and contains mandatory study courses in civil protection and environment protection as well (<https://likumi.lv/ta/id/37967-augstskolu-likums>). The study programme includes the preparation of a Bachelor's thesis.

- 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

- 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

Provided data (SAR BSP Annex Descriptions of the study courses/modules) on the requirements starting a study course, the purpose of the study course implementation, the planned study results, the content of the study course, recommended list of literature and the evaluation criteria of study results complies to the Law on Higher Education Institutions (HEI, Augstskolu likums (likumi.lv)). According to the Law on HEI, the descriptions of the study courses and the study materials have been prepared in Latvian.

- 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

The sample of the diploma to be issued and diploma supplements with the additional information on the national higher education system are provided (SAR BSP Annex Sample of the diploma and its supplement to be issued for completing the study programme). The samples of the documents comply with the requirements of the Law on HEI (Augstskolu likums (likumi.lv)).

- 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

According to the Law on HEI (Augstskolu likums (likumi.lv)) no less than five professors and associate professors elected on the positions at the HEI should participate in the implementation of the mandatory and the limited elective parts of the academic study programmes. The academic staff of the BSP Chemistry fully complies with the requirement (SAR, Part 3, 3.4.1., pp.104-105; SAR Annex Basic information on the teaching staff involved in the implementation of the Study field and SAR BSP Annex The curriculum of the study programme).

- 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

- 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

- 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

Rector of the DU certified the Latvian language proficiency of the academic staff involved in the implementation of the BSP Chemistry (code 43441) (SAR Annex A statement signed by the rector, director, head of the study programme or field that the knowledge of the state language of the teaching staff involved in the implementation of the study programmes within the study field complies with the regulations on the state language knowledge and state language proficiency test for professional and official duties) according to the "Regulations regarding the extent of the knowledge of the official language and the procedures for examining the proficiency in the official language".

- 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

- 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

SAR Annex Standard sample of study agreement contains the agreement form for studies at the DU in the chosen study programme. The agreement states the obligations of the parties as well as the compliance with regulation on studies at the DU (SAR Annex List of the governing regulatory enactments and regulations of the higher education institution/ college).

- 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 agreement between the DU and University of Latvia confirms the opportunity to continue the studies in the academic Bachelor's study programme "Chemistry" of the University of Latvia if the implementation of the DU study programme is terminated (SAR, Part 2, 2.1.4., pp. 21-22, SAR Annex A document certifying that the higher education institution or college will provide students with opportunities to continue their education in another study programme or another higher education institution/ college (agreement with another accredited higher education institution or college) if the implementation of the study programme is terminated).

- 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 compensation policy declared in the Statement (SAR, Annex A document certifying that the higher education institution or college guarantees compensation for losses to students if the study programme is not accredited or the study programme license is revoked due to actions (actions or omissions) of the higher education institution or college and the student does not wish to continue studies in another study programme).

- 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

- 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

#### **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

BSP Chemistry complies with the State Education Standard, 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 BSP Chemistry fully complies with the State Academic Education Standard, the requirements of the Law on Higher Education Institutions and other legal regulations, and the requirements of the Study field. Although the BSP Chemistry is designed so that aims, objectives, learning outcomes, and admission requirements are generally related and logically linked, the aim is too broad as it really only covers the field of chemistry. The BSP Chemistry has undergone changes since the last accreditation, but the lack of clear examples prevents the assessment of whether these changes were purposeful or whether they have improved the study programme. However, it should be noted that the study programme is up to date and based on the guidelines developed by the European Chemistry Thematic Network (ECTN). The only shortcoming is the lack of the elective study courses (Part C), as only one study course is offered at a time. Students have the opportunity to write their final thesis in the different areas of chemistry on relevant topics of the Study field and the BSP Chemistry in collaboration with the teaching staff. The resources and provisions, which include study provision, library and materials, are adequate for the implementation of the BSP Chemistry and the acquisition of appropriate learning outcomes as part of an undergraduate study in the field of chemistry. The scientific and teaching staff are heavily burdened by the classes with students. Teaching staff publish in scientific journals, but the number of publications in journals with a high impact factor must be increased. The mobility of teaching staff is low, and international and national cooperation is very limited.

In summary, the main strengths of the BSP Chemistry are that (i) there is a relatively high demand for graduates on the job market, (ii) the total number of students has increased, (iii) the study programme is based on the guidelines developed by the European Chemistry Thematic Network (ECTN), (iv) traditional teaching methods contribute to the achievement of the aims and learning outcomes of the study courses and the study programme, (v) very well-equipped classrooms and laboratories that meet the requirements of an undergraduate study in chemistry, (vi) the costs of the study programme are covered and there is room for its further development, (vii) teaching staff publish their research results in JCR-listed journals and their number is constantly increasing.

In addition, some shortcomings should be emphasized, the most important of which are: (i) the aims of the study programme stated in SAR are too broad and unreasonable, (ii) high dropout rate, (iii) students do not have the possibility to choose between several elective study courses, (iv) the research and teaching staff is heavily burdened with teaching activities, (v) the number of teaching

staff with PhD in chemistry is insufficient, (vi) the number of participations in international projects and international scientific conferences is low, (vii) the lack of mobility leads to a lack of change towards a new approach in education and scientific research.

### Evaluation of the study programme "Chemistry"

Evaluation of the study programme:

Good

### 2.6. Recommendations for the Study Programme "Chemistry"

#### Short-term recommendations

- |   |
|---|
| 1) The goals of the study programme should be clearly formulated and leave no room for doubt (within three months).   |
| 2) Measures should be developed to reduce the drop-out rate of students (within 2 years).   |
| 3) The number of study courses offered in Part C - elective study courses should be increased so that students have the opportunity to choose between several study courses (from academic year 2024/2025). |
| 4) The number of permanently employed teaching staff with PhD in Chemistry should be increased (within 2 years).  |

#### Long-term recommendations

- |  |
|--|
| 1) The teaching load must be better balanced in order to open the possibility for intensification of scientific work, cooperation and mobility (until the next accreditation). |
| 2) The number of publications in journals with a high impact factor must be increased (until the next accreditation).  |
| 3) The mobility of teaching staff, and international and national cooperation must be intensified (until the next accreditation).  |

## II - "Chemistry" ASSESSMENT

### II - "Chemistry" ASSESSMENT

#### 2.1. Indicators Describing the Study Programme

##### Analysis

3.1.1. In the scope of the MSP Chemistry (45441) students get more expanded and specialized knowledge and practical experience of chemistry. Study course descriptions are available in SAR (Annex Descriptions of the study courses/modules). Study programme code belongs to the educational programmes – chemistry according to the Cabinet of Ministers regulations No. 322 "Latvian education classification" (only Latvian, see: <https://likumi.lv/ta/id/291524#piel1>). The first and second level of classification, denoted by the first two digits in code 45, is academic education (master's degree). The third, fourth, and fifth levels of classification (educational thematic groups, thematic areas, and programme groups) denoted by the next three digits 441 are Chemistry. The study programme complies with the Study field.

3.1.2. The MSP Chemistry (45441) is only a full-time study programme implemented in the Latvian language. The degree to be obtained after 2-year (4 semesters) studies is a master's degree of Natural Sciences in Chemistry. The total amount of the study programme is 80 CP (credit points) (120 ECTS), including mandatory part with 38 CP (60 ECTS), the limited elective part is 14 CP (21 ECTS), the elective part is 2 CP (4 ECTS) and the master's thesis is 26 CP (39 ECTS) (SAR, Part 3, 3.1.2., p. 65). Since this is an academic study programme, there is no professional qualification to be obtained. The goals and objectives of the study programme correspond to Level 7 of the Latvian Qualifications Framework (LKI) and it is oriented towards students with a bachelor's degree in chemistry, chemical technology or equivalent education with no additional admission requirements. Applicants participate in the competition with the average weighted grade of the bachelor study programme transcript. The weighted average grade is calculated as the sum of the multiples of grades and credit points obtained in all study courses divided by the sum of credit points acquired in the study programme. If credit points are not specified, then it is calculated as the sum of grades and contact hours obtained in all study courses divided by the number of contact hours of all study courses (SAR, Part 3, 3.1.2., p. 64). Enrolment criteria are appropriate for this study programme.

The aim of the study programme according to SAR (Part 3, 3.1.2. pp. 64-65) is to provide a set of knowledge, skills and competence in accordance with the level 7 knowledge, skills and competence of the framework structure determined in the Latvian education classification, to provide students matriculated at DU with a high-quality education that meets the needs of the state standards, providing the opportunity to acquire theoretical and practical knowledge, to supplement the skills and abilities of research work and the opportunity to successfully continue their studies in doctoral studies. This goal is achieved with the tasks set by the study programme (SAR, Part 3, 3.1.2., pp. 64-65).

During the study period, students can obtain theoretical and practical knowledge to ensure master's specializations in environmental chemistry or practical bioanalytics, integrating various related fields of chemistry, ecology, biology, medicine and environmental science, emphasizing the interrelationship between theory and practice (SAR, Part 3, 3.1.2., p. 64). The knowledge, skills and competences acquired during the studies allow the graduate to work as a leading level specialist in chemical and material industry companies and scientific research institutes, to plan, organize and manage the course of production and research processes according to the task, quality and time requirements. Study programme goals, tasks, and results are interrelated and justified.

According to the experts, a full-time study programme duration of 2 years (4 semesters, equivalent to 80 CP or 120 ECTS) is sufficient and appropriate to meet study programme goals and learning outcomes. The study programme is being implemented only in the Latvian language, and since enrollment criteria do not include the English language and all of the staff members are proficient in the Latvian language, the study programme implementation is reasonable and justified.

3.1.3. Within the previous reporting period, the study programme has undergone significant changes, taking into account student feedback and development trends in the field of chemistry (SAR, Part 3, 3.1.1., pp. 62-64). The main points of change include the introduction of new study courses, updated study materials, increased use of the electronic environment Moodle in the study process, and improved student involvement and feedback processes. According to the experts, generally, such changes are appropriate and ensure that the study programme stays relevant and develops to provide students with the necessary knowledge to enter the labour market after graduation. However, it is important to note that both the SAR and the onsite meetings lacked information about examples of the various changes made. The director of the study programme could not name the latest changes made in accordance with the interests of the students.

3.1.4. The MSP Chemistry is related to STEM. At the national level, the Study field is strategically very important for the implementation of such national-level planning documents as "Latvia's

sustainable development strategy until 2030", "National Development Plan 2021-2027" and "Environmental Policy Guidelines 2021-2027" (SAR, Part 2, 2.1.1., p. 14.). This study programme provides specialists in chemistry and, therefore, can help achieve the National goal to increase the number of graduates in the field of natural sciences. During the onsite visit, graduates confirmed that there are no problems with entering the labour market after graduation (Meeting with graduates, January 30, 2024). Students during the interviews also confirmed that in most cases they already have an opportunity to participate in a project or research (Meeting with students of both study programmes, January 30, 2024). Analysing the employment of graduates of previous study programmes, it should be noted that a large number of applicants have already been employed in companies or scientific institutes in the chosen field of specialization before starting their studies (SAR, Part 3, 3.1.3., p. 67). Regarding study programme graduates' employment, the employment rate is relatively high. Based on the analysis of the survey results of MSP Chemistry graduates (SAR, Part 3, 3.1.3., p. 67), 78,57% of graduates (11 persons) work in a job related to or corresponding to received education, 14,29% (2 persons) work in a field not related to chemistry, and one respondent (5%) chooses the point "Other answer" by writing the comment "Partly". Chemistry specialists are needed in different fields such as pharmaceuticals, environmental science, etc. (SAR, Part 3, 3.1.2., p. 67). Taking this into account there still is long-term future perspective and room for this Study field graduates in the labour market. However, each year the enrolled students' number fluctuates, and in the past 7 years there have not been more than 7 enrolled students (SAR, Part 3, 3.1.4., p. 68). The total number of students in this study programme is slowly growing. The number of expelled students in the reporting period (past 7 years) is 7. According to SAR (SAR, Part 3, 3.1.4., p. 68), the main reasons for students dropping out of the MSP Chemistry study programme are related to starting work, which is not always compatible with studies. According to the experts, overall study programme graduates are in demand in the field. Important to note, however, that those graduates, who participated in the onsite meeting were all employed in the pedagogical field, teaching chemistry.

3.1.5. Not applicable.

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

Conclusions:

The study programme complies with the Study field. Aims, objectives, learning outcomes, and admission requirements are interrelated and logically connected. The study programme leads to the achievement of learning outcomes. The degree obtained upon graduation (Master's degree of natural sciences in chemistry) is appropriate and compatible with the contents of the study program. The study programme was changed considerably, taking into account student feedback and development trends in the field of chemistry. And there was a lack of examples to analyze all changes done, so it is hard to conclude whether changes are appropriate to ensure the development of the study programme. Although the enrolled student count decreased last year, the study programme is economically justified and chemistry graduates are needed for the labour market.

Strengths:

- 1) High demand for graduates in the labour market;
- 2) Total number of students in the study programme is increasing.

Weaknesses:

- 1) Lack of examples to analyze all corrections made.

## 2.2. The Content of Studies and Implementation Thereof

### Analysis

3.2.1. The MSP Chemistry is conducted in Latvian, lasts two years, is conducted in 4 semesters and includes mandatory (Part A), limited elective (Part B) and elective (Part C) study courses. A total of 80 CP (120 ECTS) are earned upon completion of the MSP Chemistry (SAR, MSP Chemistry Annex Descriptions of the study courses/module; BSP Chemistry Annex The curriculum of the study programme).

Mandatory study courses (Part A) include advanced subjects that are important for the master study in the field of chemistry and cover the fields of inorganic, organic, physical and analytical chemistry, toxicology and sustainable development. In total, the mandatory study courses comprise 64 CP (96 ECTS) of which a total of 26 CP (39 ECTS) belong to the master's thesis, which is carried out in both years of study (SAR, MSP Chemistry Annex Descriptions of the study courses/module; MSP Chemistry Annex The curriculum of the study programme). The names of the study courses that are part of the Part A study courses should be changed to distinguish between the same names used in the BSP Chemistry. This concerns the study courses Inorganic Chemistry, Organic Chemistry and Physical Chemistry, which are suitable for the master's programme in terms of content, but which must also be distinguished by their names from the study courses of the same name in the BSP Chemistry (SAR, BSP Chemistry Annex The curriculum of the study programme; MSP Chemistry Annex The curriculum of the study programme).

In the first year of study, students choose between the two specializations Environmental chemistry or Practical bioanalysis. These specializations form Part B of the study programme, which comprises a total of 14 CP (21 ECTS). The specialization in environmental chemistry includes study courses on the topics of water, ice and salt pollution, renewable resources, chemical reactions and processes in production plants, chemical indicators for the quality of chemical products, current global and local problems with possible solutions in the field of material resources. Specialization in practical bioanalytics includes study courses on instrumental methods, systematic review of research in the field of chemistry, statistics, sensory evaluation of food, methodology of processing and preparation of samples and similar (SAR, MSP Chemistry Annex Descriptions of the study courses/module; MSP Chemistry Annex The curriculum of the study programme).

The elective study courses (Part C) are represented with 2 CP (3 ECTS), whereby one study course must be chosen in the second year of study. As with the Part C study courses in the BSP Chemistry, students do not have a choice between two or more elective study courses in the MSP Chemistry. In particular, they were only offered one study course (Concept and practice of sustainable development) to choose from, which is why the list of electives in the Part C study courses must be expanded (SAR, MSP Chemistry Annex Descriptions of the study courses/module; MSP Chemistry Annex The curriculum of the study programme). From the discussion with the graduates (on-site meeting January 30, 2024), it is clear that it would be desirable to also offer topics for the acquisition of pedagogical, psychological and methodological skills within the Part C study courses, which are necessary for work in primary and secondary schools, as these are lacking in the context of professional activity. It was significant that all graduates of the MSP Chemistry worked or work in primary and secondary schools where they teach chemistry and related subjects.

The study programme concludes with a master's thesis, which is completed during the two years of study and is assessed with 26 CP (39 ECTS) (SAR, MSP Chemistry Annex Descriptions of the study courses/module; MSP Chemistry Annex The curriculum of the study programme).

In the opinion of the experts, and taking into account the guidelines developed by the European Chemistry Thematic Network (ECTN) (<http://www.ectn-lc.eu/assets/files/Eurobachelor-Book010609FI.pdf>), the content of the MSP Chemistry fully meets the requirements for chemistry education at the undergraduate level. It can be seen from the above that the MSP Chemistry fully meets the ECTN criteria, as master study

programmes should involve 90-120 ECTS credits, at least 60 of which must be at master level. An analysis of the content of the MSP Chemistry study courses shows that practically all of these study courses are at master's level or higher. Thus the master thesis should normally carry at least 30 ECTS. Therefore, the MSP Chemistry fully meets the conditions defined by the ECTN and it is recommended that DU initiates the appropriate procedure for the study programme to obtain the appropriate EuroMaster label and thus be recognized by other European institutions as a standard that automatically provides the right of access (though not the right of admission, which is the prerogative of the receiving institution) to PhD programmes in chemistry.

From discussions with graduates and employer representatives (on-site visit, January 30, 2024) and taking into account the content of the study programme (SAR, MSP Chemistry Annex Descriptions of the study courses/ module), the experts are of the opinion that the MSP Chemistry meets the needs of the economy and the labour market.

Based on the analysis of the content of the study courses (SAR, MSP Chemistry Annex Descriptions of the study courses/module) and Mapping of the study courses/modules for the achievement of the learning outcomes of the study programme (SAR, MSP Chemistry Annex), the experts are of the opinion that the study courses are interrelated and complementary, correspond to the objectives of the MSP Chemistry and ensure the achievement of the learning outcomes.

Since it is a study programme that covers all the requirements for training chemists at the graduate level and ends with a master's thesis that relates to the current scientific research of the teaching staff in the field of chemistry (SAR, Annex Biographies of the teaching staff members), it can be said that the MSP Chemistry is aligned with the scientific trends. A more detailed analysis in this context is presented in chapter 3.2.6.

According to the experts, the MSP Chemistry complies with the State Academic Education Standard (SAR, MSP Chemistry Annex Compliance with the study programme with the State Education Standard).

3.2.2. Students who complete their master's thesis as part of the MSP Chemistry work on topics and are supervised by teaching staff who work closely in the field of chemistry and related disciplines such as physics, chemical technology, materials science, environmental science and biochemistry (SAR, Part 2, 3.2.2., Figures 3.2.2.1., p. 72). At the same time, each topic that students work on is based on research and involves a specific scientific problem, the application of appropriate methods and techniques used in research laboratories or in industry. In addition, in the final year of their studies, students must participate in the DU conference, where they present the topic of their master's thesis orally, thus acquiring the appropriate competencies and skills to present research results to a larger audience (SAR, Part 3, 3.2.2., p. 71).

In addition, the teaching staff under whose supervision Master's theses are written are scientifically active in the field of chemistry and related disciplines, as well as participating in congresses and leading and participating in projects with other scientific institutions and industry (SAR Annex Biographies of the teaching staff members; SAR Annex List of cooperation agreements, including the agreements for providing internship). Taking into account the above, the experts are of the opinion that the award of a degree in MSP Chemistry is based on the achievements and knowledge in the field of chemistry and related scientific disciplines.

3.2.3. Three forms of study are used, namely ex-cathedra lectures, that serve to acquire knowledge, and practical lessons and laboratory work used to acquire practical skills. 60% of the time is reserved for independent work by the students (SAR, Part 3, 3.2.1., p. 69). In addition, there is the preparation of a master's thesis, which is based on research work carried out in the laboratory. Although study courses are generally theoretical in nature, research elements carried out by the students are also included in the teaching, based on various forms of reports, studies and other forms of independent work done by the students. Students carry out the practical part of the work

independently within the framework of the subject area defined by the content of the study course. Participation in seminars and laboratory exercises is compulsory for all students throughout their studies. Students can only take the examination if they have fulfilled all the requirements prescribed by the lecturer, which are determined at the beginning of the study courses in the semester and are publicly available. The forms of teaching and assessment of student achievements are determined by the lecturers. They depend on the content of the study courses and are adapted to the needs and abilities of the students, all with the aim of acquiring the required knowledge and skills. Due to the small number of students, it can be said that the implementation of the entire study programme is student-centered and the learning methods are selected accordingly. Students have the opportunity to influence the design of the study, provide feedback on the study and align all of this with their professional interests. Modern teaching techniques such as design thinking and flipped learning, which should be introduced due to the small number of students and the insufficient number of teaching staff (especially those with PhD in chemistry), are not used to the highest extent. Anyhow, various forms of problem-solving methods are implemented in the study programme and used to describe the current challenges in the field of chemistry (SAR, Part 3, 3.2.3., pp. 72-73).

In order to increase the pedagogical and methodological competence of teaching staff, regular seminars are held at DU level, where teaching staff are introduced to various methods, experiences and best practices used in modern higher education (SAR, Part 3, 3.2.3., p. 73).

According to the experts, the traditional methods of study programme implementation, contribute to the achievement of the aims and learning outcomes of the study courses and the MSP Chemistry (SAR, MSP Annex Descriptions of the study courses/modules).

3.2.4. Not applicable.

3.2.5. Not applicable.

3.2.6. The topics of the students' final theses can be grouped into two areas that directly reflect the sub-specializations of the MSP Chemistry: Environmental chemistry and Practical bioanalysis. The topics of the master's theses are always based on the current research interests of the teaching staff (SAR, Annex List of the publications, patents, and artistic creations of the teaching staff over the reporting period) and the needs of cooperation with external institutions and industrial partners (SAR, Annex List of cooperation agreements, including the agreements for providing internship). To ensure the high quality of the master's theses, with constant support and guidance from the supervisors, presentations of the research work carried out by the students are organized at Department of Environment and Technology level, where the teaching staff and scientists of the department give recommendations and comments to the students to improve their research work and consequently their master's theses. Most students start writing their master's thesis in the first year of the MSP Chemistry, and the work is usually related to the students' interests and their part-time employment outside DU (if it is related to the field of chemistry) (SAR, Part 3, 3.2.6., pp. 74-75). All this ensures the high quality of the master's theses, which is also reflected in the high grades awarded to the students' theses (SAR, Part 3, 3.2.6., Figure 3.2.6.1., p. 75).

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

Conclusions:

The MSP Chemistry corresponds to the State Academic Education Standard. The MSP Chemistry is up to date and based on the guidelines developed by the European Chemistry Thematic Network (ECTN). The study programme meets the requirements of the economy and the labour market. Students have the opportunity to write their master's thesis in the various areas of chemistry on relevant topics in collaboration with the teaching staff. The disadvantages of the study programme



are related to the impossibility of choosing between two or more study courses in the Part C of study programme, as well as to the inappropriate names of some of the study courses, which are identical to those of the BSP Chemistry. Although the methods of implementing the MSP Chemistry are traditional, they contribute to achieving the aims and learning outcomes of the study courses and study programme. The academic degree in MSP Chemistry is awarded on the basis of achievements and knowledge in the scientific field of chemistry. The topics of the students' master's theses are relevant to the field of chemistry and correspond to the MSP Chemistry.

**Strengths:**

- 1) The study programme is based on the guidelines developed by the European Chemistry Thematic Network (ECTN);
- 2) Traditional methods of implementing the MSP Chemistry that contribute to the achievement of the aims and learning outcomes of the study courses and the study programme.

**Weaknesses:**

- 1) Only one study course is offered in Part C - elective study courses, therefore students do not have the opportunity to choose between several study courses;
- 2) The names of some of the study courses are identical to those on BSP Chemistry. They need to be changed so that, in addition to the appropriate content and title, they are appropriate for the master's level study 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:** Fully compliant

According to the experts, the award of a degree in MSP Chemistry is based on the achievements and knowledge in the field of chemistry and related scientific disciplines.

**2.3. Resources and Provision of the Study Programme**

**Analysis**

3.3.1. The implementation of the MSP Chemistry mainly takes place in the new DU Life Sciences and Technologies building (SAR, Part 3, 3.3.1., p. 75) which, according to experts, is equipped with modern classrooms and laboratories that ensure efficient and appropriate teaching. The teaching staff of two organisation units of DU, the DU Department of Environment and Technology and the DU Institute of Life Sciences and Technology, are involved in teaching in the MSP Chemistry (SAR, MSP Annex The curriculum of the study programme (for each type and form of the implementation of the study programme). The teaching staff involved in the implementation of the MSP Chemistry participates in the implementation of scientific projects and cooperation with industry (SAR, Annex Biographies of the teaching staff members; SAR, Annex List of cooperation agreements, including the agreements for providing internship; SAR, AIC coordinator added annexes Ongoing and completed projects), which is the basis for the systematic renewal of material resources and equipment used in addition to scientific work and the implementation of study courses related to laboratory exercises and the preparation of practical work.

Teaching takes place mainly in the following rooms: a classroom (112.5 m<sup>2</sup>) adequately equipped for all forms of teaching, including distance learning, a laboratory for the preparation of lectures and

demonstration exercises (16.9 m<sup>2</sup>), a laboratory for general and inorganic chemistry (61.2 m<sup>2</sup>), a laboratory for analytical, physical and colloidal chemistry (66.4 m<sup>2</sup>), a laboratory room for the preparation of work in the aforementioned laboratories (16.9 m<sup>2</sup>), a laboratory for organic chemistry and biochemistry (66.3 m<sup>2</sup>) with a corresponding additional laboratory room for preparatory work (16.9 m<sup>2</sup>) (SAR, Part 3, 3.3.1., pp. 76-77). According to the experts, all of these laboratories are equipped with devices and consumables that enable effective and appropriate chemistry teaching at undergraduate study level while complying with safety standards.

Students also have access to laboratories that are used primarily for research work (Environmental Chemistry Laboratory - 63.9 m<sup>2</sup>, Chromatography Laboratory - 43.4 m<sup>2</sup>, Renewable Resources Laboratory - 40.9 m<sup>2</sup>, Fluorescence Analysis Laboratory - 19.5 m<sup>2</sup> and Organic Synthesis Laboratory - 32.0 m<sup>2</sup>), where students usually work while preparing their theses (SAR, Part 3, 3.3.1., pp. 76-77). Students have access to a 1,000 m<sup>2</sup> DU library with more than 258,820 books and 29,692 journals, including approx. 2,400 books from the field of chemistry (SAR, Part 3, 3.3.1., p. 77). In addition to books and journals, the library has a freely accessible reading room with 60 workstations, including 15 computers with freely accessible subscriptions to various databases, of which Web of Science, Scopus and ScienceDirect are of particular importance for students when preparing theses and seminars and when working on research projects in which they may be involved during their studies. The library's opening hours are tailored to the needs of students and are available to them on working days (9 AM to 8 PM) as well as Saturdays (10 AM to 4 PM) (SAR, Part 2, 2.3.3., pp. 34-37). Considering the above and the visit to the library during the on-site visit (January 29, 2024), the experts are of the opinion that the library is adequately equipped with books, journals and electronic resources for the needs of studying chemistry at undergraduate level.

The experts are of the opinion that the existing resources and provisions, which include study provision, library and materials, are sufficient for the implementation of the MSP Chemistry and the acquisition of corresponding learning outcomes within the framework of an undergraduate study in the field of chemistry. As no data is available on the support of technical staff in the delivery of the study programme, it is not possible to assess this. Financial issues in connection with the implementation of the study programme are dealt with in chapter 3.3.3.

### 3.3.2. Not applicable.

3.3.3. A total of 15 students were enrolled in the MSP Chemistry in the academic year 2022/2023, which is the highest number of enrolled students in the assessment period (SAR, Part 3, 3.1.4., Figure 3.1.4.1., p. 68). According to the available data (SAR, Part 3, 3.3.3., p. 78), the implementation of the study programme is largely financed by the state budget through funding via full-time study places. In addition to funding from the state, some of the costs associated with the implementation of the study programme are financed from the funds of projects carried out at DU, such as ERDF and ESF projects (SAR, Part 3, 3.3.3., p. 78). The cost structure includes the salary fund, employer taxes, costs for business trips, services, costs for materials, energy resources, water and inventory, costs for the purchase of books and journals, costs for the purchase of equipment, and investments as well as social security costs for students. According to the decision of the DU Senate, the minimum number of students in the academic master's study programme is starting from three students (SAR, Part 3, 3.3.3., p. 78). According to the information provided at request of the experts during the on-site visit, the total costs per one MSP Chemistry student per year is 4586.16 EUR, and the minimum number of students in the study programme to ensure its profitability is 5 students (SAR, AIC coordinator added annexes About costs). Tuition fees are determined in compliance with the instructions of the State Audit Office.

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

#### Conclusions:

The implementation of MSP mainly takes place in the new DU Life Sciences and Technologies building where the students have extensive opportunities to familiarise themselves with the basic methods of chemistry and chemical technology. There is sufficient space for the learning process as well as large and modern premises for research. The available resources and facilities, library and materials are sufficient to implement the MSP Chemistry and achieve the relevant learning outcomes.

#### Strengths:

- 1) Students have extensive learning opportunities in the new and well-equipped DU Life Sciences and Technologies building;
- 2) The Department of Environment and Technology, and the DU Institute of Life Sciences and Technologie provide both teaching and methodical work for mandatory and limited elective parts of study courses as well as by actively developing scientific projects, contributing to the systematic renewal of the scientific-technical base;
- 3) Sufficient study resources in the DU library;
- 4) The costs of the study programme are covered by the state budget and partly by projects.

#### Weaknesses:

- 1) 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

According to the experts, the existing resources and provisions, which include study provision, library and materials, and financial provision are sufficient for the implementation of the MSP Chemistry and the acquisition of corresponding learning outcomes within the framework of an undergraduate study in the field of chemistry.

## 2.4. Teaching Staff

### Analysis

3.4.1. The SAR (Part 3, 3.4.1., p. 79) states that all academic staff of the study programme meet the requirements set out in the 3 paragraph of the first part of Article 55 of the Law on Higher Education Institutions. The pillars of scientifically active DU employees are the staff who carry out teaching. The information contained in the SAR (Part 3, 3.4.1., p. 79) shows that there are 12 teaching staff members, including two full-time professor positions, three associate professor positions, one assistant professor, three lecturers, two leading researchers and one researcher. 75% of the teaching staff have PhDs in various scientific fields. From the information contained in SAR (Annex Basic information on the teaching staff involved in the implementation of the Study field), it is possible to extract four people with a PhD in chemistry, of which 2 are visiting professors and two DU professors employed in permanent positions (one associate professor and one assistant professors). In such a situation, it is also difficult to determine whether the staff is sufficient due to the lack of precise qualifications of the employees (no details of positions held and specialties were provided). At least 2-3 permanent positions should be created for candidates who hold a PhD in

chemistry.

In addition, it should be noted that the academic staff of the MSP Chemistry only partially fulfils the requirements set forth in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (SAR Annex Basic information on the teaching staff involved in the implementation of the Study field and SAR MSP Annex The curriculum of the study programme), as only three members (Assist. Prof. J. Kokina, PhD, Assoc. Prof. S. Osipovs, PhD and Assoc. Prof. J. Soms, PhD) of the academic staff were elected to DU positions. Visiting Professor A. Vīksna, PhD, is involved in the implementation of mandatory part of the study programme, while visiting Assoc. Prof. J. Švirksts, PhD, is involved only in the implementation of the master's thesis in chemistry (SAR Annex Basic information on the teaching staff involved in the implementation of the study field).

3.4.2. In the period from 2013 onwards, the number of teaching staff increased insofar as one visiting assistant professor and two lecturers were additionally involved in the implementation of study programmes. Nevertheless, it should be noted that there are still only five professors and lecturers from the field of chemistry involved in the implementation of the entire MSP Chemistry, which is not sufficient for the effective implementation of the study programme and its further development. As stated above, the academic staff of the MSP Chemistry only partially meets the requirements set out in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions. As a result, the teaching staff of the MSP Chemistry is burdened with teaching, and the question arises as to how much time is available for academic work and other activities in the academic community.

Although information was obtained during the interview with DU management (on-site meeting with the HEI management) about the planned increase in the number of employed PhD chemistry in the Study field who will be involved in the implementation of corresponding study programmes, no further evidence of this strategy and development policy of DU can be found in the available documents. It is highly recommended to employ additional teaching staff with PhD in chemistry and include them in the implementation of the study programme in order to carry out the study programme properly and qualitatively conduct the study programme.

3.4.3. Not applicable.

3.4.4. Research workers have been publishing in journals on the JCR list for the past six years. In the analyzed data period in publishing scientific papers in 2017-2023, teaching staff published scientific publications from the JCR list: year (number): 2017 (23); 2018 (49); 2019 (41); 2020 (37); 2021 (34); 2022 (52) and 2023 (45), of which the number of publications in Q1 was as follows in 2017-2023: 2-29-13-12-12-23-18. Over the years, teaching staff have published a similar amount of manuscripts, but it is difficult to find the reason for the strategy of publishing in journals with a wider international reach and a wider scientific audience from other countries. The number of publications in the Web of Science and Scopus journal can be determined by looking at the SAR (Annex List of the publications, patents, and artistic creations of the teaching staff over the reporting period; AIC coordinator added annexes), Web of Science database, and Scopus database.

3.4.5.

According to the content related to SAR (Part 3, 3.4.5., p. 81), the teaching staff of the study programme are related and ensure wholeness, are correlated and have the nature of deepening knowledge, which may help in the use of practical objectives in the study programme. According to the experts, the subjects included in the studies are very narrowly and closely related to the study programme and often do not go beyond the appropriate framework related to the study programme. The mobility of teaching staff is low, and there is a lack of both international and domestic cooperation which all results in absence of a fresh approach to education and scientific research.

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

### Conclusions:

Due to the shortage of teaching staff with PhDs, the scientific and teaching staff is overwhelmed with student classes. Despite the workload of key personnel, the teaching and research staff publish in journals from the JCR list and possess the necessary knowledge to conduct research. The acquisition of international research projects and participation in international scientific conferences are not directly impacted by this. There is a lack of a new approach to education and scientific research, as international mobility and cooperation with national and international institutions are not sufficient and effective. Apart from the minimum specified by DU, which a teaching staff member must fulfill, and given the enormous amount of work involved in the teaching process, it is difficult to talk about any additional development. Nevertheless, at the current stage, the teaching and research staff fulfills their teaching and publishing obligations and, to a minimal extent, those related to mobility, international cooperation and research projects (domestic and international).

### Strengths:

1) The number of teaching staff publishing their research results in journals from the JCR list is constantly increasing.

### Weaknesses:

- 1) The low number of research workers is causing research and teaching staff to be heavily burdened with teaching activities;
- 2) More staff members with PhDs in Chemistry are needed to study the field of Chemistry;
- 3) A relatively low number of participations in international scientific conferences by members of the teaching staff;
- 4) A fresh approach to education and scientific research is not possible because of the lack of mobility.

## 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:** Partially compliant

The number of permanently employed teaching staff with PhDs in chemistry is too low and there is too much work for four teachers with a chemistry degree. Nevertheless, in addition to them, there are also qualified teaching staff (holding PhD in chemistry) and visiting teaching staff who are in agreement (at the minimum level of requirements) with the principle relating to legal provisions.

## 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 the information provided in the SAR (Part 3, 3.1.2., pp. 64-66, Part 3, 3.2.1., pp.

69-71) and SAR MSP Annex The curriculum of the study programme, the MSP Chemistry is fully compliant to the State Academic Education Standard. The amount of credit points (80 CP, 120 ECTS) is in line with the State Education Standard (<https://likumi.lv/doc.php?id=266187> (in force from 16.05.2014); Grozījumi Ministru kabineta 2014. gada 13. maija noteikumos Nr. 240 "Noteikumi par valsts akadēmiskās izglītības standartu" (in force from 05.10.2023.)). The study programme consists of the mandatory part, the limited elective, and the elective parts. The study programme includes the preparation of a Master's thesis.

- 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

- 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

Provided data (SAR MSP Annex Descriptions of the study courses/modules) on the requirements starting a study course, the purpose of the study course implementation, the planned study results, the content of the study course, recommended list of literature and the evaluation criteria of study results complies with the Law on Higher Education Institutions (Augstskolu likums (likumi.lv)). According to the Law on Higher Education Institutions, the descriptions of the study courses and the study materials have been prepared in Latvian.

- 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

SAR MSP Annex (Sample of the diploma and its supplement to be issued for completing the study programme) contains the sample of the diploma to be issued and diploma supplements with the additional information on the national higher education system. The samples of the documents conform to the requirements of the Law on Higher Education Institutions (Augstskolu likums (likumi.lv)).

- 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:** Partially compliant

According to the Law on Higher Education Institutions (Augstskolu likums (likumi.lv)), no less than five professors and associate professors elected to the positions at the HEI should participate in the implementation of the mandatory and the limited elective parts of the academic study programmes. The academic staff of the MSP Chemistry partially complies with the requirement (SAR Annex Basic information on the teaching staff involved in the implementation of the Study field and SAR MSP Annex The curriculum of the study programme) as only three members (Prof. I. Kokina, PhD, Assoc. Prof. S. Osipovs, PhD and Assoc. Prof. J. Soms, PhD) of the academic staff were elected to the positions at the DU. Visiting Prof. A. Vīksna, PhD is involved in the implementation of mandatory part of the study programme, however, visiting Assoc. Prof. J. Švirksts, PhD is mentioned in the implementation of the Master's

thesis in chemistry only (SAR Annex Basic information on the teaching staff involved in the implementation of the study field).

- 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

- 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

- 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

Rector of the DU certified the Latvian language proficiency of the academic staff involved in the implementation of the MSP Chemistry (code 45441) (SAR Annex A statement signed by the rector, director, head of the study programme or field that the knowledge of the state language of the teaching staff involved in the implementation of the study programmes within the Study field complies with the regulations on the state language knowledge and state language proficiency test for professional and official duties) according to the "Regulations regarding the extent of the knowledge of the official language and the procedures for examining the proficiency in the official language" for the performance of the professional duties.

- 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

- 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

SAR Annex Standard sample of study agreement contains the agreement form for studies at the DU in the chosen study programme. The agreement states the obligations of the parties as well as the compliance with regulation on studies at the DU (SAR Annex List of the governing regulatory enactments and regulations of the higher education institution/ college).

- 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 agreement between the DU and University of Latvia confirms the opportunity for the continuation of the studies in the academic master's study programme "Chemistry" of the University of Latvia if the implementation of the DU study programme is terminated (SAR, Part 2, 2.1.4., pp. 21-22; SAR Annex A document certifying that the higher education institution or college will provide students with opportunities to continue their education in another study programme or another higher education institution/ college (agreement with another accredited higher education institution or college) if the implementation of the study programme is terminated).

- 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 compensation policy declared in the Statement (SAR, Annex A document certifying that the higher education institution or college guarantees compensation for losses to students if the study programme is not accredited or the study programme license is revoked due to actions (actions or omissions) of the higher education institution or college and the student does not wish to continue studies in another study programme).

- 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

- 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

### **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

MSP Chemistry partially complies with the requirements set forth in the Law on Higher Education Institutions as only three members of the academic staff (elected to the positions at the DU) are involved in the implementation of mandatory part of the Master's study programme. MSP Chemistry fully complies with the State Academic Education Standard as well as to other regulatory enactments.

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

The MSP Chemistry partially complies with the Law on Higher Education Institutions and fully complies with the requirements of State Academic Education Standard and other statutory regulations, and the requirements of the Study field. The study programme is designed so that aims, objectives, learning outcomes, and admission requirements are generally related and logically linked. The MSP Chemistry has undergone changes since the last accreditation, but the lack of clear examples available in SAR and collected during on-site meetings prevents assessment of whether these changes have been purposeful or whether they have improved the study programme.



Although it is not possible to assess the impact of the changes on the study programme, the MSP Chemistry is up to date and based on the guidelines developed by the European Chemistry Thematic Network (ECTN). There are two drawbacks that can be associated with this study programme. The first is the lack of elective study courses (Part C), as only one study course is offered at a time. The second drawback is the insufficient number of professors and associate professors elected to positions at DU (just three, and five are needed) involved in the implementation of the mandatory and limited elective parts of the MSP Chemistry. Students have the opportunity to write their master's thesis in the different areas of chemistry on topics relevant to the Study field and the MSP Chemistry in collaboration with the teaching staff. The resources and provisions, which include study provision, library and materials, are adequate for the implementation of the MSP Chemistry and the acquisition of appropriate learning outcomes in graduate study in the field of chemistry. The scientific and teaching staff have a heavy workload due to the classes with students. Teaching staff publish in scientific journals, but the number of publications in journals with a high impact factor must be increased. The mobility of teaching staff is low and international and national cooperation is very limited.

In summary, the main strengths of the MSP Chemistry are that (i) there is a relatively high demand for graduates on the job market, (ii) the total number of students has increased, (iii) the study programme is based on the guidelines developed by the European Chemistry Thematic Network (ECTN), (iv) traditional teaching methods contribute to the achievement of the aims and learning outcomes of the study courses and the study programme, (v) extensive learning opportunities in the new and well-equipped DU Life Sciences and Technologies building (vi) very well equipped library, (vii) the costs of the study programme are covered and number of enrolled students is sufficient to maintain all aspects of the study programme (viii) teaching staff publish their research results in JCR-listed journals and their number is constantly increasing.

In addition, some shortcomings should be emphasized, the most important of which are: (i) a relatively short description of the changes made during the change of study programmes, which makes it impossible to analyze all the corrections made, (ii) students do not have the possibility to choose between several elective study courses, (iii) the names of some of the study courses identical to those of the BSP Chemistry, and that should be changed so that they correspond in content and title to the master's study programme, (iv) the research and teaching staff is heavily burdened with teaching activities, (v) the number of teaching staff with PhD in chemistry is insufficient, (vi) the number of participations in international projects and international scientific conferences is low, (vii) the lack of mobility leads to a lack of change towards a new approach in education and scientific research.

### **Evaluation of the study programme "Chemistry"**

Evaluation of the study programme:

Good

### **2.6. Recommendations for the Study Programme "Chemistry"**

#### **Short-term recommendations**

1) The number of study courses offered in Part C - elective study courses should be increased so that students have the opportunity to choose between several study courses (from academic year 2024/2025).

2) The names of some study courses that are identical to those of the BSP Chemistry must be changed so that they are suitable for the master's level study programme in addition to the corresponding content and title (within 2 years).

3) The number of professors and associate professors elected to the positions at DU involved in the implementation of the mandatory and limited elective parts of the study programme should be increased in accordance with the Law on HEI (from the academic year 2024/ 2025).

4) The number of permanently employed teaching staff with PhD in Chemistry should be increased (within 2 years).

### Long-term recommendations

1) The teaching load must be better balanced in order to open the possibility for intensification of scientific work, cooperation and mobility (until the next accreditation).

2) The number of publications in journals with a high impact factor must be increased (until the next accreditation).

3) The mobility of teaching staff, and international and national cooperation must be intensified (until the next accreditation).

## 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:		Partially compliant	It is not clear where students, graduates and employers receive a summary of feedback on the results of the surveys they have participated in. During onsite meetings, the responsible for the QA system outlined that only half of the students participates in surveys.

Requirements	Requirement Evaluation	Comment
R2 - Compliance of scientific research and artistic creation with the level of development of scientific research and artistic creation (if applicable)	Partially compliant	The scientific and applied research directions of the teaching staff are consistent with the objectives of DU and the Study field. The scientific research is partly in line with the study programmes, as only a small part of the teaching staff is active in the field of chemistry. In addition, the lack of broader activity, both academic and international, is not conducive to the development of teaching staff and the internationalisation of studies. Measures are needed to promote the internationalisation of research. The number of publications and participation in conferences must be increased, while student exchanges and international cooperation must be intensified.
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	Cooperation with the institutions from Latvia is mainly limited to the agreement with the University of Latvia. Although there is cooperation with industry in the form of an agreement, its influence on the Study field and corresponding study programmes is practically non-existent. Therefore, actions are necessary on the part of DU to increase cooperation with scientific and teaching units in Latvia and the internationalization and scientific and teaching exchange of teaching staff with centers in the EU and outside the EU. In addition, creating opportunities for long-term trips is necessary in order to improve the achievement of the aims of the Study field.

Requirements	Requirement Evaluation		Comment
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	<p>The provided recommendations (Recommendations of accreditation experts, December 18, 2013; Recommendations of the accreditation experts of the academic bachelor's study programme "Chemistry", December 18, 2013, and Recommendations of the licensing experts of the academic master's study programme "Chemistry", June 16, 2015) were analyzed by DU staff and the greater part of recommendations were implemented in the study courses at the bachelor's and master's study programme levels (SAR, Part 2, Chapter 2.6.1., pp. 54-56; SAR Annex Review of implementation of recommendations; SAR Annex List of the publications, patents, and artistic creations of the teaching staff over the reporting period; SAR Annex List of cooperation agreements, including the agreements for providing internship, SAR BSP Chemistry Annex, The curriculum of the study programme, SAR Annex Descriptions of the study courses/ modules).</p> <p>Some of the recommendations are fulfilled partly. A low number of the academic staff with PhD in chemistry potentially can have an important impact on quality of the studies, long-term and high-quality development of the study programmes, particularly, in case of the MSP Chemistry.</p>

#### 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	Chemistry (43441)	Not relevant	Fully compliant	Partially compliant	Fully compliant	Good
2	Chemistry (45441)	Fully compliant	Fully compliant	Partially compliant	Partially compliant	Good

#### The Dissenting Opinions of the Experts

There are no Dissenting Opinions of the Experts.