Expert group joint opinion

Evaluation Procedure: Assessment of Study Field

Higher Education Institution: Daugavpils University

Study field: Physics, Material Science, Mathematics, and Statistics

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

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The study field “Physics, material science, mathematics and statistics” at Daugavpils University (hereinafter DU) has a high reputation regionally and nationally in Latvia. The study field consists of a joint academic master’s study programme (hereinafter - joint AMSP) “Physics” and two doctoral study programmes “Mathematics” and “Solid State Physics”. The joint AMSP “Physics” provides an opportunity to continue in the doctoral level study programme “Solid State Physics”, but currently there are no bachelor or master study programmes in mathematics and bachelor study programmes in physics at DU. This does not offer a solid study path for a student from the bachelor level to a doctoral degree. Moreover, such programmes are essential for a research university. The job market for graduates is very good and many of them have made successful careers in academia and industry.

The objectives of the study field “Physics, material science, mathematics and statistics” including training experts, scientific competence, ability to conduct independent research and transferable skills are clearly stated, relevant and attainable. This is compliant with the strategy of DU on high quality education and scientific research. The study field “Physics, material science, mathematics and statistics” belongs to the strategic specialization area “Natural Sciences” of DU and contributes to interdisciplinary activities and cooperation with the industry. The university offers infrastructure and resources for the implementation of the study field. The study environment is modern and the laboratories are impressive. Unfortunately, some of the laboratory equipment is out of order and there is a long service delay. The library has a limited collection of books, but there is access to several relevant databases of electronic material.

The leaders of the university, study field and study programmes have identified the strengths, weaknesses, opportunities and threats of the study field and several action points are listed in the development plan. For example, clarity of the objectives, enthusiasm of the faculty and a good learning atmosphere are highlighted as strengths. On the other hand, lack of international collaboration and mobility and several funding issues are listed as weaknesses. A clear implementation plan is needed for the action points in the development plan to secure the future of the study field at DU. In particular, more effort should be made to make the study field more attractive for the students. The number of students in the study field is very low and there are no international students. Some of the doctoral students and faculty members were not able to speak fluent English in the panel meeting and they needed an interpreter. The fact that Latvian is the official language of the study programmes does not promote international collaboration and student recruitment. DU applies for accreditation for the master programme “Physics” and the doctoral study programmes “Solid State Physics” and “Mathematics” both in Latvian and English. This intention is supported by the assessment panel.

The university level management is very well organized. The structure of the management of the study field “Physics, material science, mathematics and statistics” is clear and functions well. Heads of the Study Programmes have active roles in running their programmes, but the role of the Director of the Study Field in the strategy development for the study field is less clear. The future challenges include issues related to student recruitment, the official language of the study programmes, duration of the study programmes, faculty renewal and international mobility and collaboration. Moreover, it is not sustainable that full-time doctoral students work outside the university to finance their studies. A joint AMSP in physics with the University of Latvia (hereinafter - UL) is an outstanding initiative. A similar concept could be implemented in the doctoral study programmes as well. For example, joint doctoral study programmes or graduate schools would be beneficial both for the students and for the faculty.

A clear quality assurance system is in place and feedback is collected systematically. This

contributes to the achievement of the goals, implementation, monitoring and development of the study programmes and it involves students, faculty, staff and other stakeholders. Admission criteria, learning objectives, assessment criteria and assessment methods are clear. The relevant information is available online and an e-learning study environment is in place. A small number of students and faculty members enable the individual development of a student and personal study support, but it also challenges the neutrality, objectivity and transparency of the assessment of the learning objectives. There is a limited amount of elective studies and there is a danger that the competence profile of the graduates is narrow. Networking events, guest lecturers from the industry and visiting professors from abroad could be invited to broaden the scope of the study courses offered in the study programmes. This would also allow increasing English proficiency of the students and the faculty members.

Overall, the study field has an important role for DU as a scientific university. Despite the small volume, the study programme functions well and the leaders are committed to the continuous development of the study field. The assessment panel supports the continuation of the study programmes and encourages the leaders to continue the implementation of the development plan and recommendations of the assessment processes.

I - Assessment of the Study Field

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1.1 Management of the Study Field

Analysis

1.1.1. The objectives of the study field “Physics, material science, mathematics and statistics” including training experts, scientific competence, ability to conduct independent research and transferable skills are clearly stated, relevant and attainable (SAR, p. 15). The aims are compliant with the main objectives of DU (SAR, p. 4) and the mid-term strategy of DU on high quality education and scientific research (SAR, p. 6-7, p. 15).

The study field “Physics, material science, mathematics and statistics” belongs to the strategic specialization area “Natural Sciences” of DU and contributes to interdisciplinary activities and cooperation with the industry (SAR, p. 5). The mission of DU is to promote sustainable development of the Latgale region and Latvia and DU is a regional centre of expertise in several areas including mathematics and physics (SAR, p. 4). The study field has an important role in educational, scientific, innovation and business development in eastern Latvia.

The study programmes “Physics” and “Solid State Physics” are interconnected. The AMSP “Physics” provides an opportunity to continue studies in the doctoral level study programme “Solid State Physics”. Currently, there do not exist a bachelor study programme in physics, a bachelor study programme in mathematics and a master study programme in mathematics at DU. Thus there does not exist a solid study path for a student from the bachelor level to a doctoral degree in these fields of science. The DU management told the experts in the panel meeting that offering doctoral study programmes only is a strategic decision of the university. However, having bachelor study programmes in mathematics and physics is one of the goals for the period 2023-2029 (SAR, p. 20). This indicates that the lack of the lower level study programmes has been identified and there is a plan to implement them.

1.1.2. The Study Direction Council has carried out a detailed SWOT analysis and identified strengths, weaknesses, opportunities and threats of the study field “Physics, material science, mathematics and statistics” (SAR, Table 2.1.2.1. p. 17-20). For example, clarity of the objectives, enthusiasm of the faculty and a good learning atmosphere are highlighted as strengths. On the other hand, lack of international collaboration and mobility and several funding issues are listed as weaknesses.

Several concrete action points are identified for maintaining and developing the study field in the

future (SAR, p. 20, appendix 2.1.2 Summary of the study direction development plan_EN). The development plan includes bachelor and master study programmes in mathematics and physics, collaboration with other Latvian and foreign institutions, mobility and renewal of the faculty. Many of these themes were discussed in the on-site visit, which indicates that the leaders, faculty and students are aware of them.
The number of students in the study field is extremely low and there do not seem to be any international students. In particular, more effort should be made to make the study field more attractive for students. For example, more joint study programmes with other institutions, a wider scope of topics and more effective career planning with the local industry and educational institutions might make the study field more attractive. It came up in the panel meeting with the employers that there is a lack of school teachers in mathematics and physics. This might be an opportunity for the study field. It came up with the leaders of DU that the aim is to attract more international students to DU. However, this might be more relevant in other fields, for example in biology, instead of mathematics and physics. DU applies for accreditation for AMSP “Physics” and DSP “Solid State Physics” and “Mathematics” both in Latvian and English. This intention is strongly supported by the assessment panel.
1.1.3. The structure of the management of the study field “Physics, material science, mathematics and statistics” is part of the corresponding management structure of DU. The university level management is very well organized (SAR, p. 7-9). The roles of the Study Direction Council and the Study Programme Directors in monitoring, coordinating and developing the study field are clear (SAR, p. 21-22). It became clear during the on-site visit that the leaders of the university have an active role in the development of the study field.
The Director of the Study Field coordinates and monitors the study process, but for example, the strategy and development work of the study field remained unclear in the panel meeting with the Director of the Study Field. In particular, there does not seem to be a clear strategy for how to implement the action points in the development plan of the study field (Appendix 2.1.2 Summary of the study direction development plan_EN). The Heads of the Study Programmes seem to have a more active role in the study programme management and development work. However, because the number of students and faculty members in the study field is small, the decision making processes function well and there is enough administrative and technical support for the study field.
1.1.4. Admission processes of the study programmes “Physics”, “Mathematics” and “Solid State Physics” are compatible with the corresponding rules at DU (SAR, p. 23-24). The admission rules are approved annually by the DU Senate, the admission is ensured by the Secretariat of the DU Admission Commission and the Admission Commission determines and approves the admission results. The admission processes are implemented logically, efficiently and transparently. The admission information is available on the DU website. There are no cases of recognition of the prior education of a student, but the required mechanisms are in place. Admission criteria and processes were clear for the students in the panel meeting. The principles and criteria of the evaluation of study courses are clear, logical, flexible and available in the e-learning environment (SAR, p. 25). It came up in the panel meeting with the students that they receive feedback and support for their learning process. The students seemed to be well aware of the assessment methods and criteria.
1.1.5. The assessment of the student's progress and the achievement of the learning objectives are based on clear criteria which are available online. The assessment is effective, consistent and in accordance with regulations (SAR, p.25). Flexible examinations are available. The assessment methods are monitored and developed by the Study Direction Council. Changes in the study courses or in the study programmes are finally approved by the DU Council of Studies. The students were aware of the assessment processes and satisfied with them.
A small number of students and faculty members is an opportunity for personalized study support, but it also challenges the neutrality, objectivity and transparency of the assessment. According to the students, they receive enough support to achieve the learning objectives and to complete their

degrees. Individual needs of the students, for example, family matters and schedules, are taken into account according to the students. The needs of the students are implemented in teaching and assessment in a flexible and supportive manner.
1.1.6. DU has a “Code of Ethics for Employees and Students of Daugavpils University” which contributes to promoting academic and professional integrity and good practices in science. The code of conduct is available on the DU website (https://du.lv/wp-content/uploads/2021/12/Etikas-kodekss.pdf). The leaders of DU seemed to be committed to the code of conduct in the panel meetings.
DU and the study field “Physics, material science, mathematics and statistics” comply with the “General Guidelines of Academic Integrity (https://ebooks.rtu.lv/product/akademiska-godiguma-terminu-vardnica-akademiska-godiguma-vispar ejas-vadlinijas/) and “Regulations on Studies at Daugavpils University" (https://du.lv/wp-content/uploads/2022/06/ENG-NOLIKUMS_PAR_STUDIJAM_DU_2018-1-1.pdf).
Clear processes are in place in case of a violation of the code of conduct (SAR, p. 26-27). For example, if a student violates the regulations, a student will be suspended from the examination and an Expert Commission appointed by the Dean of Faculty evaluates potential cases of plagiarism. DU has implemented the “Procedure for submission of final works for plagiarism control at Daugavpils University’’ (https://du.lv/wp-content/uploads/2022/09/Procedure-of-thesis-submission-for-plagiarism-control.pdf) , which includes a mandatory submission of electronic versions of the examination papers, including the theses are examined by a plagiarism control system PLAG LV (SAR, p. 26).

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

The study field “Physics, material science, mathematics and statistics” belongs to the strategic specialization area “Natural Sciences” of DU. It has an important role in educational, scientific, innovation, and business development in eastern Latvia. The study field has a clear structure and functioning management. Admission criteria are clear and the assessment methods take into account the individual development of a student. The study field applies the university level code of conduct and the leaders are committed to implement it.
Strengths:
1. Very clear management structure at the university level.
2. The study field “Physics, material science, mathematics and statistics” belongs to the strategic specialization area “Natural Sciences” of DU and contributes to interdisciplinary activities and cooperation with the industry.
3. Clear objectives of the study field.
4. Admission processes of the study programmes “Physics”, “Mathematics” and “Solid State Physics” are compatible with the corresponding rules at DU, and they are clear for the students.
5. Ethical issues are addressed by a university level code of conduct.
6. A small number of students and faculty members is an opportunity for personalized study support.
Weaknesses:
1. The number of students in the study field is extremely low. More effort should be made to make the study field more attractive for the students.
2. The study field does not have a clear implementation plan for the action points in the “Summary of the Study direction development plan” (appendix 2.1.2).
3. The lack of bachelor or master study programmes in mathematics and a bachelor programme in physics at DU does not enable a solid study path for a student.
4. A low number of students and faculty challenges the objectivity of assessment and peer support among the students.

1.2. Efficiency of the Internal Quality Assurance System

Analysis

1.2.1. A quality assurance system is in place in the study field and it is compatible with the DU quality assurance policy managed by DU Council of Studies and DU Study Quality Assessment Centre (SAR, p. 27-28). The quality assurance system contributes to the achievement of the goals, implementation, monitoring and development of the study programmes and it involves students, faculty, staff and other stakeholders. The information on the quality assurance mechanisms is available on the DU website.

The quality assurance of the study field "Physics, Material Science, Mathematics, and Statistics" is managed by the Council of the study direction. The implementation of the quality assurance of the study programme is described in SAR, p. 29-31. At the end of the academic year, there is a discussion on the development plan to improve the quality of studies in the study field. The teaching is research based and lecturers regularly review the content of the study courses. The e-learning environment Moodle is used effectively in teaching.

The Director of the Study Field and the Study Programme Directors prepare an annual self-evaluation report. The monitoring and development of the study courses are discussed with the faculty and the students have access to the descriptions of the study courses (SAR, p. 29). The faculty is encouraged to conduct research and support is offered, for example, to participate in conferences and professional development courses (SAR, p. 29-30). Some examples of participation in motivation promotion activities are mentioned in SAR, p. 30. However, it turned out in the panel meeting that the faculty and staff have not been very active, for example, in participating in conferences and courses. International mobility and collaboration is a very important part in maintaining and improving the level of education in the study field. It also turned out in the panel meeting with the Erasmus exchange coordinator that the mobility resources are not fully employed by the faculty and staff.

1.2.2. The principles of the management of the study field "Physics, Material Science, Mathematics, and Statistics" are regulated by "Daugavpils University Regulations on the Opening and Management of Study Directions and Study Programmes" and they are in accordance with the strategy and policy of DU. External assessment processes including licensing, and accreditation are performed regularly and they are coordinated by the director of the study field together with the Study Quality Assessment Centre and the vice-rector of studies.

Internal assessment processes are performed continuously by the study field council to ensure that the learning objectives are reached and that the study programmes are compliant with the job market demands (SAR, p. 8). The quality of studies is ensured by the following measures: strategic planning of the study processes, examining the performance of the study field, regular surveys, preparing self-assessment reports of the study field and implementing an e-learning environment (SAR, p. 10-11). Performance indicators on students, faculty, graduates and employers are analyzed and taken into account in the development of the study field (SAR, p. 31-32). The internal quality assurance mechanisms of the study field are effective, consistent and available for all stakeholders.

The Study Quality Assessment Centre carries out annual surveys for the students, faculty and other stakeholders. In particular, student surveys on study programmes are organized annually (SAR, p. 35). Student surveys are available online. Clear mechanisms are in place to review and implement student feedback. The results are reviewed by the study field council chaired by the Director of the Study Field, the Study Programme Directors and the DU Centre of Study Quality Assessment (SAR, p. 11). There are annual questionnaires designed by the Student Council. The results of student surveys are taken into account in the planning of the next academic year, assessing the pedagogical and professional competencies of the faculty members and the availability of the study material (SAR, p. 35-36). It was confirmed by the students in the panel meeting, that they are aware of the feedback mechanisms and they think that their feedback is taken into account.

Students are encouraged to submit their complaints and proposals to the study programme director, the head of the department, the dean, the vice-rectors, and the rector (SAR, 2.2.3). All relevant information is available on the DU website. The complaints and proposals can be submitted directly in person or anonymously on the DU website without formal requirements. The DU Centre of Study Quality Assessment coordinates the examination of students' complaints and proposals (SAR, p. 33). The system for complaints and proposals is effective and the complaints are discussed with the involved parties. For example, there have been discussions related to distance learning in the study field "Physics, material science, mathematics and statistics (SAR, p. 33-34). Since the number of students is low and people know each other, it is easy for the students to approach the leadership with their queries. This was confirmed by the students, faculty and leaders in the panel meetings.
1.2.4. DU operates an internal information system DUIS, that collects statistical data on the study programmes, faculty, study progress and students. The system is accessible internally. The data is entered by the study programme directors and faculty records managers and processed by the Department of Studies. The data is exported monthly to the State Education Information System and the process is aligned with the legislation. Student feedback is collected according to a clear schedule and the data is stored in the DU survey system (Open Source Project LimeSurvey) (SAR, p. 35). Alumni and employer surveys are also organized. The results of some of the most recent surveys are summarized in Appendix 2.2.4_employer survey analysis_DSP_EN. The feedback is discussed in the council of the study field and it is taken into account in the improvement of the study field (SAR, p. 35-36). The data from student and employer surveys ensure the compliance of the objectives of the study field with the job market.
1.2.5. The information on the study programmes "Mathematics", "Physics", and "Solid State Physics", including the admission requirements, the study course descriptions and contact information is available on the DU website in Latvian and English. The International and Public Relations Department is responsible for the compliance of the information with the official registers and the study departments are responsible for the information about the students (SAR, p. 36-37). The students indicated in the panel meeting that they were satisfied with the provided information.
The information in Latvian on the study programs, published at the DU website
https://du.lv/studijas/studiju-programmas/doktora-studiju-programmas/cietvielu-fizika/,
https://du.lv/studijas/studiju-programmas/doktora-studiju-programmas/matematika/,
https://du.lv/studijas/studiju-programmas/akademiska-magistra-studijas/fizika/,
in general, corresponds to the information available in the official registers (VIIS and E-platform) and provides applicants and students with appropriate information.
The information in English is sometimes outdated (e.g. previous study programme director is indicated for the study program Physics, https://du.lv/en/studies/study-programmes/academic-master-study-programmes/).

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

A quality assurance system is in place in the study field "Physics, material science, mathematics and statistics" and it is compatible with the DU quality assurance policy. There are clear mechanisms to collect and take student feedback into account. Data is collected systematically and it is analyzed for the development of the study programmes. Relevant information on the study field and study programmes is available online.
Strengths:
1. The quality assurance system contributes to the achievement of the goals, implementation, monitoring and development of the study programmes.
2. There is a clear structure and management of the quality assurance system at the university level.

3. Students are actively involved in collecting feedback and the quality assurance system. There are clear mechanisms to review and implement the student feedback.

Weaknesses:

1. During the on-site visit it turned out that the faculty and staff have not been very active in participating in conferences, and courses and having extended visits abroad.

Assessment of the requirement [1]

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

Assessment of compliance: Fully compliant

The internal quality assurance system is in place at DU and it supports monitoring and development of the study field.

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

Assessment of compliance: Fully compliant

DU has implemented internal quality assurance mechanisms which are coordinated by the Centre of Study Quality Assessment.

3 1.2 - A mechanism for the development and internal approval of the study programmes of the higher education institution/ college, as well as the supervision of their performance and periodic inspection thereof has been developed.

Assessment of compliance: Fully compliant

There are mechanisms for the development, and internal approval of study programmes, their monitoring and periodic examination.

4 1.3 - The criteria, conditions, and procedures for the evaluation of students' results, which enable reassurance of the achievement of the intended learning outcomes, have been developed and published.

Assessment of compliance: Fully compliant

The student progress assessment processes are in place and available online. The learning outcomes and assessment criteria are available for the students in the e-learning environment.

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

Quality assurance mechanisms for the faculty are in place. There are opportunities for professional development for the faculty and staff.

6 1.5 - The higher education institution/ college ensures the collection and analysis of the information on the study achievements of the students, employment of the graduates, satisfaction of the students with the study programme, efficiency of the work of the academic staff, the study funds available and the disbursements thereof, as well as the key performance indicators of the higher education institution/ college.

Assessment of compliance: Fully compliant

Student, alumni and faculty surveys are organized annually. Clear processes are in place to analyze and implement the results.

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

Assessment of compliance: Fully compliant

The DU study management system ensures the study field development by regular accreditation processes and implementing the recommendations in the study field development.

1.3. Resources and Provision of the Study Field

Analysis

1.3.1. DU has a system for determining and redistributing the financial support required for the implementation of the study field and the corresponding study programmes. The calculation of the study costs of study for one student is provided by the DU Finance and Accounting department. The calculation includes staff costs and corresponding taxes, teacher mobility, infrastructure running costs, library costs, equipment purchase and investment costs, and student social security costs (SAR, p.37).

Following SAR, the study field running costs are covered by the state financing for studies (subsidy) and tuition fees. Alongside, it becomes clear from SAR, that DU uses financing from scientific activities, both projects (annexes 3.4.4) and state research base funding to sustain the study field. DU provides additional support to the study field by allocating some scientific funds for small grants for teachers and students (SAR, p.38).

The decision about the distribution of the available funds between study programmes is made by the DU Budget Commission. The administration of the DU is fully aware of losses incurred due to the implementation of the study programmes in the study field with an extremely low number of students. DU to a great extent “sponsors” this study field to keep scientific competence and contribute to the regional interests. This is a well-considered, and conscious and voluntary political decision of the DU academic community (panel meeting with DU administration and Rector).

The DU Finance and Accounting department estimated the total costs per student at about 9100 EUR for the joint AMSP ``Physics”, 26200 EUR for DP “Solid State Physics” and 20200 EUR for DP “Mathematics” (additional information after the assessment visit).

For the joint AMSP “Physics” DU benefits from the agreement with a partner university (UL). The partner university allows DU students to join lectures online without incurring any charges. Nevertheless, the calculated costs would not allow to sustain the study programme if there is only one student. The approximate number of staff contact hours for this study programme is about 650 (expert calculation based on SAR 3.2.1 joint AMSP “Physics study plan”), and the hourly rate is about 9 EUR/hour, which seems too low for the academic staff.

In turn, for the DSP “Solid state physics”, the estimated number of contact hours is about 660, which gives the hourly rate of about 26 EUR/hour even if there is only one student.

The running costs of all three study programmes (estimated as 90 000 EUR, an expert calculation based on additional information provided after the assessment visit) comprise about 2.5% of the whole study budget (estimated based on public data: number of students and tuition fee). Thus, the confidence of the DU administration about the ability to sustain a study field without noticeable negative effects on other study fields is reasonable.

1.3.2. DU in general possesses the infrastructure and materials required for the implementation of the study field. In 2012 – 2015, DU invested 16.72 MEUR from the European Regional Development Fund to renovate and build new study premises that now host laboratories, used in the

implementation of the study fields (SAR, p.39; tour to the facilities). The premises include 3 lecturing auditoriums, one of which is equipped for the teleconferences, smaller study/seminar rooms, equipped with projectors, and study rooms. The premises are adapted for people with functional disorders. The computer class with 16 places is available (SAR annex 2.3.2).
Alongside the study environment, DU students have access to renovated dormitories and sports facilities. Student service provides access to photocopying, visual, photo/video/audio recording, and playback equipment (SAR, p.40).
DU supports EDUROAM connection in all buildings (on-site visit).
The laboratory/ research facilities, used for the study need to include solid state technology and spectroscopy clean room facility (Innovative microscopy center scientific laboratories), metal processing laboratory, laboratory of laser technologies, as well as two study laboratories: laboratory of Mechanics and Electromagnetism, Laboratory of Optics and Quantum Physics. (SAR annex 2.3.2; tour of the facilities). Laboratories were provided with modern equipment in 2017 - 2020 using total investments of 3.07 MEUR from the European Regional Development Fund.
The available equipment includes two scanning electron microscopes, a confocal laser scanning microscope, a multifunctional atomic force microscope, a nanoparticle sputtering system, a nano-coating sputtering machine, sputtering machine, x-ray diffractometer, femtosecond laser system, holographic recording equipment, different power lasers, electrochemical measurement station, spectrophotometer, microspectrophotometer, photoluminescence device with Raman spectrophotometer (SAR annex 2.3.2; tour on the facilities).
The metal processing and robotic laboratories are equipped with two industrial robots (KUKA, ABB), a rotation positioner, an industrial laser, laser metalworking tools (melting, welding, cutting), metal powder supply device, CNC milling machine, sample cutting, grinding and cleaning devices, Vickers microhardness meter (SAR annex 2.3.2; tour on the facilities).
Five items (atomic force microscope, nanoparticles sputtering system, spectrophotometer, X-ray diffraction unit, and electron scanning microscope) are registered in the UseScience database (https://scientificservices.eu/browse/ou-301-daugavpils-university, accessed 30.01.2024).
According to the additional detailed information, provided after the assessment visit, DU uses licensed professional software for data analysis, processing, and visualization (MS Power BI, IBM SPSS Statistics, Notepad++), calculations (WolframAlpha, www.geogebra.org), design (Solid Edge, Fusion 360), simulation (COMSOL), programming (Atmel Studio, SSCNC, NI LabVIEW). Licensed software for text processing and presentations is available, as well. DU uses open-access software, too. Students have access to the software, at least using workstations at the DU premises - the type of access depends on the software (additional information after the assessment visit).
DU established a procedure to finance the repair, improvement, and purchase of materials, required for the laboratories. The persons responsible for laboratories initiate the procurement procedure, and the final decision is made by the DU Budget Commission, responsible for the allocation of funds. Nevertheless, the financing is on an irregular basis and strongly depends on the availability of funds via research projects (panel meeting with the vice-rector for studies, directors of the study programmes, and head of the laboratory).
1.3.3.The university library has 6616 books in physical science and technology (171 in English, which is 3%), and 11873 books in mathematics (1084 in English, which is 9%). Alongside, the library provides access to the databases EBSCO Publishing (including Academic Search Elite, Business Source Premier, MasterFILE Premier, Newspaper Source, ERIC, Business Wire News, MEDLINE, Health Source –Consumer Edition, Agrikola), Cambridge Journals Online, ScienceDirect, Web of Science, Scopus, SpringerLink, Letonika (SAR, p.41-42). Databases are available for the students via the university web page, the identification is made via IP addresses (https://du.lv/par-mums/struktura/biblioteka/datubazes/abonetas-datubazes/, accessed 18.01.2024, visit to library)
The library provides additional services: electronic catalog (Alise), book reservation via the internet,

book exchange self-service system, automated book return, interlibrary subscription, internet, incl. wireless internet, computers, printers, copiers, and multifunctional devices. The library has an open access reading room with 60 workplaces, 15 of which are computerized. The library has an open access section. The library keeps the final thesis of the University students. The library does not digitize the collection.
DU had established a procedure for the update of the library collection. The demands for new books/databases are submitted annually by the faculty lecturers, and applications are approved by the DU Budget Commission. The library informs users about the latest literature, database subscription trials, etc. (SAR, p.41, panel meeting with academic staff).
The newest book (except PhD and MSc thesis), found on the query "physics" was dated 2020, and only 11 items dated 2014-2020 were retrieved. For the query "nanotechnology" the newest book was dated 2019 (5 items dated 2014-2020 were retrieved). For the query "technology" the newest book was dated 2021, and 30 items dated 2014-2020 were retrieved (search over https://biblio.du.lv/Alise/lv/home.aspx, 19.01.2024).
The library provides access to the databases, which is, in general, sufficient and meets both the didactic and scientific needs of the study field. At the same time, the collection of the newest books is limited due to several issues. For the majority of study courses, the collection of books provides at least one textbook for each study course, but some of the textbooks are outdated (search over https://biblio.du.lv/Alise/lv/home.aspx, 19.01.202;, annexes 3.2.1 Descriptions of study courses for each study programme).
1.3.4. In general, DU implements an e-study environment based on the Moodle platform, which is extensively utilized for hosting course materials and facilitating communication with bachelor-level students enrolled in other study programmes. For the master's and PhD study programmes within the evaluated study field, communication and deposition of study materials aren't so practical because of the low number of students. For these study programmes, teachers prefer to communicate with students and distribute study materials individually, using e-mail. The grades are assigned via Moodle for all study courses. Alongside this, DU regularly organizes professional development courses for academic staff regarding the use of the Moodle environment (SAR, p.42-43, panel meeting with the study programme directors and academic staff, 18-19.01.2024).
For the joint AMSP "Physics", students have access to the UL study platform (panel meeting with the director of the programme).
The university effectively uses MS Teams and Zoom, among other activities enabling students enrolled in the joint study programmes to attend lectures at the UL online (SAR, p.42, p.61.)
For the study programmes in the field of mathematics, DU maintains DU e-resources repository (SAR, p.43, https://de.du.lv/matematika.html, accessed 31.01.2024), a valuable resource, that is regularly updated.
DU operates the information system DUIS, which is synchronized with Moodle. DUIS provides both staff and students with the descriptions of all study courses, a list of classes, and student progress records. (SAR, p.43)
The DU web page operates in two languages (English, and Latvian), is generally well-designed, and convenient, and demonstrates a high level of publicity. For instance, main DU strategic documents and regulations are available via the web page without login (https://du.lv/, accessed 18.01.2024).
1.3.5. DU developed and implemented a documented procedure for the election of academic staff. The corresponding regulation is approved by the DU Senate and is available on the DU web page (https://du.lv/wp-content/uploads/2021/12/Nolikums-par-velesanam-akademiskajos-amatos-DU_APSTIPRINATAIS.pdf personnel, accessed 31.01.2024). The regulation is based on the state regulations: Law on Higher Education Institutions of the Republic of Latvia and Cabinet Regulation No. 129, 25.02.2021. DU does not include additional criteria for the requirement for the academic position candidates, except those formulated in state documents (the above regulation; panel meeting with academic staff).

The involved stakeholders are informed about vacant positions, since vacancy announcements in accordance with law, are published on the DU website and/or in the official publication of the Republic of Latvia "Latvijas Vēstnesis" (SAR, p.43).
The election body depends on the position. For the professors and associated professors, it is the Professor Council, for other positions it is the Faculty Council. The DU professors are elected by the Professor Councils, hosted either at the University of Latvia (Mathematics) or Riga Technical University (Physics) (panel meeting with academic staff).
The election procedure is in accordance with national legislation.
The enrolment of the guest professors/teachers) are under the responsibility of the study programme directors (panel meeting with the study programme directors).
The number of vacant academic staff positions is announced by the Faculty Council (for teaching staff), by the Institute Council (for research staff), and is approved by the Rector (SAR, p.43).
1.3.6. DU implements an academic staff professional and didactic development policy, that is based on two internal documents: the "Regulation on elections to academic positions in Daugavpils University, and the "Procedure of assessing the scientific activity of Daugavpils University academic staff" (https://old.du.lv/wp-content/uploads/2016/01/zinatniskas-_aktivitates_vertesanas_kartiba.pdf, accessed 31.01.2024). The annual evaluation takes into account the scientific activity of the staff member and the results of student opinion polls. DU formulated a set of criteria for the evaluation of academic staff (SAR, p.44).
Within the evaluation period, DU organized a series of teaching/training events to raise the qualifications of the academic staff. The events were organized in the framework of three European Social Funds projects. Two projects (8.2.2.0/18/I/005 and 8.2.3.0/18/A/010) were targeted to the development of horizontal competencies, such as communication skills, leadership, personal management, financial management, etc. In turn, within the project 8.2.1.0/18/A/019, series of seminars on teaching material preparation were delivered The effectiveness of the courses was estimated by the feedback from participants (SAR, p.45).
Academic staff have the opportunity to participate in international mobility. During the evaluation period, 2017 – 2022, two academic staff members participated in the outgoing teaching mobility (SAR, annex 2.5.3). DU can increase the number of mobilities using the Erasmus+ programme, as not all available financing is used (panel meeting with Erasmus+ coordinator).
DU stimulates the scientific contributions of its academic staff by providing direct financial incentives for publishing and achieving an increase in the Hirsch index. (SAR, p.38).
1.3.7. For the implementation of the study field, DU employs 19 teachers; 7 of them are elected academic staff, and 16 have PhD degrees (84.2%). The workload of the full-time employed staff is calculated based on 1000 hours per year (SAR, p.46). This corresponds to 31 contact hours per week, based on 32 study weeks per year.
The involvement of teaching staff in the implementation of the study programmes within the study field could be estimated using study plans (SAR, annexes 3.2.1., Study plans). The maximal amount of credit points per teacher for lectured study courses were observed in the "Mathematics" study programme, where the professor was responsible for the 22 CP, but together with other teachers. Assuming that the professor takes half of these 22 CP, his lecturing workload could reach 11 teaching hours per week, which is a reasonable workload (expert's calculation based on common practice: 1 CP corresponds to 1 contact academic hour per week, 16 contact hours per semester). At the same time, teaching staff indicated that the lecturing workload in general, does not exceed 14 contact hours per week, and part of this workload is not related to the assessed study field, as teachers provide lecturing in other study fields as well. Academic staff usually is employed as teachers part-time; the other part-time employment is for scientific activities. Academic staff did not express any complaints about the poor balance between teaching, research, and administrative duties (panel meeting with academic staff).
1.3.8. DU provides sufficient support for the students. The support is provided by the Student

Service Center (document exchange, references, consultations, feedback), Psychological Support Center, and Career and Initiative Support Center. DU organizes Days of Careers for students. The social support programme is implemented, too (SAR, p.47-48).
The DU infrastructure is modernized to improve accessibility for persons with special needs. The facilities are equipped with “baby rooms” and a “playroom” for students with children. The medical room is operational, the medical aid is provided by a certified paramedic (SAR, pp.47-48, https://du.lv/par-mums/vides-pieejamiba/, accessed 31.01.2024).
The support for foreign students is provided by the Department of International Communication (SAR, pp.44-45)

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

In general, DU is fully compliant with the criteria set for the resources and provision of the study field.
Strengths:
1. Strong contribution to the sustainable development of the region.
2. Modern teaching and research infrastructure.
3. Effective use of the available European financing for investment in both human capital and infrastructure.
4. Ability to sustain the study field by re-distribution of the available resources.
5. Reasonably balanced staff workload.

Weaknesses:
1. Financial deficiency/lack of a sustainable plan for the maintenance and repair of laboratory equipment.
2. Limited use of the ERASMUS+ funds for teacher exchange.
3. Limited ability to sustain an up-to-date library (in part mitigated by the availability of online resources).

1.4. Scientific Research and Artistic Creation

Analysis

1.4.1. DU is a significant center of science and education in East Latvia. It is a modern science-based university that offers high-quality education, contributes to scientific innovation and the transfer of scientific ideas to society, and serves as an excellence center in several fields, mathematics, material sciences, and physics among them. The main goals of the DU strategy, defining research integration in studies are:
1. To provide high-quality education that corresponds with future challenges and is based on theoretical knowledge and acquiring of research skills, preparing internationally competitive specialists and encouraging life-long learning
2. To develop scientific and creative work on an international level, deepening integration of scientific research in the study process, facilitating technology transfer and development of innovations contributing to public understanding of science.
Strategic goals are implemented in the strategic areas of DU: natural sciences, social sciences, humanities, and artistic sciences, - that were set in accordance with the order of the Cabinet Ministers of the Republic of Latvia on June 21, 2022, No 449 “On strategic specialization of state

universities". https://likumi.lv/ta/id/333471-par-valsts-augstskolu-strategisko-specializaciju -available in Latvian) Study field "Physics, Material science, Mathematics and Statistic" falls under the strategic area of natural sciences and includes the following scientific research directions at DU: 1) topical issues of mathematical modeling, including issues of mathematical modeling of complex networks (genes, neurons, telecommunications); 2) qualitative theory of nonlinear boundary value problems of ordinary differential equations; 3) numerical and qualitative research of systems and equations of higher order differential equations; 4) molecular and solid state physics, 5) materials physics, chemical physics, semiconductor physics, materials science, 6) laser physics and spectroscopy, 7) nanomaterials, 8) intelligent materials and structures (SAR, p.49). Scientific research directions are relevant to the study field and contribute to the successful implementation of science-based studies in DSP Mathematics, DSP Solid State Physics, and joint AMSP Physics integrating the scientific knowledge and results of the performed research obtained by teaching staff members participating in research, directly into the study process. Well-equipped research laboratories at DU contribute to the performance of high-level research for PhD students of "Solid state physics" and open the door for national and international collaborations as well as collaboration with the industry, since real products (e.g. holograms) may be produced. Discussions with the representatives from industry and with Alumni during on-site visits revealed that highly qualified specialists holding PhD degrees in physics and mathematics released from the University are very competitive in the job market, but also are very welcome to start their career as teachers/researchers at the universities.

1.4.2. The connection of scientific research with the study process is well justified because academic staff participating in different projects try to transfer and integrate the gained knowledge into the studies. Also, lecturers from other research institutions or industry are invited to deliver lectures on hot topics related to study subjects. The integration of science in studies is implemented by upgrading study modules, discussing with colleagues during scientific seminars and conferences, and involving PhD students in these discussions. During on-site visits teaching staff, alumni, and students indicated the importance of the student's involvement in interdisciplinary research. Students have the unique opportunity to learn the whole research process from proposing the research idea to final results. For example, students of DSP "Solid state physics" participate in the acquisition and analysis of properties of nanomaterials and molecular structures followed by the application of these materials in biosensors (SAR, p.50). Research work of DSP "Mathematics" students is related to mathematical modeling issues that arise in biomathematics and networks class, the qualitative theory of boundary value problems of ordinary differential equations, for example, calculus of variations approach to boundary value problems, problems for systems of second-order differential equations, problems for fourth-order differential equations, solutions of planar systems with parameters(SAR, p. 51).

The quantitative data, the scope of scientific research directions, scientific publications, and implemented projects at DU can be found in SAR, ANNEX 2.4.4. "Compilation of quantitative data for direction", SAR, ANNEX 2.4.4. "Participation in projects for direction" and SAR, ANNEX 2.4.4. "List of scientific publications for the direction". It should be noted that the teaching staff of DSP "Solid State Physics" and Joint AMSP "Physics" participated or were project leaders in different projects, for example, ERAF project „ Development of the analytical molecular recognition device based on the nanostructures of metal oxides for biomolecules detection" No. 1.1.1.1/16/A/001, 2017-2020 (with the participation of 7 teaching staff members), ERAF project „ Molecular design of new luminescent compounds for diagnostic purposes". No. 1.1.1.1/16/A/211, 2017-2020, ERAF project "Development of nanomaterial-based electrochemical sensor for detection of hydrogen peroxide" (No. 1.1.1.2/16/I/001), 2020-2023 and in several DU internal projects. All mentioned projects indicated strong research interdisciplinarity. Participation of the teaching staff of DSP "Mathematics" in a project funded by Latvian Research Council "Analysis of complex dynamical systems in fluid mechanics and heat transfer", lzp-2020/1-0076, 2021-2023, (with the participation of 3 teaching staff members), EU ERA-NET project "Modelling Approaches to Guide Intelligent Surveillance for the

Sustainable Introduction of Novel Antibiotics, Nr. ES RTD/2020/04, 2020-2023, and in DU internal research projects led to improvements in the study content, in particular, the Study course “Selected issues of mathematical modeling” was upgraded including mathematical modeling in biology. It should be noted that the teaching staff was actively participating in different ESF projects “Implementing national and international events for the development of student talents” (No. 8.3.2.1/16/I/002), 2018-2020 (with the participation of 3 teaching staff members), ESF project „Daugavpils University strategic specialization academic personnel professional competence strengthening, No.8.2.2.0/20/I/003, 2020-2023 (two members of teaching staff). Several projects aimed at digitalization of study courses were also implemented. Last but not least the projects addressed to society were of great importance, since these events may be a platform for attracting new students. Almost all staff members participated in Daugavpils Science Festivals, Scientists’ Night events, and others.

However, it should be noted that PhD studies in both DSPs are implemented in one person mode: in each DSP only one professor supervises PhD students. This narrows the research area and limits the possibility for the students to choose a topic that might be relevant to Mathematics or Solid State Physics, but led by other professors who are not PhD supervisors recently. During the on-site visit, PhD supervisors and PhD students of both DSPs confirmed that the selection of the new PhD students is performed on a personal basis, but the candidate must fulfill the entrance requirements for PhD studies.

1.4.3. International collaboration in the field of scientific research is modest, but there were some activities of the teaching staff that turned out into international projects: Horizon 2020 programme ERA-NET JPI-EC-AMR "Diagnostics and surveillance of antimicrobial resistance: development of tools, technologies and methods for global use" or Interreg project "Robonet" LLI-542 "Development of IT programming and robotics competences in schools of the cross-border region in Latgale, Visaginas and Ignalina" in 2022 (SAR, p.52). The main international activities are related to the publication of scientific papers in international journals (SAR, Annex 2.4.4. “List of scientific publications for the direction”), but it should be admitted that many of these papers, especially in mathematics are published in national conference proceedings (SAR, p.52). The students are also encouraged to publish papers in scientific journals and present their research results at different conferences (SAR, Annex 2.4.5. List of scientific publications students).

Despite the newly proposed Study field development plan (SAR, Annex 2.1.2. “Summary of the study direction development plan”), the main obstacle to low international activity of the teaching staff is the unsatisfactory knowledge of the English language. This is a common problem for the university. It was mentioned already in a previous evaluation of the study field. Without proper knowledge of the English language, it is impossible to reanimate staff's and the student's research and studies mobility, even if the Erasmus+ funds are provided; without linguistic competence, it is impossible to start any study programme in English, which may help to increase the number of students in the study programmes via attracting of foreigners, or explore the possibility to create joint study programmes; without knowing the language it is impossible to go for the conferences or participate in different seminars/webinars provided online. During the on-site visit, the Administration of the University introduced the experts with the plans on how to increase the number of students attracting students from Philippines, but it cannot be realized before the whole teaching staff acquires the requested proficiency in English.

1.4.4. There are several mechanisms implemented at DU, how to involve teaching staff in scientific research.

1. Election of teaching staff. - This process works well since the particular results of research activities and research production are crucial for the University's teaching staff.

2. Participation in research projects. - It is effective because it allows for the acquisition of funding.

3. DU has a motivation system for academic staff, cascading science performance indicators to the level of a researcher, i.e. setting the following criteria: Number of WoS / SCOPUS publications (at

least 1 year); participation in research projects; participation in international scientific events (at least 1 participation per year); research mobility (at least 1 participation in 2 years). In cases when the lecturer does not meet the set requirements, DU may decide to terminate the contract. (SAR, p. 53). The motivation system is effective, except for one point: even if staff mobility is unsatisfactory (SAR, ANNEX 2.5.3. “Incoming and outgoing mobility of teaching staff”), persuading a teacher to participate in mobility programmes can be a considerable challenge. On the other hand, some teachers may benefit from research paper publications having a relatively high Hirsh index (SAR, Annex 2.4.4. "Compilation of quantitative data for direction).

During the on-site visit, the Administration of the University informed the experts about the possibility for researchers to apply for Faculty funding for the research idea/project. The amount of money allocated for this application is 3000 EUR. The additional data became available after the visit: DU awards annually 17 such grants for staff. For the period from 2020 to 2023, four grants (one per year) were awarded for staff projects in physics, and two (0,5 per year) in mathematics (After visit answers Q8).

All discussed mechanisms related to the involvement of teaching staff in scientific research are relevant, well-functioning, and allow personal development for each teaching staff member encouraging them to act as an active scientist participating in research and a teacher implementing science-based studies. Increased staff mobility which allows for opening broader international scenes for scientific collaborations would contribute to higher effectiveness of implemented measures.

1.4.5. To promote students’ skills in the development of scientific projects and the preparation of publications, students in Master's study programmes implemented at DU can participate in the annual student research project competition. In cooperation with DU academic staff, students also have an opportunity to participate in the annual DU research project competition and receive funding for the implementation of scientific research. Following the evaluation criteria of DU research projects, it is mandatory to involve at least one MSP or DSP student or doctoral degree candidate in the implementation of DU research projects. The mentioned condition is effective, because it promotes students’ involvement in research work, and students participate actively in such competitions. During the assessment period, 11 students participated in DU internal research projects; 4 DSP students participated in the project “Strengthening the professional competence of academic staff in strategic specialization areas at Daugavpils University” (SAR,p.54).

Students are also encouraged to participate in different international conferences not only presenting the results of their research but also promoting international recognition of the study field. According to data provided in SAR, Annex 2.4.5.”Participation of students and postdoctoral students in conferences” PhD students were very active participating in conferences: there are two DSP students who have participated in 19 conferences, one - in 17 conferences, one - in 12 conferences and 12 students -between 1-9 conferences. In total, 16 students from DSPs : 7 from DSP Mathematics, 9 from DSP Solid State Physics were participating in different conferences. The promotion of students’ involvement in scientific activity at DU is also confirmed by the fact that a graduate of DSP "Solid State Physics", received the Annual award of Daugavpils University in nomination – Young Scientist 2017 (SAR, p.54).

During the on-site visit, the Administration of the University informed the experts about the possibility for students to apply for Faculty funding for the research idea/project. The amount of money allocated for this application is 2000 EUR. The additional data became available after the visit: DU awards annually 12 such grants for students. In the period from 2020 to 2023, four grants (one per year) were awarded to students in physics (After-visit answers Q8).

1.4.6. To achieve both: the indicators defined in the model of excellence and the goal of the study process, DU provides a broad knowledge base, support for research and innovation, support for the development of the student's personality, as well as ensures students’ future careers by promoting their employment. Various forms of innovation (product innovation, process innovation, marketing

innovations, organizational innovations) are also implemented in the Study field “Physics, material sciences, mathematics and statistics”.
Product innovation: DU Faculty of Natural Sciences and Mathematics has excellent equipment that can be used for teaching and research purposes (SAR, Annex 2.3.2. Infrastructure and material-technical provision). Research laboratories are used to promote students’ competitiveness and ability to use new technologies and sources of information. Besides, students are having hands-on activities with this unique equipment. The study process in the scientific laboratories contributes to updating the content of the study programmes, increasing the quality of the development of research works, by introducing innovative technological, methodological, and IT solutions.
Process innovations. Over the last two years, the MOODLE system was introduced and fully explored in the teaching process. Since the number of PhD students is very small, a lot of lectures are delivered in virtual mode using the e-learning platform ZOOM.
Marketing innovations. Different marketing events (Scientists' Night, DU Science Festival, Open Door days, etc.) contribute significantly to the promotion of the study field.
Organization innovation. Several digitized systems like DUIS, Namejs, HoP (SAR, p.55) are used for the organization of the study processes, and document circulation management, which simplifies the collaboration between different departments and different groups and enables student and employee self-service options.

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

Scientific research and research infrastructure are well established at the Faculty of Natural Sciences and Mathematics of DU and allow for delivering science-based studies. Scientific research directions of the Study field “Physics, material sciences, mathematics and statistics” correspond to the development goals of DU. Relevant mechanisms for the involvement of the teaching staff and students in scientific research are developed and innovative solutions are applied integrating scientific research into the study process. However international cooperation of DU teaching staff can not be fully implemented due to the inadequate linguistic competencies and low international mobility of the teaching staff.
Strengths:
1. Excellent research equipment, good research infrastructure, and high-level research.
2. Possibilities for the students to perform research using unique equipment.
3. Participation in different project activities.
4. Annual DU grants to support the students' and teachers’ research.

Weaknesses:
1. Modest number of publications in internationally recognized journals (WoS, SCOPUS).
2. Deficiency in proficient English language skills among students and staff.
3. Low mobility of the students and the staff.
4. Supervision of PhD students in one-person mode.

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

Research performed by the staff of the study field “Physics, Material science, Mathematics and Statistics” at DU corresponds to the development goals of the higher education institution and is relevant to the study field.
Teaching staff are competent to provide science-based education.

The main obstacle to the implementation of studies in English is not sufficient proficiency in English of the teaching staff as it can be retrieved from the SAR, Annex 2.3.7."Teaching staff for study direction_EN''

1.5. Cooperation and Internationalisation

Analysis

1.5.1. From the self-assessment report and observations during the on-site visit, it was noted that a strong collaboration has been established between the DU, University of Latvia, and Riga Technical University, which is still ongoing (SAR annex “2.5.1. List of Cooperation Agreements with other Institutions_ENG.docx”). This collaboration has facilitated the development of a joint AMSP in Physics, which is crucial for the study programme’s continued success, especially in the event of only one active student. It is worth mentioning that successful involvement and joint projects have been conducted with Daugavpils Opportunity High School. From 2018 to 2022, a total of 12 scientific research projects have been undertaken, earning appreciation from local educational institutions (as observed during the on-site visit). Experts encourage the continuation of such efforts with pupils, as it will contribute to the increased enrollment of students in the respective study field.
It was evident that not all opportunities for cooperation with HEIs are being fully utilized. For instance, there is no indication of any ongoing collaboration with the Institute of Solid State Physics for joint research activities that could benefit the DSP "Solid State Physics" study programme. Experts speculate that the lack of collaboration with other HEIs may be attributed to the small number of students and could be addressed by increasing enrollment.
DU is the sole university in the Latgale region offering studies in the fields of physics and mathematics, and it is significantly influenced by the specifics of the local environment. This makes it challenging to establish cooperation with employers from various industries. Nevertheless, efforts have been made, and graduate students have been approached with proposals to continue their studies in the field (as reported during the on-site visit; annex “During visit_Employers.docx”).
1.5.2. Cooperation with educational and scientific institutions from abroad appears to be a notable weakness for the study field in general. While in SAR p.57 DU mentions its admission to the Baltic group of the European Organization for Nuclear Research (CERN), there are no indications of any collaboration or joint events with CERN.
The second international cooperation mentioned was the Belarus-Latvia Scientific and Innovative Center (SAR, p.54), which, due to recent global political issues, is no longer viable.
Although the interview process with study programme directors emphasized potential cooperation with Mindanao University in the Philippines (on-site meetings), it remains unclear how such collaboration would benefit this particular study field. In conclusion, no concrete strategic plan to enhance cooperation with institutions abroad can be derived from the provided SAR or during on-site meetings. Experts also observed weak English language skills among students and some academic staff, which need improvement. That would serve as a pre-requirement for effective collaboration with institutions abroad.
A clear opportunity for DU lies in leveraging its established cooperation with other educational institutions from abroad in different study fields. The experience gained from such collaborations can and should be applied to the current study field.
1.5.3. Information regarding the mobility of teaching staff, both incoming and outgoing, for the specified reporting period is detailed in the appendix (SAR annex 2.5.3_Incoming and outgoing mobility of teaching staff). Additionally, the appendix (SAR annex 2.5.3_Incoming and outgoing mobility of students_EN) contains data on the incoming and outgoing mobility of students for the reporting period, along with information on accredited study programmes. The data reveals a lack of incoming mobility among foreign students and teaching staff. Additionally, there is minimal outgoing mobility among students, with only three occurrences reported in total. As for teaching staff, only

two individuals have reported engaging in any activities related to mobility.
The evident lack of cooperation with educational and scientific institutions, as discussed in the previous chapter, also contributes to an unsatisfactory rating in staff and student mobility. However, there has been an improvement in outgoing student mobility activity in the academic year 2021/2022, though it is not consistent. Once again, a deficiency in proficient English language skills hinders some students, preventing them from considering attendance at international conferences. As derived from interviews with current students, where an interpreter's assistance had to be used for successful communication.
During the on-site visit, it became apparent that there is a significant opportunity for students and staff members to enhance their mobility through the well-supported "ERASMUS+" programme. In the experts' opinion, it would be advisable to implement mandatory mobility for students (in conjunction with the availability of the "ERASMUS+" programme), emphasizing the necessity of learning English and improving networking skills for young scientists.

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

DU has made significant efforts to establish a well-functioning cooperation with UL in the context of the Joint AMSP, ensuring the sustainability of the study programme even in the case of a single student. This valuable experience should also be applied when expanding the study field programmes to bachelor and master levels. The established collaboration with the local high school is a strategic move to enhance the future enrollment of students. However, there is an evident lack of cooperation between scientific and educational institutions from abroad, contributing to poor mobility among academic staff and students that needs to be addressed. As a first step, a general strategy should be developed to tackle this issue.
Strengths:
1) Outstanding outreach activities in local schools and other education institutes.
2) The joint AMSP in Physics with UL ensures continuous studies even for one student in the class.
3) The job market for graduates is widely spread within other universities in Latvia and abroad, providing a solid foundation for strengthening cooperation opportunities.
Weaknesses:
1) The low number of students hinders the formation of a large number of projects or activities with other universities or institutions.
2) Cooperation with universities or scientific institutions abroad is insufficient.
3) There is low or nonexistent mobility for academic staff and students.
4) Unsatisfactory level of English proficiency contributes to an unsatisfactory rating in staff and student mobility.
5) It remains unclear how collaboration with Mindanao University would benefit this particular study field.

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 and internationalisation is partially compliant due to lack of evidence for mobility in general and no evident plan for improvement for near future. From positive side "ERASMUS+" programme is well-supported.

1.6. Implementation of the Recommendations Received During the Previous Assessment

Procedures

Analysis

1.6.1. Implementation of the recommendations provided in 2012 following accreditation for the study field "Physics, Material Science, Mathematics and Statistics" can be summarized as follows:
[1] To continue the study programmes of mathematics and physics.
DSP "Solid State Physics" and "Mathematics" are ongoing. In 2021, the joint AMSP in "Physics" received licensing approval. However, admission to the ABMSP in "Mathematics" and "Physics," as well as the AMSP in "Mathematics," was discontinued. The recommendation can be considered partially completed.
[2] To create a detailed development plan for cooperation with other HEIs, local businesses, and entities.
Effective collaboration models are already established, particularly with high school student scientific works. The joint AMSP "Physics" with UL exemplifies successful cooperation with other institutions of higher education (hereinafter - HEIs). It is anticipated that DU will explore opportunities to expand such collaborations to other programmes within the study field.
[3] to introduce the applied/technical direction in the content of mathematics master and doctoral study programmes.
DU states that within the DSP "Mathematics," the curriculum includes the study course "Selected Issues of Mathematical Modeling" (4CP). This study course delves into the realms of mathematical modeling in biology, offering insights into complex systems, solution behaviors, self-organization, and relevant research methodologies. The recommendation can be considered as completed.
[4] Work more closely with regional high schools to attract the best graduates.
The recommendation can be considered partially completed, as the study field does not feature study programmes aimed at high school graduates as of now. However, there have been thoughtful efforts made towards fostering cooperation with high schools, especially regarding high school student scientific projects.
[5] Attract more PhD students to prevent the threat of staff aging.
According to DU's assertion, four graduates have participated in doctoral study programmes. Three of them in DSP “Solid State Physics” and one in DSP “Mathematics”. However, in practice, the latter study programme heavily depends on a limited number of professors, making the sustainability of the study programme questionable. The recommendation can be considered partially completed.
Recommendations given by experts during the licensing of joint AMSP "Physics" in 2021 can be summarized as follows:
[1] Short-term. Develop an algorithm for financial and academic issues when a student accepted to one university chooses to specialize in another university.
DU states that a contract has been signed between DU and UL for financial distribution in such cases. Remote learning is organized using software solutions. Also there are plans in place on how to logistically accommodate visiting students from UL. The recommendation can be considered as completed.
[2] Short-term. Make changes to the study contract, indicating information about the student's declared place of residence.
The necessary changes to the study contract have been made. The recommendation can be considered as completed.
[3] Short-term. Rethink the system for the selection of a large number of elective courses (57 courses), such as what is the intended course assembly for students and what would be the scope of specializations.
As of now, DU specialization "Physics of Technology" offers a sufficient number of part B study courses. The recommendation can be considered as completed.
[4] Long-term. Expand active recruitment activities to increase the number of students.

DU states that the recommendation is partially completed. Number of students is an indication of this. More efforts are needed to maintain the study programme sustainable.
[5] Long-term. In annual student surveys, as well as in everyday study processes, pay attention to equal opportunity provision for UL and DU students in the respective study programmes in partner universities, to identify and address issues on time.
DU states that the study programme director on the DU side regularly communicates with students and identifies potential study opportunity issues. As of now, there are no indications of potential issues regarding equal opportunity provision for joint study programme students. The recommendation can be considered as completed.
[6] Long-term. Improve student awareness of mobility opportunities (e.g., ERASMUS+) and create a more favorable environment to facilitate this, as well as reduce barriers to credit transfer for study courses completed abroad.
As of now, there is insufficient data to evaluate the results of the implementation of this recommendation. Therefore, it is recommended to continue activities regarding awareness of mobility opportunities. The recommendation is partially completed.
[7] Long-term. Find additional alternatives in partner universities that, in case of study programme termination, could provide the opportunity to continue studies in corresponding specializations; considering the possibility of cooperation at the Baltic level, as the study programme may be deemed inapplicable at the Latvian level.
Partially implemented, as the study programme has been only relatively recently licensed and such activities have not been started yet.
[8] Long-term. Improve the mutual communication system between universities, focusing specifically on communication between faculty members, avoiding study course fragmentation.
A joint study council for AMSP "Physics" has been established. Surveys involving faculty from both UL and DU have been carried out to identify and enhance any shortcomings in the organization of the study. The recommendation can be considered as completed.
[9] Long-term. Enhance the joint quality management system of study programmes, paying attention to aspects that could result in potential risks and challenges in the long term, for example, ensuring that students complete the mandatory part of the study programme and have the option to choose study courses from both UL and DU; the analysis and assessment of these challenges have not been carried out.
The annual student surveys conducted by DU aim to pinpoint study deficiencies. Across various subjects, students are given the option to attend lectures remotely. Careful selection and planning of laboratory work ensure that essential materials and equipment are accessible at both DU and UL. In study courses where UL faculty instructs DU students, designated instructors from DU are assigned to offer consultative support in the respective subjects. The recommendation can be considered as completed.

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

DU has made significant progress in addressing major short-term recommendations, reflecting the institution's commitment to continuous improvement. The efforts put forth in implementing joint study programmes, notably the newly licensed joint AMSP "Physics", are particularly praiseworthy. While acknowledging these accomplishments, the institution needs to consider the long-term recommendations that require sustained attention. Exploring opportunities for similar collaborations in the realm of doctoral study programmes could be a strategic avenue for growth. Several long-term recommendations, such as those related to recruitment activities for potential students, raising awareness about Erasmus+ mobility, and seeking collaborations beyond state borders, are still in progress.
Strengths:

1. Implementation of joint AMSP can be considered relatively successful.
2. Short-term recommendations regarding joint AMSP have been generally addressed.

Weaknesses:

1. The study field does not feature full-cycle education.
2. Long-term sustainability of DSP "Mathematics" is questionable.

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

DU has addressed major short-term recommendations, however long-term recommendations still demand some attention from the institution.

1.7. Recommendations for the Study Field

Short-term recommendations

Strategy work with a clear implementation plan should be initiated in the study field to ensure student recruitment, enable faculty renewal, widen the scope of topics, and continue the study programmes.
More elective studies should be implemented in the doctoral study programmes to give a wider competence profile for the graduates.
Networking events, guest lecturers from the industry and visiting professors from abroad should be invited to broaden the scope of the study programmes and to enhance collaboration opportunities.
Development of the open-access strategy for the laboratory equipment with the inclusion of paid services. Exploring better visibility and accessibility to partners would help to develop and maintain the laboratories and shorten service delays.
A plan for permanent upgrading proficiency in English of the staff who participates in the programs delivered in English should be prepared.

Long-term recommendations

The duration of the doctoral study programmes should be four years instead of three years.
Implementation of joint doctoral study programmes or graduate schools in physics and mathematics with other Latvian universities to increase national collaboration and obtain critical mass.
Mandatory mobility requirement for doctoral students and faculty.
Implementation of bachelor and master study programmes in mathematics and a bachelor study programme in physics.
Job contracts with the university for the doctoral students would enable full-time studies.
Explore opportunities to develop and implement joint study programmes in doctoral studies.

II - "Physics" ASSESSMENT

II - "Physics" ASSESSMENT

2.1. Indicators Describing the Study Programme

Analysis

2.1.1.The joint AMSP “Physics” is developed following the requirements of the study field “Physics, material science, mathematics and statistics” and is in line with the overall strategy of DU. Joint AMSP “Physics” by its title and Study curriculum complies with the designated study field.
2.1.2. The joint AMSP "Physics" primary objective is to prepare highly qualified Master's level physics specialists for the labour market. This is achieved by offering opportunities for specialization in physics subdisciplines specific to Latvia, focusing on areas with high research and innovation potential. Additionally, the study programme aims to stimulate the acquisition of interdisciplinary competencies among students. There is an emphasis on promoting the professional development of students by allowing them to build on the knowledge and skills acquired during their Bachelor's programme in their chosen specialization within physics. Students have opportunities to engage in independent research under the guidance of a supervisor, gaining experience and competence in scientific research and the analysis of research problems. Another planned study programme outcome is creating prerequisites for graduates to pursue successful doctoral studies. The study programme is identified by the code 45443 (SAR p. 117-118). Following Cabinet Regulation No.332 “Noteikumi par Latvijas izglītības klasifikāciju” (SAR p. 117-118) the code signifies that it is an AMSP (45) in the thematic field of physical sciences (44) and within the group of educational programmes specializing in physics (443). Evaluation for application is English and Latvian language modes.
The study programme is offered in full-time format. Duration is 2 years. The study programme consists of main A-part study courses, which are conducted by UL, specialization study courses, interdisciplinary/additional study courses and C-part. Specializations are as follows: [1] astrophysics, [2] physics of technology, [3] atomic, molecular and optical physics, [4] theoretical physics, [5] physics of continuous media, [6] solid state and material physics. Out of these sub-specializations, [2] physics of technology is provided by DU. All other specializations are provided by UL.
Admission to the joint AMSP "Physics" of UL and DU follows an agreement signed by the two universities. Before each academic year, the universities agree on the language of study programme implementation (Latvian and/or English) and the number of students to be enrolled. State-funded budget places at each university are determined by the funding allocation from the Ministry of Education and Science. Admission is carried out independently by each university through a competitive process.
Enrollment in the study programme adheres to the DU admission rules for full-time and part-time higher-level studies. Admission requirements include a first-cycle higher education degree in physics or mathematics, or in natural sciences and in engineering sciences and technologies with completed study courses in physics and mathematics. Foreign applicants must show proficiency in English at least at the B2 level. Competitors are evaluated based on the average grade of final/state national exams. Upon completion of the study programme, the degree to be obtained is a "Master's Degree of Natural Sciences in Physics."
The study programme's name, the degree to be obtained, programme aims and objectives, and student admission requirements are interconnected.
2.1.3. Joint AMSP "Physics," developed in collaboration between the UL and DU, received its license on October 27, 2021. Its license number is 2021/07K. No modifications have been made to its parameters, and there are no planned changes.
2.1.4. The study programme prioritizes high-quality education and aligns with labour market demands. Influenced by the European Physical Society's specifications, the study programme focuses on real opportunities in physics, addressing areas like atomic physics, materials physics, and

theoretical physics. Forecasts indicate a growing demand for professionals in engineering and life sciences over the next five years, supporting the study programme's strategic relevance. Collaborative efforts with employers, including research institutes and tech companies, ensure curriculum alignment with industry needs. The Latvian National Development Plan 2021-2027 sets a target of 12% for science, mathematics, and information technology graduates, sustaining the demand for physics programmes. There is no employment data available for the current study programme reporting period. As of SAR the accreditation report submission, the study programme at DU has one student in the first study year. Between 2017 and 2022, a total of 14 students were enrolled in both the old and new AMSP "Physics,", with 8 students graduating during this period. In 2022, 13 students studied in the new joint AMSP "Physics,", with 12 specializing at UL and 1 at DU, funded through the state budget (SAR, Annex 3.1.4: “AMSP Physics Statistical data on students_EN_DU.xlsx”, SAR p. 119).

2.1.5. The joint AMSP originated from a Cooperation Agreement signed on May 31, 2019. This collaboration is, co-financed by the European Social Fund. The study programme aligns with the universities' development strategy strategies and contributes to industry needs, supported by partnerships with high-tech companies. Modern facilities, well-equipped laboratories, and highly qualified staff at both UL and DU reinforce the study programme's foundation. The decision is entirely justified, considering the financial and infrastructural limitations of DU. Therefore, the joint AMSP allows both institutions to employ their infrastructure and specializations, creating a more encompassing physics study programme in Latvia enabling students at DU to use full opportunities provided by UL. The study programme is managed by a joint council and as for now there are no indications of potential risks regarding quality assurance. Furthermore, even though currently there are no UL students who have chosen a specialization implemented at DU, there are plans in place on how to logistically accommodate those students effectively.

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

Joint AMSP “Physics” between the UL and DU aims to prepare highly qualified physics specialists for the job market. It follows the education standards and aligns with the study field and DU's overall strategy. The study programme offers full-time studies with several specializations - physics of technology provided by DU. The study programme is still in the approbation period as it was licensed in 2021. Despite limited employment data, the study programme has attracted students, with collaborative plans for logistical accommodation. The decision is justified, considering DU's financial constraints, allowing both institutions to leverage their infrastructure and specializations effectively. However, student numbers at DU, and in specialization implemented by DU, are extremely low - only one student.

Strengths:

1. Wide amount of specializations available to students.
2. Regional and national significance.
3. The joint study programme leverages the strengths and capabilities of each involved institution.

Weaknesses:

1. Extremely low number of students.

2.2. The Content of Studies and Implementation Thereof

Analysis

2.2.1.The content of the joint AMSP “Physics” is based on the European Master of Physics specifications produced by the European Physical Society (EPS., The goal and learning results of the joint AMSP “Physics” are based on competencies and defined in line with the 5th Growth Priority of the Smart Specialisation Strategy of Latvia "Modern Education System" (SAR, p.123).

The study programme corresponds to level 7 of the European qualification framework. The admission requirements (see part 2.1.2. of the present report) are adequate to provide the necessary background for successful studies.
The objective of the study programme is to educate highly qualified and internationally competitive Master's level physics specialists for the labor market. To do this, the study programme provides the opportunity to specialize during studies in physics subdisciplines, that are historically strong in Latvia and have high research and innovation potential, and stimulates the acquisition of interdisciplinary competencies (SAR p.112). The study programme defines learning outcomes in terms of knowledge, skills, and competencies (SAR p.113). The study courses are well interconnected, their relationship to the development of the planned learning outcomes is well-defined and adequate (SAR, Annex 3.2.1. "AMSP_Mapping of study courses").
The total duration of the study programme is 2 years, and the corresponding workload is 80CP. The compulsory part consists of 26 CP (33% of the total workload) and includes study courses that are targeted at the development of core research skills (Research laboratory work, Numerical modeling of physical processes), and “physical” thinking; that expand erudition and familiarize with actual problems in physics (Master's in physics specializations, Current topics in physics and astronomy)
The study programme offers a variety of specializations. The specialization study courses consist of 32 CP (40% of the total workload). The specialization “Physics of technology” is implemented by DU. The study content of this specialization has a strong focus on the industrial application of physical science: DU provides such study courses as Nanomaterial Production Technologies, Practical Holographic Systems, Basics of Industrial Robotics, Modeling of Technological Processes, and Industrial Use of Laser Technologies. There is a study course “Didactics of Natural Science”, which helps graduates to start a teacher's career at the high school (SAR, Annex 3.2.1.AMSP Physics_Study plan). Study courses provided by DU are in good agreement with the DU research activities in the field. These study courses have been developed by the DU academic staff in cooperation with the scientific staff taking into account the current research in physics and interdisciplinary fields at DU, and the recommendations of the industrial partners (SAR, p.124; panel meeting with the study programme director, staff and students).
The study programme includes intensive 6 CP (8%) academic practice (SAR, p.128; part 2.2.4 of the present report for more details).
The Master thesis takes 20CP, that is 25% of the workload.
Together, DU provides 58 CP (73%) of the total workload, the rest is provided by the UL.
Joint AMSP “Physics” is compliant with the state education standard (SAR, Anex 3.2.1.AMSP Physics_Compliance with National Educational Standard), and is compliant with the requirements, defined for the joint study programmes by the Law on Higher Education Institutions of the Republic of Latvia (SAR annex 3.1.5.AMSP Physics_Compliance of the joint program with the University Law_EN.docx)
The career path of the graduates generally goes smoothly. Some of programme graduates were able to continue their PhD studies at other universities of Latvia (panel meeting with graduates). This indicates the relevant quality of the study programme.
The curriculum of the study programme does not include English language courses. The newly enrolled students are thought to have learned English during their Bachelor studies. In practice, the students demonstrated limited proficiency in English (panel discussion with students).
2.2.2.The master’s degree is awarded on the basis of student's individual scientific work. The master thesis takes 25% of the total study programme workload. To develop scientific vision and research skills, joint AMSP includes such study courses as "Current Topics in Physics and Astronomy I", and "Research Laboratory Work I"). The academic practice study course provides an insight into the working environment of a research institute or company, and is often related to the development of the master thesis (SAR, p.125-126).
The development of the Master thesis implies individual research work under the supervision of a

project scientific supervisor, preparation of a Master thesis concept, that include the theoretical part with a literature review, finalization and defense of the Master thesis (annex 3.2.1.AMSP Physics_Descriptions of study courses.docx, study course “Master thesis in physics I and II”). The successful development of the Master thesis requires the student's ability to carry out independent research, integrated into the research process by DU (SAR, p.125).
The master's degree award commission is composed entirely of the representatives of DU (order of the rector Nr. 4-4/dk-52). Although it is not required for an academic master's study programme, the involvement of representatives from other institutions or employers could be an important contribution to the openness of the master thesis defense procedure.
2.2.3.Despite the small number of students, the study process is scheduled regardless of the number of students, i.e. DU does not implement any restriction on the minimal number of students in the class (panel meetings with the study programme director and academic staff).
The studies are in the form of lectures, seminars, individual consultations, and individual work (SAR, p.126-127). The teaching methods, besides frontal lecturing, include learning by doing, intermediate tests, presentations, and research work. The proportion of contact hours and individual work is 30% - 70%, except for academic practice and master thesis development.
DU implements principles of student-centered education. DU emphasizes that learners' different learning styles, requirements, interests, backgrounds, and prior knowledge are taken into account, but does not specify more details. The reflection is facilitated by intermediate tests and seminar discussions (SAR, p.127).
For the assessment of the student progress, DU implements basic principles: the principle of openness; the principle of obligation; the principle of assessment review options; principle of diversity of the types of tests used (SAR p.124).
As part of the study programme is provided by the partner university, the sound part of the study courses is taught online and using e-learning methods. Students have access to the lecture recordings in the e-learning environment, as well as lecture notes whenever they are needed for the study courses, taught both by DU and UL (SAR, p.126; panel meeting with study programme director)
Owing to academic practice and master thesis development, work in a research environment is an integral part of the joint AMSP “Physics”. The practical work is usually done on projects, and by companies, where “employers" put high demands on the quality of the student work (SAR, p.126-127)
2.2.4. The study programme includes an academic practice with a total workload 6CP, that corresponds to 240 work hours. It provides an insight into the working environment of a research institute or company.
The typical tasks of the academic practice include familiarization with the structure and operation of the particular institution, the specifics of its scientific activity, and scientific problems relevant to that institution, as well as preparation and presentation of the academic practice report. The coordination of the academic practice and assignment of the tasks is provided by the study programme director and by the appointed academic practice supervisor (SAR, p.128). The organization of the academic practice is provided in accordance with the “Rules for the Organisation of Student Internships” (annex 3.2.4.LU DU AMSP Fizika prakses apraksts.pdf, in Latvian) and is adequately effective.
The academic practice is provided to effectively stimulate and train teamwork skills, and problem-solving skills, develop competencies related to analytical and research skills, as well as communication and IT skills, to apply the learned skills to solve modern physics problems in academic research, and applied physics applications (annex 3.2.4. LU DU AMSP Fizika prakses apraksts.pdf, in Latvian). From this point of view, the tasks of the academic practice are directly related to the learning outcomes of the study programme.
The academic practice is organized in the departments of natural sciences of the DU (Technology

Department of the Institute of Life Sciences, DU) and partner universities (Institute of Physics, Institute of Atomic Physics and Spectroscopy, Institute of Chemical Physics, University of Latvia), but may be organized on the basis of other research institutions (Institute of Solid State Physics) or commercial enterprises (Light Guide Optics International, Ceram Optec, Lattelecom) (SAR, p.128).
In recent times, the academic practice was organized at DU when master students participate in ongoing research (panel meetings with students and academic staff).
2.2.5. N/A
2.2.6. Unfortunately, at the moment of preparation for SAR there were no graduates of the study programme. The student, enrolled in the study programme at the time of on-site visit, has the topic of the thesis, compliant with the field panel meeting with students.

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

The content of the joint AMSP "Physics" corresponds to the objective of the study programme. The study courses are interconnected and complementary, the learning outcomes of the courses contribute to the learning outcomes of the entire study programme. The composition and the content of the courses meet the needs of the labour market (both industry and academia) and are relevant to the current scientific trends in the field. The composition of the study programme complies with the state education standard. The methods, used within the study programme, contribute to the achievement of the learning outcomes.
The AMSP is tightly linked to the research in the field. The master's degree is developed in a course of student research, i.e. it is based on the achievements and findings of the relevant field of science. The study programme includes practical placement.
Strengths:
1. Well-designed curriculum with a clear focus on industrial applications.
2. Excellent cooperation at the national level.
3. Sound academic practice.
4. Enthusiastic staff and students.
Weaknesses:
1. Limited international collaboration.
2. The students cannot improve their English (e.g. using a free optional course).
3. An extremely low number of students.
The master's degree award commission does not include representatives from industry or partner institutions.

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

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

Assessment of compliance: Fully compliant

The study programme includes intensive research work by the students, sound academic practice, and generally modern study course content.

2.3. Resources and Provision of the Study Programme

Analysis

2.3.1.The implementation of joint AMSP at the DU is provided by the staff of the DU Institute of Life Sciences and Technologies and the Faculty of Natural Sciences and Mathematics. The peculiarity of the study programme is that DU provides only a specialization “Technology physics”, that consists of

11 limited elective courses, taught by 11 teachers. The obligatory study courses and limited elective courses (civil and environment protection) are taught by the partner university, and the students from DU join classes online. Upon necessity, DU may provide equipment for the online connection in the auditorium. The laboratory classes for obligatory study courses are taught at DU, using two study laboratories: the laboratory of Mechanics and Electromagnetism, and the Laboratory of Optics and Quantum Physics. The laboratory classes for limited elective courses use scientific laboratories of DU: (Innovative microscopy center scientific laboratories, metal processing, and robotic laboratories, and laboratory of laser technologies, see also part.1.3.2 of the present report (SAR, p.119, annexes 2.3.2 “2.3.2.Infrastructure and material-technical provision_EN.docx” and 3.2.1 “AMSP Physics_Study plan.docx”, tour to the facilities).
The contact hours (classes) are scheduled regardless of the number of students, i.e. DU does not implement any restriction on the minimal number of students in the class (panel meetings with programme director and academic staff).
The financial provision of the study programme by the state financing is not sufficient because of the extremely low number of students. DU estimates that 5 students is a minimum number in each year, required for the profitability of the study programme (additional information after the on-site visit). Therefore, DU provides financial provisions from other means (see part 2.3.3 of the present report).
The AMSP “Physics” is implemented jointly with the partner university - UL. The UL provides obligatory courses for at least 46 CP (out of 80 Cp) for the DU students free of charge: students may attend lectures online, but the laboratory classes take place at DU. Alongside this, DU students may use the laboratories of the UL for the development of their master thesis in the framework of scientific cooperation (panel meeting with programme director).
The description of the study courses contains necessary information (abstract, learning outcomes, study plan, criteria for evaluation, etc). For some study courses, the list of compulsory literature contains records, that are not available in the DU library (e.g., study courses “Practical holographic systems”, Didactics of natural sciences”, “Nanomaterials production technology”), sources in languages the student may not know – German or Russian (e.g. study courses “Open system physics”, Vacuum technologies”), some study course description refers to sources more than 30 years old (e.g. “Electron microscopy”), so the literature references could be updated. The description of study courses, provided by the UL contains literature sources that are not available at the DU library, but SAR does not describe how this problem is addressed (SAR, p.119, annex 3.2.1. AMSP Physics_Descriptions of study courses, library catalog https://biblio.du.lv/Alise/lv/home.aspx, accessed 31.01.2024)
2.3.3. According to SAR, the running costs of the joint AMSP "Physics" are state financing for studies (subsidy) or tuition fees. DU set the tuition fee at 1600 EUR per year of study (3200 EUR for two years - total duration of studies), at the same time, the calculation provided by DU Finance and Accounting department indicates running costs of about 9100 EUR per student, that makes reasonable estimation of 5 students as the minimum number of students in each year, required for the profitability of the study programme (SAR, p.120; additional information after the on-site visit).
At present, the number of students is much less than 5, therefore DU is financing the study programme from other means, including scientific financing (both projects and state research base funding), as well as redistributing state financing, allocated to other study fields. As it was mentioned in part.1.3.1 of the present report, DU willingly subsidizes this study programme due to their strategic decision and can do it without jeopardizing other study fields (SAR, p.119, panel meeting with administration).

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

In general, DU has the necessary resources to implement joint AMSP ``Physics” even with the number of students below the profitable level. The discrepancies are related to outdated and

sometimes unavailable library resources.
Strengths:
1. Well-established and beneficial cooperation with the partner university.
2. Developed and modern research and laboratory infrastructure.
3. Ability to cover the study programme implementation costs using financing besides state subsidy.
Weaknesses:
1. Outdated or unavailable literature mentioned in some study course descriptions.
2. Low number of students.

Assessment of the requirement [6]

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

Assessment of compliance: Fully compliant

Generally, DU has necessary resources for the implementation of the study programme, especially taking into account cooperation with the UL.

2.4. Teaching Staff

Analysis

2.4.1. The qualifications of teaching staff involved in the joint AMSP "Physics" fully meet the conditions of the study programme implementation, programme content, and the requirements of regulatory acts as it is specified in the 3rd paragraph of the 1st part of Article 55 of the Law on Higher Education Institutions, where it is indicated "that no less than five professors and assoc. professors who have been elected to academic positions at the respective university, participate in the implementation of the compulsory part and the limited elective part of the academic study programme". 15 professors and associated professors elected by the University of Latvia (UL) and 10 lecturers (8 of them are holders of PhD degrees) participate in the implementation of the joint AMSP (see SAR, Table 3.4.1, p. 131-132). From the side of DU 11 lecturers are involved, 4 of them are elected as academic staff, while the other 7 are visiting lecturers from research and industry. 8 lecturers have PhD degrees, others are Masters of Science as it is stated in the SAR, p.132, however, the names of the teachers are not specified, thus making the assessment more complicated. The composition of the teaching staff fulfills the requirements (SAR, table 3.4.1.1, p.132-133 and SAR, annex 3.4.1. AMSP_Physics_Statement_Article 55). The proficiency of the state language (Latvian) of academic staff complies with the regulations on state language proficiency since the study programme is to be delivered in Latvian (SAR, annex 2.3.7. Statement _native Language), but the proficiency of the foreign language (English) is not addressed in the SAR. There is some confusion between the provided documents: following the statement of the rector of DU (SAR, annex 2.3.7. Statement_foreign_language_B2) the proficiency of all teachers in English is satisfactory, but SAR, annex 2.3.7. "Teaching staff to study direction" provides controversial information.
Qualification of staff can be assessed via publications in high-level journals and participation in different research projects. It was hard to assess this part, because no specified list of joint AMSP teaching staff was provided, and assessment was done trying to extract some data from the list of publications (SAR, annex 2.4.4 List of scientific publications the direction) and the list of projects (SAR, annex 2.4.4. Participation in the project for direction). In general, the qualification of the staff in the assessed study field is high and their contribution to the research is important, but it was impossible to track and record the quality of the joint AMSP teaching staff due to the gaps in the provided information.

2.4.2. Some changes have been undertaken in the teaching staff, in comparison to the initially planned, because two lecturers passed away. In this case, the study courses “Physics of Open Systems” and “Fundamentals of Industrial Robotics” were taken over by young competent teachers (SAR, p. 133). These changes in the composition of teaching staff in no way impaired the quality of the studies.
However, the problem with teaching staff replacement due to retirement is not fully solved yet. This was indicated by the faculty members during the on-site visit. The discussion revealed that some retired lecturers are employed on the tentative contract due to the lack of teachers with specific knowledge and competencies, however, they are not active in research anymore.
2.4.3. N/A
2.4.4. It was impossible to perform a detailed analysis due to the lack of information. Considering SAR, annex 2.4.4. “Compilation of the quantitative data for direction”, it can be stated that all teachers indicated in this document, had several WoS / SCOPUS publications and some of them participated in research projects, except for teachers having temporary employment due to the retirement age.
2.4.5.The cooperation of the teaching staff in the implementation of the joint AMSP “Physics” is established via joint Study Council which ensures collaboration between DU and UL, joint research projects, and participation in conferences and publications. The faculty members have many joint publications, which confirms the cooperation of staff in scientific activities. To ensure the interconnection of study courses, meetings of lecturers (both collectively and individually) are organized. (SAR, p.135). It also covers discussions concerning teacher’s workload during the semester, introduction of the new study modules, improvements requested from students, and planning of scientific events.

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

Qualification and completion of the teaching staff of the joint AMSP Physics fulfills the requirements indicated in The Law on Higher Education Institutions.
Strengths:
1. High qualification of the DU teaching staff members involved in the implementation of the joint AMSP “Physics“.
2. Well-established mutual collaboration with the program implementers at the University of Latvia.
3. Excellent study programme management.
Weaknesses:
1. AMSP Physics has an excellent Study programme director, but he holds the position of visiting lecturer at DU.
2. To progress study programme implementation, more active engagement of staff is needed in the research field.
3. Linguistic competencies of DU teaching staff should be improved.
4. There is no working mechanism for the recruitment and composition of joint AMSP Physics teaching staff at DU.
5. Teachers' participation in staff mobility via ERASMUS would be of benefit.

Assessment of the requirement [7]

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

Assessment of compliance: Fully compliant

The qualification of the academic staff complies with the conditions for the implementation of the joint AMSP in both, Latvian and English languages, and the requirements set out in the Law of Higher Education.
However, for the implementation of this study programme in English, DU staff should upgrade their linguistic skills in English.

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

Annex (“3.2.1.AMSP Physics_Compliance with National Educational Standard.docx”) confirms that the study programme complies with Cabinet Regulation No.240 “Noteikumi par valsts akadēmiskās izglītības standartu”.

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

Attached study course descriptions (“3.2.1.AMSP Physics_Descriptions of study courses.docx”) are prepared in Latvian and English. Descriptions comply with regulations outlined in the Law on Higher Education Institutions.

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 provided Diploma sample (“3.1.2.AMSP Physics_Sample of the diploma and its supplement_last.pdf”) complies with the procedure by which state-recognized documents of higher education are issued following Cabinet Regulation No. 202 “Kārtība, kādā izsniedz valsts atzītus augstāko izglītību apliecinošus dokumentus”.

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

SAR 3.4.1. indicates involvement in the joint study programme of 9 professors and 6 associated professors. All of them are elected at UL.

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

Attached resumes of staff (“ 2.3.7.CV_EN.zip”) and confirmation (“ 3.4.1.STATEMENT of eksperts_DSP_Solid state physics_EN.docx”) verify that their state language proficiency is compliant with Cabinet Regulation No. 733 "Noteikumi par valsts valodas zināšanu apjomu, valsts valodas prasmes pārbaudes kārtību un valsts nodevu par valsts valodas prasmes pārbaudi".

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: Partially compliant

Attached are resumes of staff (“2.3.7.CV_EN.zip”) and confirmation (“2.3.7.STATEMENT_foreign_language_B2.docx”) in general verify that most of the staff’s language proficiency in English is at least B2, however, analyzing provided document (SAR, annex 2.3.7. “Teaching staff to study direction”) experts group identified, that linguistic competencies of some staff members are B1.

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

Sample of attached study agreement (“2.1.4.Agreement on studies_DU.docx”) complies with Cabinet Regulation No. 70 "Studiju līgumā obligāti ietveramie noteikumi”.

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 attached contracts (“2.1.4.Agreements.zip”) confirm that the institution provides the opportunity to continue studies within Riga Technical University and the University of Latvia joint

professional Master's study programme "Medical Engineering and Physics" (47526).

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

DU confirmation (“ 2.1.4.CONFIRMATION_Compensation guarantee for students_EN.docx”) states, that students are guaranteed compensation for losses if the study programme is not accredited or the license of the study programme is revoked due to the actions of the institution (actions or failure to act) and the student does not wish to continue the studies in another study programme.

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

Assessment of compliance: Fully compliant

Annex (“ 3.1.5.AMSP Physics_Compliance of the joint program with the University Law_EN.docx”) and other provided documents confirm that the joint study programme complies with the requirements in question outlined in Law on Higher Education Institutions.

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

AMSP "Physics" in both: Latvian and English languages generally complies with regulatory enactments outlined in the Law on Higher Education Institutions and other regulatory enactments. However, shortcomings regarding the English language proficiency of the DU staff identified by experts require upgrading of English language skills for the sustainable implementation of the programme in English.

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

Joint AMSP “Physics” between the UL and DU aims to prepare highly qualified physics specialists for the job market. It follows the state education standards and aligns with the study field and DU's overall strategy. The study programme offers full-time studies with several specializations - physics of technology provided by DU. The study programme is still in the approbation period as it was licensed in 2021. Despite limited employment data, the study programme has attracted students, with collaborative plans for logistical accommodation. The decision is justified, considering DU's financial constraints, allowing both institutions to leverage their infrastructure and specializations effectively. However student numbers in DU, part of a joint AMSP and DU implemented specialization, are extremely low - only one student.

Joint AMSP "Physics" corresponds to the study field "Physics, material science, mathematics, and statistics." The objective of the study programme is to prepare highly qualified and internationally

competitive Master's level physics specialists, eligible to continue education at PhD level. The composition of the study programme and content of the study courses correspond to the study programme objective and declared learning outcomes. The admission requirements are adequate for the study programme.
In general, DU has the necessary resources to implement joint AMSP ``Physics" even with the number of students below the profitable level. The discrepancies are related to outdated and sometimes unavailable library resources.
Qualification and completion of the teaching staff of the joint AMSP Physics fulfills the requirements indicated in The Law on Higher Education Institutions.
Strengths:
Wide amount of specializations available to students.
Regional and national significance.
1. Well - designed curriculum with a clear focus on industrial applications.
2. Excellent cooperation at the national level.
3. Sound academic practice.
4. Enthusiastic staff and students.
5. Well-established and beneficial cooperation with the partner universities.
6. Developed and modern research and laboratory infrastructure.
7. Ability to cover the study programme implementation costs using financing besides state subsidy.
8. The academic staff teachers team comprises experienced teachers and highly dedicated young teachers, indicating high potential for the study programme development.
Weaknesses:
1. Extremely low number of students.
2. Limited international collaboration.
3. The master's degree award commission does not include representatives from industry or partner institutions.
4. Outdated or unavailable literature mentioned in some study course descriptions.
5. It is hard to assess the progress in programme implementation related to the scientific production of the teaching staff due to the lack of constructive information.
6. DU staff proficiency level in English should be permanently upgraded, especially for teachers who will contribute to the implementation of the AMSP" Physics" in English.
7. Low emphasis on the recruitment and composition of joint AMSP Physics teaching staff at DU.
8. Low mobility of the staff and students

Evaluation of the study programme "Physics"

Evaluation of the study programme:

Good

2.6. Recommendations for the Study Programme "Physics"

Short-term recommendations

1. To improve the linguistic competences (English) of teaching staff up to at least B2 level.
2. To develop teaching staff replacement mechanism due to retirement.
3. To elaborate the strategy for the students attraction to the study programme.
4. To elaborate mechanisms for the cost-effective exploration of the unique laboratory technique.

5. To involve representatives from industry or partner institutions to the master degree award commission.
6. To update compulsory literature in the descriptions of the study courses to avoid citing unavailable or outdated literature.
7. To include the study course “Scientific English” into the study programme curriculum as a limited elective or free elective.

Long-term recommendations

1.To achieve participation of each staff member in mobility at least once per 6 years.
2. To enhance international collaboration and collaboration with industry by the involvement of visiting/ guest lecturers in the study process.

II - "Solid State Physics" ASSESSMENT

II - "Solid State Physics" ASSESSMENT

2.1. Indicators Describing the Study Programme

Analysis

2.1.1.The DSP “Solid State Physics” is developed in accordance with the requirements of the study field “Physics, material science, mathematics and statistics” and is in line with the overall strategy of DU. DSP “Solid State Physics” by its title and study curriculum complies with the designated study field as it is classified as a field of physics.

2.1.2. DSP “Solid State Physics” at DU is designed to offer high-quality, internationally recognized education in the physical sciences at the doctoral level. The programme aims to prepare highly qualified physicists capable of addressing significant challenges in modern physics and material science.

Enrollment in DSP is governed by DU's annual admission rules. Prospective students must hold a master's degree in physics or a related field or an equivalent qualification. According to SAR (p. 88), admission involves discussions on the research topic in English, assessing the applicant's detailed research proposal, motivation, scientific relevance, alignment with priority directions in physical science development, prior achievements including publications and conference participation, professional activity connection to the thesis topic, and proficiency in English. However, in practice, there were no indications that such discussions and evaluations of English proficiency had ever taken place. Evaluation for application is in English and Latvian language modes.

The study programme aligns with the eighth level of the Latvian Education Classification, focusing on doctoral studies in physics. The study programme code is 51443. The code signifies that it is a DSP (51) in the thematic field of physical sciences (44) and a group of educational programmes specializing in physics (443). It is a three-year full-time study programme, emphasizing independent research, publication in international journals, and innovation implementation. The degree awarded is a doctoral degree (Ph.D.) in natural sciences.

2.1.3. The title, code, degree to be obtained, of the study programme, objectives, aims and admission requirements are interrelated.

No significant changes to existing parameters have been made in the study programme during the period since the previous accreditation in 2012. However, the evaluation process now includes consideration for a new language mode - English. Generally, the decision to introduce an English

language option is deemed necessary, given the crucial role of the English language in research work, especially in this study field. Regardless, minor discrepancies have been identified concerning the language skills of certain staff members, which should be addressed should the decision be made to implement the program in English. Apart from this concern, there are no other issues regarding the implementation of the English language mode, as study course descriptions already heavily incorporate English language source materials. The focus lies solely on the language skills of select staff members required for content delivery. Nevertheless, DU can overcome these issues. The proposed changes to parameters are justified and would be supported.
2.1.4. From 2017 to 2022, DSP "Solid State Physics" produced seven graduates. Six out of seven defended their theses at DU and are employed as scientists or academic staff in Latvia, actively participating in international scientific publications. Three of the doctorate holders are also experts in Natural Sciences - Physics and Astronomy at the Latvian Academy of Sciences.
DSP currently has 3 students, with a fluctuating enrollment pattern from 2017 to 2022, reaching a peak of 4 students in 2019. No foreign students have been admitted during this period. The limited number of students is attributed to a shortage of physics specialists in Latvia, exacerbated by demographic challenges and inconsistent education reforms. All doctoral students have been funded by the state budget and scholarships, but this hasn't provided a sufficient livelihood, leading students to work outside the university, especially those involved in experimental physics. The dropout rate for DSP "Solid State Physics" is noted at 46%.
2.1.5. N/A

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

DSP aligns with the requirements of the study field "Physics, material science, mathematics and statistics" and DU's overall strategy. Aimed at providing high-quality education in the physical sciences, the study programme seeks to produce highly qualified physicists capable of addressing modern challenges in physics and material science. Enrollment follows DU's admission rules, requiring a master's degree in physics or a related field, although discrepancies exist between stated admission practices and actual implementation. The study programme, focusing on doctoral studies in physics, operates as a three-year full-time initiative emphasizing independent research and publication in international journals.
Strengths:
1. Graduates have an impressive scientific track record.
Weaknesses:
1. No sufficient evaluation of English language skills in the enrollment process.
2. Extremely low number of students.

2.2. The Content of Studies and Implementation Thereof

Analysis

2.2.1. The goal and learning results of the DSP “Solid State Physics” are well defined (SAR, p.88). The content of the DSP “Solid State Physics” has a focus on surface science, thin films, nanomaterials, and applied laser optics. The study courses are in good correspondence with the DU scientific activity in the field of solid-state physics, and general covers most aspects required for PhD students to develop skills and competencies in the field (SAR annex 3.2.1.DSP Solid State Physics; annex 3.4.4.DSP_Solid State Physics_projects). The mandatory study courses are well interconnected, and their relationship to the development of the planned competencies and skills is demonstrated (SAR, annex 3.2.1.DSP_Solid State Physics_mapping). Due to the low number of students, the study programme demonstrates flexibility and could be adjusted to specialize students in the fields of molecular and solid-state physics, material physics, chemical physics, semiconductor

physics, laser physics, spectroscopy, nanomaterials, and smart materials. DU concentrates on interdisciplinary problems, one of the peculiarities is the application of solid-state physics to biological problems, a good example is chemical biosensors. The study courses support students' research and the doctoral thesis topics. The study courses seem more targeted to a career in experimental physics, but some courses are relevant to industry, too.
All described study courses are mandatory (except for one 2CP free elective study course), but the competence profile of the graduates is broad and allows them to adopt.
The doctoral study programme was developed as a part of the DU research plan contained in the Development Strategy of DU, that, in turn, was harmonized with the “Latvian Smart Specialization Strategy ''. The study courses of the study programme develop competencies, related to the scientific specialization of DU, partner universities, research institutions in Latvia (material science, spectroscopy, laser optics, semiconductor physics, nanomaterials), and to the needs of the Latvian hi-tech enterprises (vacuum science, thin films, coatings, laser processing, etc). The study programme meets the needs of the industry, and labor market and follows scientific trends in a corresponding scientific field. As a result the career of the graduates generally goes well, they find relevant jobs both in the country and abroad (panel meeting with graduates), including those that continued research work at other universities in Latvia. This indicates that the study programme meets the requirements of the job market.
The students are satisfied with supervision and personalized advice, have research and study plans, and have to report officially about progress annually (panel meeting with students)
Some of the doctoral students and faculty members had difficulties speaking fluent English (panel meetings with academic staff and students), nevertheless, English was excluded from the study programme. On the other hand, students must pass an English exam, which is a requirement from the promotion council. There is no CP assigned to this exam in the programme (SAR annex 3.2.1.DSP Solid State Physics).
2.2.2.The doctoral degree is awarded based on original scientific work in the field of solid state physics/solid state physics technology, which could be in the form of a dissertation, or as a collection of scientific papers with a summary. The obligatory requirement is that the results should be published in international scientific journals. There are some difficulties in publishing in high-impact journals because of the short duration of studies, and, probably, due to limited international collaboration.
2.2.3.Because of the small number of students, the study process is highly individualized and flexible. DU implements principles of student-centered education: an individual approach to students (that comes quite naturally because of the extremely low number of students), that takes into account students' learning styles, requirements, interests, experience, and previous knowledge, continuous cooperation between students and academic staff (SAR, p.100).
The studies are in the form of group classes, seminars, individual consultations, and individual work (SAR, p.92). The proportion of the individual work is sound and includes both studies and independent scientific work. From the total workload of 120 CP, the individually planned research work comprises 84 CP (70%), seminars on actual topics, and research results of 10 CP (8%). For lectures, that in total comprise 24 CP, about 80% of the workload is individual work (40 hours per 1 CP, 8 of them are contact hours, SAR, p.88)
The duration of the study is only three years. This differs much from other world universities, where the duration of PhD studies is 4 years. Therefore, the promotion procedure usually takes place after the studies (panel meeting with academic staff and graduates). Such a short term makes it difficult to publish results in a high-impact journal. There is no strict schedule for publishing in a course of PhD studies.
DU could consider transferring the DSP "Solid State Physics" to the four-year PhD studies, due to increasing the workload, dedicated to the research and writing of the thesis, introducing the course on scientific writing to facilitate publications, English courses, and/or free elective courses.

The contact hours (classes) are scheduled regardless of the number of students, i.e. DU does not implement any restriction on the minimal number of students in the class (panel meetings with the study programme director and academic staff).
The student schedules are adjusted, bearing in mind the students work outside the university (panel meetings with students and academic staff).
2.2.4. N/A
2.2.5.The promotion procedure in the framework of the DSP is in accord with Latvian national legislation (Regulation of the Cabinet of Ministers No. 1001, 27.12.2005). DU has a promotion council in the field "Physics and astronomy" (https://du.lv/zinatne/promocija/promocijas-padomes/fizikas-un-astronomijas-promocijas-padome/), competent to award degrees in the field. The members of the council have the status of the experts of the Latvian Scientific Council, which is required by law. The operation of the council is regulated by the Regulations of the Daugavpils University Physics and Astronomy Promotion Council (https://du.lv/wp-content/uploads/2024/01/Fizikas_astronomijas_PP_Nolikums-2.pdf, accessed 31.01.2024, SAR p.102). As an alternative, the students have the opportunity to submit the thesis to the promotion councils of other Universities.
Although the Promotion Council is composed of national experts, the promotion process includes the involvement of at least one international expert, that is one of the reviewers (panel meeting with the study programme director). The doctoral defenses are announced and the summaries of the theses are available on the DU website. The Promotion Council decides on awarding or refusing a degree after the reports and the defense. The students seem to know the processes and they are aware that they may have to pay the costs in case the defense is delayed. (SAR p.101).
2.2.6. The topic of a doctoral thesis is usually chosen by a student in consultations with their research advisor and the director of the study programme (SAR, p.102). DU practices an approach whereby thesis supervisors or consultants from other scientific institutions (either from Latvia or abroad) are involved to provide appropriate scientific experience in the chosen scientific field (panel meetings with the study programme director, staff, and students). The topics of the final thesis fully correspond to the research profile of DU in the corresponding study field (annex 3.2.5_DSP Solid State Physics_List of defended doctoral theses.xlsx), and to a great extent are related to the ongoing research projects. The examples of the thesis topics are "Obtaining ZnO nanostructures of different morphologies and their application in the development of an electrochemical sensor", 2018, "Chalcogenide thin film surface modification by focused electron beam", 2019, "Obtaining micro- and nano-structures on the surfaces of thin films of metals and metal composites by focused electron radiation", 2023.

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

Generally, it is a well-composed study programme. The content of the doctoral study programme "Solid State Physics" corresponds to the objective of the study programme and the defined learning outcomes. The study courses are interconnected and complementary. The content of the courses covers main topics relevant to the young scientists active in the field of solid state physics in Latvia, i.e. the content is well-harmonized with the main direction of scientific research in Latvian universities and research institutions. Hereby the composition and the content of the courses meet the needs of the labour market (both industry and academia). The composition of the study programme complies with the state education standard. The methods, used within the study programme, contribute to the achievement of the learning outcomes.
The study programme is tightly linked to the research in the field. The PhD degree is developed in a course of research, i,e. it is based on the achievements and findings of the relevant field of science.
The duration of the study programme is short for the student to achieve a PhD degree during the studies. The students cannot improve their English skills within the study programme. The study

programme does not foresee internships abroad.
Strengths:
1. Well-composed doctoral study programme that covers topics and provides competencies, relevant to the young researcher in the field of Solid state physics.
2. A small number of students enable personalized researcher training.
3. The graduates are competitive both nationally and internationally.
4. Enthusiastic faculty members.
Weaknesses:
1. Lack of international mobility within the study programme.
2. The Study course "English for PhDs" is lacking. At the same time, the English proficiency of the doctoral students is insufficient.
3. The study programme has limited international visibility.

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

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

Assessment of compliance: Fully compliant

The courses of the study programme are up-to-date and relevant for the competencies required for young researchers for a successful career in experimental solid state physics.
The award of the PhD degree is based on novel research which is integrated into DU's scientific agenda in the field.

2.3. Resources and Provision of the Study Programme

Analysis

2.3.1.The PhD studies are mostly research-oriented. DU provides effective research infrastructure for the studies within DSP “Solid state physics”. The infrastructure includes Innovative microscopy center scientific laboratories, metal processing and robotic laboratories, a laboratory of laser technologies, and equipment installed in these laboratories. The library provides access to the scientific periodic databases (EBSCO, Cambridge Journals Online, ScienceDirect, Web-of-Science, Scopus, Springer Link), which is more crucial for the research work than the availability of textbooks. DU provides access to the scientific software (COMSOL, NI LabView). The general description of the available resources is already provided in the part. 1.3.2 of the present report.
The laboratories face a shortage of funding for the maintenance and repair of the equipment. The main source of funds for the repair of equipment is scientific projects (panel meeting with the head of the lab)
For each study course taught in the DSP curriculum, DU has corresponding laboratory equipment. On the other hand, the literature mentioned as compulsory in the study course descriptions often is not available in the library (e.g. study courses on Computer modeling of the physics processes, Methods for generating high vacuum, Physics of optical recording, etc.). Some of the mentioned books were published more than 30 years ago. The descriptions of the study courses contain necessary information: abstract, learning outcomes, study plan, criteria for evaluation, etc. (SAR, annex 3.2.1. DSP Solid State Physics Course descriptions; expert’s search on library catalog).
DU schedules contact hours (classes) for DSP students, regardless of the number of students, i.e. DU does not implement any restriction on the minimal number of students in the class (panel meetings with the study programme director and academic staff during the on-site visit).
2.3.2. For the implementation of the student research within DSP "Solid State Physics", DU

collaborates with the Institute of Solid-State Physics and with UL both at the institutional level and at the level of personal contacts. Institute of Solid State Physics provides access to their equipment to the DU PhD students. From 2022, DU participates in the Baltic Group of the European Organization for Nuclear Research (CERN). There were no CERN-related projects at DU until now. Until 2022, scientists from DU, Belarus, and Lithuania were collaborating in the frame of the Belarusian-Latvian Scientific Innovative Center. The cooperation with Belarus ceased after Russian military aggression to Ukraine, and now the Centre maintains cooperation with national (local) enterprises. To maintain and enhance contacts with enterprises, DU collaborates with Latgale Business Center (LUC) and Innovative Entrepreneurship Support Center "Latgale". The collaboration at the international level is limited to individual contacts. (SAR, p.96; panel meetings with academic staff and PhD students during the on-site visit).

The established cooperation provides an opportunity for the DU students and staff to access the research infrastructure at the partner's institution, at least on the national level. The scientific reputation and qualification of the DU staff facilitate its involvement in research projects, at least on the national level. This creates pre-conditions for achieving learning and research outcomes.

Alongside, according to the estimation of the head of the DU Erasmus+ office, DU has resources within the Erasmus+ programme to provide 100% mobility of the PhD students (panel meetings during on-site visit), but these resources are not fully explored.

2.3.3.According to SAR, the running costs of the DSP "Solid State Physics" is state financing for studies (subsidy) or tuition fees. DU set the tuition fee of 2200 EUR per year of study (6600 EUR for the three years – total duration of studies), at the same time, the calculation provided by DU Finance and Accounting department indicates running costs of about 26200 EUR per student. DU does not define a minimal number of students for DSP. DU finances the deficit from other means, including scientific financing (both projects and state research base funding), as well as redistributing state financing, allocated to other study fields. As it was mentioned in part.1.3.1 of the present report, DU willingly subsidizes this study programme because of a strategic decision and can do it without jeopardizing other study fields. For the DSP, the motivation is to uphold the continuity of education processes and to cultivate young researchers for DU. (SAR, p.97; panel meetings with administration and director of the study programme).

The study programme meets some difficulties in sustaining the number of students and preventing drop-out. PhD students seldom have a job contract with DU as researchers and often work somewhere else to cover daily living needs. The employment of PhD students depends to a great extent on the research projects (panel meeting with academic staff and students during the on-site visit). This problem is general for all Latvian universities, because state scholarships for PhD students are not sufficient for living.

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

In general, DU has the necessary resources to implement DSP “Solid State Physics” even with an extremely small number of students. The drawbacks are related to the outdated and sometimes unavailable library resources in the description of the study courses. On the other hand, DU has adequate online resources to provide access to the newest scientific papers.

Strengths:

1. Excellent modern research infrastructure.
2. Reasonable cooperation at the national level within the specific research profile.
3. Ability to cover study programme implementation costs using financing besides state subsidy.

Weaknesses:

1. Lack of funds for the repair and maintenance of laboratory equipment.
2. Outdated or unavailable literature is included in the description of some study courses.
3. Limited or no research cooperation at the international level.

4. Low number of students.
5. High drop-out rate to a great extent caused by the financing model of the PhD studies at the national level. Students have no job contract with the university and are working outside the university to finance their studies, as the state scholarship is not sufficient to sustain full-time studies.

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

DU has the necessary material and information resources for the implementation of the study programme. DU has the financial capacity to sustain the study programme even with a small number of students.
The minor drawback is, that the outdated or unavailable literature sources are included in the description of some study courses, but this is alleviated by the availability of online resources.

2.4. Teaching Staff

Analysis

2.4.1. The high qualification of teaching staff involved in the implementation of the DSP Solid State Physics is disclosed via publications (SAR, Annex 2.4.4. “List of scientific publications for the direction”) and participation in research projects (SAR, Annex 3.4.4. “DSP_Solid State Physics”). It generally meets the requirements specified in the 3rd paragraph of the 1st part of Article 55 of the Law on Higher Education Institutions, where it is indicated that “the academic staff of the doctoral study programme must include at least five doctors, of whom at least three are experts approved by the Latvian Council of Science in the branch or sub-branch in which the study programme plans to confer a scientific degree”. 10 lecturers - doctors are involved in teaching DSP Solid State Physics, including 6 experts in the field of physics and astronomy appointed by LZP (SAR, table 3.4.2.1, p. 106 and SAR, Annex 3.4.1. “Statement of experts_DSP_Solid state physics”). There are 1 regular professor at DU and one visiting professor. It is stated that all teachers have adequate knowledge of the national and foreign (English) language (SAR, Annex 2.3.7, “Statement_foreign language_B2”), however, it contradicts the information provided in another document (SAR, Annex 2.3.7 “Teaching staff to study direction”), where it is indicated that the English language proficiency of three LZP experts and one visiting professor is evaluated to be B1. A poor English knowledge of some staff members was identified during the on-site visit as well. Since at the moment all study courses of the study programme are given in Latvian, the aims and learning outcomes of the study programme and the relevant study courses can be achieved. In the case of implementation of DSP “Solid state physics” in English permanent upgrade of the English language skills of the whole teaching staff is required.
It should be noted, that the supervision of PhD thesis contributes to the quality of the implemented study programme and enables the achievement of study results, but only one person from the whole list of the teaching staff supervised successfully defended PhD thesis, according to provided information (SAR, Annex 3.2.5. “DSP Solid State Physics _list of defended doctoral theses”). The proposed research area for PhD applicants should become broader in the future. More than one highly competent teacher, who also demonstrates proficiency in English should be involved in the supervision of PhD students in the case of DSP “Solid State Physics” delivery in English.

2.4.2. There were only minor changes in the provision of compulsory and special elective study courses and the content of the whole study programme during the assessment period. However, it is indicated (SAR, p.107) that the study programme experiences difficulties, which affect study quality, due to the retirement of a colleague who was responsible for modules requiring very specific knowledge. In general, the age of staff members is not crucial, however, 3 members (including one visiting professor) are at retirement age. The potential to cover modules of these lecturers is there, but following the discussions during the on-site visit, DU's strategy regarding adequate replacement of the retired staff with young teachers is not elaborated in detail. The knowledge transfer from the main study course teacher to teacher-successor would be of benefit when preparing young/new staff members to take over (if necessary) the teaching responsibilities of the already existing modules.
2.4.3. Publication activity of the DSP academic team is modest. According to SAR (p. 108), 17 scientific articles were published during the assessment period, however, the number of articles provided in SAR (annex 2.4.4. Compilation of quantitative data for direction) is much higher. The quality of research papers is modest since the highest Hirsh index is only 11. It is also to point out that both professors have not published papers and have not participated in any project during the last years (SAR, Annex 2.4.4. List of scientific publications for the direction; and SAR Annex 2.4.4. Compilation of quantitative data for direction). Other staff members are closely collaborating with life science researchers. During the assessment period, teaching staff participated in 3 ERDF funded projects, 1 Interreg project (Latvia-Lithuania), 2 DU internal research projects, supervised 1 postdoc project, 2 educational projects funded by ESF (SAR, Annex 3.4.4. DSP_Solid State Physics_projects), for a total amount of 7.731136,82 EUR, which indicates high activity of staff members in research and applications.
2.4.4. Two members of the academic staff (professors) (out of 10) have not published any paper in peer-reviewed editions during the last 6 years, but they are temporarily employed due to their high age. One member has not participated in any research or educational project. Other members of the staff were active in research and published some papers in the journals included in WoS and SCOPUS databases.
2.4.5. Mutual collaboration of the teaching staff in the implementation of the study programme is established via common publications, participation in research projects, and also via line PhD supervisor - former PhD student, now - a member of the staff. However, the problem with replacement of the experienced teachers with new/young teachers is not solved yet. This impacts the quality of the delivered modules and also the study programme as a whole.

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

The qualification of the teaching staff members involved in the implementation of the study programmes complies with the requirements for the implementation of the study programme and the requirements outlined in the regulatory enactments, and it enables the achievement of the aims and learning outcomes of the study programmes and the relevant study courses, with exception of the requirement for having foreign language proficiency at B2 level for each staff member.
Strengths:
1. Good track records of projects with the participation of the teaching staff of DSP "Solid State Physics".
2. Good mutual collaboration among the teaching staff of the DSP.
Weaknesses:
1. Proficiency in English for some academic staff members is not sufficient.
2. There is no detailed plan on how to secure smooth replacement of competent retired staff with new/young staff to keep the high quality of the studies.
3. Temporarily employment (retired) of teaching staff lacking any research records during the last years is not effective.

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 qualification of the academic staff complies with the conditions for the implementation of the DSP "Solid State Physics" in both, Latvian and English languages, and the requirements set out in the Law of Higher Education.
However, for the implementation of this study programme in English, DU staff should upgrade their linguistic skills in English up to B2 level.

2.5. Assessment of the Compliance

Requirements

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

Assessment of compliance: Not relevant

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

The attached study course descriptions (“3.2.1.DSP Solid State Physics_Course descriptions.zip”) are prepared in Latvian and English. Descriptions comply with regulations outlined in the Law on Higher Education Institutions. Study course's informative provision consists mainly of literature and articles in English.

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 provided Diploma sample (“3.1.2.DSP Solid State Physics_Diploma and transcript.zip”) complies with the procedure by which state-recognized documents of higher education are issued following Cabinet Regulation No. 202 “Kārtība, kādā izsniedz valsts atzītus augstāko izglītību apliecinošus dokumentus”.

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

SAR 3.4.1. indicates involvement in the study programme of 2 professors (of those 1 is elected at DU), 4 leading researchers (all elected at DU) and 2 researchers (elected at DU).

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: Fully compliant

The attached confirmation (“3.4.1.STATEMENT of eksperts_DSP_Solid state physics_EN.docx”) indicates involvement in a programme of 10 doctoral degree holders out of which 6 hold Expert rights of the Latvian Science Council.

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

Attached resumes of staff (“ 2.3.7.CV_EN.zip”) and confirmation (“ 3.4.1.STATEMENT of eksperts_DSP_Solid state physics_EN.docx”) verify that state language proficiency is compliant with Cabinet Regulation No. 733 "Noteikumi par valsts valodas zināšanu apjomu, valsts valodas prasmes pārbaudes kārtību un valsts nodevu par valsts valodas prasmes pārbaudi".

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: Partially compliant

The attached resumes of staff (“2.3.7.CV_EN.zip”) and confirmation (“2.3.7.STATEMENT_foreign_language_B2.docx”) in general verify that most of the staff’s language proficiency in English is at least B2, however, analyzing provided document (SAR, annex 2.3.7. “Teaching staff to study direction”) experts group identified, that linguistic competencies of some staff members are B1.

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

Sample of attached study agreement (“2.1.4.Agreement on studies_DU.docx”) complies with Cabinet Regulation No. 70 "Studiju līgumā obligāti ietveramie noteikumi”.

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

Attached contracts (“2.1.4.Agreements.zip”) confirm that the institution provides the opportunity to continue studies within the University of Latvia doctoral study program "Natural Sciences" (51421).

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

DU confirmation (“ 2.1.4.CONFIRMATION_Compensation guarantee for students_EN.docx”) states, that students are guaranteed compensation for losses if the study programme is not accredited or the license of the study programme is revoked due to the actions of the institution (actions or failure to act) and the student does not wish to continue the 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

DSP "Solid state Physics" in both: Latvian and English languages partially complies with regulatory enactments outlined in the Law on Higher Education Institutions and other regulatory enactments. However, shortcomings regarding the English language proficiency of the DU staff identified by experts require upgrading of English language skills for the sustainable implementation of the study programme in English. A number of elected professors and/or associate professors involved in the study programme does not meet requirements set forth in Law on Higher Education Institutions."

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

DSP aligns with the requirements of the study field "Physics, material science, mathematics and statistics" and DU's overall strategy. Aimed at providing high-quality education in the physical sciences, the study programme seeks to produce highly qualified physicists capable of addressing

modern challenges in physics and material science. Enrollment follows DU's admission rules, requiring a master's degree in physics or a related field, although discrepancies exist between stated admission practices and actual implementation. The well-composed study programme, focusing on doctoral studies in physics, operates as a three-year full-time initiative emphasizing independent research and publication in international journals.
In general, DU has the necessary resources to implement DSP “Solid State Physics” even with an extremely small number of students. The drawbacks are related to the outdated and sometimes unavailable library resources mentioned in the description of the study courses. On the other hand, DU has adequate online resources to provide access to the newest scientific papers.
The qualification of the teaching staff members involved in the implementation of the study programme complies with the requirements for the implementation of the study programme in both languages: Latvian and English, and the requirements outlined in the regulatory enactments, and it enables the achievement of the aims and learning outcomes of the study programme and the relevant study courses, with exception of the requirement for having foreign language knowledge on the level of B2 for the whole staff.
Strengths:
1. Graduates have impressive scientific track records.
2. Well-composed doctoral study programme that covers topics and provides competencies, relevant to the young researcher in the field of Solid state physics.
3. Small number of students enables personalized researcher training.
4. The graduates are competitive both nationally and internationally.
5. Enthusiastic faculty members.
5. Excellent modern research infrastructure.
6. Reasonable cooperation at the national level within the specific research profile.
7. Ability to cover study programme implementation costs using financing besides state subsidy.
8. Good track record of projects with the participation of DSP Solid State Physics teaching staff.
9. Good mutual collaboration among the teaching staff.
Weaknesses:
1. Not sufficient evaluation of English language skills in the enrollment process.
2. Extremely low number of students.
3. Lack of international mobility of the staff and students.
4. Lack of study course "English for PhDs" and as a consequence insufficient English proficiency of the doctoral students.
5. High drop-out rate, to a great extent caused by the financial model of the PhD studies at the national level. Students are not employed at the university and work outside the university to finance their studies, as the state scholarship is not sufficient to sustain full-time studies.
6. The study programme has limited international visibility.
7. Lack of funds for the reparation and maintenance of laboratory equipment.
8. The outdated or unavailable literature sources are included in the description of some study courses.
9. Limited or no cooperation at the international level.
10. Proficiency of English knowledge level of some staff members, involved in the implementation of the study programme thought for delivery in English language is not sufficient.
11. The problem with the retirement of colleagues and their replacement is not solved. There is no detailed plan on how to secure their smooth replacement with a new/young staff to keep the high quality of the studies.

Evaluation of the study programme "Solid State Physics"

Evaluation of the study programme:

Good

2.6. Recommendations for the Study Programme "Solid State Physics"

Short-term recommendations

1. To improve students' English proficiency , e.g. by introducing free elective English study course, or using mobility.
2. To provide compulsory international mobility of the PhD students and the staff, for example, in the form of internships, using available ERASMUS+ funds.
3. To develop a strategy for permanent upgrading of linguistic skills in English of teaching staff thought for implementation of DSP "Solid State Physics" in English language.
4. To update outdated or add unavailable literature sources in the descriptions of study courses.
5. To use networking events and guest lecturers from the industry to enhance the connections to society and explore the opportunities of getting the topic for the doctoral thesis from the industry.
6. To develop a strategy for the replacement/ exchange of the study staff due to retirement.

Long-term recommendations

1. To elaborate a clear plan of faculty renewal to be able to widen the scope of topics of the doctoral theses and to continue the doctoral study programme.
2. To eliminate one-person mode supervision of PhD students (only one teacher supervises all PhDs), thus broadening the area of Solid State Physics research and guaranteeing more flexibility by choosing thesis topics and study courses for future PhD students.
3. To elaborate a policy for equipment maintenance and repair
4. To attract foreign students, at least in the framework of student exchange.
5. To consider the introduction of job contracts with the university and funding for the doctoral students. This would enable full-time studies and decrease the drop-out rate.
6. To consider increasing the duration of the doctoral programme to four years instead of three years.
7. To consider the introduction of elective studies for the doctoral students to give a wider competence profile.
8. To consider proactive collaboration in doctoral training with other Latvian universities, for example, the creation of joint doctoral study programmes or graduate schools.
9. Seek out possibilities to ensure compliance regarding elected staff with the requirements set forth in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions.

II - "Mathematics" ASSESSMENT

II - "Mathematics" ASSESSMENT

2.1. Indicators Describing the Study Programme

Analysis

2.1.1. The doctoral study programme “Mathematics” is developed following the requirements of the study field “Physics, material science, mathematics and statistics” and is in line with the overall strategy of DU. DSP “Mathematics” by its title and study curriculum complies with the designated study field.
2.1.2. The aim of DSP “Mathematics” is to prepare highly qualified specialists who can solve practical and theoretical tasks with the methods of theoretical mathematics and mathematical modeling.
Enrollment in DSP is governed by Daugavpils University's annual admission rules. Prospective students must hold a master's degree in mathematics or computer science. According to SAR (p.69-71), admission involves discussions on the research topic in English, assessing the applicant's detailed research proposal, motivation, scientific relevance, alignment with priority directions in physical science development, prior achievements including publications and conference participation, professional activity connection to the thesis topic, and proficiency in English. However, in practice, there were no indications that such discussions and evaluations of English proficiency had ever taken place. Evaluation for application is English and Latvian language modes.
The study programme code, 51460, signifies it is a doctoral degree. 46 corresponds to the thematic field of Mathematics and Statistics, and the group of educational programs is 460 Mathematics and Statistics.
The study programme duration is three years. Type and form of implementation - full-time intramural. The amount of the programme is 120CP Degree awarded is a doctoral degree (Ph.D.) in natural sciences.
2.1.3. No significant changes of existing parameters have been made in the study programme during the period since the previous accreditation in 2012. However, there have been changes in the curriculum and study plan - starting from the 2023/2024 academic year, the course "Special Seminars of the Department" will be replaced with "Modern Methods in the Theory of Boundary Value Problems of Ordinary Differential Equations" (4CP). The DSP "Mathematics" includes mandatory courses (30 CP), limited selection courses (4 CP), free choice courses (2CP), and individual research work leading to a thesis (84 CP). Graduation examinations in mathematics and English are required. The evaluation process now includes consideration for a new language mode - English. Generally, the decision to introduce an English language option is deemed necessary, given the crucial role of the English language in research work. Study programme informative provision heavily relies on sources in English already. The proposed changes to parameters (addition of language mode), study plan, and curriculum are justified and would be supported.
2.1.4. Analyzing the career paths of three graduates from DU DSP "Mathematics" between 2017 and 2022 (SAR p.71), along with one graduate in early 2023, reveals that two alumni actively contribute to scientific research, publishing in internationally recognized journals, and holding positions in various Latvian universities. They serve as lecturers, undertake administrative responsibilities, and one is an expert in Natural Sciences – Mathematics at the Latvian Council of Science (LZP). Another graduate is involved in software development, while one is currently not employed due to family circumstances.
At the time of the SAR accreditation report submission, one student is currently in the third year of the DSP "Mathematics." From 2017 to 2022, a total of two students, funded by the state budget and instructed in Latvian, have been enrolled in DSP "Mathematics." There has been no instance of student dropout in DSP "Mathematics."

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

DSP "Mathematics" aligns with the study field of "Physics, material science, mathematics, and

statistics." It aims to prepare highly qualified specialists in theoretical mathematics and mathematical modeling. Admission involves discussions on the research topic, a detailed proposal assessment. At present, one student is in the third year of the programme.
Strengths:
1. Regional and national significance.
2. Graduates demonstrate a good track record regarding research and/or teaching work.
Weaknesses:
1. Extremely low number of students.

2.2. The Content of Studies and Implementation Thereof

Analysis

2.2.1. The content of DSP “Mathematics” is focused on ordinary differential equations, which is an important field of theoretical mathematics and essential in industrial applications. The mandatory study courses are interconnected and give a solid knowledge of the topic. The study courses are closely related to the doctoral thesis topics and they support the completion of the doctoral degree. Both theory and applications are covered. For example, there exist study courses “Using Computers in Mathematics” and “Selected Questions of the Mathematical Modeling” that are relevant to the industry. The students had a research and study plan and they were satisfied with the personalized advice.
Most of the study courses are mandatory and there is a limited amount of elective studies (SAR, p. 74). There is a danger that the competence profile of the graduates is somewhat narrow, in particular, because there do not currently exist bachelor’s and master’s programmes in mathematics at DU. More elective studies should be offered for doctoral students to give a wider competence profile. Students would need more than three years to take more elective studies. It is more common internationally that doctoral programmes are four years long. Collaboration in doctoral training with other Latvian universities, for example, joint doctoral study programmes or graduate schools is highly recommended. Visiting lecturers from abroad would also benefit students.
It became clear in the panel meetings with the graduates and employers, that the job market for the graduates is good and the study programme has a high reputation among employers in Latvia. This indicates that the study programme meets the requirements of the job market.
2.2.2. The doctoral degree is based on scientific achievements in the field of ordinary differential equations and their applications. The doctoral thesis consists of peer-reviewed scientific research papers, which indicates the relevance of the scientific contribution. The duration of the study programme is three years and it is very challenging to write high-impact research papers with this time constraint. Some students would have preferred to have four years (panel meeting), in particular, since all students seem to work outside the university to finance their studies. Students are reported to study full-time in SAR, p. 66-67, but it seems to be challenging to do this in practice.
2.2.3. The learning objectives of DSP “Mathematics” include knowledge, skills, and competence that are relevant to the field of science. The doctoral degree provides graduates with relevant competencies in all three aspects (SAR, p. 73-74). Teaching methods are flexible with a focus on the independent work of a student. It was confirmed by the students in the panel meeting, that regular lectures and meetings with the advisor are arranged.
Students meet a very low number of faculty members during their studies. This challenges not only the scope of studies but also the transparency, neutrality, and objectivity of the assessment of the learning outcomes. For example, all recent doctoral theses in mathematics are advised by the same person (SAR, p.71-72). Moreover, the same person lectures all mandatory study courses in ordinary differential equations. This is not sustainable. It would be beneficial for the students to have more guest lectures from other universities abroad and the industry.
The study programme “Mathematics” does not seem to include internships or mobility, since the

corresponding slot in SAR is left empty (SAR, p 77). It would be beneficial for the students to have more mobility and collaboration in their doctoral studies. International mobility of the students and faculty is low and there is room for improvement. A mandatory mobility requirement for doctoral students is highly recommended.
Some of the doctoral students and faculty members were not able to speak fluent English in the panel meeting and they needed an interpreter. The fact that Latvian is the official language of the study programme does not promote international collaboration and student recruitment. DU aims to attract more international students and applies for accreditation for the doctoral study programme "Mathematics" in Latvian and English. This intention is strongly supported by the assessment panel.
2.2.4. N/A
2.2.5. The doctoral promotion process at DU is implemented according to the legislation in Latvia (SAR, p. 77). The processes in DSP "Mathematics" are compatible with the DU processes and there are clear procedures to submit, review, and defend a doctoral thesis (SAR, p. 77-78). A sufficient number of experts in the field of mathematics are participating in the review process of a doctoral thesis. Most experts seem to be Latvian and it would be good to have more international experts involved in the promotion process. The doctoral defenses are announced and the summary of the theses are available on the DU website. The Promotion Council decides on awarding or refusing a degree after the reports and the defense. The students seem to know the processes and they are aware that they may have to pay the costs in case the defense is delayed.
2.2.6. The topic of a doctoral thesis is chosen together with a student and an advisor. Regular meetings are arranged with the advisor to support the study progress. Several recent doctoral thesis topics are interdisciplinary, in particular, with applications in biology (SAR, p. 72). The doctoral theses are based on research papers that are published in peer-reviewed journals. DSP "Mathematics" at DU has a high impact on the researcher training in Latvia, mainly because of prominent faculty members. Many graduates have continued research work at universities in Latvia and the employers are very pleased with the graduates.

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

The content of DSP "Mathematics" is focused on ordinary differential equations, which is an important field of theoretical mathematics and essential in industrial applications. The job market for graduates is good and the study programme has a high reputation among employers in Latvia. The doctoral degree is based on scientific research, the topics are relevant, and clear doctoral promoting processes are in place. The students get enough support to attain the learning objectives and to complete the doctoral degree. Despite the low number of students and faculty members, DSP "Mathematics" functions well.
Strengths:
1. Well-functioning doctoral study programme "Mathematics" has a high reputation in Latvia.
2. Small number of students enables personalized researcher training.
3. Prominent and enthusiastic faculty members have a high impact on researcher training in Latvia.
4. The job market for graduates is good. Many of them have continued conducting academic research.
Weaknesses:
1. It is not sustainable that one person is the supervisor of all doctoral theses in mathematics and lectures all mandatory study courses in ordinary differential equations.
2. Lack of international mobility and collaboration of doctoral students and faculty members.
3. The English proficiency of the doctoral students is insufficient.
4. Students work outside the university to finance their studies and they are not able to fully focus on studies. It came up in the panel meeting during the on-site visit, that students are not employed

at the university.

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

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

Assessment of compliance: Fully compliant

The doctoral theses are based on scientific papers in the field of mathematics that are published in peer-reviewed journals.

2.3. Resources and Provision of the Study Programme

Analysis

2.3.1.The PhD studies are research-oriented. DU provides effective research infrastructure for the studies within DSP “Mathematics”. The infrastructure includes computer classes and installed mathematical software (Wolframalpha, www.geogebra.org). The library provides access to the scientific periodic databases (EBSCO, Cambridge Journals Online, ScienceDirect, Web-of-Science, Scopus, Springer Link), that are more crucial for the research work than the availability of textbooks. The general description of the available resources is already provided in the part. 1.3.2 of the present report.
For some study courses, the literature mentioned as compulsory in the study course description is not available in the library (e.g. study courses Using Computers in Mathematics I, II). The majority of the mentioned books were published in 2000-2015, and generally, may (but not should) be updated. The description of the study courses contains necessary information: abstract, learning outcomes, study plan, criteria for evaluation, etc. (SAR, Annex 3.2.1. DSP Mathematics course descriptions; expert’s search on library catalog).
DU schedule contact hours (classes) for DP students, too, regardless of the number of students, i.e. DU does not implement any restriction on the minimal number of students in the class (panel meetings with the study programme director and academic staff).
2.3.2. Studies and research within DSP “Mathematics” are closely related to the research at the Laboratory of Ordinary Differential Equations of the Institute of Mathematics and Computer Science of UL. The Laboratory staff (except for the head of the laboratory) are former DU doctoral students. DU PhD students have access to the Laboratory infrastructure for joint research (SAR, p.74)
The established cooperation provides an opportunity for the DU students and staff to access the research infrastructure of the partner institutions, at least at the national level. The scientific reputation and qualification of the DU staff facilitate its involvement in research projects, at least at the national level. This creates pre-conditions for achieving learning and research outcomes.
According to the estimation of the head of the DU Erasmus+ office, DU has resources within the Erasmus+ programme to provide 100% mobility for the PhD students (panel meeting during on-site visit).
2.3.3. According to SAR, the running costs of the DSP "Mathematics" are state financing for studies (subsidy) or tuition fees (SAR, p.81). DU set the tuition fee of 2200 EUR per year of study (6600 EUR for the three years – total duration of studies), at the same time, the calculation provided by DU Finance and Accounting department indicates running costs of about 20200 EUR per student. DU does not define a minimal number of students for DSP. DU finances the lacking amount of money from other sources, including scientific financing (both projects and state research-based funding), as well as redistributing state financing, allocated to other study fields. As it was mentioned in part

1.3.1 of the present report, DU willingly subsidizes this study programme because of a strategic decision and can do it without jeopardizing other study fields. For the DSP, "Mathematics" the motivation is to uphold the continuity of education processes and to cultivate young researchers for DU. Alongside, the DSP “Mathematics” is the only PhD study programme on theoretical mathematics (i.e. not together with computer science) in the country (SAR, p.74; panel meetings with administration and director of the study programme).

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

In general, DU has the necessary resources to implement DSP “Mathematics” even with an extremely small number of students. The drawbacks are related to the outdated and sometimes unavailable library resources.
Strengths:
1. Adequate research infrastructure.
2. Reasonable cooperation at the national level within the specific research profile.
3. Ability to cover the study programme implementation costs using financing besides state subsidy.
Weaknesses:
1. For some study courses, the compulsory literature in the study course description is outdated or unavailable.
2. Limited or no cooperation at the international level.
3. Low number of students.

Assessment of the requirement [6]

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

Assessment of compliance: Fully compliant

DU has adequate infrastructural and information resources for the sustainable implementation of the DP.
DU can sustain the study programme using its own financial resources even if the number of students is low.
The minor drawback is outdated or unavailable literature in the study course description, but this is alleviated by availability of on-line resources.

2.4. Teaching Staff

Analysis

2.4.1. The qualification of the staff members complies with the requirements set for the implementation of the study programme: 5 doctors in mathematics are involved, 3 of them are experts, approved by the Latvian Council of Science (LZP) in the field of mathematics (SAR, Annex 3.4.1. “DSP Mathematics”). This is in accordance with the requirements specified in the 3rd paragraph of the 1st part of Article 55 of the Law on Higher Education Institutions.
The qualification of the teaching staff members involved in the implementation of the study programme is high as it can be derived from the provided list of scientific publications (SAR, Annex 2.4.4]. Staff members are participating in the implementation of some industry-related projects that ensure unity of theory and practice during the study process (SAR, Annex 3.4.4). The lingual proficiency in English of the teaching staff involved in the implementation of the DSP “Mathematics”

corresponds to at least the B2 level according to the European Language Assessment levels, as it is stated in (SAR, Annex 2.3.7).
The qualification of the teaching staff enables the achievement of the aims and learning outcomes of the DSP “Mathematics” and relevant study courses, however, more elective study courses delivered by different lecturers should be included in the curriculum of the programme. Also, the topics for possible PhD thesis should be proposed by all staff members to broaden the narrow scope of the study programme and to show the potential of the staff. Based on the discussion during the on-site visit, and analysis of the provided documentation only one professor supervises all PhD students. (Very last PhD student enrolled in 2021).
2.4.2. Some changes have been undertaken after the last DSP assessment: one PhD graduate holding obtained the status of the expert in mathematics from LZP and was newly involved in the teaching process, as a 5th member of the DSP staff. This indicates that the HEI purposefully takes measures to keep the quality of the implementation of the study programme and to fulfill the requirements specified in the 3rd paragraph of the 1st part of Article 55 of the Law on Higher Education Institutions.
The total number of staff publications indexed in Scopus and WoS databases during the assessment period was 57. The majority of these publications are conference proceedings, indicating a strong relationship between science and industry. 4 staff members were participating in 3 national LZP-funded research projects, related to DSP “Mathematics”. A new staff member A.Kiričuka is participating in 2 ESF-granted educational projects, that are devoted to the sustainable development of the Latvian education system. She was leading an internal DU project “Boundary-value problems for Leonard-type equations with an additional quadratic term” related to the study field. Publications and projects with the participation of DSP “Mathematics” teaching staff contribute significantly to the development of the doctoral programme.
2.4.3. The total number of staff publications indexed in Scopus and WoS databases during the assessment period was 57. The majority of these publications are conference proceedings, indicating a strong relationship between science and industry. 4 staff members were participating in 3 national LZP-funded research projects, related to DSP “Mathematics”. A new staff member was participating in 2 ESF -funded educational projects, that were devoted to the sustainable development of the Latvian education system. She was leading an internal DU project “Boundary-value problems for Leonard-type equations with an additional quadratic term” related to the study field. Publications and projects with the participation of DSP “Mathematics” teaching staff contribute significantly to the development of the doctoral programme.
2.4.4. Each member of the academic staff involved in the study process has published papers in the journals indexed by WoS and Scopus. The total number of 57 is relatively high. However, the majority of papers are published in diverse conference proceedings. Looking in-depth, during the assessment period (2017-2022) each member of staff of the DSP "Mathematics" has published only very few papers in the WoS databases, which is a world-recognized system for high-level scientific publications. Three staff members have coauthored 5 papers, one teacher - 2 papers, and another one - 1 paper. Two PhDs graduated from the program during the assessment period. Indicated are only papers, published in WoS journals, showing rather low publication activity of the staff members with the internationally recognized publishing houses. A bit higher number of WoS papers (WoS +Scopus), published between 2017 and 2022 are provided in SAR, Annex 2.4.4. ”Compilation of quantitative data on the scientific/applied research of the academic staff involved in the implementation of the study field "Physics, Material Science, Mathematics and Statistics" in 2017-2022”. Even though it is stated that DU staff members are active scientists (SAR, p.53), looking at the future international perspective of the study programme, the teachers should be more active.
2.4.5. The cooperation of the teaching staff in the implementation of the study programme is established naturally: DSP teaching team includes 3 former PhD students, who were supervised by

the same leading scientist. This means that the inter-collaboration is already established via common publications and participation in the same project. The last, fifth team member, delivers lectures on “English language for mathematicians” for PhD students. He is using published articles of the staff members for reading and analysis by the students, keeping strong contact with other members of the staff.

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

Qualification and completion of the teaching staff of the DSP Mathematics fulfill the requirements indicated in The Law on Higher Education Institutions and enable the achievement of the aims and learning outcomes of the study programme and the relevant study courses.
HEI purposefully takes measures to keep the quality of the implementation of the science-based study programme and supports scientific publications and the involvement in research-related projects of the academic staff.
DSP ”Mathematics” would benefit from more intense international collaboration and the involvement of more than one staff member in the supervision of PhD students.
Strengths:
1. The team consists of highly experienced teachers and young teachers, who defended their PhD theses within the assessment period.
2. The mutual collaboration is established through a relationship PhD supervisor- a former PhD student, providing a unique opportunity to share knowledge in research and studies.
Weaknesses:
1. During the last 5 years only one teacher was supervising PhD students, it is not clear whether other members of staff had the opportunity to propose topics for PhD thesis.
2. The scientific input of the staff members to the implementation of high-quality study programmes is modest: the number of publications is relatively high, however, the majority of these publications are conference proceedings of different local conferences.
3. There is a need to motivate young team members to start their branches of research in Mathematics to be less dependent on 1-2 narrow topics that are explored at the department during the years.

Assessment of the requirement [7]

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

Assessment of compliance: Fully compliant

The qualification of the academic staff complies with the conditions for the implementation of the study programme in both: Latvian and English languages, and the requirements set out in the Law of Higher Education.

2.5. Assessment of the Compliance

Requirements

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

Assessment of compliance: Not relevant

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

The attached study course descriptions (“3.2.1.DSP Mathematics_Study course descriptions.zip”) are prepared in Latvian and English. Descriptions comply with regulations outlined in the Law on Higher Education Institutions. The literature and articles provided in the descriptions are mainly in English.

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 provided Diploma sample (“ 3.1.2.DSP Mathematics_diploma and transcript.zip”) complies with the procedure by which state-recognised documents of higher education are issued following Cabinet Regulation No. 202 “Kārtība, kādā izsniedz valsts atzītus augstāko izglītību apliecinošus dokumentus”

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

SAR 3.4.1. indicates involvement in the study programme of 1 professor and 2 associate professors. All of them are elected at DU.

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: Fully compliant

The attached confirmation (“ 3.4.1.STATEMENT of eksperts_DSP_Mathematics_EN.docx”) indicates involvement in the study programme of 5 doctoral degree holders out of which 3 hold Expert rights of the Latvian Science Council.

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

Attached resumes of staff (“ 2.3.7.CV_EN.zip”) and confirmation (“ 3.4.1.STATEMENT of eksperts_DSP_Solid state physics_EN.docx”) verify that state language proficiency is compliant with Cabinet Regulation No. 733 "Noteikumi par valsts valodas zināšanu apjomu, valsts valodas prasmes pārbaudes kārtību un valsts nodevu par valsts valodas prasmes pārbaudi".

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

Assessment of compliance: Fully compliant

The attached resumes of staff (“2.3.7.CV_EN.zip”) and confirmation (“2.3.7.STATEMENT_foreign_language_B2.docx”) verify that language proficiency in English is at least B2.

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

Sample of attached study agreement (“2.1.4.Agreement on studies_DU.docx”) complies with Cabinet Regulation No. 70 "Studiju līgumā obligāti ietveramie noteikumi”.

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 attached contracts (“2.1.4.Agreements.zip”) confirm that the institution provides the opportunity to continue studies within the UL DSP “Computer Sciences and Mathematics” (subprogramme Mathematics) (51460).

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

DU confirmation (“ 2.1.4.CONFIRMATION_Compensation guarantee for students_EN.docx”) states, that students are guaranteed compensation for losses if the study programme is not accredited or the licence of the study programme is revoked due to the actions of the higher education institution college (actions or failure to act) and the student does not wish to continue the 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

"DSP "Mathematics" partially complies with regulatory requirements and can be delivered in both languages: Latvian and English. A number of elected professors and/or associate professors involved in the study programme does not meet requirements set forth in Law on Higher Education Institutions."

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

DSP "Mathematics" aligns with the study field of "Physics, material science, mathematics, and statistics." It aims to prepare highly qualified specialists in theoretical mathematics and mathematical modeling. Admission involves discussions on the research topic, and a detailed proposal assessment. At present, one student is in the third year of the programme.
Despite the low number of students and faculty members, DSP “Mathematics” works well. It has a high reputation regionally and nationally in Latvia. The study programme is research-based and offers relevant competencies in a focused field of ordinary differential equations.
In general, DU has the necessary resources to implement DSP “Mathematics” even with an extremely small number of students. The drawbacks are related to the outdated and sometimes unavailable library resources mentioned in the description of the study courses. On the other hand, DU has adequate online resources to provide access to the newest scientific papers.
Qualification and completion of the teaching staff of the DSP Mathematics fulfill the requirements indicated in The Law on Higher Education Institutions, and it enables the achievement of the aims and learning outcomes of the study programme and the relevant study courses in both languages: Latvian and English..
Strengths:
1. Regional and national significance.
2. Well-functioning doctoral study programme “Mathematics” has a high reputation in Latvia.
3. Small number of students enables personalized researcher training.
4. Prominent and enthusiastic faculty members have a high impact on researcher's training in Latvia.
5. The job market for graduates is good. Many of them have continued conducting academic research.
6. Adequate research infrastructure.
7. Reasonable cooperation at the national level within the specific research profile.
8. Ability to cover the study programme implementation costs using financing besides state subsidy.
9. The academic staff consists of very experienced teachers and young teachers, who defended their PhD theses within the assessment period. This allows to establishment of mutual collaboration through a relationship PhD supervisor- a former PhD student, providing unique possibilities to share knowledge in research and studies.
Weaknesses:
1. Extremely low number of students

2. It is not sustainable that one person is the supervisor of all doctoral theses in mathematics and lectures all mandatory study courses in ordinary differential equations. During the last 5 years only one teacher was supervising PhD students. It is not clear whether other members of staff had the opportunity to propose topics for PhD thesis.
3. The scientific input of the staff members to the implementation of high-quality study programmes is modest: the number of publications is relatively high, however, the majority of these publications are conference proceedings of different local conferences.
4. There is a need to motivate young team members to start their own branches of research in Mathematics to be less dependent on 1-2 narrow topics that are explored at the department during the years.
5. Limited or no cooperation at the international level, including lack of international mobility and collaboration of doctoral students and faculty members.
6. The fact that Latvian is the official language of the study programme does not promote international collaboration and student recruitment.
7. The English proficiency of the doctoral students is insufficient.
8. Students work outside the university to finance their studies and they are not able to fully focus on full-time studies. It came up in the panel meeting during the on-site visit, that students do not have job contracts with the university.
9. For some study courses, the compulsory literature in the study course descriptions is outdated or unavailable.
10. The problem with the retirement of colleagues and their replacement is not solved. There is no detailed plan on how to secure their smooth replacement with a new/young staff to keep high quality of the studies.

Evaluation of the study programme "Mathematics"

Evaluation of the study programme:

Good

2.6. Recommendations for the Study Programme "Mathematics"

Short-term recommendations

1. To improve the English proficiency of the doctoral students by increasing mobility and visiting faculty, or by introducing free elective English course.
2. To use more networking events and guest lecturers from the industry to enhance the connections to society and give opportunities to have doctoral thesis topics from the industry.
3. To implement a mandatory mobility requirement for doctoral students, for example, in the form of internships.
4. To update outdated or unavailable literature in the descriptions of study courses.

Long-term recommendations

1. To elaborate a clear plan of faculty renewal is needed to be able to widen the scope of topics of the doctoral theses and to continue the doctoral programme.

2. More collaboration in doctoral training with other Latvian universities is recommended, for example, joint doctoral study programmes or graduate schools.
3. To attract foreign students, at least in the framework of student exchange.
4. To consider the introduction of job contracts with the university and funding for doctoral students to facilitate full-time studies.
5. To consider increasing the duration of the doctoral study programme to four years instead of three years.
6. To consider the introduction of more elective studies should be offered for doctoral students to give a wider competence profile.
7. Seek out possibilities to ensure compliance regarding elected staff with the requirements set forth in Section 55, Paragraph 1, Clause 3 of the Law on Higher Education Institutions.

III - Assessment of the Requirements for the Study Field and the Relevant Study Programmes

III - Assessment of the Requirements for the Study Field and the Relevant Study Programmes

Assessment of the Requirements for the Study Field

Requirements	Requirement Evaluation			Comment
R1 - Pursuant to Section 5, Paragraph 2.1 of the Law on Higher Education Institutions, the higher education institution/ college shall ensure continuous improvement, development, and efficient performance of the study field whilst implementing its internal quality assurance system:	Fully compliant			The internal quality assurance system is in place at DU and it supports monitoring and development of the study field.

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	Research performed by the staff of the study field “Physics, Material science, Mathematics and Statistics” at DU corresponds to the development goals of the higher education institution and is relevant to the study field. Teaching staff are competent to provide science-based education. The main obstacle to the implementation of studies in English is not sufficient proficiency in English of the teaching staff as it can be retrieved from the SAR, Annex 2.3.7."Teaching staff for study direction_EN''
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 and internationalisation is partially compliant due to lack of evidence for mobility in general and no evident plan for improvement for near future. From positive side “ERASMUS+” programme is well-supported.
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	DU has addressed major short-term recommendations, however long-term recommendations still demand some attention from the institution.

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)

No.	Study programme	R5	R6	R7	R8	Evaluation of the study programme (excellent, good, average, poor)
1	Physics (45443)	Fully compliant	Fully compliant	Fully compliant	Partially compliant	Good
2	Solid State Physics (51443)	Fully compliant	Fully compliant	Partially compliant	Partially compliant	Good
3	Mathematics (51460)	Fully compliant	Fully compliant	Fully compliant	Partially compliant	Good

The Dissenting Opinions of the Experts

None