

## APPLICATION

### Study field "Wildlife Sciences" for assessment

Study field	<i>Wildlife Sciences</i>
Title of the higher education institution	<i>Latvijas Universitāte</i>
Registration code	<i>3341000218</i>
Legal address	<i>RAIŅA BULVĀRIS 19, CENTRA RAJONS, RĪGA, LV-1050</i>
Phone number	<i>67034301</i>
E-mail	<i>lu@lu.lv</i>

# **Self-evaluation report**

Study field "Wildlife Sciences"

University of Latvia

<b>Self-evaluation report</b>	2
<b>Study field</b>	5
1. Information on the Higher Education Institution/College	5
2.1. Management of the Study Field	17
2.2. Efficiency of the Internal Quality Assurance System	34
2.3. Resources and Provision of the Study Field	46
2.4. Scientific Research and Artistic Creation	64
2.5. Cooperation and Internationalisation	70
2.6. Implementation of the Recommendations Received During the Previous Assessment Procedures	75
<b>Annexes</b>	79
<b>Other annexes</b>	81
<b>Biology (45421)</b>	82
<b>Study programme</b>	85
3.1. Indicators Describing the Study Programme	85
3.2. The Content of Studies and Implementation Thereof	94
3.3. Resources and Provision of the Study Programme	100
3.4. Teaching Staff	104
<b>Annexes</b>	107
<b>Biology (43421)</b>	108
<b>Study programme</b>	110
3.1. Indicators Describing the Study Programme	110
3.2. The Content of Studies and Implementation Thereof	118
3.3. Resources and Provision of the Study Programme	126
3.4. Teaching Staff	130
<b>Annexes</b>	134
<b>Biotechnology and Bioengineering (43421)</b>	135
<b>Study programme</b>	138
3.1. Indicators Describing the Study Programme	138
3.2. The Content of Studies and Implementation Thereof	142
3.3. Resources and Provision of the Study Programme	146
3.4. Teaching Staff	152
<b>Annexes</b>	156

<b>Natural sciences (51421)</b> .....	157
<b>Study programme</b> .....	165
3.1. Indicators Describing the Study Programme .....	165
3.2. The Content of Studies and Implementation Thereof .....	169
3.3. Resources and Provision of the Study Programme .....	174
3.4. Teaching Staff .....	178
<b>Annexes</b> .....	185

# 1. Information on the Higher Education Institution/College

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

University of Latvia (hereinafter – UL) was founded in 1919 and is the only classical university in Latvia. The University of Latvia is a university of science, incorporating and developing the country's main study and scientific research potential in the field of humanities, natural, technical, and social sciences. UL serves science and fatherland. By participating in worldwide research and educational processes, it contributes to the growth and sustainability of the Latvian state and nation. UL retains its status as the largest higher education institution (hereinafter – HEI) in the country in terms of the number of students.

**Mission:** The mission of the UL is expressed in its motto “For Science and Fatherland”. The UL contributes to global science, higher education, knowledge, technology transfer and innovation, and ensures the growth of Latvian democracy and culture, the development of the Latvian language and the prosperity of the national economy.

**Vision:** Space for excellence, environment for development, time for responsibility. The UL is a university of science of high international standing. The UL creates an interdisciplinary, open, and innovation oriented excellent work and study environment. Activities of the UL form the basis for the sustainable development and economic transformation of Latvia.

### Values:

- University community;
- Excellence;
- Science-based development;
- Openness;
- Cooperation;
- Academic freedom.

UL plays a significant role not only in the development of the higher education system in Latvia, but also in the growth of the country's economy, providing cutting edge studies and research, based on the unity of higher education and science. The UL actively participates in solving topical problems of the state and society, and is the centre of intellectual life in Latvia, where new knowledge is created, while nurturing the national language, culture and promoting the development of the state and society. The UL focuses its efforts on providing quality studies and developing scientific excellence, creating structures open to interdisciplinary and transdisciplinary research and studies, ensuring a high return on invested resources, sustainable and environmentally friendly use of resources. The UL is evolving as a modern international academic centre, creating an environment and infrastructure for excellence in studies, research, and innovation.

The study process at the UL is implemented at [13 faculties](#), [7 regional branches](#) (available only in Latvian) and [3 medical colleges](#). Research activities are also performed at [18 research institutes](#), and various research, training and consulting activities are conducted in [27 study centres](#). The UL [Regional Centre](#) (available only in Latvian) coordinates and supervises the activities of the UL regional branches, as well as promotes cooperation between the UL and local authorities in the fields of human resources development, education and interdisciplinary research. The UL has more than [200 bilateral cooperation agreements with universities in 51 countries](#). The [UL Culture](#)

[Centre](#) (available only in Latvian) is represented by more than 20 amateur arts groups – choirs, dance groups, vocal ensembles, early music ensembles, theatre, a brass band, and a ceramics studio. The [UL Sports Centre](#) organises UL sports activities for up to 40 different sports classes in 11 sports – basketball, wrestling, group fitness classes, football, floorball, table tennis, kendo, general fitness, volleyball, cheerleading and self-defence. Within the UL regular activities are also performed by basic structural units: [Museum of the UL](#), the [UL Botanical Garden](#), the [UL Experimental Rhododendron Breeding Nursery "Babīte"](#), the [University of Latvia Press](#), and the [UL Baldone Observatory](#) (available only in Latvian). The UL foundations are also operating successfully: [UL Foundation](#) and the [Alumni Club](#) (available only in Latvian).

As of 1 October 2022, the UL has 3087 employees, including 1396 – the UL academic staff and 1691 – the UL general staff. The UL financial performance is characterised by a turnover of EUR 98 million. The University's EUR 135 million equity represents 69% of total assets. The main activity of the UL takes place in Riga, at 19 Raina Boulevard and the UL Academic Centre in Tornkalns, as well as in several locations in Riga and in the UL regional branches in Aluksne, Bauska, Cesis, Jekabpils, Kuldīga, Madona and Tukums.

In the world university ranking *Times Higher Education* for excellence in science, the UL is ranked 482<sup>nd</sup>, with an overall ranking of 800-1000 (2022).

The UL implements study programmes at all levels, covering 28 branches of science and 22 study fields. The UL 13 faculties offer 140 study programmes. See Table 1.1.1. for the study fields, the number of study programmes and the accreditation periods.

Table 1.1.1

**Study fields implemented in the UL, number of study programmes and accreditation periods (01.11.2022.)**

No	Study fields	Number of study programmes	Accreditation period
1.	Architecture and Construction	1	08.06.2022-09.06.2028.
2.	Wildlife Sciences	4	29.05.2013-31.12.2023.
3.	Economics	8	08.09.2021-09.09.2027.
4.	Physics, Materials Science, Mathematics and Statistics	7	29.05.2013-31.12.2023.
5.	Geography and Earth Sciences	6	24.04.2017-24.04.2023.
6.	Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science	5	29.05.2013-22.08.2023.
7.	Internal Security and Civil Protection	3	05.06.2013-31.12.2024.
8.	Information and Communication Sciences	5	16.06.2021-17.06.2023.

9.	Education, Pedagogy and Sports	24	12.06.2013-31.12.2024.
10.	Chemistry, Chemical Technologies and Biotechnology	3	24.05.2013-31.12.2023.
11.	Arts	1	24.11.2021-25.11.2027.
12.	Psychology	3	21.06.2019-21.06.2025.
13.	Sociology, Political Science and Anthropology	9	12.06.2013-31.12.2024.
14.	Social Welfare	2	14.09.2022-13.09.2028
15.	Religion and Theology	3	22.05.2013-31.12.2023.
16.	Law	4	21.06.2019-21.06.2025.
17.	Translation	2	14.05.2013-31.12.2024.
18.	Management, Administration and Management of Real Property	8	29.09.2021-30.09.2027.
19.	Language and Culture studies, Native Language Studies and Language Programmes	21	26.06.2013-31.12.2024.
20.	Health Care	13	31.05.2013-31.12.2022.
21.	History and Philosophy	6	24.05.2013-31.12.2023.
22.	Environmental Protection	3	05.06.2013-31.12.2024.

The UL study programmes in several study fields are also available in seven UL branches located in the regions of Latvia. In the academic year 2022/2023, 7 different study programmes in 2 study fields, ranging from short cycle professional higher education study programmes, professional bachelor study programmes to master's study programmes, are being implemented in the regional branches. See Table 1.1.2. for the number of study fields and study programmes in the regional branches.

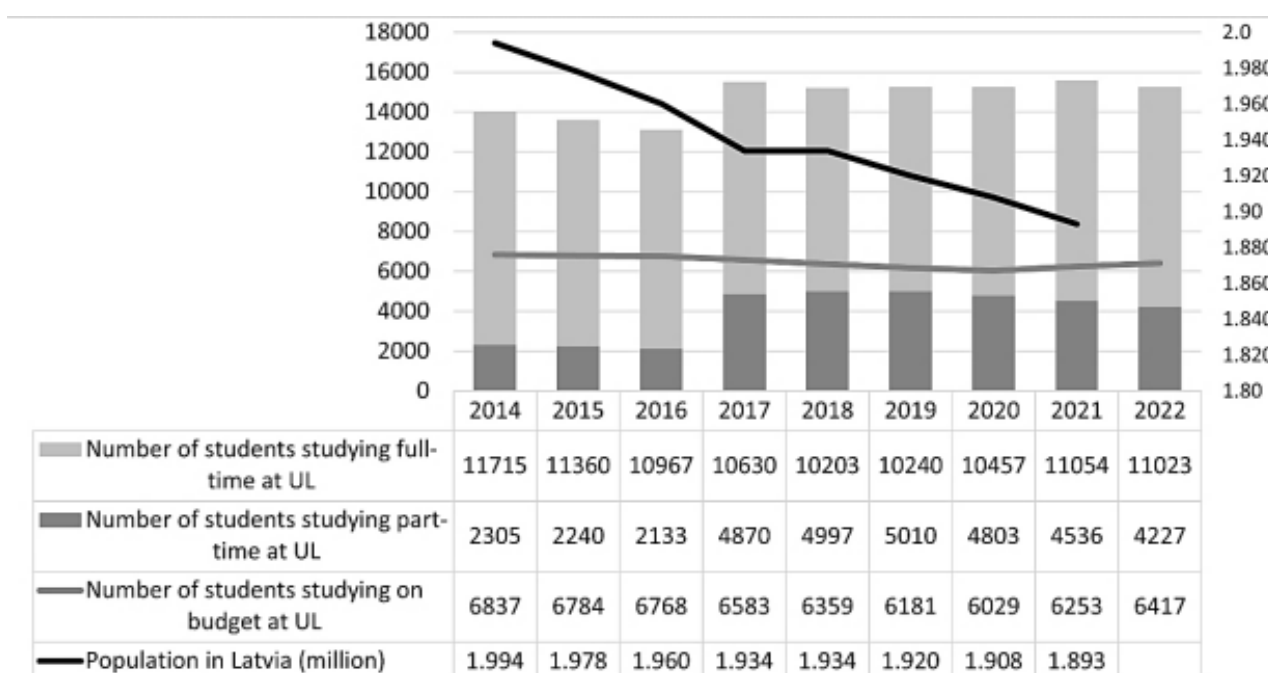
*Table 1.1.2*

*Number of study fields and study programmes implemented in the regional branches of the UL, data as of 2022*

Regional branches	Aluksne	Bauska	Cesis	Jekabpils	Kuldiga	Madona	Tukums
Number of study fields	2	2	2	1	2	1	1

Number of study programmes	4	4	6	5	7	2	5
Number of students	80	194	480	131	298	74	316

As of October 1<sup>st</sup>, 2022, the total number of students studying at the UL is 15 250, 42% of whom are financed from the state budget. Around 10% of students study at the UL regional branches. In total, almost five thousand new students are enrolled every year. See trends of the number of students over a period of nine years in Figure 1.1.1.



**Fig. 1.1.1.** Number of students at the UL compared to the population of Latvia, 2014-2022

UL medium-term development strategy for the period from 2021 to 2027 ([the UL Strategy 2021-2027](#) in Latvian and English) was approved on June 28<sup>th</sup>, 2021, by the Senate decision No 2-3/90. With the cooperation of the involved parties and the analysis of the national and international competitiveness of the UL, the mission of the UL has been revised and strategic goals have been defined in six development directions-three in each-in the core business and institutional areas. Development goals have been set for science, studies, public education, as well as in the domains of staff and organisational culture, environment, and governance. *The UL Strategy 2021-2027* envisages the further development of the UL as an internationally recognised science centre, the development of unique study and lifelong learning programmes, as well as the offer of competitive working and study conditions. The UL continues the work initiated in the previous strategic period to achieve the highest level of scientific excellence, as well as to promote student-centred learning and develop a modern study environment. The involvement and contribution of the UL to the society of Latvia is being purposefully promoted. The UL is improving the working conditions and environment necessary for talent development. Sustainable growth is playing an increasingly vital role and is becoming a crosscutting principle in all its areas of activity. Significant attention is paid to ensuring academic integrity and strengthening the value-oriented organisational culture of the UL. See Table 1.1.3. for the current strategic goals and development directions of the UL.



**The UL Strategic Goals Map, 2021-2027**

Development directions	Strategic goals
<b>Development of principal activities</b>	
1.D. Scientific excellence	1.G. Internationally recognized research university
2.D. Development of studies	2.G. Unique study offer and high competitiveness of graduates
3.D. Contribution to society	3.G. University activities as a basis for the growth of Latvia
<b>Institutional development</b>	
4.D. Talent development	4.G. Development- and excellence-oriented HR policy
5.D. Environment and governance	5.G. Green thinking, attractive, sustainable university environment, and effective administrative support
6.D. Organisational culture	6.G. Inclusive, cooperation- and innovation-focused culture

The outcomes of the implementation of *the UL Strategy 2021-2027* will be measured by twenty-one performance indicators, five of which have been designated as *the UL Key Performance Indicators*. They are – research funding from foreign sources per full-time equivalent of academic staff in EUR, co-publications with foreign partners in *Scopus* and *Web of Science* databases (%), the percentage of graduates who are satisfied (rated at least ‘good’) with the quality of their studies (%); the percentage of foreign students at UL (%), as well as the commercialisation revenue (EUR/thousands).

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

The main decision-making bodies of the UL are the Constitutional Assembly, the Senate, the Council, the Rector, and the Academic Arbitration Court. See Table 1.2.1 for the proportion of the composition of the main decision-making bodies of the UL and the terms of the elections.

The **Constitutional Assembly** is the representative body of the academic staff, general staff and students of the University and the decision-making body in academic and scientific matters (Law on Higher Education Institutions). The management of the Constitutional Assembly, its election, commissions, and their competences, as well as the conduct of the Constitutional Assembly meetings and the adoption of decisions shall be determined by the Regulations of the Constitutional

Assembly of the University of Latvia.

The **Council** is the collegial supreme decision-making body of the public higher education institution, which is responsible for the sustainable development, strategic and financial supervision of the public higher education institution, as well as for ensuring the functioning of the public higher education institution in accordance with the objectives set out in its development strategy. The Council protects the autonomy of the public university and respects and promotes the academic freedom of academic staff and students (Law on Higher Education Institutions). The Council of the University of Latvia operates in accordance with the procedure laid down in the Constitution of the University of Latvia and the Regulations of the Council of the University of Latvia.

The **Senate** is the collegial supreme academic decision-making body of the University, responsible for the excellence, development, and compliance with internationally recognized quality standards of the University's education, research, and creative activities. The Senate regulates the academic, creative, and scientific activities of the University. The Senate protects and ensures the academic freedom of academic staff and students within the framework of the autonomy of the University. (Law on Higher Education Institutions). The Senate of the University of Latvia operates in accordance with the procedure laid down in the Constitution of the University of Latvia and the Regulations of the Senate of the University of Latvia. The structure of the Senate and the decision-making process, insofar as it is not determined by other normative acts, shall be determined by the Rules of Procedure of the Faculty Senate.

The **Academic Arbitration Court** is a decision-making body and a representative body of academic staff and students. The composition of the Academic Arbitration Court and the procedure for the consideration of cases by the Academic Arbitration Court shall be determined by the Statute of the Academic Arbitration Court approved by the Constitutional Assembly of the University.

The **Rector** is the highest official of the University, who exercises the general administrative management of the University and represents the University without any special authorisation. The competence of the Rector of the University shall be determined by the Law on Higher Education Institutions, the Constitution of the University, the Regulations of the Administration of the University, and other normative acts.

Table 1.2.1

**Characterisation of the terms of election, proportion of the composition, and authority of the main decision-making bodies of the UL**

Decision-making Body	Term of Election	Total Number of Participants	Representation of Academic Staff	Representation of General staff	Student Representation
Constitutional Assembly	3 years	200	65%	10%	25%
Council	4 years	11	45.5%*		
Senate	3 years	50	76%	4%	20%
Rector	4 years	1	100%		

Academic Arbitration Court	3 years	5	80%		20%
----------------------------	---------	---	-----	--	-----

\*In the UL Council there are 11 members, of whom: five, selected in accordance with the procedure laid down in the Constitution of the University, are nominated by the Senate (45,5%); one, an eminent academic outside the University, is nominated by the President of the Republic (9%); five representatives of the public in accordance with the procedure established by the Cabinet of Ministers, involving the public in the selection process (including graduate organizations, industry associations and employers, representatives of academic, research and creative organizations, persons with internationally significant achievements in science, arts or business, representatives of sectoral ministries and local governments), shall be selected by the ministry under whose supervision the higher education institution is placed and nominated by the Cabinet of Ministers (45,5%).

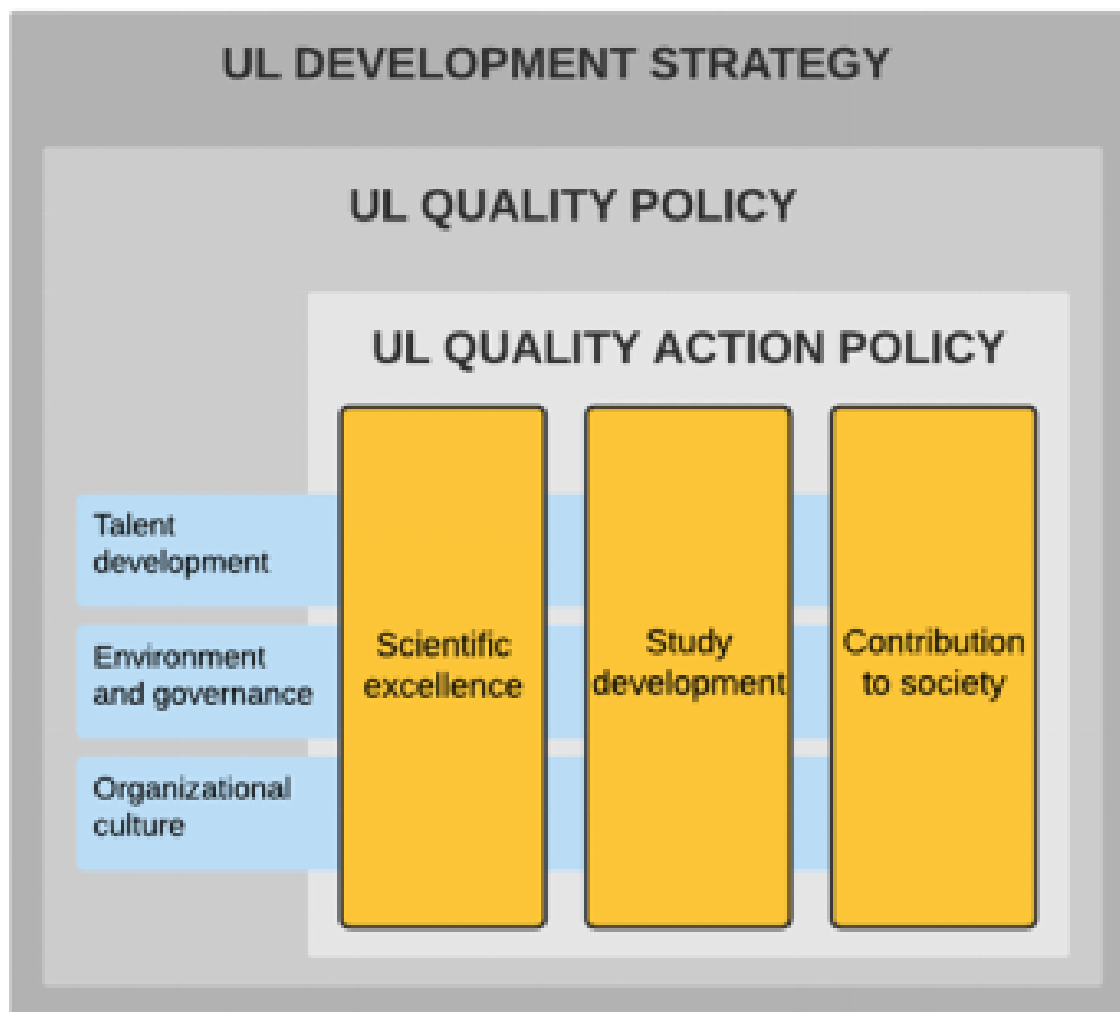
For characterisation of the authority of the main UL decision-making bodies, see chapter 1.2. of *the UL Quality Management Handbook*. (*The Quality Management Handbook* is available in the section *Other attachments*)

The governance structure of the UL: [LV](#), [ENG](#)

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

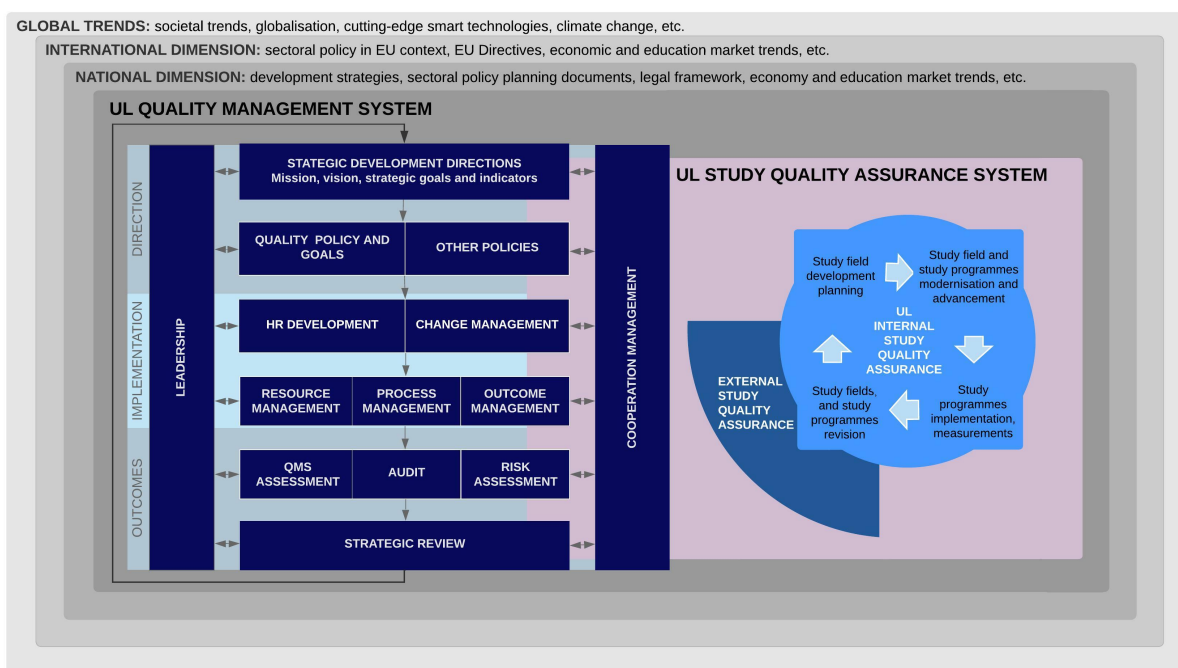
The [Quality Policy](#) and the resulting [Quality Action Policy](#) are a set of quality-related principles, objectives and the actions necessary for their achievement. UL quality is defined as a measure of excellence, which characterises the ability to meet and exceed the visible and future needs of the involved parties, as well as to ensure the compliance of processes with the regulated requirements of the relevant sector, and international standards recognised in the organisation management.

**The quality management system** of the UL is implemented in accordance with the principles of the *Total Quality Management* (TQM), integrating the approach of excellence into the corporate culture of the UL. For the implementation of total quality management, the UL uses an internationally recognised and applicable quality management methodology – the *European Foundation of Quality Management* (EFQM) excellence model. In the core activities the quality management system is deepened by developing internal quality assurance systems integrated into the quality management system, which are based on current sectoral standards and frameworks. The internationally recognised *Results-Approach-Deployment-Assessment-and-Refine* (RADAR) methodology is used to ensure the cycle and continuity of quality management at the UL; the *Plan-Do-Check-Act* (PDCA) approach is used in quality assurance systems.



**Fig. 1.3.1.** *Hierarchy of the Quality Policy and Action Policies at the UL*

Figure 1.3.2 provides a diagram of a quality management system with an integrated quality assurance system for studies. For a more detailed description of the UL Quality Management System, see Chapter 2.1 of the *UL Quality Management Handbook*. (*The Quality Management Handbook* is available in the section *Other Attachments*)



**Fig. 1.3.2.** *The UL Quality Management System and Principles of the Study Quality Assurance System of the UL*

To ensure the quality of higher education, the UL implements the Quality Assurance System for Studies, which includes procedures for planning, ensuring, measuring, and evaluating the quality of higher education in accordance with the requirements of legislation of Latvia, *the European Standards and Guidelines (ESG) for quality assurance in the European Higher Education Area (EHA)*, as well as for internal needs. In the UL planning for the development of the study field and improvement of the study programmes for a period of 6 years is ensured. The procedure for the implementation of study programmes is established in the internal legal acts of the UL, including regulation of the development of new study programmes, admission requirements, matriculation and registration for studies, development, implementation and review of study courses and modules, planning, implementation and assessment of study internship, organisation of assessments and final examinations, and rotation, the principles of academic integrity and their observance, exmatriculation, awarding of diplomas and certificates, the recognition of knowledge, skills, competence acquired through non-formal and extra-curricular education or in professional experience, recognition of learning outcomes achieved in the previous education, and referencing of academic activity, the procedure for conducting surveys, submission of student proposals and complaints, contestation of administrative decisions, doctorate promotion process, etc. UL ensures that the measurements and data necessary for quality assessment and improvement are collected and used for both immediate corrective action and regular evaluation and planning of further improvement. The 6-year study field development plan is monitored annually, the measurements are analysed, and the SWOT is discussed, if necessary, by introducing changes to the operational study programme implementation plans, to the study field plan or, when assessing the overall development of study fields within the framework of the UL Strategic Control, by making amendments to the UL Strategic Action Plans. For more information on quality assurance of studies, see Chapter 3.1 of *the UL Quality Management Handbook*. For the breakdown of responsibilities for quality management and assurance, see Section 2.5 of *the UL Quality Management Handbook*.

The UL quality assurance system is based on the participation of key stakeholders in the quality assessment and improvement of the UL activities. Stakeholders of the UL are natural or legal persons, domestic and international, who use the services of the UL or whose socio-economic situation is affected by the activities of the UL. The key stakeholders are defined in Article 12 of *the UL Quality Policy*. For the description and examples of the roles of key stakeholders in quality management, see Section 3.2, subsection 1.2 (Table 3.6) of *the UL Quality Management Handbook*.

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

<p>1. The higher education institution/ college has established a policy and procedures for assuring the quality of higher education.</p>	<p>The UL has formulated the Quality Policy, which is detailed in the Quality Action Policy in line with its strategic core activities.</p> <p>For quality assurance of higher education, the UL Studies Quality Assurance System (in compliance with ESG) has been implemented and integrated into the UL Quality Management System (in compliance with EFQM). For more information, see Part I, Section 1.3 of this document and Section 3.1 of the UL Quality Management Handbook (The Quality Management Handbook is available in the section Other attachments)</p> <p>The establishment, maintenance, and improvement of the UL quality management system are performed by the management and heads of core structural units (deans of faculties) and their delegated employees. The Academic Department is responsible for the establishment, implementation, and improvement of the study quality assurance system, in close cooperation with the heads of study fields and directors of study programmes. Two collegiate committees have been established for quality assessment with the participation of the UL stakeholders: The Quality Advisory Committee and the Study Programme Quality Assessment Committee. For more information, see Section 2.5 of the UL Quality Management Handbook.</p>
---	--

2.	A mechanism for the creation and internal approval of the study programmes of the higher education institution/ college, as well as the supervision of their performance and periodic inspection thereof, has been developed.	<p>The development and internal approval of study programmes are stipulated in the Regulations of the University of Latvia on Study Programmes and Continuing Education Programmes (the UL Senate Decision No 102 of 24.04.2017). For more information, see part II, subsection 2.2.2. of this report, as well as subsection II of Section 3.1 the UL Quality Management Handbook.</p> <p>Periodic quality review of study programmes is stipulated in the Procedure for Preparation of Annual Reports on UL Study Fields (the UL Order No 1/290 of 14.07.2020). For more information, see part II, subsection 2.2.2. of this report, Section 3.1, subsections IX, and X of the UL Quality Management Handbook.</p>
3.	The criteria, conditions, and procedures for the evaluation of students' results, which enable reassurance of the achievement of the intended learning outcomes, have been developed and made public.	<p>Information related to learning outcomes, including assessment, is contained in study course descriptions, the preparation and updating of which, as well as the rules for their publication, are stipulated in the Procedure for the Development and Actualisation of Study Courses at the University of Latvia (the UL Order No 1/277 of 10.08.2018). Process and assessment of entrance examinations and final examinations, as well as the assessment and recognition of learning outcomes achieved in previous education or professional experience, are regulated by the relevant regulations of the UL. For more information, see part II, subsections 2.1.4. and 2.1.5. of this report.</p> <p>The desired ethical and fair conduct and justice are ensured at the UL by internally regulating issues related to the academic freedom and academic integrity, electing, and ensuring the Academic Arbitration Court, and ensuring the operation of the Academic Ethics Committee, as well as regulating the principles of protection of intellectual property rights. For more information, see part II, subsection 2.1.6. of this report, and the Quality Management Handbook, Section 3.2, subsection 2.1.</p>

4.	Internal procedures and mechanisms for assuring the qualifications of the academic staff and the work quality have been developed.	<p>The principles of personnel management at the UL in the areas of personnel selection, labour relations, motivation system and personnel development are defined in the UL Human Resource Management Policy (the UL Senate Decision No 264 of 28.01.2019). Accordingly, the development of academic staff is planned for the medium-term, and training plans are drawn up for the year. The qualification requirements of the staff are defined in the internal regulatory enactments of the UL in accordance with the external regulatory enactments, however the requirements for ensuring the quality of work – within the framework of regular staff appraisal, including the analysis of students' satisfaction with the delivered study courses, as well as the results of scientific activity. For more information on attracting, engaging, developing, and retaining staff, see part 2, subsections 2.3.5. and 2.3.6. of this report, and the UL Quality Management Handbook, Section 3.2, subsection 3.2.</p>
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.	<p>Information on students' grades is accumulated in the information system of the University of Latvia (hereinafter – ULIS) and analysed in the framework of study course implementation (including student-centred approach) and study programme improvement. Satisfaction of students and graduates with the study programme is monitored through communication activities of staff involved in the implementation of study programmes, representation of students and graduates in decision-making and advisory bodies, as well as by conducting surveys in accordance with the Procedure for the Organisation of Regular Surveys to Evaluate the Study Process at the University of Latvia (the UL Order No 1/334 of 22.08.2016). For more information on the involvement of stakeholders in quality assurance see part II, subsection 2.2.4. of this report, and Section 3.2, subsection 1.2 of the UL Quality Management Handbook.</p> <p>Issues related to the efficiency of academic staff, available study resources and their costs are monitored in the core structural units (faculties, institutes, etc.) as well as centrally. For more information on study information management, see part II, Section 2.3. of this report, and Section 3.1, subsection VII of the UL Quality Management Handbook.</p> <p>The performance management system of the UL results had been introduced and implemented at the UL, within which the key performance indicators of the UL are monitored according to which further strategic decisions are made. For more information, see Section 3.2, subsection 7 of the UL Quality Management Handbook.</p>



6	<p>The higher education institution/ college shall ensure continuous improvement, development, and efficient performance of the study field whilst implementing their quality assurance systems.</p>	<p>The development of each study field is planned in accordance with the 6-year development strategy of the UL. The monitoring of the plan and the evaluation of its effectiveness are conducted within the framework of the annual self-assessment of the study field. These processes take place at the level of the respective Study Field Council, the core structural unit(s) implementing the study field (a study field may be implemented by several faculties), as well as at the level of the administration and the Senate.</p> <p>The UL provides the external evaluation required by the legislation, obtaining additional external quality certificates for individual programmes. For more information, see Part II, subsection 2.2.2. of this report, and Section IX and X of the UL Quality Management Handbook.</p> <p>To promote the quality and competitiveness of the study programmes of the UL, UL creates and finances internal grant projects (Fund for improvement of the study quality of the UL), as well as attracts external funds (European Social Fund (<a href="https://www.ozolzile.lu.lv/projekti/eiropas-socialais-fonds/">https://www.ozolzile.lu.lv/projekti/eiropas-socialais-fonds/</a>) (available only in Latvian), Erasmus+ (<a href="https://www.ozolzile.lu.lv/projekti/erasmus/">https://www.ozolzile.lu.lv/projekti/erasmus/</a>)).</p>
---	--	--

## 2.1. Management of the Study Field

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

The study field "Wildlife Sciences" (hereinafter - the SF LS) is implemented on the basis of the University of Latvia (UL) Strategy 2021-2027, the Law on Higher Education Institutions, Regulations of the Cabinet of Ministers No 794 "Regulations on Accreditation of Universities and Colleges" of 11.12.2018, Regulations of the Cabinet of Ministers No. 793 "Regulations on Opening and Accreditation of Study fields" of 11.12.2018, Regulations of the Cabinet of Ministers No. 240 "Regulations on the State Academic Education Standard" of 13.05.2014, as well as other internal UL documents. The SF LS adapts and details the UL Strategy 2021-2027 to meet the needs of the specific field of study.

The aim of the SF LS is to prepare specialists at the Bachelor's, Master's and Doctoral levels in biology and biotechnology in order to provide the country with specialists necessary in priority research directions and sectors of the national economy.

The objectives of the SF LS:

1. to develop and improve an innovative and research-based study provision promoting student involvement in research at all levels of education;
2. to promote the development of interdisciplinary and international study programs enabling the mobility of students and teaching staff;
3. to promote the dissemination and transfer of scientific knowledge and achievements in society;
4. to promote the development, growth and renewal of academic staff;
5. to provide an open, collaborative and creative learning and research environment;
6. to ensure the involvement of staff and students in planning and implementation of the study field development.

The goals of the study field are determined by internationally recognized priorities in the offer of higher education and current affairs of Latvia's national economy, in accordance with the Latvian National Development Plan for 2021-2027 (NDP2027) and directly correspond to the following priorities of NDP2027: 1) priority "Knowledge and skills for personal and national growth"; its direction of action "Science for the development of society, growth and security of the national economy"; 2) priority "Quality living environment and territorial development"; its directions of action "Nature and environment - "Green course"", "Technological environment and services", "Balanced regional development".

The goal of SF LS is to ensure that life sciences - biology and biotechnology studies at the Faculty of Biology of the UL become a leading study offer at the level of higher education, which covers the national demand for wide-profile specialists at the level of basic studies in Latvia, while at the same time providing opportunities for specialization at higher study levels and in research directions, which are current in the labor market and science of Latvia and EU countries. The goal of research development is to provide research-based education in the field of biology and biotechnology, ensuring the attraction of national funding for both fundamental research and applied research.

On the other hand, the forecasts in the "Education Development Guidelines for 2021-2027" (Regulation of the Cabinet of Ministers No. 436 of 22.06.2021) indicate that in the demand for labor in STEM higher education, including biology and biotechnology, in 2027 there will be a labor shortage of around 14000 workers. Therefore, academically educated persons with higher education will be in great demand in the national economy in the near future, both in Latvia and the EU.

To achieve this goal, the following academic Bachelor's, Master's and Doctoral study programmes are implemented within the framework of the SF LS:

- the academic Bachelor's study programme "Biology" (hereinafter - the BSP "Biology");
- the joint academic Bachelor's study programme with RTU "Biotechnology and Bioengineering" (hereinafter - the BSP "Biotechnology and Bioengineering");
- the academic Master's study programme "Biology" (hereinafter - the MSP "Biology");
- the academic Doctoral study programme "Natural Sciences" (hereinafter - the DSP "Natural Sciences").

There is a logical link between all study programmes implemented in the SF LS. Both basic programmes provide basic knowledge, skills and competences in biology and biotechnology. The Bachelor of Science degree in Biology or Biotechnology qualify graduates for studies at the higher-level MSP "Biology", where they acquire advanced, specialised knowledge, skills, and competences in a sub-discipline of biology, as well as general knowledge in science communication, innovative entrepreneurship, and bioethics. The academic MSP "Biology" prepares top-level specialists with basic skills in research activities and high-level knowledge, skills and competences related to the theoretical basis and research methodology of a sub-discipline of biology, making graduates

demanding in scientific institutes and universities, public institutions, and private companies, both in Latvia and abroad. Approximately 25% of MSP Biology graduates with a Master's degree in Biology continue their studies in the DSP "Natural Sciences" (formerly DSP "Biology").

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

The SF LS SWOT analysis (Table 2.1.2.1) was carried out by the SF LS Council and approved by the Council of the Faculty of Biology (hereafter FB). In accordance with the SF LS aim, the SWOT analysis assesses the strengths and weaknesses, as well as the opportunities and threats of the study and research work, and the interaction with society. According to the SWOT analysis, the SF development plan (Annex 3-B) has been drawn up, and it provides specific measures, objectives, deadlines, and responsible persons to implement and develop the SF LS at the University of Latvia in correspondence with the UL Strategy.

In Latvia, the SF LS offers the widest choice of sub-disciplines of biology at all levels of study, as well as the only opportunity to specialise in biotechnology and bioengineering. The BSP "Biotechnology and Bioengineering" is implemented as a joint programme with Riga Technical University, thus providing students with a wide range of study and thesis opportunities. Although the number of students has tended to decrease in recent years due to demographic factors, the SF LS programmes are in demand. There are, of course, some areas for improvement. The results of the student and employer surveys confirm the need to increase the amount of practical work in the MSP "Biology", but this is not easily achievable within the existing budget of study places. Also, the programmes have a small number of international students (mainly Erasmus+ exchange students), and therefore the teaching of the programmes in English should be considered. There is also a need to increase the involvement of foreign lecturers in the study process. This has been partially addressed within the framework of the SAM 8.2.2 project "Renewal and Competence Development of Academic Staff at the University of Latvia". Considering the experience gained during the COVID-19 pandemic, it is possible to provide some guest lectures remotely; for example, in the spring semester of 2022, two guest lectures by cooperation partners from the University of Cartagena (Spain) were given in the BSP "Biotechnology and Bioengineering". Some of the UL FB members have a high number of contact hours, which hinders their research work. This can be addressed by more evenly scheduling lecturer workloads and attracting new lecturers. Attracting new faculty members, including from Latvian research institutes, could also help to address the lack of involvement in Horizon Europe and other international research projects.

In accordance with the SF LS Development Plan, continuous development of study and research work is envisaged, which will thus provide opportunities to increase the number of students (including foreign students), involvement of the UL lecturers in interdisciplinary and international projects, as well as to improve the career development of academic staff. In the field of science, there is a need to develop science communication and commercialisation strands, which would increase the visibility of the SF academic staff.

The threats to the implementation of the SF LS in the field of studies are mainly related to the demographic situation. These can be addressed by improving the quality of studies, offering new study programmes and specializations, and attracting international students. In this respect, the BSP "Biotechnology and Bioengineering", which has generated considerable interest among students, as well as the MSP "Biology" with the sub-direction "Bioinformatics", which is particularly needed by employers in Latvia, seem to be promising. A significant part of the threat is related to the lack of funding, both for studies and research, as well as for student support. The base funding of study places is limited, especially in view of rising infrastructure costs and the threat of inflation. Despite the annual Fundamental and Applied Research Project competition of the Latvian Council of Science, as well as initiatives by line ministries such as the Biomedical Research Sectoral Programme of the Innovation Fund of the Ministry of Economics, state funding in Latvia still lags far behind that of most EU countries. The European Structural Funds (ESF) provide significant support for scientific activity, but funding is expected to cease in 2023 due to the end of the previous ESF period. ERASMUS exchange grants for students and lecturers do not cover the real costs either, thus reducing the possibility for SF LS students to study abroad and the willingness of lecturers to visit foreign universities. In view of the lack of funding as one of the factors that hinder the renewal of the academic staff and attraction of foreign lecturers, the SAM 8.2.2 project "Renewal and Competence Development of Academic Staff at the University of Latvia" has been of significant support, and it helped to attract 3 foreign lecturers, as well as to involve doctoral students in teaching.

### Study field "Wildlife Sciences" SWOT analysis

- The SF LS offers the widest choice of biology sub-disciplines at all levels of study in Latvia, as well as the only opportunity to specialise in biotechnology and bioengineering. The education offered is highly valued by students and employers.
- The SF LS offers students a large amount of practical work and provides research-based study opportunities, offering students the possibility to participate in research projects already during their undergraduate studies.
- Leading experts from Latvian research institutions are involved in the implementation of the SF LS study programmes. The recommendations of students, graduates, employers, and professional organisations are taken into account in the implementation and improvement of study programmes. Students often work on their Theses in Latvian research institutes such as BMC, BIOR, etc.
- The generational change of lecturers is progressing well. Many scientists of the new generation from Latvian research institutes work at the UL FB.
- The opportunities offered by Moodle (e-studies), as well as MS Teams for online classes are used on an increasing scale.
- The quality of research work is reflected in the growing number of scientific publications, as well as in the increase in bibliometric indicators (H-index, number of citations, etc.) of lecturers. Students are often involved in the preparation of publications.
- The number and volume of scientific project applications and funding has increased with the expansion of national science-funding competitions.
- Most research projects are interdisciplinary and involve researchers from both the UL and other higher education institutions and research institutes in Latvia.
- The number and volume of contract research projects in cooperation with Latvian high-tech companies is increasing.
- Modern and inclusive infrastructure is available for studies and research at the Houses of Nature and Science of the UL Academic Centre, as well as at other scientific institutions such as BMC.

## Opportunities

- The quality of study programmes offered by the SF LS is not homogeneous. In all study programmes, there is a need to increase the opportunities for students to develop final theses.
- Limited funding of state-funded study places does not allow to increase the amount of practical work in the Master's study programme, as well as limits the choice of themes for students' final theses
- Insufficient number of foreign students and lecturers.
- For some SF LS lecturers, the high number of contact hours hinders their involvement in research, project preparation, implementation, and publication.
- Very limited success in international research project competitions such as Horizon 2020 or ERA-NET.
- Insufficient international cooperation in the field of science for lecturers who are not employed in research institutes.

## Threats

- The SF LS should take advantage of the new study programmes to increase the number of local students both at the undergraduate level with the BSP “Biotechnology and Bioengineering” and at the higher, DSP level.
- It is possible for the SF LS to start attracting international students, especially to the BSP “Biotechnology and Bioengineering”, but this can only be done by ensuring at least a minimum number of students per group.
- It is necessary to make more use of the experience and expertise of the UL FB researchers in interdisciplinary and international projects.
- Building on the improved research infrastructure and the increase in research capacity, it is necessary to develop a new and broader range of collaborative offers for business and professional organisations in the fields of biology, biomedicine, and biotechnology.
- It is necessary to strengthen the career development of academic staff (tenure track), as well as to promote the involvement of both Latvian and foreign lecturers in the study process and further the development of joint research projects.
- It is necessary to strengthen and expand cooperation in the field of study and research with the strongest Latvian scientific institutes (BIOR, “Silava”, BMC, OSI, etc.).
- It is necessary to expand and strengthen science communication in biology, biomedicine, and biotechnology in order to increase the interest of potential students and cooperation partners in the FB.
- It is possible to attract graduates from other universities, e.g., from the Faculties of Agriculture and the Faculty of Forestry of the Latvia University of Life Sciences and Technologies.
- Given the demographic situation in the country and the wide range of study programmes on offer in the EU, it may be difficult to ensure an increase the number of students, or even to maintain the current number of students.
- An increasing number of graduates of the undergraduate programmes are choosing not to continue their studies at a higher level.
- Emergencies and other unforeseen circumstances may reduce opportunities for student exchange and attraction of international students.
- ERASMUS+ grants are insufficient to cover student living costs during exchange trips, therefore the number of UL FB students going on exchange is decreasing.
- Most support for study and research infrastructure and research funding is available through the European Structural Funds. As the current Structural Funds funding period is coming to an end, a decrease in funding for the previously funded areas of research is expected.
- The EU funds for infrastructure development have been used to purchase expensive and sophisticated equipment, but often there are neither funds nor human resources to maintain it.
- Although the FB has highly qualified lecturers, it may be difficult to find replacements in case of illness or if the offer of study programmes in English is expanded.

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

Collegiate responsibility for the administration of the study field lies with the UL decision-making bodies – the Senate, the UL Study Programme Quality Assessment Commission (hereinafter – SP QAC) (headed by vice rectors), respective faculty councils and study field councils, which evaluate study quality and decide on study quality assurance measures.

The governance of the UL is responsible for the study quality assurance, delegating responsibility for the development and functioning of the study quality assurance system to the Academic Department.

The responsibility for the development of the study field and quality of implemented study programmes lies with the head of the study field and dean, study programme directors.

Each lecturer is responsible for the quality of the content and implementation of the study course, research activity and professional development.

The students' responsibility is defined in their rights and obligations to promote the achievement of the UL goals and excellence in studies, participating in the UL collegial institutions and regularly expressing their opinion in student surveys.

The governance scheme of the UL Study field and the study programmes comprised in it is found in Annex 4-B.

The procedure of management, quality assurance and development of study fields of the UL, the functions and principles of operation of the Study Field Council, the qualification requirements, duties and rights of the director of a study field and the directors of study programmes and sub-programmes of the study field are defined in the [\*Regulation on Management of UL Study \(approved by the Senate Decision No.70 of 27.01.2020\)\*](#).

Each UL study programme has a **study programme director** who manages the development and implementation of the study programme. The study programme director shall be approved by the Senate on the proposal of the faculty council representing the relevant scientific field. The study programme director shall be a member of the council of the relevant study field and shall coordinate their activities with the head of the study field and the study field council. The study programme director shall be accountable to the dean of the faculty. The responsibilities of the study programme directors include ensuring the successful functioning and sustainability of the study programme and other tasks in accordance with the procedure laid down by the UL.

**The competence of the head of the study field** is to ensure the management and development of the study field. The head of the study field is approved by the Rector on the proposal of the dean of the respective faculty. The head of the study field is accountable to the respective Study Field Council and the dean. The heads of study fields, in cooperation with the study programme directors, ensure the revision, development planning and implementation of study programmes included in the study field. Heads of study fields organise the work of study field councils, as well as regularly organise the development of annual study field reports and their promotion for review and approval to the respective Study Field Council and respective Faculty Council. Heads of study fields in cooperation with the study programme directors and the Academic Department of the UL ensure the accreditation and re-accreditation of the study field and perform other duties. The Head of the Study Field may have deputies.

**The Study Field Council** is a collegial study field management body, which supervises academic, professional and doctoral study programmes of all levels within one study field. The participants of the respective Study Field Council is the head of the study field and its deputy, if there is one, the study programme directors and subprogramme directors relevant to the study field, the representatives of the students in respective programmes (not less than 20% of the composition of the Study Field Council, promoting the representation of all levels of study programmes, as well as the largest possible number of study programmes, nominated by the students self-government), representatives of employers and cooperation partners of the study field (candidates are nominated by the heads of structural units, heads of study fields, study programme directors and heads of subprogrammes). The composition of the Study Field Council may be supplemented with graduates

of the respective study field programme who are not involved in the implementation of said study field, as well as with professors, associate professors, and other qualified specialists (candidates are nominated by the heads of structural units, heads of study fields and study programme directors). The Study Field Council approves the development plan of the study field, evaluate the concepts of new study programmes, changes in study programmes, annual self-assessment reports of the study field, licencing and accreditation applications and related documentation.

**The FB Council** consisting of representatives of the academic and general staff, elected for three years, and student representatives, who make up at least 20% of the councillors, decide on academic, economic, financial, and other activities of the faculty that are within the competence of the faculty or may be passed on to the Senate.

**The Study Programme Quality Assessment Commission** assesses the performance of UL study fields and study programmes, as well as makes proposals to the respective Faculty Council and the UL governance on the further development of the programmes. SP QAC reviews and provides opinions on study programmes, including, evaluates applications of new study programme concepts, new study programmes and closure proposals, significant changes in accredited study fields that require a decision of the SP QAC, as well as applications for new study modules and subprogrammes. When evaluating the concepts of new study programmes, annual reports of study programmes and study fields, the SP QAC is guided by the opinion of anonymous, independent experts. The SP QAC consists of vice-rectors, the Chairman of the Academic Commission of the Senate or his authorised representative, the Director of the Academic Department and representatives, the Representative of the Department of Study Service, the Internal Auditor, the Head of Quality, representative of the Library of the UL, a representative delegated by the Student's Council (hereinafter – SC) and a representative delegated by the UL Alumni Club.

In the UL Administration **the Academic Department** has the key role in the management of the field of study. The competence of the Academic Department is to monitor the requirements of the regulatory enactments in force in the Republic of Latvia and changes therein, national and EU development policy documents, as well as standards and good practices in the field of academic activities and lifelong learning. The Academic Department ensures the UL functional strategy, development of regulations and supervision of their implementation in these fields corresponding to the outer regulations and to the UL Strategy; ensures the development, implementation of studies, as well as scientific quality assurance systems (or processes)' monitoring and continuous improvement of their implementation; ensures regular review of academic and lifelong learning processes and risks; regular review of methods and procedures; identifies and ensures necessary control and preventive measures in accordance with the practice implemented by the UL; ensures analytical identification of the results of academic activities and lifelong learning and the opportunities for their improvement, etc.. The Division of Study Quality Assurance monitors the compliance of all study levels with internal regulations; coordinates the medium-term development plan of studies in cooperation with faculties; manages its implementation; monitors and provides methodological support in developing new study programmes and implementing and improving existing programmes; organises internal quality assurance processes in studies; organises and coordinates external quality assessment; ensures centralised administration of doctoral student admission, doctoral studies and promotion process; provides support in the process of implementation and improvement of studies at all levels; evaluates study programme results and competitiveness; and participates in resource evaluation.

**The Department of Study Service** consists of the Academic Services Division, the Admissions Division and the Mobility Division, which are competent to organise and ensure the matriculation and exmatriculation of national and international students; the circulation of study documents and their registration; maintain the graduation documentation (qualification) register, including



diplomas and graduates register; to provide students with social, cultural and other support functions, as well as to provide consultations and information to students on social security; to inform potential applicants and candidates about the study programmes, study process and study organisation, as well as to ensure the administration and implementation of mobility programmes etc.

The Head of the UL Quality Control and the Internal Auditor also participate in the development, evaluation, and improvement of the study quality management system.

According to the new *Regulations of the Administration of the University of Latvia*, the Department of Human Resources established **the Department of Academic Competence Development of the University of Latvia**, the functions of which will include the development and improvement of personnel development, career and succession planning systems, the implementation of personnel development measures, as well as the methodological management of academic personnel management issues by UL departments.

Cooperation with the **student self-government of the faculty**, which represents the interests of students in the operation of the faculty, including solving issues of the academic, social, and cultural environment, plays an important role in the management of studies. The members of the student self-government are represented in **the UL Student' Council**, thus participating in the management of the UL.

The management of the SF LS and its corresponding programmes is implemented in accordance with the above-mentioned standard scheme, as in all SFs at the University of Latvia. The Study Field Council is chaired by Professor Kaspars Tārs. The Field Council consists of directors of all study programmes, student representatives, the head of the study field, representatives of the FB departments, as well as employer representatives from the Scientific Institute BIOR (Aivars Bērziņš) and Latvian State Forest Research Institute "Silava" (Tālis Gaitnieks). The head of the study field, Professor Nils Rostoks, has a long academic as well as administrative (Dean, 2010-2018) experience at the FB. The study programme directors have considerable academic experience, and they are well acquainted with the system of laws and regulations governing the study process at the UL. There is good cooperation with the UL administrative departments, the cooperation ensuring effective management of the study process. The Field Council reviews all documents related to the licensing and accreditation of study programmes, and changes in study programme plans.

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

Student admission procedures and requirements:

- [Terms of Admission at University of Latvia](#)
- [Terms of Admission and Criteria for Undergraduate](#) (available only in Latvian)
- [Terms of Admission and Criteria for Postgraduate Studies](#) (available only in Latvian)
- [Terms of Admission and Criteria for Doctoral Studies](#)

- [The Procedures for the Initiation of Studies in Subsequent Study Stages at the University of Latvia](#) (available only in Latvian)

Normative regulations governing recognition procedures:

- [Regulations on the recognition of knowledge, skills, competence acquired outside of formal education or in professional experience, recognition of study results achieved in the previous education, and referencing of academic activity at the University of Latvia](#)
- [University of Latvia procedure for recognition of competencies developed outside formal education or through professional experience and learning outcomes achieved in previous education](#)

The admission process at the UL, and therefore in the study programmes of the SF LS, is regulated by *the Terms of Admission at the University of Latvia* and its subordinate orders, which determine the procedures for the given academic year:

1. Admission requirements and criteria for undergraduate programmes.
2. Admission requirements and criteria for higher-level study programmes.
3. Admission requirements and criteria for doctoral programmes.
4. Admission procedure for the academic year.
5. Registration fee in the admission.
6. Tuition fees for completion of the full study programme.
7. Number of study places for admission.
8. Procedure for the development of entrance examination materials.
9. Composition of the Admission Committee.
10. Composition of the entrance examination boards.
11. Date and place of entrance examinations.

Requirements and criteria for study programmes are reviewed and updated annually, and according to the Article 46 of *the Law on Higher Education Institutions*, they are published on the UL website by November 1<sup>st</sup>. Admission procedures vary by study level.

**Enrolment in undergraduate studies** is centralised through the *Single Enrolment in Undergraduate Programmes System*, which integrates the enrolment in 12 HEI in Latvia. The competition for study places is based on the results of the centralised examinations or the secondary education certificate grades of the persons who have acquired secondary education before 2004, who have been exempted from the centralised examinations or have completed their secondary education abroad. In the case of study programmes that do not have relevant centralised examinations, additional requirements for specific grades are set, and the programmes requiring specific skills or aptitude set an additional entrance examination. As a result, applicants are ranked according to their scores. Programmes may provide benefits to national Olympiads and winners of other contests (for more information on admission requirements, see the description of each study programme). The admission to the Bachelor's study programmes in the study field takes place in accordance with the UL admission rules and requirements.

For the BSP "Biology", the additional requirements include a centralised examination in Biology and a pass in Chemistry or Natural Sciences. For the BSP "Biotechnology and Bioengineering", the additional requirements are a centralised examination in Biology or Physics or Chemistry, and a pass in (1) Biology or Natural Sciences, (2) Mathematics or Chemistry or Physics.

Starting with school graduates from 2023, who will be able to take the centralised examination in Biology, Physics, or Chemistry at different levels of the curriculum (higher, optimal, general), the following coefficients will be applied to ensure the mutual comparability of the centralised examinations:

- a coefficient of 0.75 will be applied to examination of the optimal learning content level, equating to examination of the highest learning content level;
- a coefficient of 0.50 will be applied to examination of the general learning content level, equating to examination of the higher learning content level;
- the learning outcomes of the centralised examination obtained until 2022 will be equated to the examination of the optimal learning content level and a coefficient of 0.75 will be applied to them, equating to the examination of the highest learning content level.

The advantages in the enrolment in the BSP "Biology" 2023 will be open to the 1st - 3rd place winners of the Latvian National or International Biology Olympiads in 2022 and/or 2023 or to the 1st - 3rd winners of the Latvian National Student Scientific Research Works Conference in the field of biological or medical and health sciences in 2022 and/or 2023; and to the 1st-3rd place winners in the overall standings of the UL School of Young Biologists competition in the 12th grade group in 2023.

**Enrolment in master's degree programmes** is decentralised, at each faculty, but with uniform deadlines. Enrolment is based on grades obtained during undergraduate studies. In programmes that allow for prior education in various fields, the entrance examination is used to determine the correspondence of the candidate's prior knowledge to the field of the study programme. For example, in the MSP "Biology", the number of students matriculating each year with previous education (Bachelor's degree) not in biology but in related fields such as healthcare, pharmacy, agriculture, forestry, environmental sciences, etc., is increasing. These applicants are given an entrance interview during which they are assessed on their answers to 7 questions about their previous education, their background in biology, their motivation to study in the MSP "Biology", and their ideas on the choice of the topic of their Master's Thesis. The Entrance Commission is chaired by the Director of the MSP "Biology" and includes the Dean of the FB and a representative of the academic staff. If necessary, the entrant will be advised on the necessary actions to be taken in order to successfully study in the MSP "Biology", e.g., they will be recommended to contact the head of a specific FB department, pointed at their knowledge gaps and actions to fill these gaps, etc.

**Admission in doctoral studies** takes place centrally. The applicant must submit the topic of the promotion thesis and supervisor should be agreed upon. The applicant's eligibility is assessed by the doctoral council of the branch of science. The requirements of previous education (master's degree or corresponding higher education) depend on the direction of the DSP "Natural Sciences" in which the applicant intends to specialise.

The UL provides an opportunity to commence studies also in subsequent study stages, in accordance with the *Regulations for commencing studies in subsequent study stages at the University of Latvia* (the UL 07.06.2022 order No 1-4/332). A precondition for commencing studies in subsequent study stages is the recognition of previously mastered study courses or knowledge, skills, competence, learning outcomes achieved in previous education, which is regulated by the *Regulations on UL Procedure for Recognition of Competencies Developed outside Formal Education or Through Professional Experience and Learning Outcomes Achieved in Previous Education* as well as the *recognition and alignment of academic activity* (the UL Senate Decision No 2-3/ 86 of 28 June 2021) (hereinafter – the Regulations) and the *UL Procedure for the Recognition of Study Courses and Knowledge, Skills and Competencies Acquired in Study Courses and Outside Formal Education or Through Professional Experience and Learning Outcomes Achieved in Previous Education* (the UL Order No 1-4/ 543 of 04.11.2021). On the basis of the application of a student, the possibility of recognising study courses acquired in another Latvian higher education institution, an institution of higher education abroad or a period of previous studies in UL is examined. In accordance with paragraph 8 of the Statute, previously acquired study courses may be recognised at the same

or lower level of study. On 30.06.2022., there were 41 students from all active students who have recognised study courses, but since the previous accreditation period 01.01.2014, 219 students had recognitions.

Applying to commence studies in subsequent stages, the application must be filled in and the necessary documents must be attached. The UL recognition committee for the recognition of knowledge, skills, competence acquired through non-formal and extra-curricular education or professional experience, and recognition of learning outcomes achieved in the previous education (hereinafter – Recognition Committee) or study programme director, if the student renews studies in the same UL programme, evaluates and recognises previously achieved learning outcomes that corresponds to the learning outcomes in the study courses of the respective UL study programme. Final examinations are not recognised. Recognised learning outcomes are included in the academic obligations fulfilled by the student. Recognition of study courses, recognition of education acquired through non-formal and extra-curricular education, also taking of additional study courses, or taking assessments is a paid service, in accordance with the UL price list of paid services, which is approved annually. The UL evaluates and recognises knowledge, skills, competence acquired through non-formal and extra-curricular education or through professional experience, and learning outcomes achieved in the previous education. During application, documents confirming the achieved learning outcomes must be enclosed/attached – certificates, employer's statements, recommendations, project results, job descriptions, etc. Learning outcomes achieved through professional experience may be recognised only in the part of the respective study programme that contains an internship or as intended learning outcomes in the study course of the study programme or study module, which confirm acquired practical knowledge. In cases stipulated in the Regulations of recognition, the Recognition Committee may ask the applicant to pass assessments required in the respective study course or in its part. The UL evaluates and recognises knowledge, skills, competence acquired through non-formal and extra-curricular education or through professional experience, and learning outcomes achieved in the previous education. During application, documents confirming the achieved learning outcomes must be enclosed/attached – certificates, employer's statements, recommendations, project results, job descriptions, etc. Learning outcomes achieved through professional experience may be recognised only in the part of the respective study programme that contains an internship or as intended learning outcomes in the study course of the study programme or study module, which confirm acquired practical knowledge. In cases stipulated in the Regulations of recognition, the Recognition Committee may ask the applicant to pass assessments required in the respective study course or in its part.

In Bachelor's study programmes, the most common cases of recognition of study courses are the following: when a student returns from an exchange programme (Erasmus+ or other), as well as when matriculating into a Bachelor's study programme, persons may request recognition of study courses they have acquired in their previous studies, provided that their scope and content are consistent with the existing courses in the study programme. Students have every opportunity to have courses recognised if they have not been able to complete their studies at another university. In such cases, the Recognition Commission will compare the scope and content of the previously completed courses and decide whether to recognise the courses. In certain cases, previously completed study courses are recognised for students whose studies in the study programme of the study field are a second or further higher education programme. For example, if a student has already taken a civil protection course as part of a Bachelor's degree programme in chemistry, it is not necessary to take the course a second time as part of a Bachelor's degree programme in biology. Similarly, when resuming studies after a break, courses are recognised due to changes in the curriculum.

In Master's programmes, the most frequent cases of recognition of study courses are when students have returned from mobility programmes, participated in various projects such as the

Summer School, or have enrolled in the programme from other higher education institutions of Latvia where they have not been able to complete their studies. In these cases, the Programme Director or the Recognition Commission will compare the scope and content of the previously studied courses and decide whether to recognise the courses. For example, in the MSP "Biology", there are students who have previously obtained a Master's degree in another field, such as, for example, computer science. In such cases, it may be possible to accept certain courses, such as programming, computer science or statistics, especially if the student wishes to specialise in the bioinformatics sub-discipline.

The doctoral programme also offers the possibility to recognise previously completed courses. However, such applications are rare in this programme, and the recognition of courses has been linked to the return from Erasmus+ studies or to changes in the curriculum. In addition, academic activities carried out outside the doctoral programme may also be counted towards the requirements of the UL doctoral programme. The criteria and procedures for the homologation are also laid down in the Regulations.

For the UL students, who [study](#) or undergo [internship](#) within the framework of various international exchange programmes, the recognition and equivalence of learning outcomes achieved during mobility is carried out in accordance with the above-mentioned UL Regulations regulating recognition, as well as the *UL Procedure for Organising Mobility Within the Erasmus+ Programmes* (UL Order No.1/363 of 18.12.2014). According to these regulations, the recognition of learning outcomes acquired during mobility depends on whether: 1) the learning outcomes acquired during the mobility comply with the conditions of international exchange programmes, and 2) the learning outcomes acquired during the mobility comply with the requirements of the study programme of the UL. The homologation of the learning outcomes acquired during the mobility shall be carried out by the director of the respective study programme or the Recognition Commission based on transcripts of records from the partner university or the certificate from the place of internship. After the evaluation, the recognised learning outcomes are included towards the fulfilment of the student's academic obligations.

All exchange students must agree a preliminary mobility plan with the programme director before going on mobility. If changes are made to this plan during the exchange, they shall be agreed with the programme director. The preliminary study or placement plan shall also stipulate the process of homologation; the study programme director shall approve the study courses chosen by the student at the foreign higher education institution and shall note which UL study course from the student's study plan will be replaced or homologated. If the student participates in practice mobility, the student shall agree with the relevant study programme director how the placement will be recognised before the mobility departure. If the UL study plan includes practice, the practice mobility will be assimilated to the practice in the UL programme.

All procedures are published and available in the UL Regulatory Acts System, which is accessible to all UL employees and students by registering with the assigned username and password.

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

In accordance with the a *Law on Higher Education Institutions of the Republic of Latvia*, the UL

internal regulations *Procedure for the Development and Actualisation of Study Courses at the University of Latvia* (the UL Order No 1/277 of 10.08.2018) have been developed, and they stipulate that the information on the conditions for the commencement of each study course, its aim, objectives, requirements for obtaining credit points, the content of the study course, the organisation of the study process in contact classes, the organisation and tasks of student independent work, the planned learning outcomes (knowledge, skills, competences) and their testing methods and assessment criteria, shall be included in all course descriptions available to students in the UL Information System (ULIS) and in the UL e-study environment. The registration and recording of the assessment of student results shall take place in the e-environment of the relevant study course. For each study programme and each study course at the UL, learning outcomes are defined as a set of knowledge, skills, and competences. The courses of the study programmes are designed according to the principles of progression and succession. To ensure this, a mapping of the intended learning outcomes at the level of the study programme and at the level of the study courses shall be carried out. The results of the mapping and analysis of the study programmes of the study field are available: of the BSP "Biology" in Annex 28-1-B and Section 3.2.1; of the BSP "Biotechnology and Bioengineering" in Annex 28-3-B and Section 3.2.1; of the MSP "Biology" in Annex 28-2-B and Section 3.2.1; of the DSP "Natural Sciences" in Annex 28-4-B and Section 3.2.1.

At the beginning of their studies at the FB, students are informed about the organisation and implementation of studies in the relevant study programme, and at the beginning of each individual study course, lecturers inform about the course organisation, content, study requirements, planned learning outcomes, examinations, and assessment criteria, as well as they explain the relevance of the study course to the achievement of the overall learning outcomes of the programme. Students can get acquainted with the criteria and conditions of the assessment of student performance and the binding procedures in course descriptions and in the e-learning environment, as well as at the beginning of each study course, in the first class, when each lecturer familiarises students with the organisation of the course, the requirements for the mid-term and final examinations, the assessment criteria and the examination procedures, with no change in the requirements and assessment criteria during the semester.

The organisation of the study course assessments and the grading of the students' achievements is performed in accordance with *the Law on Higher Education Institutions* and *the Procedure for Organization of Examinations of Study Courses at the University of Latvia* (the UL Senate Decision No 211 of 29.06.2015) elaborated by the UL Constitution and applicable to the assessment of learning outcomes of full-time and part-time students enrolled at the UL study programmes at all levels.

Each study course has two types of examinations: mid-term examinations (with the total of mid-term grades not less than 50% of the overall grade) and a final examination (with the exam grade not less than 10% of the overall grade). Examinations may be written or oral or combined (written and oral). The form and methods of examinations shall be chosen for the assessment of student achievements and shall correspond to the teaching methods used in the study process in contact classes and in the organisation of student independent work.

Passing the examination is compulsory for obtaining credit points in the study course. The procedure and criteria for the assessment of mid-term examinations shall be determined by the responsible unit according to the specifics of the study course. The mark obtained in the study course is calculated in the UL centralised performance registration system according to the algorithm specified in the course description and taking into account the grades obtained in the mid-term and final examinations, and recorded in the examination protocol.

In the programmes of the study field, the types of mid-term examinations are as follows: test, independent work, practical work, laboratory work, report, paper, and other types of work according to the specifics of the study course. The number and type of mid-term examinations are specified in the course description. In order to obtain a grade for the course, the student must obtain a passing grade in the examination. For most study courses, the passing grade in the mid-term examinations is required for the student to be allowed to sit the examination. If a passing grade in each mid-term examination is not obligatory for students to be admitted to the examination, this condition shall be stated in the course description. A course may be graded as passed even if the examination is failed, but this condition shall be specified in the course description. The overall grade for the course shall be calculated in the UL e-learning environment according to the algorithm specified in the course description and taking into account the grades obtained in the mid-term and final examinations.

Attendance requirements may also be set according to the specific nature of the study course. For example, in the first year of the BSP "Biology", attendance at laboratory and practical work is compulsory.

Each study course is concluded with a final examination: examination or defence (for coursework, final project, term paper, field course, practice). The procedure for the defence and assessment of the course work, final project, term paper, field course, and practice is set out in the UL regulations.

Learning outcomes are assessed on a 10-point scale. If allowed by external regulations, the study results may be evaluated as "pass" or "fail" with the permission of the UL Vice-Rector. A course is considered to have been successfully completed, i.e., a pass grade is achieved, if the grade on a 10-point scale is not lower than 4 (almost average) or is a 'pass'. In this case, the student receives credits for the completion of the course.

For the assessment of students' knowledge, skills, and competence in each study course in the 10-grade system, the study result criteria described beforehand are used. The basis for formulation of criteria is learning outcomes formulated in each study course and explanations of assessments, which is published in *the Procedure for the Development and Actualization of Study Courses at the University of Latvia* (the UL Order No 1/277 of 10.08.2018).

The needs of students and the relevance of assessment methods and procedures to the achievement of the objectives of study programmes are analysed and developed, considering the experience of academic staff, by analysing learning outcomes achieved by students and the results of surveys conducted over several academic years. In the surveys, students recognise the importance of clearly formulated intended learning outcomes and defined assessment criteria, as well as the regular feedback on students' achievements in the study process. To ensure this, the academic staff systematically analyse their experience, collaborate with colleagues, analyse students' achievements, and improve course descriptions and e-study environment by developing assessment criteria that corresponds to the intended learning outcomes, thus providing the basis for the assessment.

Evaluating learning outcomes, the basic assessment principles formulated in the regulations of the Cabinet No 141 *the Regulations Regarding the State Standard for First Level Professional Higher Education* (20.03.2001), No 512 *the Regulations Regarding the State Standard for Second Level Professional Higher Education* (26.08.2014) and No 240 *the Regulations Regarding the State Standard for the Academic Education* (13.05.2014) are observed:

- **the principle of openness of the assessment** – the UL has established a set of requirements for evaluating learning outcomes in line with the aim and objectives of the study programme as well as the aim and objectives of study courses;

- **the principle of the possibility of reviewing the assessment** – the UL has established the procedure for reviewing the obtained assessment;
- **the principle of mandatory assessment** – it is necessary to obtain a positive grade on completion of the entire study programme content;
- **the principle of the variety of types of assessment used in the grading** – different assessment types are used in the assessment of the study programme;
- **the principle of conformity of assessment** – during the assessment student is given an opportunity to demonstrate knowledge, skills and competence in relevant tasks and situations. The content included in assessments corresponds to the content specified in the course programmes.

The basic criteria for the assessment of graduation examinations are determined in the *Requirements for Elaboration and Defending of the Graduation Papers (bachelor's, master's, diploma, and qualification papers) at the University of Latvia* (the UL Order No 1/38 of 03.02.2012). Additional criteria may be determined for the assessment of graduation papers, which are approved by the respective Faculty Council on a proposal from the relevant Study Programme Council.

The FB Council has approved the methodological guidelines "[Presentation of Practice Reports, Course Papers, and Bachelor's and Master's Theses](#)" (document in Latvian), which provide students with additional information on the requirements for the presentation of final papers. It should be noted that practice reports refer to course reports produced by 1st and 2nd year students after training in biological field methods.

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

The UL in its activity respects the principles of fair and responsible conduct as stipulated in the *Academic Ethics Code of the University of Latvia* (the UL Senate Decision No 2-3/46 of 26.04.2021) (see hyperlink in the annex 1B for chapter 1.2.) and in the *Regulations on Academic Integrity at the University of Latvia* (the UL Senate Decision No 2-3/48 of 26.04.2021) (see hyperlink in the annex 1B for chapter 1.2.); these regulations are publicly available to staff of the UL and its students.

The most frequent violation of the principles of academic integrity in the study process is the submission of identical examination reports by two students. Such cases have been found, for example, in the BSP "Biology" study course "Physics for Natural Sciences". The course lecturer reported the violation to the Faculty Dean, and the Dean's decision was to annul the grades for the tests in question and to have students re-sit the tests.

To prevent violation of academic integrity, in accordance with the order *On the Plagiarism Control (Par plaģiāta kontroli)*, the UL Order No 1/125 of 22.04.2014) (available only in Latvian, see section *Other annexes*) the UL has created the *Unified Computerised Plagiarism Control System* (hereinafter – the System). The System verifies students' graduation papers and doctoral thesis, as well as the *Procedure for Cases in Which, Performing Electronic Identification, Signs of Plagiarism are Detected in the Study Work (Procedūra gadījumos, kad, veicot elektronisko pārbaudi, studiju darbā konstatētas plaģiāta pazīmes*, by the UL supplement to Order No 1/125 of 22.04.2014) (available only in Latvian, see section *Other annexes*) is developed, which establishes further course of action in the event of plagiarism



The UL as the developer of this System and its operator constantly updates the System and provides other HEI with the opportunity to use the System based on a cooperation agreement. In accordance with the cooperation agreement concluded in the 2014, this System is used by seven HEI in Latvia since the beginning: Daugavpils University, Liepaja University, Latvia University of Life Sciences and Technologies, Rīga Stradiņš University, Rēzekne Academy of Technology, EKA University of Applied Sciences and RISEBA University of Applied Sciences. Since 2014, the Alberta College, Baltic International Academy, BA School of Business and Finance, Turība University, ISMA University College, Jāzeps Vītols Latvian Academy of Music, Jēkabpils Agribusiness College, College of Law, Latvian Maritime Academy, Latvian Academy of Culture, Latvian Academy of Culture agency "Latvian College of Culture at the Latvian Academy of Culture", Malnava College, Riga Building College, Vocational education competence center "Riga Technical College", Riga Technical University, State Agency for Social Integration College, Cosmetology College, State Police College, Ventspils University College, Vidzeme University of Applied Sciences, and Academy of Luther has joined in the use of the System; in total the System is being used by 30 HEI.

The system automatically compares the uploaded graduation papers of the UL with study papers of previous years (starting from 2005) from UL and other HEI, and in the event of a certain percentage match, the authorised persons from faculties are sent an overview of these test results, whereby the same text snippets from different authors are simultaneously viewed. The authorised persons pass this information on to the respective study programme director, the appointed supervisor and reviewer for review and, in the event of a suspected breach of academic integrity, pass on the results of the analysis to the respective Graduation Examination Commission for final consideration.

The most typical example of violations of the principles of academic integrity in the study programmes of the study field is self-plagiarism, when a Master's Thesis has a text overlap with the Bachelor's Thesis of the same student, in case the Bachelor's and Master's Theses are on similar topics. The Director of the Study Programme and the Dean receive information on all such cases from the System, and they deal with it on an individual basis, if necessary, also informing the Final Examination Commission, the supervisor and the reviewer about the situation. Given the specific nature of research in biology, with the same research methods and laboratory protocols described in standard phrases, a textual match in the materials and methods section is not considered a breach of academic integrity. The Final Examination Commission assesses the amount of work done, the quality of the obtained results and analysis, and the quality of the discussion. In some cases, the System identifies papers with a small proportion in English and Latvian. This is due to the extensive use of discipline-specific terminology and abbreviations in Master's Theses, which are not recognised by the system as English or Latvian words. There have been cases of plagiarism in Bachelor's Theses written in the BSP "Biology". In all the Bachelor's Theses written during the reporting period, there were found two matches with research reports published by the LSFRI "Silava". In both cases, the Institute provided confirmation that the author of the Thesis works at the Institute and is also the author of the specific chapter in the research report. The cases were considered admissible, and the final Theses were successfully defended. In two cases, plagiarism was detected in relation to previously defended Bachelor's Theses. In these cases, the supervisors, the Heads of the Departments and the students were informed of the situation, and the defence of the final Theses was withdrawn.

The cooperation of several HEI in the field of using the System promotes more effective control of study works in each HEI and Latvia overall. This System is a unique collection of study papers in Latvian, it is financially and technologically available to even the smallest of HEI, and successfully performs its functions in practice by promoting the originality of final theses and their quality.

Despite the successful application of the System described above, for University of Latvia as the university of science the direction of scientific activity is always important, e.g., scientific publications, citation frequency and reputation in the international science field where English is the dominating language. Therefore, the essential element in this direction is to verify the originality of the submitted manuscript before publishing in the University of Latvia Press or journals or collections of articles of other academic press, which can be achieved only with such instruments that have access to the restricted or paid databases of international publishing houses. Currently, the only tool in the world that can provide such an opportunity is Turnitin LLC's "Turnitin Similarity" service.

In parallel to that, "Turnitin Similarity" can ensure more of the functionalities that the System maintained by the UL cannot offer due to its architecture and scaling limits, namely, the possibility to integrate the text originality tool into the e-study platform and provide access to the tool for academic staff to verify the originality of regular study papers.

Lastly, text translation and creation technologies, which with the assistance of machine learning and artificial intelligence tools, create new challenges for the verification of the originality of the texts submitted during the study process, are gaining popularity and cause an uproar in the media around the world and in Latvia. Only the collective competence, trained language models and computing power of global companies such as Turnitin LCC allow us to respond to the new language technology challenges effectively and promptly for the study and scientific environment, which is why in the 2022 the UL, after carefully evaluating and testing the solutions available on the market, came to decision on the need to supplement the already existing plagiarism control system with a tool necessary to the academic and scientific community of the UL.

16.12.2022. UL concluded an agreement with the company Turnitin LLC for the implementation and use of the anti-plagiarism tool for the needs of the UL.

The following plan has been developed for the implementation of the process in the UL:

January 2023 – delivery and testing of the plagiarism system in the UL e-study environment with the aim of technically testing the delivered system.

February 2023 – user training for working with the system, seminars, etc.

March 2023 – piloting in the production environment of e-studies.

April-June 2023 – system tests and elimination of the imperfections of the process.

September 2023 – fully completed implementation of the system and handing it over to the UL users.

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

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

The functioning of a sustainable study programme that meets the objectives of the UL study field

and study programme is ensured by systematically defining and implementing quality assurance procedures, including continuous monitoring and analysis of the implementation of the study programme, the use of measurements for the prompt implementation of preventive and improvement measures. The provision of management levels involved in the quality assurance of the study programme allows to implement the programmes in a predefined form according to predefined procedures, reacting promptly to changes in the situation, with quality-related decisions being taken collectively or according to the division of competence. An important methodological tool for quality assurance is *the Quality Management Handbook of the UL*, which identifies in detail the practice of the UL in ESG implementation.

The following activities are the most relevant for the implementation of quality improvement measures within the internal quality assurance system:

The internal quality assurance system of SF LS fully complies with *the UL Quality Management Handbook*, and external and University of Latvia normative acts and regulations. The internal quality assurance system is implemented through cooperation between the FB and the administrative departments of the UL. On the FB side, the responsible for the internal quality assurance system are the Dean of the FB, the FB Council, the SF LS Council, study programme directors, individual lecturers and methodological staff. A hierarchical structure is imposed, and it ensures several levels of quality control. The content of the study courses is the responsibility of individual lecturers and is controlled by the SF Council, the FB Council, and the UL Academic Department. The responsibility for dropouts and achievements lies with the individual lecturers, the Directors of the Study Programme and the Head of the SF, as well as with the Dean. Cooperation between all stakeholders is organised in the form of formal meetings, the frequency of which is determined by the normative acts and regulations, as well as informal events, such as meetings of heads of departments with the participation of the Dean and programme directors, or academic seminars with broad participation of academic and general staff. Decision-making is efficient, facilitated by the extensive use of electronic document circulation in the FB, as well as by the organisation of electronic voting and remote meetings. The implementation of the SF LS is carried out in close cooperation with other UL faculties, as well as with Latvian and foreign research institutes. Thus, the Council of the SF LS contains employers' representatives from scientific institutes. Moreover, several faculty members of the FB are researchers and senior researchers in Latvian scientific institutes. This contributes to the implementation of the latest scientific findings into the study process, the provision of good level laboratory work for students, as well as opportunities for the development of final Theses at partner institutions, which then also serve as employers for SF LS graduates.

To ensure the quality of the BSP "Biotechnology and Bioengineering" as a joint study programme, a study programme council has been established, which includes programme directors from the UL and RTU, as well as vice-rectors of both universities. The joint programme council considers issues related to the planning of the study programme, student enrolment, and problems identified in the implementation of study courses.

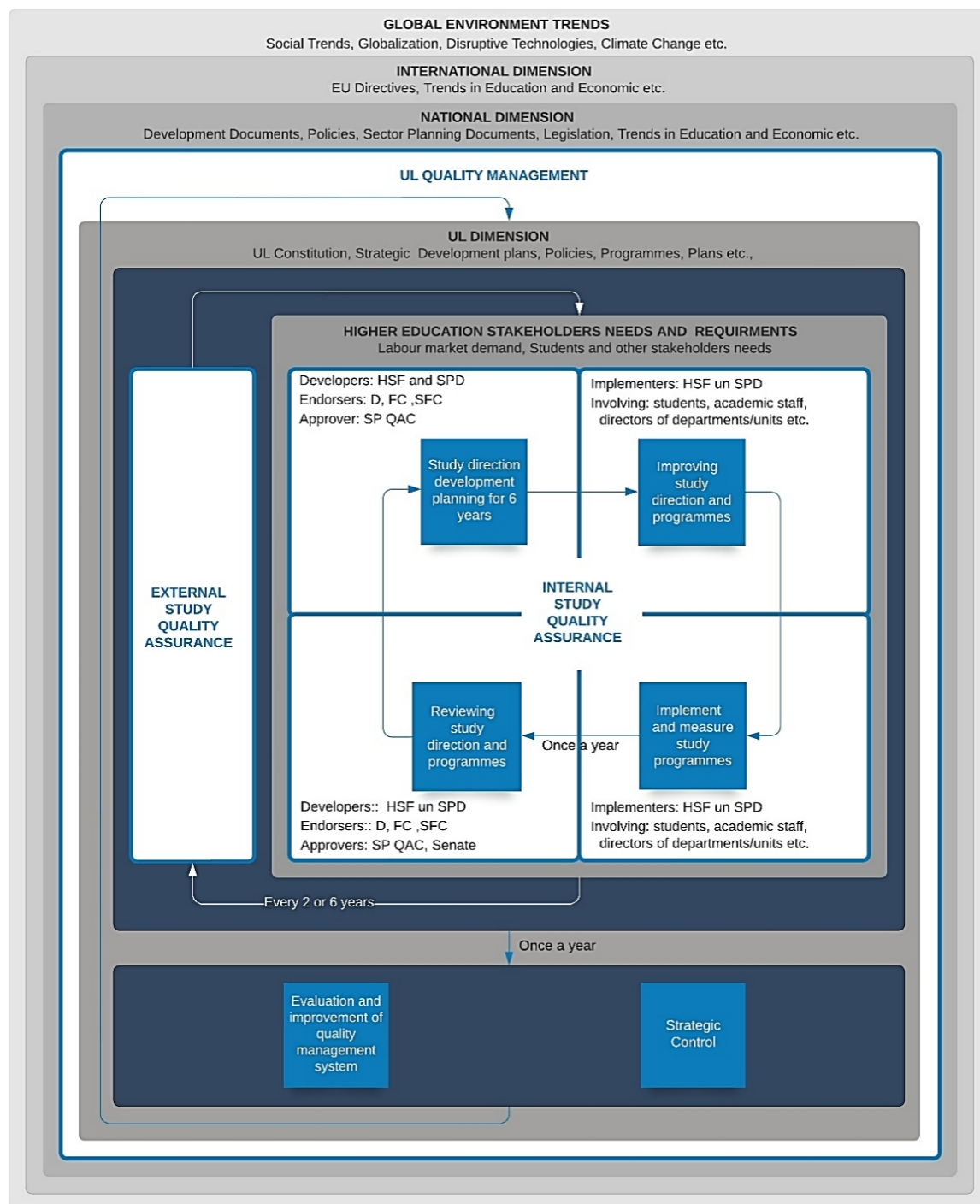
**2.2.2. Analysis and assessment of the system and the procedures for the development and review of the study programmes by providing specific examples of the review of the study programmes, the aims, and regularity, as well as the stakeholders and their responsibilities. If, during the reporting period,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

**Normative regulations, where the procedure and actions that should be followed during the creation and revision process of study programmes are stated in the:**

- [Regulations on University of Latvia Study and Continuing Education Programmes](#)
- [The UL Procedure for Preparation of Annual Study Field Reports](#) (available only in Latvian)

The quality of the study field and its study programmes is managed through a *Plan-do-check-act* or Deming cycle, planning the development and improvement of the field of study over a six-year period, cascading its goals and objectives down to the level of each study programme and regularly monitoring the requirements of stakeholders for effective planning, needs and proponents, in accordance with *the UL Strategy 2021-2027*, taking into account national and international sectoral policies and trends, as well as the impact of global environmental trends on the activities of the UL up to the level of study programmes.

Within the framework of **the UL Study Quality Assurance System** (see Fig. 2.2.2.1), the development of the study field and the interconnection of study programmes, the establishment of new study programmes, as well as the results of each existing study programme are planned, monitored, evaluated, and reviewed, ensuring the involvement of all levels of the study field management in the quality assurance of studies, as well as representatives of key stakeholders. The review of study programmes is regulated by the procedure established in *The UL Procedure for Preparation of Annual Study Field Reports* (approved by the UL Order No 1/255 of 13.07.2018).



**Abbreviations:**  
HSF - Head of Study Field; SPD - Study Programme Director;  
D - Dean; FC - Faculty Council; SFC - Study Field Council;  
SP QAC - Study Programme Quality Assessment Commission

Figure 2.2.2.1. The quality assurance system for the study fields implemented by the UL and study programmes included in it

The development of new study programmes is regulated by the *UL Regulations on Study Programmes and Continuing Education Programmes* (approved by UL Senate Decision No. 102 of 24.04.2017), and carried out in several stages, including coordinating and evaluating twice at all levels of the administration involved in the quality assurance of studies - by coordinating and approving the study programme conception, as well as by coordinating and approving the study programme description at the end of the process. For a detailed description of the content of the programme development and concept, see *the Quality Management Handbook*, Chapter 3.1, Section II.

In the process of self-evaluation and evaluation of the development of new study programmes,

responsibilities are divided between the study programme directors, the Director of the Study Field, the Study Field Council, the Faculty Council, the Academic Department and the Study Programme Quality Assessment Commission, as well as the Senate.

The UL heads of study fields in cooperation with study programme directors, prepare Annual Study Field Self-Assessment Reports (hereinafter – Self-Assessment Report) every academic year (except periods when the respective study field is involved in the re-accreditation process). Self-Assessment Reports are approved by respective Study Field Council and Faculty Council and submitted to the Academic Department. The Academic Department evaluates the compliance of the self-assessment report with the requirements and directs it for evaluation in the SP QAC composed of all vice-rectors, the Chair of the UL Senate Academic Committee, the UL Students' Council representative, the UL Alumni Club representative, the Library of the UL representative, the Quality Manager, the Internal Auditor, as well as representatives of the Academic Department and the Department of Study Service. Self-Assessment Reports reflect implementation and development of the study field, and its programmes, quantitative indicators and survey results are analysed, as well as proposals for improvement of the study field are provided. In the process of reviewing the study field, as well as during development of new study programmes, the Academic Department provides an independent expertise and ensures the inclusion of substantiated proposals by the said expert. Accreditation self-assessment reports are prepared using the annual self-assessment results. The recommendations of the Accreditation and Licensing Evaluation Expert Group and the SP QAC are evaluated by the respective Study Field Council, preparing a plan for the implementation of expert recommendations, which is agreed with the SP QAC. More information on the content of the self-assessment of study programmes and the process of ensuring external accreditation in Sections IX and X of Chapter 3.1 of *the UL Quality Management Handbook*.

The implementation of the SF LS is carried out in accordance with the external and internal normative acts in close cooperation with the SF Director, the SF Council, the FB Council, the directors of the study programmes, and the involved academic and methodological staff. The most significant change in the SF LS is the creation and licensing of a new academic BSP "Biotechnology and Bioengineering". This is a joint study programme with Riga Technical University, which started enrolling students in 2020. It should be noted that currently the study programme has 69 students, most of whom study at their own expense. The results of the course surveys show that students are satisfied with the content and delivery of the courses, even though the programme was launched during the COVID-19 pandemic and most of the time students have been studying remotely. In addition, in 2018, a new subfield "Bioinformatics" in the MSP "Biology" was developed in cooperation with the UL Faculty of Computer Science. The need for the development of biotechnology, bioengineering and bioinformatics was repeatedly highlighted in student and employer surveys, as well as having assessed the development of equivalent fields in the Baltic States and worldwide.

The expert assessment of the previous self-assessment reports has pointed at the need to reduce student attrition at both BSP and MSP level. In order to address this issue, changes have been made to the structure of both the BSP "Biology" and the MSP "Biology". To reduce the student load and increase the proportion of biology courses in the first year of study, the BSP "Biology" has reduced the number of study course CPs in the first year of study. A number of narrowly specialised elective courses with relatively low student interest have been closed, while new courses in topical subfields of biology have been created. The majority of elective courses in speciality in the MSP "Biology" are taught every two years, thus ensuring both efficient use of the programme's resources and providing students with the opportunity to study a rich range of elective courses.

The low number of foreign students is also noted, which is not surprising given that all the SF LS study programmes are conducted in the state language. Although there are a number of study

courses that are also offered in English, the simultaneous delivery of these courses in both Latvian and English is an additional burden for some ERASMUS students, while local students often request to study in Latvian. At the same time, it should be noted that the number of lecturers with English language skills at C1 level (SAM 8.2.2 project), as well as the number of lecturers who are native speakers of English has increased. In the future, it is planned to implement the BSP "Biotechnology and Bioengineering" also in English, which could increase the number of foreign students.

The number of students going on Erasmus+ exchange trips has also decreased during the reporting period. This could be due to several reasons: 1) a general decrease in the number of students; 2) students' employment in paid work; 3) the low level of Erasmus+ grants in EUR does not correspond to living costs; 4) the modern study and research infrastructure at the Academic Centre and the quality of the studies convince students that everything they need can be learnt locally. Many of these factors cannot be addressed within the Study Field, in particular demographic and financial considerations. However, the SF LS has made changes to study plans to improve the opportunities for exchange students. It is also hoped that the new homologation procedure will facilitate the recognition of Erasmus+ courses.

The expert assessment also highlighted the decline in the number of students, especially in the MSP "Biology". The reasons for this decline are discussed in more detail in the self-assessment report of the programme concerned, but it should be briefly pointed out that the number of students is now much more in line with the number of state-funded places in the MSP "Biology". The number of students will certainly be stabilised by the graduates of the BSP "Biotechnology and Bioengineering" who will be able to start their studies in the MSP "Biology" from 2023. There is also interest in the MSP "Biology" shown from graduates of other related study programmes and universities, which, on one hand, allows to increase the number of students, but, given the students' uneven knowledge in biology, requires additional work of lecturers to compensate for the gaps in knowledge.

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

UL, in keeping with the principles of democracy and equality, and in line with *the UL Quality Assurance Policy*, in all stages of the study process, from admissions to final examinations, ensure the participation of applicants and students in the evaluation of the UL study process. In matters relating to the admission procedure, UL applicants have the right to lodge complaints with the Chairman of the Admission Board.

The right of UL applicants to lodge complaints regarding irregularities in the admission procedure are governed by the *Terms of Admission at University of Latvia* (the UL Senate decision No 2-3/68 of 31.05.2021), specifying the procedures for the lodging, processing, and appeal of the complaint.

However, to improve the quality of studies, students have the right to submit proposals and complaints concerning the study process and quality, the quality of material supply, duty fulfilment of the UL employees, service culture and cooperation, as well as dishonest or unethical actions from

the UL employees.

To ensure the quality of the study process, in 2022 the UL reworked *the Procedure for the Submission and Resolution of Students' Proposals* and of 2002 and replaced it with *the Order of Submitting and Examining Proposals and Complaints of the Students* (the UL Order No 1-4/501 of 28.09.2022.) (hereinafter – the Procedure). This Procedure defines the form in which students, individually or in a group, can submit proposals and complaints, as well as its registration and reviewing order. Proposals and complaints can be submitted to faculty deans or vice rectors (in case they concern the deans work or if the submission may unfavourably influence the future of studies). The Procedure stipulates that replies to proposals and complaints are to be submitted within the deadline set in [the Law on Submissions](#). It should be noted that this Procedure states that faculty deans and vice rectors submit the report on received proposals and complaints, as well as the decisions made regarding them in the previous academic year, to the UL Quality Manager by the end of each academic year. The UL Quality Manager assesses those reports, analyses tendencies, and prepares report to the Management of the UL. The established process demonstrates the internal control mechanism and cyclic monitoring of submission of complaints, decision making, respect to students' rights and interests, which is essential in ensuring acceptable functioning of this system as well as its possible improvement.

To fully evaluate the UL study processes, the *Procedure for Organisation of Examinations in Study Courses at the University of Latvia* (UL Senate Decision No.211 of 29.06.2015), which stipulates the right of students to submit complaints about the procedural or assessment order of the mid-term examinations and examinations in study courses, and the procedure for consideration of such complaints. The student has the right to submit a complaint to the lecturer who has assessed the examination within five working days from the date of notification of the assessment in ULIS (provided that prior to submitting the complaint the student has requested from the lecturer a justification for the assessment). The lecturer must consider the application within 5 working days. If the lecturer considers that the student complaint is not reasoned, they shall refer the complaint to the Head of Department for consideration and decision.

As regards the evaluation of graduation examinations, *Regulation on graduation examinations at the University of Latvia* (the UL Senate Decision No 183 of 27.12.2011), which stipulates that the students are entitled to appeal if the dean has not given them permission to take the graduation examinations or to appeal against the graduation examination procedure.

The UL also has an Academic Court of Arbitration, whose regulations provide for the opportunity to apply to this collegial institution for any study-related issues, including control over adherence to the principles of assessment.

The students have the right to appeal against the UL order on the exmatriculation in conformity with the *University of Latvia state budget subsidized study place competition (rotation) procedure* (the UL Senate Decision No 381 of 24.05.2010). In its turn, *the Study Fee Relief Procedure* (the UL Order No 1/89 of April 14, 2009) provides students with an opportunity to appeal against decisions on granting or refusing tuition fee discounts within one month from notification issued to the student by submitting a written application addressed to the Rector of the UL, to be considered by the Rector within one month.

Whereas *the Procedure for Granting an Academic Leave of Absence in the University of Latvia* (the UL Senate Decision No 178 of 01.12.2008) provides for the right to appeal against the decision of the dean refusing to grant a student the academic leave of absence. Also, *the Procedures for the Initiation of Studies in Subsequent Study Stages at the University of Latvia* (the UL Order No 1/128 of 08.06.2009) provides for the right to appeal within a specified period against the decisions made by the dean.



In compliance with the rights of students also outside the study process, for those students who use the UL student hotels, *the Internal Regulations of the Dormitories of the University of Latvia* (the UL Order No 1/171 of 30.06.2009) define the rights and obligations of students, including the right to submit complaints about problems in student hotels. These issues are addressed by the superior of a student hotel.

Every student has the right not only to use the right provided by *The Academic Ethics Codex of the University of Latvia* (the UL Senate Decision No 2-3/46 of 26.04.2021) to address the Academic Ethics Committee of the UL about possible ethical violations, but also to submit proposals for improvement of the Code and its implementation to the Academic Ethics Committee of the UL.

The proposals and complaints are registered with the departments or commissions where they are submitted, as well as outcomes of the enquiry taken and respective resolutions.

At the normative level, *the Regulations on Visiting Students from the Latvian Higher Education Institutions* (the UL Order No 1/17, 25.01.2006) have defined the principle that visiting students also have the same rights and obligations as students at the UL, which means that the system of submission and consideration of complaints and proposals is applicable to these students.

It follows from the above that the centralised segment of the UL complaint and proposal submission and review system covers all the components of every student study life as it applies to enrolment at the UL as well as the full-cycle studies, final examinations, etc.

The SF LS has a relatively low number of student complaints, which is also consistent with the results of student surveys and the high evaluation of lecturers and courses. Conflict situations are resolved as quickly as possible to prevent escalation. Given the relatively small number of students and the low student/teacher ratio, lecturers can focus on individual students and their requirements or needs, thus preventing conflicts from developing. Perhaps the biggest conflict was experienced in the early stages of the COVID-19 pandemic in 2020, when the transition to online learning took place. This was a new experience for both lecturers and students, which inevitably created problems given the lack of internet connectivity for students, the lack of experience in using MS Teams for lecturers, etc. The study process may have been marred by formal irregularities on the part of lecturers, who allowed final examinations to be taken before the successful completion of the mid-term examinations. This leniency of the lecturers was used by the student as a basis for a complaint in order to obtain a passing grade in one of the MSP "Biology" courses. Given that the student had not mastered the course sufficiently well and that the mid-term examinations were not of satisfactory quality, the student was given an unsatisfactory grade, which led to a series of complaints involving the Department of Studies (now Academic Department), the UL Ethics Commission, and the Educational Quality and Management Service. Without detailing the outcome of the specific complaint, in the SF LS, conclusions have been drawn and stricter compliance with formal requirements in mid-term and final examinations have been ensured.

It is also traditional for students to complete questionnaires for each course of study upon its completion. The results of these surveys are analysed by the programme directors, the SF Director, the Dean, and the lecturers concerned if the results are significantly lower than those of other lecturers. These informal discussions among the administrative and academic staff of the SF LS are an effective means to successfully resolve problems of study quality.

#### **2.2.4. Provide information on the mechanism for collecting the statistical data, as developed by the higher education institution/ college. Specify the type of data to be collected, the regularity of collection, and the way the information is used to improve the**

**study field. Describe the mechanism for obtaining and providing feedback, including with regard to the work with the students, graduates, and employers.**

To control, analyse and forecast the dynamics of the number of students, the UL collects data on:

- characterising number of applicants and matriculated students and their profile, such as secondary education institution, year of graduation, assessment obtained in secondary education examinations, age, gender, previous higher education and the assessment obtained in its examinations;
- number of students, broken down by faculties, study programmes, study levels, study years, forms and types of studies, source of financing for studies, status of studies – exmatriculated as having not completed the academic obligations, exmatriculated as having not settled the financial obligations, exmatriculated as a degree holder (graduate), on academic leave of absence.

To control the progress of student's studies and the implementation of the programme, the UL collects data on:

- interim assessment and final examination of student's study courses, broken down by type of assessments, final results of final examinations, weighted average grade;
- completion of the study programme, in accordance with the requirements set for the acquisition of the programme, broken down by study semesters, parts of the programme (Compulsory part, Restricted elective courses, Elective courses and others, according to the structure of the programme);
- students' academic debts in credit points by study semesters, parts of the programme, study courses;
- fulfilment of the tuition fee schedule provided in the student agreement, broken down by study programmes and semesters.

To obtain information for planning and efficient use of study resources, the following statistical information is collected in connection with study programmes:

- financing of study places, broken down by state-funded, the UL funded and student-funded study places;
- the number of student scholarship recipients and the number of study and student loans.

To prevent violations of the principles of academic integrity in the UL students' graduation papers and promotion papers, the UL ensures automatic review of all submitted graduation papers and promotion papers using the System, making a mutual comparison with the graduation papers of the UL and other HEI accumulated in the System.

To evaluate the satisfaction of students, graduates and employers with the study quality and its results, as well as to implement the necessary improvement measures, the UL regularly organises and compiles data from the following surveys:

- a survey on study courses and work of teaching staff;
- a survey at the start of studies;
- a survey of first-year students on study experience;
- a survey of final-year students on study experience;
- a survey of students, who discontinue studies;
- graduate survey;
- employers survey.

**A survey on study courses and work of teaching staff** is implemented for all students. With this survey the UL can learn the students' opinion on the content of relevant study courses in the specific semester and provides assessment of the teaching staff's work. The information obtained through this survey helps to improve the study process, eliminating imperfections and improve the study quality.

**A survey at the start of studies** takes place in the ULIS once per academic year. The purpose of the survey is to gather information to improve student recruitment activities. The objectives of the survey are: (1) to find out the motivation of students in their choice of university and study programme, (2) to find out the sources of information about studying at the UL, (3) to obtain an evaluation of the application and registration process, and (4) to find out the socio-demographic portrait of the respondents who have started their studies. The data collected for each study programme are aggregated in LUIS, while for the UL as a whole, the data are collected and analysed by the Academic Department.

**A survey of first-year students on study experience** which is also conducted electronically once a year. The aim of the survey is to obtain information for the improvement of the study environment and for the enhancement of student adaptation. The objectives of the survey are: (1) to find out students' views on different aspects of their studies, and (2) to find out students' views on the support they need when starting their studies. The data collected for each study programme are aggregated in ULIS, while for the UL as a whole, the data are collected and analysed by the Academic Department.

To obtain students' evaluation of the study programme for its further development and improvement of the study process, quality and study environment, **a survey of the final-year students on study experience** is conducted. The survey is conducted in electronic form for each study programme once a year. The data collected for each study programme are aggregated in ULIS and made available to the programme directors and the Dean of the Faculty. Data analysis is carried out by the programme directors, the Dean, and necessary improvement measures are proposed by the programme directors, the Dean, and the Study Programme Council. The results are used in the preparation of annual reviews of the Study field, in self-assessment reports for accreditation and re-accreditation of the Study field, as well as in the preparation of study programme development plans.

To ascertain main reasons for study discontinuation and to promote the decrease of student dropout rate, **a survey of students, who discontinue studies** is conducted. The survey is conducted throughout the academic year electronically (in some cases on paper). The data is collected and analysed by the Academic Department on a semester basis. The results of the survey are presented to the UL management and to the Faculty management.

The aim of **the graduate survey** is to obtain an evaluation of the satisfaction of graduates regarding the quality of the programme, the knowledge, skills, and competences acquired at the UL, the contribution of the programme they graduated to their employment, as well as their plans to continue their studies. The survey is carried out by programme directors at their discretion using a questionnaire prepared by the Academic Department.

**The employers survey** aims at finding out how employers perceive the relevance of the knowledge, skills and competences acquired by the UL graduates to the requirements of the labour market. The survey is carried out by the programme directors at their discretion using a questionnaire prepared by the Academic Department.

Survey results published on the *My Portal* are available to every student and employee of the UL with the username and password assigned to them. However, accessibility of the summary of

survey results on the ULIS is different for various user groups. Moreover, similarly as students' grades some of the survey results, for example, assessment of study courses and work of teaching staff, is restricted access information.

Surveys on study courses and work of the teaching staff are fully available to each respective member of teaching staff about their own implemented study course; to programme directors – about teaching staff and heads of teaching staff departments (head of department or subdepartment, head of study field, vice-dean, and dean), as well as the UL SC and student self-governments of faculties.

The rest of surveys—a survey at the start of studies and surveys on student experience—summaries of results about their own study programme are available to students and programme director; on study programmes attached to the position – head of department or subdepartment, head of study field, vice-dean, and dean. Summaries of survey results on their own faculty are fully available to student self-governments of faculties, and on all study programmes to the UL SC.

Each year the head of the study field in cooperation with the study programme directors prepares a report on the operation of the study field and the programmes therein during the academic year. In the preparation of the report, statistical data is collected and analysed, and the obtained information is used for the evaluation and improvement of the study field.

In general, the results of student surveys are an important source of information to evaluate the overall quality of the study programme, the study environment, as well as to evaluate each of the study courses and lecturers individually.

The results of the course surveys are used to improve the programmes, to regularly update the courses of study, to evaluate the content of the topics, to avoid duplication, to introduce new forms of learning in the courses of study, for example, to introduce new laboratory work aimed at improving the research skills of the students.

Study course surveys, in which students evaluate both the course of study and the lecturer, have led to the conclusion that changes in the study plans are necessary; for example, in the BSP "Biology" the course of study "English II" was excluded from the study plan because of low interest of students in this study course and low grades for this course. Based on the evaluations of the course "English I" (BSP "Biology") and student feedback, discussions have been held with the lecturer on the way and content of the course, which has resulted in higher course evaluations in recent years. Student feedback on the course "English I" was also the basis for the decision to no longer make this course mandatory for all BSP "Biology" students. Student critical feedback on the courses has also been the basis for replacing lecturers in several courses. For example, such changes have taken place in the BSP "Biology" course "General Biology: Introduction to Cell Biology" and in the MSP "Biology" course "Basic Skills for Innovation Activities".

The graduated and employer surveys are the basis for understanding the ability of study programmes to prepare graduates for the labour market. For example, based on alumni and employer assessments of alumni knowledge and skills in data analysis, the course "Practical Biometry for Biologists" of the MSP "Biology" was moved from the Restricted Elective Part to the Compulsory Part.

**2.2.5. Specify the websites (e.g., the homepage) on which the information on the study field and the relevant study programmes is published (in all languages in which the study programmes are implemented) by indicating the persons responsible for the compliance of the information available on the website with the information published in the official**

## **registers (State Education Information System (VIIS), E-platform).**

The target audience of the UL website <https://www.lu.lv/en/> (hereinafter - the Website) is prospective and current students, employees, cooperation partners, researchers, and general public.

The Website is designed to make available and to store public information, enabling visitors to access information about the UL activities in a digital form on the Internet.

The Website consists of the following sections:

- ROTATING NEWS – essential information of the UL through the visual identity of the UL, which has certain parameters and strengthens the image of the University and promotes its visibility in the digital environment.
- NEWS AND EVENTS – current affairs and planned events at the UL. The information is prepared by the Department of Communication in coordination with other UL structural units.
- DISCOVER UL – Information about studies, extracurricular activities, science.
- STUDIES – with subdivisions:
  - College study programmes;
  - Bachelor's study programmes;
  - Master's study programmes;
  - Doctoral study programmes;
  - Residency

The information is prepared and posted on the Website by the Department of Communication in cooperation with the Academic Department and the Department of Study Service.

The STUDIES section in Latvian provides information on programme goals, objectives, learning outcomes, programme volume and duration, programme study language, information on job opportunities after graduation, as well as programme study plans. In case of questions, contact information is provided for further information. This section also publishes study-relevant information under the heading STUDY PROCESS – academic calendar, lecture timetable, tutorials, key documents and sample forms, information on mobility at HEI, recognition of experience/education, lifelong learning opportunities as well as references to the UL e-study environment and the ULIS.

The section contains information about the offers of the Library of the UL, information of the Career Centre, activities of the Students' Council.

The two subsections STUDENT LIFE and EXTRACURRICULAR ACTIVITIES inform both existing and prospective students about student hotels, catering, parking and bicycle parking, mentor support, and information for people with disabilities. There is a wide range of information on how to enrich one's extra-curricular life with sport, culture.

The ADMISSION section contains information for pupils, prospective and existing students. In this section, the pupils can get acquainted with the events and creative competitions organised by the respective faculty, the participation wherein and successful performance can give additional admission points. The prospective students may be introduced to the information on all levels of programmes, admission requirements, loans, and scholarship information, as well as opportunities for the renewal of studies on the Website. The prospective students will be able to familiarise themselves with the most frequently asked questions and answers, information on the Career Centre activities, preparatory courses, and classes for pupils.

Other Sections – *Science, Cooperation, About Us*, provide more information about the UL activities in research, projects, conferences, cooperation partners, normative acts, strategy, etc.

The Website <https://www.lu.lv/par-mums/dokumenti/pasnovertejuma-zinojumi/> (available only in Latvian) contains Annual Study Fields Self-Assessment Reports.

The Websites of the structural units (faculties) prepare information on the programmes offered by the respective faculty and on the scientific activities of the faculty. Content blocks are the same as the ones on the UL official site, but more specific information is posted directly about the respective faculty activities.

The FB website (<https://www.bf.lu.lv/en>) has changed significantly since the previous accreditation period. It provides information for applicants, students, staff, and other interested parties. The main sections of the website are similar to the overall system of the UL website: NEWS, ADMISSION, STUDIES, RESEARCH, COOPERATION, ABOUT US. The section ADMISSION at the FB contains information about the study programmes implemented by the Faculty, an informative text "Why to study at the FB" and a link to the School of Young Biologists, which offers activities for school students. The STUDIES section is intended for current students; it contains links to the current timetables of classes, academic calendar, office hours, information about opportunities to study abroad, information about scholarships governed by the University of Latvia Foundation and their beneficiaries from the FB, as well as conventions for writing final Theses. The RESEARCH section contains information on the projects implemented by the faculty, major publications, and dissertations defended at the FB. This section also contains information on the Biology section reports at the UL International Scientific Conference, and a link to the journal "Environmental and Experimental Biology", which is under the responsibility of the FB. The main cooperation partners of the FB in Latvia are listed in the COOPERATION section. The ABOUT US section contains basic information about the FB, its history, faculty, the field training site in Kolka and contacts. There is also a link to the FB Student Self-Government website, and a link to the news. This section also contains a link to the annual FB photo competition "My Best Picture of Latvian Nature This Year".

The FB website is accessible from the UL website via the FB visiting card.

If the information for publication is submitted as a text in a foreign language other than English, a translation of the text into Latvian or its brief summary must be attached.

The heads of the UL departments are responsible for the preparation, correctness and updating of the information within the competence of their departments. The content administrators of the structural units' websites are responsible for maintaining the website, posting and regular updating of prepared information. For a given faculty, the person responsible for content placement is the marketing or public relations specialist or coordinator who administers the existing website, or an employee who has completed a short TYPO 3 content placement course in the Department of Information Technology. The UL Administration is responsible for the compliance of the information available on the website with the information available in official registers.

## **2.3. Resources and Provision of the Study Field**

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

## **and its use for the development of the study field.**

The system of the UL for financing the study field and the corresponding study programmes is based on *the Law on Higher Education Institutions*, the Cabinet Regulations No 994 of 12.12.2006 *the Procedures for Financing Higher Education and Colleges from the Funds of the State Budget*, No 445 of 05.07.2016 *the Regulations Regarding Remuneration of Teachers* and other external and internal regulatory enactments.

For the successful implementation of study fields, the UL must ensure sufficient financial resources for the entire study process, including the remuneration of the teaching staff, the library and other resources related to the implementation of studies, as well as the development of the study programme. The main costs related to the implementation of the study process are the remuneration of the teaching staff and the costs related to the organisation of the study process.

### **The remuneration of the teaching staff includes:**

- Costs of contact hours (e.g., lectures, seminars, practical and laboratory work).
- Independent work management, consulting, and examination costs.
- Costs of methodical work (preparation for classes, preparation of new courses, etc.).
- Student work management and evaluation costs, including reviewing.
- Internship management and organisation costs.
- Costs of scientific work of the teaching staff to ensure the development of new study materials.

With the UL Rectors Order the norms of the formation of the remuneration of the teaching staff are determined in the *Planning and Accounting Regulations for Academic Personnel's Workload* (the UL Order No 1/469 of 07.12.2016). Considering the specifics of studies and available resources, the management of the faculties may set different regulations in coordination with the vice-rector of the respective field.

### **Costs related to the organisation of the study process:**

- General staff costs include the costs of study support staff remuneration, organisation, and provision of faculty activities.
- Other costs are other direct costs related to the specific study programme, such as rent of external services, premises, additional equipment lease, transport lease, etc.
- Infrastructure costs – costs of premises, including utilities, repairs, and maintenance.
- The costs of property and services include the material and methodological provision of the study programme, including technical equipment, visual materials, professional development (experience exchange trips, training), etc.
- Indirect costs include the costs of the University's overall operational support (IT, finance, personnel, marketing, etc.) and investment in development.

To estimate the amount of funds required for financial provision, the UL calculates the prime cost of each study programme according to the methodology developed by the UL, which takes into account all the costs of providing the study process described above and information on the specific study programme plan, involved teaching staff, planned number of students, and other aspects, thus ensuring the reliability of the forecasts.

## **Funding for studies at the UL - sources of funding**

To provide the necessary funds for the conduct of studies, the University of Latvia uses (1) the subsidy from the state budget (regarding the base funding set by the Ministry of Education and Science, programme level and field of study) of the Ministry of Education and Science and (2) tuition fees.

The tuition fee is determined by the UL considering the following:

- the cost of a study place, including all the costs of the study process,
- tuition fees for similar programmes at other universities,
- the interest of potential fee-paying students in the study programme,
- the expected funding per place from the state budget,
- the opinion of the Student' Council.

Tuition fees are set at the end of each year for the following academic year to ensure timely availability of information. Fees do not change during the student's studies, except in programmes where fees vary by year, but even in such cases they are all set at the beginning of study.

The revenue from lifelong learning or other services, as well as accumulated structural unit funds, may also be used for the development of study programmes (development of new courses, improvement of existing courses, methodological support, and other aspects of the programme). If necessary, financial support can be obtained from the UL Study Quality Improvement Fund, where a sum in the UL budget is annually reserved to address various faculty issues, including the development of new study programmes and the development of existing study programmes.

Indirectly, research funding sources for academic staff are also allocated for the development of study programmes, e.g., for research activities, participation in international projects, publication of scientific articles, preparation of international project applications, organisation of scientific events at the UL, implementation of research development projects and long-term commitments, etc. By participating in the above-mentioned activities, the academic staff improve their professional and research competence and often involve students, which positively influences the quality of the study process. One of the most important means of maintaining the scientific activity of the academic staff of the Study Field is the annual base and performance funding allocated to the UL and its basic structural units. From the UL centralised funds, the faculty of the Study Field can attend scientific conferences and cover the costs of publications through the UL *"Procedure for Supporting the Development of Scientific Activity"* (the UL Order No 1/148, 20.04.2018).

For data on the funding available for a specific study programme, see the section on the BSP "Biology", the BSP "Biotechnology and Bioengineering", the MSP "Biology", and the DSP "Natural Sciences".

### **Funding for studies at the UL - reallocation of received funding**

All income received from the state budget and tuition fees, as well as from other sources are used for financing the study process, after prior deduction of indirect expenses for centralised expenses in accordance with the current redistribution procedure, the UL allocates for use by the faculties.

Faculties independently manage received funding within the current year's budget. The dean and the executive director of the respective faculty are responsible for the rational use of financial resources and performs operational financial management.

Actual returns are recorded at the faculty level, without separating results for each programme or study field. At the same time, the management of the faculty monitors the outcomes of the study process, the dynamics of the number of students and the factors influencing it, the balance of the prime cost of a particular programme with the state budget subsidy and tuition fees and, if needed, makes the necessary adjustments in the organisation of the study process to ensure the long-term



viability and development of the study field of the faculty.

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

For the study programmes included in the study field, studies are conducted in the House of Nature and the House of Science. The House of Nature was brought into service in 2015. The total indoor area is 18540 m<sup>2</sup>, with 30 lecture halls, 45 student laboratories and 69 research laboratories. All classrooms have a projector and laptop for presentations, as well as whiteboards. Interactive whiteboards are also available in some classrooms. Sound equipment and recording facilities are also available in the large classrooms on the ground floor of the House of Nature. The House of Science was brought into service in 2019. The indoor space totals 2,018 m<sup>2</sup> and includes 15 lecture halls, 8 seminar rooms, 78 research and training laboratories.

On the seventh floor of the House of Nature, there is a greenhouse available for scientific research and student training. The greenhouse is provided with modern equipment for optimal plant growth conditions and automatic regulation.

The basements of both the House of Nature and the House of Science accommodate laboratory facilities for faculties and research institutes. Wireless network is available throughout the buildings. The House of Nature and the House of Science have a cafeteria, the Library of Natural Sciences, and individual work cubicles. The buildings are accessible for people with reduced mobility: there are several lifts and specially equipped sanitary facilities. The first two floors of the House of Nature are accessible to students 24 hours a day.

The FB training laboratories have microscopes connected to stationary computers, and individual workstations with micropipette sets. The laboratories have freezers (both -20° C and -80° C) for storage of samples and reagents. To enable practical work in biotechnology, a Sartorius Biostat fermentation set (8 fermenters with equipment), UHPLC ("Waters") and gas chromatography ("SCION Instruments") systems for chromatographic analysis of fermentation metabolites, spectrophotometer, laboratory benchtop centrifuge for processing fermentation samples, as well as other laboratory equipment necessary for practical work (incubator-shaker, weighing scale, thermostats, plate reader, autoclave) were acquired in the framework of project No 8.1.1. 0/17/I/010 "Modernization of the Infrastructure and Concentration of Resources of the University of Latvia STEM Study Areas". A fermentation laboratory for practical work by groups of students, equipped with a set of Sartorius Biostat fermenters, has been set up in room 432 of the House of Nature. The laboratory allows groups of up to 20-24 students to carry out fermentation training.

The House of Nature has five computer rooms (the largest with a capacity of 20 workstations). Both Windows and Linux operating systems are available in the computer labs. Microsoft Office applications, statistical software (R, SPSS, PC-Ord) and domain-specific software are available. The UL offers students and staff a possibility to obtain Microsoft Office 365 ProPlus and the SPSS software for a private computer free of charge for the duration of their studies (or employment contract).

For teaching and research purposes, specific application software (ArcGIS, Bemese, CRYSTAL14, CrysTraMo, DFHBF, EvIEWS, FiMar, Geomatica, Idrisi, Mathematica, Matlab, Photomod, WUFI) is also

available.

There are special collections made available for research, and they are a biological agent collection, an entomological collection, an herbarium, a microorganism culture collection, the collections of the UL Botanical Garden.

The FB supervises a field training site, the former Kolka "Old School". The training site is used for the BSP "Biology" courses "Field Course in Botany and Zoology", "Field Course in Ecology I", "Bryophyte and Lichen Ecology and Systematics", and "Invertebrate Diversity and Conservation", as well as for accommodating students and faculty conducting research in the Kolka area. The training site has a lecture hall, training laboratories, student and lecturer lounges and a kitchen. The premises have been renovated in recent years with the contribution from the UL and Faculty funds.

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

### ***General Description of the UL Library***

The UL Library is included in the Library Register of the Ministry of Culture (BLB1000) and accredited as a library of national importance until 2027 (accreditation certificate No 22C of the Ministry of Culture).

### ***Access to the UL Library Information Sources and Services, Opening Hours***

The guiding principle of the library's work is that its services are accessible to everyone.

The services are provided in the 8 branch libraries of the UL Library in accordance with the UL Library Terms of Use (UL Rector's Order No 1-4/9 of 07.01.2021). According to the Terms of Use, the services can be used by UL students, faculty, staff, other libraries, students at other universities, as well as any residents of Latvia. The UL Library provides free basic services and paid services.

The opening hours of the branch libraries are adapted to the convenience of their users: on weekdays, from 9.00 to 20.00, in some branch libraries from 9.00 to 18.00; on Saturdays, from 9.00 to 17.00. The Library of Natural Sciences and the Library of the House of Science are open 7 days a week, 24 hours a day. Three branch libraries are open all year round, including summer.

The Library of Natural Sciences with its open access collection, two self-service kiosks for borrowing, renewal and return of books, computers, mobile phone charging station is open for the UL staff 24 hours a day. In the Library of the House of Science, an open access collection, two self-service kiosks for borrowing, renewal and return of books, and a self-service wall for the use of laptops are available to the UL staff 24 hours a day. The UL Library is the first in the Baltic States to provide the latter facility and service. The self-service wall is equipped with 36 laptops. Using a student or employee ID card, the UL staff can borrow laptops at any time of the day and use them

for 6 hours, not only in the library area, but around the building.

The rooms of the Library of Natural Sciences with the collection on life sciences are open 24/7, at any time convenient to students. The Library of Natural Sciences is situated in the UL Academic Centre in the House of Nature (Jelgava street 1) with a total area of 662.80 m<sup>2</sup>.

The Library of Natural Sciences has more than 100 workplaces, including 20 workplaces for work with a computer.

### **Free basic services and paid services**

The UL Library provides free basic services and paid services in accordance with *the Library of the UL Paid Services and Price List* (the UL Rector's Order No 1-4/387 of 10.08.2021).

More information on the UL Library website <https://www.biblioteka.lu.lv/en/> – section *Services*.

### **User training**

The Library of the UL actively works with its target audiences – students at all programme levels, academic, research and general staff – to promote information literacy and to provide in-depth knowledge and skills at working with electronic resources. More information on the UL Library website <https://www.biblioteka.lu.lv/en/> – section *Studies*.

### **Library collection, restocking procedure**

The collection of the UL Library is formed in accordance with the directions of UL study and scientific work, requirements of study programmes, to provide with information all UL study levels, namely, Bachelor's, Master's, doctoral, as well as scientific research areas. The acquisition of e-resources is a priority in the development of the collection.

The acquisition of new information sources for the collection (books, databases, and periodical subscriptions) is carried out in accordance with the centrally allocated funding of the UL, which is approved annually by a UL order. The allocated funds are used to purchase necessary books, to pay for the databases subscribed to by the sector and to subscribe to periodicals.

The Library purchase information sources on the basis of orders from the UL academic staff, proposals from the Student Council or proposals from the Library staff, which shall be entered in LUIS and approved by the Dean of the Faculty or the Executive Director.

In 2022, 1.8 million items of information sources were made available to the Library users. In accordance with the UL study and research infrastructure, the Library's collection is housed in the 8 branch libraries and the Repository.

### **Literature for the study field available in the library**

Between 1 January 2016 and 12 April 2022 (the cut-off date), a total of 454 new titles published in that period in life sciences have been added to the UL Library's collection (Table 2.3.3.1), of which 263 titles are available in the Library of Life Sciences (Table 2.3.3.2). The print collection includes publications in the fields of environmental science, chemistry, biology, botany, zoology, medicine, and their sub-disciplines, in line with the implementation of the SF LS. By type of publication, the collection includes books, serial publications, periodicals, doctoral Theses in the field and their abstracts in English and Latvian.

Table 2.3.3.1.

**Total of Printed Publications in UL Library Collection,**  
published 01.01.2016. – 12.04.2022.

**Type of Publication**

Books		Other types of publications	
<i>Titles</i>	<i>Copies</i>	<i>Titles</i>	<i>Copies</i>
266	1134	188	1178
Total: <b>454</b> titles <b>2312</b> copies			

Table 2.3.3.2.

**Total of Printed Publications in Library of Natural Sciences,**  
published 01.01.2016. – 12.04.2022.

**Types of Publication**

Books		Other types of publications	
<i>Titles</i>	<i>Copies</i>	<i>Titles</i>	<i>Copies</i>
193	424	70	498
Total: <b>263</b> titles <b>922</b> copies			

The total of printed publications in the field of biology published between 1 January 2016 and 12 April 2022 and available in the Library collection comprises 102 titles in 429 copies (Table 2.3.3.3), of which 61 titles in the amount of 171 copies are also available in the collection of the Library of Natural Sciences (Table 2.3.3.4). The majority of titles are in English.

Table 2.3.3.3.

**Total of Printed Publications in the field of biology in UL Library Collection,**  
published 01.01.2016. – 12.04.2022.

Type of Publication				Publications by Language											
Books		Other types of publications		Books						Other types of publications					
				Latvian		English		other languages		Latvian		English		other languages	
<i>Titles</i>	<i>Copies</i>	<i>Titles</i>	<i>Copies</i>	<i>Titles</i>	<i>Copies</i>	<i>Titles</i>	<i>Copies</i>	<i>Titles</i>	<i>Copies</i>	<i>Titles</i>	<i>Copies</i>	<i>Titles</i>	<i>Copies</i>	<i>Titles</i>	<i>Copies</i>
<b>54</b>	95	<b>48</b>	334	<b>14</b>	24	<b>38</b>	69	<b>2</b>	2	<b>21</b>	34	<b>26</b>	299	<b>1</b>	1
Total: <b>102</b> titles <b>429</b> copies															

Table 2.3.3.4.

<b>Total of Printed Publications in the Field of Biology in Library of Natural Sciences,</b> <i>Published 01.01.2016. – 12.04.2022.</i>															
<b>Types of Publication</b>				<b>Publications by Language</b>											
<i>Books</i>		<i>Other types of publications</i>		<i>Books</i>						<i>Other types of publications</i>					
				Latvian		English		other languages		Latvian		English		other languages	
<i>Titles</i>	<i>Copies</i>	<i>Titles</i>	<i>Copies</i>	<i>Titles</i>	<i>Copies</i>	<i>Titles</i>	<i>Copies</i>	<i>Titles</i>	<i>Copies</i>	<i>Titles</i>	<i>Copies</i>	<i>Titles</i>	<i>Copies</i>	<i>Titles</i>	<i>Copies</i>
<b>44</b>	75	<b>17</b>	96	<b>13</b>	21	<b>29</b>	52	<b>2</b>	2	<b>7</b>	7	<b>10</b>	89	-	-
Total: <b>61</b> titles <b>171</b> copies															

### **Level of digitisation of the collection**

The UL Library, in cooperation with the UL Department of Information Technology, provides free online access to the UL e-Resource Repository at <http://dspace.lu.lv/dspace/>. A mobile version of the Repository is also available for users' convenience. To ensure free and permanent online access to the scientific achievements of the UL, the UL Library, authors of publications, representatives of UL structural units or of UL publications regularly upload the electronic versions of their publications, digitised information sources of cultural and historical value, dissertations and abstracts of UL faculty members to the UL e-Resource Repository.

The digitised publications subject to copyright are offered by the UL Library for on-site use in the reading rooms of the branch libraries.

Currently, the e-Resource Repository contains a total of more than 11 578 publications in the SF LS.

### **Electronic resources**

In line with the UL Strategic Plan, the UL Library is increasing the share of e-resources and developing remote access to e-resources.

In order to modernise the accessibility of electronic resources, the UL Library has introduced the latest technology web services Primo Discovery and SFX.

In 2022, the UL provides access to 42 e-resource platforms (e-books platforms, e-journals databases and individual subscribed e-journals, reference resources and tools, mixed-format databases). In total there are 17 477 full-text e-journals (including the individual subscribed e-journal titles), 205 306 e-books, almost 5 million full texts and abstracts of doctoral and master's theses from around the world available through subscriptions. The UL also provides links to 174 credible open-access databases with multi-format materials.

On average, the UL Library offers 110 new electronic resources each year. As of 22.04.2022, the UL Library has acquired a total of 66 e-books, with ~35 100 e-books available in the subscribed ProQuest Ebook Academic Complete collection.

Information on e-resources is available on the UL Library website, [E-resources from A to Z](#) and [E-Resources by Discipline](#), as well as in the *My Portal* section *Databases*.

The UL offers the possibility to use subscribed electronic information resources (databases, e-book platforms) outside the UL computer network by logging in with a LUIS username and password, and in some cases, with personal profile access data created while within the range of UL IP addresses.

### **Subscribed individual e-resources containing materials for the SF LS**

ClinicalKey, European Pharmacopoeia, Overleaf Commons, Physical Review Journals + Physical Review Online Archive (PROLA), The Physics Teacher, UpToDate.

### **Subscribed multidisciplinary e-resources containing materials for the SF LSS**

EBSCO Central & Eastern European Academic Source (CEEAS), Cambridge Journals Online, Emerald eJournals Premier, JSTOR, Latvian Standards Online Reading Room, Letonika, LEETA – the News and Archives databases of the Latvian National Information Agency, Nature, OECD iLibrary, Oxford Journals, ProQuest Dissertations & Theses Global, SAGE Journals Online, SAGE Research Methods, ScienceDirect, Scopus, SpringerLink, Web of Science, Wiley Online Library (WOL) E-Journals Full Collection.

**EBooks purchased by the UL Library which contain materials for the SF LS:** VLeBOOKS, ProQuest Ebook Central Academic Complete.

### **Open Access resources containing materials for the SF LS**

Ad\*Access, ArXiv.org, BioOne Complete, BMC (BioMedCentral), Bookyards, ChemSpider, Cogent OA, [Darwin Online](#), Directory of Open Access Books, Directory of Open Access Journals (DOAJ), Encyclopedia of Life (EOL), [Environmental and Experimental Biology](#) (EEB) Europeana Collections, Eurostat Data, Google Scholar, Herbert Open Access Journals (HOAJ), Hindawi, IEEE Open, Journals for Free, KARGER Open Access, LearnChemistry, MDPI, MedKnow, OAPEN, OpenGeoscience, Open Humanity Press, Periodika.lv, Project Gutenberg, PubChem, PubMed Central, [Runivers \(Руниверс\)](#), Science Books Online, [Sciendo](#), SpringerOpen, swMATH, The Encyclopedia of Earth, Terra Medica, The Cleveland Clinic Disease Management Project, Veselības statistikas datubāze, WebMD symptomchecker, Wiley Open Science, WorldWideScience, zbMATH Open, Zenodo

### **Statistics on the use of the UL subscribed databases in 2021**

Name of database	Subscription period	Assessment of use and trends
<b>UL centralised funding (UL Order) - multidisciplinary databases</b>		
<b>EBSCO Central &amp; Eastern European Academic Source Complete</b>	01.01.2021-31.12.2021	Growing usage (average of +64.53 %) <i>Subscribed for 2022</i>
<b>JSTOR</b>	01.09.2020-31.08.2021	Growing usage (average of +6.12 %) <i>Subscribed for 2022</i>
<b>Latvian Standards Online Reading Room</b>	01.01.2020-30.06.2022	Growing usage (+20.10 %) <i>Subscribed for the next period</i>
<b>LETA Archive and Nozare.lv</b>	01.01.2021-31.12.2021	Declining usage (average of -22.11 %) <i>Subscribed for 2022</i>
<b>LETA online news</b>	01.01.2021-31.12.2021	Declining usage (average of -22.14 %) <i>Subscribed for 2022</i>
<b>Lursoft Newspaper Library NEWS.LV</b>	01.05.2021-31.01.2022	<i>Subscribed for 2022</i>
<b>Nature (e-ISSN 1476-4687)</b>	01.09.2021-31.12.2022	<i>Subscribed for 2022</i>

<b>OECD iLibrary</b>	01.01.2021-31.12.2021	Declining usage (-21.27 %) <i>Subscribed for 2022</i>
<b>Oxford Journals Online</b>	01.01.2021-31.12.2021	Declining usage (-16.22 %) <i>Subscribed for 2022</i>
<b>ProQuest Ebook Central Academic Complete Collection</b>	01.01.2021-31.12.2021	Growing usage (average of +56.26 %) <i>Subscribed for 2022</i>
<b>SAGE Journals</b>	01.01.2021-31.12.2021	Growing usage (+ 20.96 %) <i>Subscribed for 2022</i>
<b>SpringerLink Contemporary Journals</b>	01.01.2021-31.12.2021	Growing usage (+ 7.79 %) <i>Subscribed for 2022</i>
<b>VLeBOOKS</b>	01.01.2021-31.12.2021	Growing usage (average of +84.70 %)
<b>Wiley Online Library E-Journals Full Collection</b>	01.06.2021-31.12.2022	<i>Subscribed for 2022</i>
<b>UL Faculty of Physics, Mathematics and Optometry funding</b>		
<b>Physical Review Journals + Physical Review Online Archive (PROLA)</b>	01.01.2021-31.12.2021	Declining usage (average of -36.79 %) <i>Subscribed for 2022</i>
<b>UL Faculty of Natural Sciences funding (split payment)</b>		
<b>Overleaf Commons for Institutions</b>	01.01.2021-31.12.2021	
<b>UL Academic Department</b>		
<b>ProQuest Dissertations&amp; Theses Global Full Text</b>	01.11.2020-31.10.2021	Declining usage (average of -18.17 %) <i>Subscribed for 2022</i>
<b>LR Ministry of Education and Science (within the national licence)</b>		
<b>ScienceDirect</b>	01.01.2021-31.12.2021	Growing usage (average of +13.40 %)
<b>SCOPUS</b>	01.01.2021-31.12.2021	Declining usage (average of -15.84 %)
<b>Web of Science Core Collection</b>	01.01.2021-31.12.2021	Declining usage (average of -36.32 %)

The information and methodological support of the Study Field includes publications in life sciences: environmental science, chemistry, biology, botany, zoology, medicine, and their sub-disciplines. The UL Library has a total of 454 titles published in the last six years, of which more than half, namely, 263 titles or 58%, are available in the Library of Natural Sciences.

Printed publications in the field of biology account for 102 titles or 22% of the total in the UL Library, and 61 titles or 13% in the Library of Natural Sciences.

The percentage of biology titles in the UL Library collection published in the last six years by

language is 62% in English, 34% in Latvian, with 64% in English and 33% in Latvian in the Library of Natural Sciences, respectively.

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

Modern ICT offer great opportunities for the development of the educational process, allowing new projects to be implemented and new systems to be put in place to make the study process as successful as possible. The use of ICT in the educational process is one of the ways to increase learning motivation.

The UL IT Department provides students and staff with the cloud-based application package MS Office 365. Office 365 provides students and staff with the best tools for modern study work, such as Outlook, Forms, OneNote, Sway, as well as the Office suite of applications, which includes Word, Excel, and PowerPoint.

In addition to MS Office 365, UL students and staff are provided with such software as SPSS, Question Pro, Autodesk, MathWorks MatLAB, Esri ArcGIS, etc. Access from outside the UL premises for the use of this software requires a VPN connection with the UL in order for the software to access network license services.

For remote learning and distance learning programmes, one of the Office 365 online applications, namely, Microsoft Teams, is used, which enables online lecture delivery, lecture recording, and communication with students online.

In addition to the MS Teams programme, for remote studies, the UL offers its students and staff the BigBlueButton information system (hereinafter – the BBB system), an open-source web-based online videoconferencing system. The BBB system provides a web-based solution for event organisations to the UL staff, including students and guests at the UL events, and it can be used as an integrated solution both within the e-learning system (for course registered users only) and outside the e-learning system, with the need to connect to the UL web conferencing server in your web browser at <https://bbb.lu.lv>.

Two e-learning environments are available at the UL: [estudijas.lu.lv](https://estudijas.lu.lv) and [edu.lu.lv](https://edu.lu.lv). The e-learning environment [estudijas.lu.lv](https://estudijas.lu.lv) is designed to support and manage the study process, and the e-learning platform [edu.lu.lv](https://edu.lu.lv) is designed for e-learning projects, events, and courses, as well as for distance learning programmes.

Both e-study environments use the open-source e-learning environment MOODLE, which is a modular object-oriented dynamic learning environment and is currently not only the most methodologically and pedagogically efficient but also the most cost-effective e-learning solution. Courses created in the Moodle e-learning environment provide students with access to necessary study materials and activities. Teaching staff can conduct both student assessment and record their attendance.

For storing data during the study process, both UL students and staff are provided with the Office 365 cloud service OneDrive in the amount of 1TB. OneDrive is a Microsoft cloud service that creates a link to all files of a user. It allows users to store and protect files, share them with other users, and



access them from anywhere on all their devices.

For data transfer, the UL offers its students and staff the <https://store.lu.lv/> bulk file transfer system. This system allows you to send files that otherwise cannot be sent by email due to their size, but it is not designed for long-term file storage.

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

#### **Normative acts that regulate the process of teaching staff recruitment and/or employment:**

- [\*Regulatory Enactments on Academic and Administrative Positions at the University of Latvia\*](#) (available only in Latvian)
- [\*Regulations of the UL Professors Council\*](#) (available in section *Other attachments*, available only in Latvian)
- [\*Procedures for the Recruitment of Unelected Teaching and Research Staff at the University of Latvia\*](#) (available in section *Other attachments*)

There are three teaching staff groups at the UL: academic staff, who hold their academic positions based on elections; acting academic staff and visiting academics; as well as hourly-paid staff.

In the case of elected academic positions, as well as the acting academic staff, *the Regulatory Enactments on Academic and Administrative Positions at the University of Latvia* regulate the recruitment and selection. According to the regulations, the following academic positions exist at the UL: professor, associate professor, assistant professor, senior researcher, lecturer, researcher, assistant, research assistant.

Decisions on the need for certain positions are made by the faculties. Competitions for elected academic positions are announced openly. Public calls for applications for the elected academic positions, including the function and terms of reference for the respective position, are published on the UL website <https://www.lu.lv/par-mums/vakances/>, internationally advertised vacancies: <https://www.lu.lv/en/about-us/vacancies/>, and also in National Scientific Activity Information System and State Employment Agency of the Republic of Latvia vacancy portal. Any person who conforms to the requirements specified by *the Law on Higher Education Institutions* may apply for the position.

The applicants for academic positions must deliver an open lecture, which is evaluated by two reviewers, who issue their opinion on the quality of the lecture. The election procedure is carried out either by the decision-making body of the relevant unit (in the case of assistants, research assistants, researchers, senior researchers, lecturers, and assistant professors – by the respective Faculty Council), however in the case of associate professors and professors – by the relevant Professors Council. Elections must take place within two months from the date of the call for applications. The personalia – docents, lecturers, assistants, senior researchers, researchers, and research assistants – are voted on by secret ballot. Professors and associate professors are voted openly (in accordance with the 05.11.2020 amendments of 2<sup>nd</sup> Paragraph of Section 33 (in force from 01.01.2021) of *the Law on Higher Education Institutions*). An applicant who has received more than half of the votes of the members present with the right to vote shall be considered elected. According to *the Law on Higher Education Institutions*, lecturers are elected for a term of 6 years. At

the end of the term, the faculty decides on the need to announce a new competition. There are no restrictions on the term of office.

In accordance with the UL regulations, minimum requirements are set for all applicants for academic positions, i.e., knowledge of the state language in accordance with regulatory enactments, knowledge of foreign languages to the extent necessary for the performance of academic duties and continuous improvement of their academic and scientific qualifications. Other requirements differ across academic positions, for instance, to qualify for the position of docent, the candidate must have a doctoral degree, while the requirements for associate professors are more demanding, i.e., they must have considerable academic and pedagogical experience, an extensive list of publications and experience in scientific research projects.

If the Senate chooses to decline the proposal from the department and not to announce vacancies, a guest lecturer may be recruited; however, if a member of hourly-paid staff is more relevant to the development plans and needs of the faculty, the prospective employee concludes a contract for a specified period (usually for the duration of the study course). In such cases, the decisions relating to the candidates' recruitment and selection are taken by the structural units, i.e., faculties. In these cases, only the control to ensure that the remuneration set by the entity complies with internal and external rules and regulations is centralised.

The Rector of the UL concludes an employment agreement for the entire term of office with the person elected.

During the reporting period, the composition of the academic staff of the SF LS has changed. This is due to the change of generations of the teaching staff (e.g., the employment relations have been terminated with Assoc. Prof. Valdis Ģirts Balodis, Asoc. Prof. Voldemārs Spuņģis, Assist. Prof. Eižens Slava), as well as in the case of termination of some lecturers' employment after the quality of studies was assessed and non-compliance found. During the reporting period, many young lecturers have started to work in the study programmes as elected members of the academic staff, for example, lecturer Zane Lukstiņa, lecturer Rūta Starka, Assist. Prof. Ilze Elbere, lecturer Andris Avotiņš, Assist. Prof. Zigmārs Orlovskis, Assist.Prof. Uģis Kagainis. One more reason for the change is career growth of academic staff, with some members having been elected to higher positions during the reporting period. Thus, during the reporting period, Didzis Elferts, Indriķis Krams, Nils Rostoks, Jānis Kloviņš became Professors, and Ainārs Auniņš, Iluta Dauškane, Dace Grauda, Gunita Dekšne became Associated Professors.

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

*The UL Strategy 2021-2027* emphasises that the goal of the development and excellence-oriented personnel policy is to ensure the development, growth and renewal of academic and general personnel, to create a performance-based personnel management system, which will also include competitive and motivating personnel remuneration, to improve academic staff career

development opportunities, to create a system for attracting local and foreign academic staff, as well as new talents, and to promote international mobility.

The professional development of the UL academic staff is organised in accordance with the Cabinet Regulations No 569 of 11.09.2018 *the Regulations on the Necessary Academic and Professional Qualifications of Pedagogues and Professional Competence Development Procedures*, where Paragraph 16 states: "Educators of higher education and colleges shall, by the end of the term of their election, undertake a vocational development programme on innovation in the higher education system, or the higher education didactics, or the management of educational work at 160 academic hours (including at least 60 contact hours). Professional development may include international mobility and participation in conferences and seminars relevant to the purpose of the professional development, as evidenced by submitted documents", as well as the Cabinet Regulation No 129 of 25.02.2021 *the Procedures for Evaluating the Scientific and Teaching Qualifications or Results of Artistic Creation Work of an Applicant for the Position of Professor or Associate Professor and of a Professor or Associate Professor Holding the Position*.

The qualification requirements and tasks of the academic staff of the UL are included in *the Regulations on Academic and Administrative Positions at the University of Latvia* (the UL Senate Decision No 2-3/11 of 31.01.2022), while the quality/performance of the academic staff of the UL is evaluated in accordance with *the University of Latvia Academic Remuneration Regulations* (the Senate Decision No 14 of 30.05.2016) and *the University of Latvia Scientific Personnel Remuneration Regulations* (the UL Senate Decision No 71 of 27.01.2020).

The UL Academic Department, the Adult Pedagogical Education Centre (APEC) of the UL Faculty of Education, Psychology and Arts (FEPA), provide daily informative, consultative, and methodological support to UL lecturers in the field of university didactics. The UL FEPA APEC offers academic staff the professional development programme "Higher Education Didactics: Contemporary Theories and Practice", as well as further education programmes "Pedagogical Aspects of Curriculum Development in Higher Education", "Professional Development of Student Curators", etc. Among the FB faculty members, assist. Prof. Iluta Dauškane and lecturer Elīna Ažēna have participated in curator training. In turn, students of the DSP "Biology" who planned to connect their future activity with academic work, have attended the course of higher education didactics.

After the completion of the continuing education programme "Methodology of Formulation and Evaluation of Study Results", the programme directors and academic staff purposefully carry out the update of their study courses and mapping learning outcomes of a study programme with the ones of study courses.

The UL academic staff have the opportunity to improve their English language skills in the continuing education programme "Improvement of Scientific and Academic Capacity of Academic Staff in English" of the Centre for Applied Linguistics of the UL Faculty of Humanities of the University of Latvia. All programme directors have attended the English language course (Nils Rostoks, Didzis Elferts, Iluta Dauškane), as well as academic staff of the Study Field, for example, Rūta Starka, Ainārs Auniņš, Uldis Kondratovičs, and others.

Every spring semester, new lecturers and doctoral students from various UL doctoral study programmes take increasing advantage of the opportunity to study in the continuing education programme "Introduction to Lecturer's Work".

A special target group in continuing education of lecturers at the UL are lecturers who work with first-year students, and that is the reason to offer them the further education programme "Professional Development for Working with First-Year Students".

Several training programmes for lecturers between 2018 and 2023 were funded by the European

Union, namely:

1. Online Learning Development and Digitisation of Learning Content
2. Innovations to Improve the Quality of Teaching
3. Academic Integrity

The Academic Integrity course was attended by the Programme Director Didzis Elferts.

All programmes have been developed after prior analysis of the professional development needs of lecturers in the context of trends in higher education. As part of the implementation of the professional development system for the UL academic staff, the UL Academic Department conducted an electronic survey of the UL academic staff, which resulted in information on the current professional development needs of the lecturers of all faculties, and several lecturers expressed their readiness to engage in the development and provision of continuing education content to their colleagues in line with their professional and didactic development needs.

Within the framework of SAM project 8.2.2.1 "Renewal and Competence Development of Academic Staff at the University of Latvia", lecturers and general staff of the Study Field have been improving their academic skills and competences with a wide range of training courses, namely:

- English - 28 persons;
- Development of Leadership Competences of Academic Staff (36 h) - 10 persons;
- Digital Skills Development (36 h) - 7 persons;
- Digital Media Literacy (24 h) - 4 persons;
- Public Speaking, Art of Speaking and Presentation Fundamentals for Engaging with Industry and Audience (16 h) - 4 persons;
- Commercialisation Training (16 h) - 4 persons;
- Scientific and Publishing Skills (32 h) - 7 persons;
- Development of Technological and Pedagogical Skills for Providing Study in Digital Environment (modules - 12 h) -17 persons.

A more comprehensive assessment of the development and academic progress of the academic staff is summarised in Table 2.3.6.1 or can be assessed from the CVs of the academic staff.

In planning the renewal and development of academic staff, the UL pays equal attention to identifying the most able students in the UL study programmes and motivating them to engage in academic work (both teaching and research) during their studies. In this context, the UL has developed the requirements and selection conditions for attracting new doctoral students within the framework of project 8.2.2. under the operational programme "Growth and Employment", with the 1st round being "Renewal and Competence Development of Academic Staff at the University of Latvia", the 2nd round - "Motivated, Modern and Competitive Academic Staff of the Study field "Education, Pedagogy and Sport" at the University of Latvia", and the 3rd round - "Strengthening the Doctoral Capacity of the University of Latvia within the Framework of the New Doctoral Model", and the requirements and selection conditions are as follows:

1. a doctoral student in the final year of an accredited doctoral study programme, as well as a doctoral student - Latvian national - studying outside Latvia in an accredited doctoral study programme, and a doctoral candidate,
2. successful acquisition of the required number of credits in the first two/three years of studies/ for a doctoral candidate - successful completion of the doctoral studies,
3. participation in an international scientific conference with a presentation/report,
4. publication of at least one scientific article in an international publication,
5. English language skills at minimum C1 level,
6. successful completion of the doctoral examination in English,

7. a positive evaluation of the doctoral candidate as a potential lecturer by the supervisor,
8. leadership qualities and interest in research and course teaching at the UL.

With a view to the recruitment and development of foreign academic staff, the UL has developed requirements and selection conditions for attracting foreign academic staff, and they are as follows:

1. persons who have been employed in an academic position in an accredited foreign higher education institution within the previous five years,
2. a doctoral degree or its equivalent in a relevant scientific discipline,
3. scientific and academic experience relevant to the position,
4. ability to work in an e-learning environment,
5. participation in at least three international conferences with a presentation/poster,
6. published monographs and scientific articles,
7. participation or involvement in research projects,
8. excellent knowledge of foreign languages, in particular English, and the ability to use them in study and methodological work.

As a result of the academic staff renewal and competence development, during the reporting period 4 foreign guest lecturers, namely, El Habib Dakir Taia (Spain), Zigmunds Orlovskis (Switzerland), Ieva Roznere (USA), Brandon T. Sinn (USA) were involved in the SF LS direction. Orlovskis was elected to the post of Assistant Professor in the academic year 2021/2022, becoming an elected academic staff of the UL.

During elaboration of the study field self-assessment report, the information on the opportunities for promotion and qualification improvement used by the participating lecturers during the reporting period was collected, the results of which are summarised in Table 2.3.6.1.

Table 2.3.6.1. *Evaluation of staff growth and qualification development.*

Nr	Criterion/Academic year	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
1.	<b>Language skills development (with a certificate)</b>	1	1	0	1	2	3	12	15	1
2.	<b>Higher Education Didactics (training)</b>	2	3	4	3	7	3	3	6	15
3.	<b>Attendance of various summer/winter schools</b>	0	2	1	1	4	3	2	2	2
4.	<b>Lectures and study abroad in the framework of Erasmus and other international cooperation programmes</b>	3	4	3	7	6	6	5	1	5
5.	<b>Participation as a listener in professional seminars at the national level</b>	5	6	3	6	7	7	6	8	7
6.	<b>Participation in professional organisations</b>	31	32	34	34	47	48	50	52	58
7.	<b>Participation in various working groups (developing legislation, etc.)</b>	4	5	5	6	6	6	5	5	5

8.	Participation in various international scientific organisations/scientific committees	12	9	8	11	14	13	12	15	14
9.	Participation in various national committees for the organisation of scientific events	14	16	19	23	18	22	19	24	26
10.	Participation in international professional organisations/committees ensuring representation of Latvia	8	8	8	8	8	9	9	9	9

*Detailed information can be found in the CVs of the academic staff*

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

In the academic year 2021/2022, a total of 108 lecturers participated in the teaching the Study Field programmes, 66 of whom were from the FB, four from the Faculty of Business, Management and Economics, eight from the Faculty of Computing, eight from the Faculty of Physics, Mathematics and Optometry, 10 from the Faculty of Geography and Earth Sciences, three from the Faculty of Humanities, seven from the Faculty of Chemistry, one from the Faculty of Medicine and one from the Faculty of Pedagogy, Psychology and Arts. Of the 66 FB lecturers, 11 were elected Professors, one visiting professor, 11 Associate Professors, 14 Assistant Professors and 11 lecturers. The rest were employed as hourly lecturers or acting academic staff (e.g., Assistant Professors). Of the 66 lecturers at the Faculty, 48 lecturers or 72.7% have a doctoral degree (mostly in biology), 17 have a Master's degree and one has a higher education degree equivalent to a Master's degree. The structure of positions is adequate to support all levels of study programmes.

The workload of all elected UL staff members consists of academic and scientific research work. Teaching work of lecturers includes reading lectures, work in laboratories and seminars, as well as preparation of methodological materials, management of final theses, assessment of student achievements, etc.) The average distribution of the total academic and research workload of the Faculty of Biology is 52.5% and 47.5%.

The number of professors and Associate Professors has increased during the period under review, including young lecturers moving up the career ladder.

All lecturers involved in the implementation of the programmes have a working knowledge of English, but only lecturers with at least B2 level of English are involved in the implementation of the study courses and programmes in English.

### **2.3.8. Assessment of the support available for the students, including the support provided during the study process, as well as career and psychological support by specifying the support to be provided to specific student groups (for instance, students**

**from abroad, part-time students, distance-learning students, students with special needs, etc.).**

The students of the UL have access to academic support, career development support and psychological support.

Academic support aims at providing students with information and advice on study issues throughout their studies. Academic support includes the implementation of the first-year support programme, counselling on the study process (study programme content, choice of study courses, documents regulating the UL study process), information on tutorials of course lecturers, counselling and seminars on study skills (notetaking, reading scientific literature, active listening, exam anxiety, time planning and the use of library and internet resources).

Academic support for students in academic matters is provided centrally by the UL Department of Study Service and by the responsible persons at the faculties: the programme director, curator, mentor, registrar, course lecturers, as well as the Student Council and the student self-governments of the faculties. Advice on the use of library and internet resources is provided by the UL Library. Table 2.3.8.1 gives examples of the main tasks to be performed by student support units/staff. Curatorial activities at the FB have now been discontinued, as the faculty's student surveys showed that curatorial activities are no longer needed.

Table 2.3.8.1. *Examples of the main tasks conducted by student support units/staff*

Structural Unit/Staff	Main Tasks
Faculty Student Self-Government	Informs students about the study process and daily matters at the faculty, organises events for students and alumni, acts as a "mediator" between students, teaching staff and the faculty management, represents the interests of the Faculty students in the Student Council.
Curators	Informs students about current developments in the study process, provides individual support to those students who have difficulties in integrating into the UL academic environment and initiates adaptation and team-building activities.
Registrar, study adviser	Provides study consultations, assists in daily issues related to the study process, manages study records, advises on the University of Latvia Information System (LUIS).
Mentors	A senior student who helps first-year students to adapt to the study environment and shares his/her experiences.
Student Council (SC)	The aim of the SC is to represent the UL students and to defend their rights and interests. The SC represents student interests in academic matters by electing student representatives to the UL decision-making bodies which consider issues related to the study process and its improvement.
Study programme director	Organises and manages the development of study programmes in accordance with the requirements of a particular scientific or economic sector, cooperates with employers and practice institutions in matters of study content, evaluates and approves individual study modules and individual study plans chosen by students, etc.

Department of Study Service	Organises the admission process, advise faculties and students on mobility programmes, study, social and cultural issues, advises and organises training on career issues; organises student adaptation activities, provides curator and mentor training, cooperation with employers, etc.
-----------------------------	--

Through a range of services, career development support aims at enabling individuals at any stage throughout their lives to identify their interests, abilities, skills, and experience to make informed decisions about educational and/or occupational choices, and to organise and manage their individual life paths in education, work, and other areas. Career development support is provided by the Career Centre of the UL Department of Study Service in cooperation with the faculties.

The Career Centre provides the following services to students:

- individual advice on future studies and career choices, development of an individual career plan, support for transition between different levels of education and from education to the labour market;
- workshops to develop career planning skills ("Improving Career Planning and Development Skills", "My First Job Interview", "Stress Management", etc.);
- Internet resource – the Career Centre website (information available in both Latvian and English) at <https://www.karjera.lu.lv/> and <https://www.karjera.lu.lv/en/> provide up-to-date information on career planning issues, information on professional occupations and the labour market;
- the electronic resource "E-career" at <https://e-karjera.lu.lv/en> , which enables students to quickly find practice and jobs by uploading their personal CV to the database, and employers to find employees by uploading their company vacancies to the database.

Psychological support is provided by the Department of Study Service. A counselling psychologist provides psychological support for students to solve any personal and academic problems (relationship problems, conflict resolution, emotional difficulties) that arise during their studies. The psychologist provides individual consultations and consultations by telephone.

In cooperation with ESN (Erasmus Student Network), special events are organised for foreign students to get acquainted with local students, Latvian culture, and traditions.

In cooperation with the association "Apeirons", an evaluation of infrastructure accessibility for people with disabilities has been carried out. The results are taken into consideration in both the construction of new infrastructure and the design of study programmes.

Within the Study Field and the Faculty, support for students is provided in various ways:

- the faculties have an international relations coordinator, who is responsible for Erasmus+ and other mobility issues, advising students on the suitability of their chosen university for their studies and on practical issues during mobility;
- the faculty registrar and methodologists advise students on all issues related to the course of studies, registration for study courses, and act as mediators between students and lecturers in case of problem situations;
- each lecturer holds weekly office hours for students from the courses currently delivered.

## 2.4. Scientific Research and Artistic Creation



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

The development plan of the Study Field has one of its objectives "to develop and improve innovative and research-based study offer, promoting student involvement in research at all levels of education", which complements the UL development direction "Scientific Excellence" and the UL strategic goal of "the University as an internationally recognised science centre". To achieve this, two objectives have been defined, and they are: 1) to ensure the quality of excellence-oriented scientific results (increasing the number of publications, participation in conferences, involvement of students in research); 2) to ensure science and practice-based studies.

Research activities within the FB implementing the SF LS are carried out in all major fields of biology, which is also reflected in the structure of the Faculty with its seven departments, namely, the Department of Plant Physiology, Department of Botany and Ecology, Department of Human and Animal Physiology, Department of Hydrobiology, Department of Microbiology and Biotechnology, Department of Molecular Biology, Department of Zoology and Animal Ecology. Three UL research institutes are also related to the research areas of the Study Field, and they are the UL Institute of Biology, the UL Institute of Microbiology and Biotechnology. In the international evaluation of science, the UL FB, together with the above-mentioned institutes and other faculties and institutes, is part of the Natural Sciences cluster, which received an overall rating of 3 out of 5 (three out of six parameters were rated 4 out of 5). The research of the faculty members of the Study Field in various subfields of biology is also carried out in other institutes: the BIOR, the Latvian Biomedical Research and Study Centre, the Latvian Institute of Aquatic Ecology.

The research directions are also reflected in the themes of the UL annual international scientific conference sessions, i.e., Plant Physiology, Botany and Ecology, Microbiology and Biotechnology, Research and Protection of the Latvian Aquatic Environment, Zoology and Animal Ecology, Ecology and Biodiversity. The research of the faculty members of the Direction were also related to the UL priority research directions for 2016-2021, namely, Climate Change and Sustainable Use of Natural Resources; Biomedicine, Pharmacy; Regenerative Medicine, Biobanking; Ecology and Biodiversity.

The research areas covered by the DSP "Natural Sciences" go "beyond" the immediate directions of the Study Field, as the programme is a consolidation of six existing doctoral programmes, namely, the DSP "Biology", the DSP "Physics, Astronomy and Mechanics", the DSP "Geology", the DSP "Geography", the DSP "Chemistry", and the DSP "Environmental Sciences". Although the DSP "Natural Sciences" is included in the SF LS, its implementation is closely linked to the scientific activities carried out by the Faculty of Geography and Earth Sciences, the Faculty of Chemistry, the Faculty of Physics, Mathematics and Optometry, and their faculty members who will be involved in the implementation of the study programme (both teaching courses and acting as Thesis supervisors). In addition to the above-listed research direction, in the context of the DSP, the research directions are related to such UL research priority themes as Atomic Physics, Optical Technologies and Medical Physics, as well as Nano and Quantum Technologies, Innovative Materials.

**2.4.2. The relation between scientific research and/or artistic creation and the study**

**process, including the description and assessment of the use of the outcomes in the study process.**

Participation in Latvian and international projects, scientific conferences, preparation of scientific publications, and other research activities of the Study Field "Natural Sciences" and FB faculty members are closely related to the study process and contribute to the integration of scientific knowledge into study materials. It should also be noted that most of the FB faculty members are simultaneously elected to scientific positions at the FB or at one of the scientific institutes (both at UL institutes and others). The active participation of academic staff in scientific projects and publications enables regular updating of the content of study courses, ensuring their compliance with the latest scientific knowledge. It also ensures the supplementation of the theoretical materials used in the courses with the teachers' personal experience in scientific work, ensuring one of the UL and Study Field strategic aims, namely, science-based studies.

The results of the research activities of the academic staff are also directly integrated into many study courses. For example, in the MSP "Biology" study courses "Current Problems in Biology: Hypotheses I" and "Current Problems in Biology: Hypotheses II", "Current Problems in Biology: Methods I" and "Current Problems in Biology: Methods II", both elected academic staff (for example, Prof. Rostoks, Prof. Ieviņš, Prof. Muižnieks, Prof. Brūmelis, Asoc. Prof. Auniņš) and invited ones conduct lectures and seminars providing information on the latest research and current developments in the specific research field. The MSP "Biology" course "Science Communication for Biologists" is a direct example of how the long-standing experience of the course lecturers (Prof. Tārs, Prof. Ieviņš, Prof. Krams, Prof. Brūmelis) in preparing scientific publications and conference reports is transferred to the Master's students. Similar courses at the DSP "Natural Sciences" are "Presentation of Research Papers" (Prof. Kļaviņš) and "Research and Development Project Management" (Prof. Kloviņš and prof. Jaudzems). Prof. Elferts integrates his project expertise and experience in preparing scientific publications into the statistics courses of all level study programmes (the BSP "Biology" – the course "Biometry", the MSP "Biology – the course "Practical Biometry for Biologists", the BSP "Biotechnology and Bioengineering" – the course "Data Analysis and Mathematical Statistics", the DSP "Natural Sciences" – the course "Statistics in Natural Sciences"). Prof. Kloviņš's and docents Elbere's scientific discoveries in the study of the microbiome are included in the MSP "Biology" course "Human Microbiome".

Scientific research work is also an integral and independent part of the study process in all level study programmes (Bachelor's, Master's, and doctoral). In all study programmes, final Theses are developed as research papers on topics chosen by students.

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

International cooperation in research in the fields covered by the SF LS takes several forms, the main ones being the production of joint scientific publications and participation in joint scientific projects. Cooperation in the implementation of projects takes place both within the FB and in

various scientific institutes where faculty members of the Study Field work. The participation of the faculty members in international scientific projects benefits the students of all study programmes included in the Study Field as the faculty members integrate the findings of their research into their study courses and use their results as examples to supplement the theoretical materials in the study courses. All study programmes included in the study field gain from the international cooperation.

Below are the international projects during the reporting period (2013-2021) in which the UL FB was involved (projects implemented by other UL faculties and whose faculty members teach individual courses in one of the programmes of Study Field are not included):

- Improving adaptation and resilience of perennial ryegrass for safe and sustainable food systems using CRISPR-Cas9 technology - EditGrass4Food
- European Network for Foodborne Parasites in Europe (EURO-FBP)
- Implementation and Sustainability of Microbial Resource Research Infrastructure for the 21st Century (IS-MIRRI21)
- Towards RUrAl Synergies and Trade-offs between Economic development and Ecosystem services (TRUSTEE)
- Horizon Europe project "Capturing the potential of Gene editing for a sustainable BioEconomy: GeneBEcon" having started on 1 September 2022

The lecturers involved in the implementation of the SF LS are mostly active in research activities, including scientific projects. Regular international cooperation provides opportunities to participate in international project consortia, so the number of international research projects is expected to increase. This development is supported by increasing national scientific funding in the form of LCS grants, Structural Fund projects, and sectoral research programmes. The UL implements a research support programme which enables the publication of research results in open access journals with a high impact factor, which in turn increases the international visibility of lecturers and encourages their involvement in international projects.

International cooperation is an ongoing process, with teaching staff continuing to play an active role both in international project calls as main project submitters, as collaborators, and in continuing their cooperation in the preparation of publications. Active cooperation within the framework of the European University Association FORTHUM is also planned for the next period.

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

In total, in the reporting period 2013-2021, the faculty members involved in the implementation of the Study Field published 869 scientific articles indexed in the Scopus database (Annex 13-A). The lowest number of publications was in 2016, with 68 publications, while the number of publications almost doubled in 2021, reaching 132 publications in Scopus. In 2021, the average of 2 Scopus-indexed publications per FB faculty member a year has been reached. In the reporting period, the highest number of publications was by Prof. Jānis Kļoviņš - 71, Prof. Kaspars Tārs - 71, Prof. Indriķis Krams - 69, Prof. Nils Rostoks - 63 and Prof. Didzis Elferts - 62. The five most important fields in terms of the number of publications in the reporting period are agricultural and biological sciences -

368 publications; biochemistry, genetics, and molecular biology - 230 publications; medicine - 161 publications; immunology and microbiology - 143 publications; environmental sciences - 140 publications. Publications are often produced in collaboration with scientists from many countries around the world. During the reporting period, 162 publications were co-authored by scientists from Finland, 148 from Estonia, 120 from the United Kingdom, 104 from Germany and 101 from Sweden. A full list of publications by the academic staff is given in Annex 14-A.

The scientific potential of the faculty members involved in the implementation of the Field is also characterised by the fact that, in addition to their academic (lecturer) position at the UL, many of them have a scientific position at one of the scientific institutes, where they carry out active research activities and then integrate findings of their research into the study process. Examples include K.Tārs, V.Rovīte, Z.Kalniņa, A.Linē, R.Pečulis, A.Ābols working at the Latvian Biomedical Research and Study Centre, I.Putnis and G.Deksne working at the BIOR Institute, U.Kagainis, I.Druvietis, D.Grauda and I.Rašals working at the Institute of Biology, I.Andersone working at the Latvian Institute of Aquatic Ecology, U.Kalnienieks, J.Liepiņš working at the UL Institute of Microbiology and Biotechnology.

Research projects are carried out by the faculty members both at the UL and other scientific institutions. The FB faculty members have been or are currently involved in the following FB projects, for example: "Development of new therapeutic and prophylactic treatments against COVID-19 and coronaviruses" (NRP project), "Development and characterization of genome-edited blueberry (*Vaccinium corymbosum* L.) cultures for production of high-value secondary metabolites" (FARP project), " Impacts of habitat fragmentation on the physiological parameters of birds, obsolescence, microbiome and decreases in boreal forests" (FARP project), " Injectable in situ self-crosslinking composite hydrogels for bone tissue regeneration (iBone)" (FARP project), " Molecular, physiological and ecological evaluation of Latvian genetic resources of valuable wild legume species, *Trifolium fragiferum*, in a context of sustainable agriculture " (FARP project), " Improving adaptation and resilience of perennial ryegrass for safe and sustainable food systems using CRISPR-Cas9 technology - EditGrass4Food " (European Economic Area Financial Mechanism project), "European Network for Foodborne Parasites in Europe (EURO-FBP)" (COST project), etc.

In order to encourage faculty members to publish in high quality scientific journals, the UL has introduced the UL Excellence Programme, which provides material support to a corresponding author for Q1 level publications in journals indexed in the Web of Science database. Under the Research Support Scheme, UL academic staff may apply for financial support to attend scientific conferences and to cover part or all the costs of publishing in open access journals. Publications in open access journals are also supported from the FB base and performance funding.

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

The SF LS requires students in all study programmes and at all levels of study (Bachelor's, Master's and doctoral) to produce a final Thesis (Bachelor's Thesis, Master's Thesis, doctoral dissertation) as an independent scientific study, thus ensuring that each student has at least an initial involvement in scientific or applied research.

Students of the BSP "Biology" work on their Bachelor's Theses at the FB, in the UL research institutes, as well as in other institutes in almost all fields of biology. In 2021, out of the 38 defended Bachelor's Theses, 19 were developed at one of the FB departments, one in the Institute "BIOR", 10 in the Latvian Biomedical Research and Study Centre, one in the Latvian State Institute of Wood Chemistry, one in the Institute of Atomic Physics and Spectroscopy, one in the Institute of Biology, three in the Institute of Microbiology and Biotechnology, one in the RSU Institute of Microbiology and Virology, and one in the LSFI "Silava".

The final Theses of the BSP "Biotechnology and Bioengineering" will be developed only in the academic year 2022/2023, but already now the students of the programme are employed in the scientific institutes of RTU and the UL.

Similarly to the students in the BSP "Biology", the students in the MSP "Biology" work on their final Theses both at the Faculty departments and in scientific institutes. Thus, in 2021, out of the 35 defended Master's Theses 14 were developed in one of the FB departments, six in the Institute "BIOR", six in the Latvian Biomedical Research and Study Centre, two in the Latvian Institute of Aquatic Ecology, one in the LAAFS (currently LULST) Institute of Soil and Plant Sciences, three in the UL Institute of Biology, one in RSU and two in the LSFI "Silava".

No doctoral Thesis has not yet been defended within the DSP "Natural Sciences", but the study process of all doctoral students is related to work in fundamental and/or applied research, because to successfully defend their doctoral Thesis, each doctoral student must have scientific publications and presentations at scientific conferences. As the DSP "Natural Sciences" is a consolidation of six existing doctoral programmes, the directions of doctoral students' research are related to the fields of biology, chemistry, physics, geography, geology, and environmental science.

Not only doctoral students (for whom it is compulsory) but also Bachelor's and Master's students have scientific publications during their studies. For example, students of the MSP "Biology" have co-authored a number of publications indexed in the Scopus database, namely: (1) Krams, I., et al., 2021. Development speed affects ecological stoichiometry and adult fat reserves in *Drosophila melanogaster*. *Animal biology*, 71; (2) Zorenko, T., et al., 2020. Does the geometric and linear morphometry of the brain reflect the divergence in the 'guentheri' group (*Arvicolinae*, *Sumeriomys*)?, *Russian Journal of Theriology*, 19. (3) Ramata-Stunda, A., et al, 2020. Development of metabolic engineering approaches to regulate the content of total phenolic, antiradical activity and organic acids in callus cultures of the highbush blueberry (*Vaccinium corymbosum* L.). *Agronomy Research*, 18.

Both at the FB and in research institutes, all level students are involved in scientific projects as lab technicians, research assistants or researchers. Such involvement has been increasing in recent years, as many projects such as FARP and NRP have the participation of students as one of their minimum requirements. As an example FARP projects can be named: Impacts of habitat fragmentation on the physiological parameters of birds, obsolescence, microbiom and decreases in boreal forests (2018.-2020.); Molecular, physiological and ecological evaluation of Latvian genetic resources of valuable wild legume species, *Trifolium fragiferum*, in a context of sustainable agriculture (2020.-2021.)

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

During the reporting period, several innovations of different levels were applied at the SF LS:

- Changes in the UL internal regulations have led to changes in the management of the study programmes and the Study Field. The Study Programme Council has been replaced with the Study Field Council, clarifying the responsibilities of the Programme Directors, the Director of the Study Field, and the Head of the Study Field Council. It is stipulated that the Director of the Study Field must not be the dean of the faculty, thus separating administrative responsibilities within the faculty from the management of the Field, which often spans several faculties.
- The most significant innovation in the field of infrastructure is the relocation of the Faculty, and consequently the whole study process, from Kronvalda Boulevard 4 to the Academic Centre of the University of Latvia, the House of Nature, Jelgava street 1. As a result, the teaching staff and students have access to modern classrooms with all necessary multimedia equipment, new laboratory rooms, individual work rooms, open-type library facilities, which are available 24 hours a day. Part of the study process also takes place in the House of Science, which also has modern facilities and equipment.
- The FB has introduced the post of marketing specialist, which, in cooperation with the UL Communication Department, ensures more effective communication with stakeholders (potential students, graduates, employers, and other interested parties). Coordinated dissemination of information allows spreading more information about the study programmes, the latest scientific findings and events organised by the Faculty.

With the onset of the COVID-19 pandemic, the UL introduced the Microsoft Teams system for remote classes. MS Teams was integrated with the existing e-learning system Moodle, ensuring synchronisation of student data between the systems.

## 2.5. Cooperation and Internationalisation

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

Cooperation with research organisations – higher education and research institutions comprises the following aspects:

1. **knowledge partnership:** participation of leading researchers from scientific institutions in the SF LSS course delivery, supervision of Bachelor's, Master's and doctoral Theses, and in the activities of the Promotion Council, as well as in the activities of the UL study programme or Study Field Council, and in mobility of UL academic staff to broaden the spectrum of research. The most important partners - scientific institutions which are not UL structural

units are the Latvian Biomedical Research and Study Centre, Latvian State Forest Research Institute "Silava", Latvian Institute of Aquatic Ecology, the Institute of Food Safety, Animal Health and Environment "BIOR", the Latvian Fund for Nature. Within the framework of the Study Field, there is also a wide and close knowledge partnership with scientific institutes which are UL structural units. The closest cooperation is with the Institute of Microbiology and Biotechnology, the Institute of Biology, the Botanical Garden, the Institute of Atomic Physics and Spectroscopy.

2. **partnership for common goals**, including the establishment of joint study programmes: the UL and RTU joint BSP "Biotechnology and Bioengineering". See Annex 23-B for an analysis of compliance of the joint study programme to the requirements.
3. **implementation of research cooperation projects**, participation in EU and Latvian programmes supporting research and innovation. The scientific staff involved in the Study Field are also involved in the implementation of joint research projects in cooperation with other scientific institutions within and outside the UL, which gives the opportunity to attract students to scientific work. Among such successfully implemented scientific cooperation projects are the ERDF project "Optical Non-Invasive Hybrid Method for Early Diagnosis and Therapy Management of Sepsis" (2017-2019) implemented by the Institute of Atomic Physics and Spectroscopy and the FB, the Norwegian Financial Mechanism project "Improving sustainable soil resource management in agriculture" implemented by the Faculty of Geography and Earth Sciences (involving the SF LS lecturers). The FB scientific staff also collaborates in the implementation of scientific cooperation projects with sports organisations - the Latvian Olympic Committee (LOC) to achieve common goals by scientifically assessing the health parameters of younger school-age children and their relationship with general physical fitness (the LOC and FB effective cooperation project "Physical activity and general health status of children" (2018-2022)). Within the framework of student scientific research, successful cooperation has been established with the Latvian War Museum for the assessment of microbiological contamination of exhibits (2015-2016) or with the Latvian pharmaceutical manufacturer Grindex for the microbial purity testing of pharmaceutical preparations (2021-2022).

The above-mentioned aspects are used as criteria for the selection of cooperation partners corresponding to the study field in general and study programs, namely, by the evaluating cooperation partners whether they can make a contribution to the improvement of SF LS. On the other hand, the Faculty of Biology, as the implementer of SF LS, is also open to cooperation offers that can contribute to any kind of economic development in the country.

In furthering the development of the SF LS and strengthening its position in the global higher education, research and knowledge transfer market, international cooperation is paramount for all areas of activity. The UL international visibility and good reputation is a prerequisite for the fulfilment of the mission of a national university.

The implemented cooperation promotes the scientific achievements of lecturers, as well as gives students the opportunity to work on their final Theses in the laboratories of cooperation partners, such as Grindex, or offers interesting research topics and unique research objects, such as the Latvian War Museum. The cooperation is mostly informal and based on personal contacts of specific FB lecturers with specific partners, who appreciate the scientific excellence and experience of the FB lecturers in the implementation of certain research topics.

The selection of cooperation partners is evaluated individually, examining each possibility of cooperation, depending on the form of cooperation (academic cooperation, cooperation in common scientific projects, knowledge partnership or other forms of cooperation).

During the last year, the implementers of SF LS have established a successful cooperation with representatives of the industry - the company MGI Tech Latvia, which is the Latvia's representative of a global leader in life science innovation. The details of the form of cooperation are still in the process, but it plans both study courses offered by industry representatives in life sciences innovations in the company, as well as this company could be an important employer for graduates of the field of study in the future.

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

Cooperation with foreign institutions is multifaceted:

1. **research** - joint projects and publications. Following the growing internationalisation of science and research projects, the FB as a UL structural unit responsible for the SF LS implements several consortium research projects in partnership with scientific institutions from other countries. Some examples are the Norwegian Financial Mechanism project ("Improving adaptation and resilience of perennial ryegrass for safe and sustainable food systems using CRISPR-Cas9 technology - EditGrass4Food"; 2021-2024), in which the leading partner is the UL FB (project leader Prof. Nils Rostoks), and the cooperation partners are Norwegian University of Life Sciences, Tallinn University of Technology, and Lithuanian Research Centre for Agriculture and Forestry; the EU Horizon2020 project "Implementation and Sustainability of Microbial Resource Research Infrastructure for the 21st Century" (project leader Prof. Indriķis Muižnieks). The SF LS academic staff have established a strong international cooperation in the field of publications, with the number of publications with foreign collaborators increasing year by year. Of the 869 publications included in the SCOPUS database during the accreditation period, ~75% are joint publications with foreign collaborators (most joint publications with authors from Sweden, Finland, Estonia, and Germany).
2. **organisation of international events** - the SF LS academic staff have participated in the organisation of various international scientific and academic events, serving on both scientific and organising committees of international congresses, conferences, and seminars both in Latvia and abroad. In Latvia, among the international events organised at the University of Latvia with the SF academic staff being the leading organisers, the highlights are the following events: the 7th International Conference of Geneticists of Baltics (October 2018), the European Conference of Biochemical Societies (June 2019), the 3rd International Conference "Nutrition and Health" (December 2020), the Inaugural Conference of the EEA-NOR project EditGrass4Food (October 2021), International Barley Genetics Symposium (July 2022), Conference of European Charophytologists (August 2022).
3. **mobility of teaching staff** - for the purpose of lecturing at foreign universities or scientific exchange, mobility is implemented within the framework of EU mobility support programmes (Erasmus, FORTHM) or of individual projects implemented by the FB (EEC and Norwegian



Financial Mechanism programme "Research and Scholarships" project; EEZ/NFI/S/2015/031). Within the Erasmus programme, 8 FB staff involved in the implementation of the Study Field have participated in lecturing mobility during the accreditation period (Prof. Balode at the University of Algarve in Portugal, Asoc.Prof. Plakane at the University of Jivaskile in Finland, Asoc.Prof. Marcinkevičs at the University of Oulu, Finland, etc.). The number of professors who have visited the UL to lecture on a topical issue relevant to the Study Field is more numerous. The number of guest lecturers during the accreditation period reaches 65. See Annex 18-B for the full list. The lectures by visiting lecturers were mainly given in the framework of the Erasmus exchange mobility of lecturers, and they were either individual lectures or lectures of at least 8 academic hours integrated into study courses. Another way of recruiting guest lecturers for individual lectures is by inviting a foreign researcher/lecturer to give a lecture when the researcher/lecturer is visiting Latvia for a scientific or academic project not directly related to lecturing mobility. Such meetings with foreign scientists and attendance of their lectures are offered in the framework of Doctoral School events. Some examples include a lecture by Dr Heiko Rischer from the VTT Technical Research Centre of Finland on the scientific and applied use of plant cell (*Scientific and applied use of plant cell, tissue and organ cultures*) in March 2020; a lecture by Dr Alan Crivellaro from the University of Cambridge on research in plant ecology and wood anatomy in December 2019; a lecture by Dr Bin Yang, Professor of Biological Systems Engineering at Washington State University, on extraction of biofuels and bioproducts from plant matter (*Low Cost Biofuels and Bioproducts from Plant Biomass*) in October 2019; a lecture by Kathryn Sieving, Professor at the University of Florida, on landscape conservation in Latin America (*Landscape conservation in Latin America: What bird behavior can tell us about habitat connectivity?*) in March 2019, etc.

A significant development in the internationalisation of studies and scientific work is the involvement of the UL in the FORTHEN (*Fostering Outreach within European Regions, Transnational Higher Education and Mobility*) project of the Alliance of European Universities (launched in June 2019) with six more European universities from Germany, Finland, Poland, France, Spain, and Italy. The cooperation within the university alliance will lead to a wide range of scientific and academic contacts with the aim of shaping European developments in the field in the near future. The project activities, comprising both organisational events and lectures, involve the SF LS academic staff and doctoral students (Assoc. Prof. Ozoliņa-Molla, Assoc. Prof. Plakane, doctoral students Z.Lukstiņa, J.Raudeniece), who thus take part in the joint development of the European academic and scientific space.

4. **Student mobility.** Students of the SF LS programmes actively use the opportunities of the UL international projects for student mobility for study or practice. Study mobility for one or two semesters, as well as short-term study mobility (up to 1 week) is mainly used by students of Bachelor's and Master's study programmes, while practice mobility for an average of 3-4 months is most often undertaken by doctoral students. For the study and practice mobility, the SF students have been using the Erasmus, FORTHEN and EEA and Norway Grants programmes, as well as university bilateral cooperation agreements. The most widely used student mobility programme for both outgoing and incoming students is Erasmus+ study mobility. In the academic year 2021/2022, the FB concluded 35 cooperation agreements with European universities in the framework of Erasmus mobility. On average, 12-16 students of the Study Field go on Erasmus studies for at least one semester each year. See Annex 17-B for the full list. A significant reduction of study mobility was brought about by the epidemiological restrictions of the Covid-19 pandemic, which for European universities, as for ones in Latvia, meant that studies were partly or entirely conducted remotely. During the period of remote learning, students also had the option to participate in study mobility by

studying remotely in the partner university's home country or remotely in Latvia, but this study model did not justify the efficiency of study and exchange, and the amount of study mobility declined to 2-3 outgoing students per semester in 2020-2021. With the renewal of face-to-face studies, the number of applicants for study mobility has been recovering, and in the autumn semester 2022/2023, the FB Selection Committee has nominated 19 students for study mobility.

Incoming exchange students in the SF LS programmes use the Erasmus programme and university bilateral cooperation agreements. During the accreditation period, the number of incoming students per academic year was within the range of 2-10 students. See Annex 17-B for the full list. The enrolment of incoming students in the SF programmes is limited by the limited offer of study courses in English, which does not allow incoming students in the SF programmes to obtain the required 30 ECTS per semester, thus requiring students to take courses from the offer of other study fields. The solution for increasing the number of incoming students could be to increase the offer of study courses in English, which is planned for the next accreditation period, as well as to start the implementation of programmes in English, which is planned for the BSP "Biotechnology and Bioengineering".

The above-mentioned aspects are used as criteria for the selection of international cooperation partners corresponding to the study field in general and study programs, and that can make a contribution to the improvement of SF LS.

The selection of international cooperation partners is evaluated individually, examining each possibility of cooperation, depending on the form of cooperation (academic cooperation, cooperation in common scientific projects, knowledge partnership or other forms of cooperation).

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

Foreign lecturers are involved in the implementation of the FB study programmes in several ways. In recent years, the most important mechanism has been the implementation of the SAM 8.2.2 project "Renewal and Competence Development of Academic Staff at the University of Latvia", which allowed the temporary recruitment of four foreign lecturers, one of whom has been elected to a permanent position of Assistant Professor (Assist. Prof. Zigmunds Orlovskis). Since 2009, in cooperation with other UL faculties and Latvian higher education institutions, the FB has implemented two doctoral schools, namely, "Study for sustainable use of plant and soil biological resources" and "Animal diversity and quality of environment". The work of the schools took the form of lectures and seminars with the participation of several dozen foreign guest lecturers. The presence of foreign guest lecturers is highly welcomed in the study courses "Current Problems in Biology: Hypotheses I" and "Current Problems in Biology: Methods I". The partners in scientific projects often give lectures on specific research topics, and the students of the SF LS are welcome to attend the lectures.

Foreign students are mainly students of Erasmus+ and other bilateral exchange programmes, who take some of the SF LS courses offered in English.

The mobility of the outgoing teaching staff during the previous accreditation period was basically implemented within the framework of the Erasmus+ program, where 2-3 lecturers of the study field went on lecture delivering mobility every year. See chapter 2.5.2 (point 3 "Mobility of teaching staff) for a more detailed description of the mobility of outgoing teaching staff and appendix 18-B. The most important factor that limits the mobility of teaching staff for lecturing is the coordination of study plans with partner universities in order to make lecturing inclusive in the study plan of partner universities.

The number of outgoing student's mobilities are between 12-16 students every year, where students go for both study and internship mobility. During the restrictions of the Covid-19 pandemic (2020-2022), there was a significant decrease in number of mobilities, which is starting to change during the last academic year. See chapter 2.5.2 (point 4 "Student mobility") for a more detailed description of study and internship mobility of outgoing students and appendix 17-B.

The most important factors that limit the mobility of outgoing students are the coordination of study plans, so that during exchange studies the student can obtain the same number of credit points as at UL, as well as the limited offer of study courses in English in several universities (especially in southern European universities such as in Spain, Italy, Portugal, etc.).

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

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

The recommendations from the previous evaluation procedure have generally been implemented. A full report on the implementation of the recommendations is given in Annex 19-B. A number of recommendations were related to the offer of study courses in English and the attraction of foreign students. In implementing these recommendations, the main focus was on increasing the number of courses offered in English, each semester preparing a list of courses that could be offered in English if foreign students expressed interest in them. The activities have resulted in a significant increase in the number of international students in the programme (Annex 16-B). In addition, starting from the academic year 2023/2024, the BSP "Biotechnology and Bioengineering" is planned to be implemented in English. To facilitate inbound and outbound mobility, during the reporting period international agreements at both faculty and university level have been concluded.

The second major group of recommendations related to changes in the study programmes and the increase of the number of specialised courses. During the reporting period, changes were made to the curricula of both the BSP "Biology" and the MSP "Biology". The programmes have been complemented by study courses in topical areas such as bioinformatics, cancer biology, human microbiome, etc. In addition, the MSP "Biology" has started cooperation with the UL Faculty of Computer Science to offer students specialisation in bioinformatics through acquiring specialised courses in computer science.

For the overall development of the Study Field, a development plan has been devised to further

ensure the competitiveness of the Field and to continuously monitor and increase its quality.

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

During the licensing process of the BSP "Biotechnology and Bioengineering", the experts made six recommendations to be implemented before the accreditation of the Study Field. Of the six recommendations, one has been analysed for implementation, four have been implemented and one will be implemented when there are international students.

- 1. Provide students with information from the very first day of their studies that the courses to be studied require maximum attendance and that missing classes, even for medical reasons, is not an option.**

The recommendation has been implemented and will be continuously implemented: before the beginning of each academic year, an information meeting with the first-year students is organised and attended by the programme directors of the two participating universities and some of the academic staff teaching in the first semester. During the meeting, students are informed about the study programme, its objectives, planned study courses, general requirements, the offer of available resources. At the same time, it should be stressed that students may also miss a practical or laboratory session for justified reasons (e.g., medical indications) and then make it up at another time agreed with the lecturer.

- 2. In view of the plan for the programme to attract both EU and non-EU international students, focus on the development of the language competence of the teaching staff involved.**

The recommendation has been fulfilled and will be continuously implemented - the teaching staff continues to improve their foreign language (English) competence through the project "Renewal and Competence Development of Academic Staff at the University of Latvia" of the Specific Support Objective 8.2.2. Since the moment of study programme licensing, Didzis Elferts, Uldis Kalnenieks, Agris Bērziņš, Nils Rostoks, Jevgenija Nečajeva have received certificates for completion of English language courses, passing examinations, and English language C1 level proficiency.

- 3. With reference to the study programme director's statement that most of the leading experts in the field are involved in the programme and they are part of the teaching staff, the sustainability of the study programme requires ensuring that qualified replacements are available for all teaching staff.**

The recommendation has been fulfilled - since the beginning of the study programme implementation, five additional lecturers have become involved: Asoc. Prof. Ģirts Barinovs (Biophysics), senior researcher Jeļena Kosmača (Biophysics), lecturer Ilona Mandrika (Introduction to Cell and Gene Engineering; Metabolism; Biomolecules and Cells), lecturer Kārlis Švirksts (Cultivation and Physiology of Microorganisms), and lecturer Zane Ozoliņa (Gene and Cell Technologies). In addition, the engaged lecturers (except for the course Fizi1087 Biophysics) work in parallel with the lecturer in charge of the course, partly reducing the workload of the senior lecturers and gaining experience in teaching specific courses, so that they can replace the other

lecturer if necessary. In the last couple of years, the UL FB has attracted several new lecturers who are currently not directly involved in the implementation of the study programme but would be able to join if the need be; for example, lecturer Andris Avotiņš (Data Analysis and Mathematical Statistics), Assist. Prof. Ilze Elbere (Genetics and Genomics, Introduction to Cell and Gene Engineering).

**4. In the framework of the new study programme, pay increasing attention to receiving feedback from international students on the quality of the study programme in order to facilitate the improvement of the implementation of the study programme.**

Due to the processes in the external environment, no foreign students have been enrolled in the first years of implementation. The main reasons are: the study programme is only a licensed programme, which does not seem to be attractive to foreign students; most of the study time so far has been spent in remote learning, with foreign students being much less interested in applying for a study programme focused on practical and laboratory work but without a possibility to attend.

As in the existing Latvian language studies, with the launch of the study programme in English, meetings with students are planned both at the start of the study process to inform them about the requirements, content and expected outcomes of the study programme, and also at regular intervals (mid-term and at the end of the semester) to obtain feedback on the course and its content, and to identify potential areas for improvement.

**5. Explore the possibility of bringing in more highly qualified guest lecturers; if not possible otherwise, then virtually.**

The recommendation is being continuously implemented: in September 2021, the UL, RTU and the Polytechnic University of Cartagena (Spain) signed a tripartite agreement on academic cooperation. One of the ways of cooperation is to attract guest lecturers for the study courses implemented by each university; for example, in the spring semester of the academic year 2021/2022, Julia Weiss and Marcos Egea Gutiérrez-Cortines participated as guest lecturers from Spain in the UL study course "Genetics and Genomics".

**6. Consider the possibility of adding personality-building courses to the curriculum in the future, e.g., history of philosophy, history of art and literature, etc.**

Work on the analysis of the existing content of the study programme and the implementation of the recommendation is in progress. The inclusion of new study courses in the study programme is potentially foreseen after the first full cycle (from enrolment to graduation), when feedback on the existing study courses will be generally clear and suggestions for necessary improvements in the study programme will have been received from all stakeholders, i.e., from students, graduates, and employers.

Despite the planned actions, students already have the opportunity to choose personality-building courses from a wide range of free elective courses. For example, in the autumn semester 2021, students have chosen free elective courses such as Basic Italian I, French II, Spanish I, German I, Basic Psychophysiology, Critical Thinking and Visual Culture.

In general, all recommendations not related to processes in the external environment have been met.

During the licensing process of the DSP "Natural Sciences", the experts made five recommendations to be implemented before the accreditation of the Study Field. Of the five

recommendations, the implementation of one recommendation has been started, and four other recommendations have been implemented.

**1. Develop a system for replacing highly qualified staff in the event of illness or other problems.**

The recommendation is fully implemented. At the beginning of the implementation of the study programme, the FB and other UL faculties involved in the implementation of the programme have at their disposal academic staff who can be involved in the implementation of the study programme courses if one of the lecturers is no longer able to continue teaching the courses.

**2. Prepare and provide more information to prospective doctoral students on the attraction of guest lecturers.**

The recommendation is implemented. Doctoral students are informed about guest lectures, seminars and other events via emails and e-learning.

**3. Developing the concept of a "doctoral school".**

The implementation of the recommendation has started. In 2021, the UL has developed the "University of Latvia Doctoral Programme Development Plan", which defines the actions to be taken to implement the new concept of doctoral study programmes and introduction of Doctoral Schools. The relevant legislative changes are currently being awaited for the plan to start being implemented.

**4. Finding and concluding cooperation agreements with the university(ies) where the students of the DSP "Natural Sciences" could continue their studies in case the licensed study programme is discontinued.**

The recommendation is fully implemented. In 2022, an agreement with the Daugavpils University (DU) on the possibility to continue studies in the doctoral study programme implemented by the DU if the implementation of the study programme at the UL is discontinued.

**5. Establish more diverse support mechanisms for the dissertation stages, including grants for dissertation development and funding for conference attendance, including transport and accommodation costs.**

The recommendation is fully implemented. Changes have been made in the UL procedure for supporting doctoral students, namely, the amount of centralised funds (up to 500 EUR) available for participation at conferences and publication of scientific articles has been increased. The conditions for conference attendance have also been extended to cover participation fees, including for conferences held remotely.

Overall, all recommendations not related to processes in the external environment have been met.

# Annexes

I - Information on the Higher Education Institution/ College		
Information on the implementation of the study field in the branches of the higher education institution/ college (if applicable)		
List of the governing regulatory enactments and regulations of the higher education institution/ college	1_B_list_of_normative_acts.docx	1_A_normativo_aktu_saraksts.docx
The management structure of the higher education institution/ college	2_B_governance_structure.pdf	2_A_parvaldibas_struktura.pdf
II - Description of the Study Field - 2.1. Management of the Study Field		
Plan for the development of the study field (if applicable)	3_B_development_plan.pdf	3_A_attistibas_plans.pdf
The management structure of the study field	4_B_study_field_management_scheme.pdf	4_A_virziena_parvaldibas_shema.pdf
A document certifying that the higher education institution or college will provide students with opportunities to continue their education in another study programme or another higher education institution/ college (agreement with another accredited higher education institution or college) if the implementation of the study programme is terminated.	5_B_agreement_LU_DU.docx.pdf	5_A_vienosanas_turpinasana_LU_DU.edoc
A document certifying that the higher education institution or college guarantees compensation for losses to students if the study programme is not accredited or the study programme license is revoked due to actions (actions or omissions) of the higher education institution or college and the student does not wish to continue studies in another study programme.	6_B_guarantees_compensations.pdf	6_A_apliecinajums_kompensacija.edoc
Standard sample of study agreement	7_B_Standard_samples_of_study_agreement.zip	7_A_Studiju_ligumi_tipveida_paraugi.zip
II - Description of the Study Field - 2.2. Efficiency of the Internal Quality Assurance System		
Analysis of the results of surveys of students, graduates and employers	8_B_survey_analysis.pdf	8_A_aptaujumu_apkopojums.pdf
II - Description of the Study Field - 2.3. Resources and Provision of the Study Field		
Basic information on the teaching staff involved in the implementation of the study field	9_B_Study_field_Teaching_staff.xlsx	9_A_Virziena_macibspeki.xlsx
Biographies of the teaching staff members (Curriculum Vitae in Europass format)	10_B_Teaching_staff_CV.pdf	10_A_macibspeku_CV.pdf
A statement signed by the rector, director, head of the study programme or field that the knowledge of the state language of the teaching staff involved in the implementation of the study programmes within the study field complies with the regulations on the state language knowledge and state language proficiency test for professional and official duties.	11_1_2_B_latvian_language_Biology_Biotechnology_Natural_sciences.pdf	11_1_2_A_valsts_valoda.pdf
A statement of the higher education institution/ college on the respective foreign language skills of the teaching staff involved in the implementation of the study programme at least at B2 level according to the European Language Proficiency Assessment levels (level distribution is available on the website www.europass.lv, if the study programme or part thereof is implemented)	12_1_2_B_english_Biology_Biotechnology_Natural_sciences.pdf	12_1_2_A_anglu_valoda.pdf
II - Description of the Study Field - 2.4. Scientific Research and Artistic Creation		
Summary of quantitative data on scientific and/ or applied research and / or artistic creation activities corresponding to the study field in the reporting period.	13_B_scientific_activity_data.pdf	13_A_zinatiskas_darbibas_dati.pdf
List of the publications, patents, and artistic creations of the teaching staff over the reporting period.	14_B_list_of_publications.pdf	14_A_publicaciju_saraksts.pdf
II - Description of the Study Field - 2.5. Cooperation and Internationalisation		
List of cooperation agreements, including the agreements for providing internship	15_B_list_of_agreements.pdf	15_A_sadarbibas_ligumu_saraksts.pdf
Statistical data on the teaching staff and the students from abroad	16_B_foreign_students_teaching_staff.pdf	16_A_arvalstu_studejosie_macibspeki.pdf
Statistical data on the incoming and outgoing mobility of students (by specifying the study programmes)	17_B_student_mobility.pdf	17_A_studentu_mobilitate.pdf
Statistical data on the incoming and outgoing mobility of the teaching staff	18_B_teaching_staff_mobility.pdf	18_A_macibspeku_mobilitate.pdf
II - Description of the Study Field - 2.6. Implementation of the Recommendations Received During the Previous Assessment Procedures		
Report on the implementation of the recommendations received both in the previous accreditation and in the licensing and/ or change assessment procedures and/ or the procedures for the inclusion of the study programme on the accreditation form of the study field.	19_B_Report_implementation_recommendations.pdf	19_A_rekomendaciju_izpildes_plans.pdf
An application for the evaluation of the study field signed with a secure electronic signature	Application_for_teh_evaluation_of_the_study_field.docx	iesniegums_AIC_Studiju_virziena "Dzīvās dabas zinātnes" novērtēšanai (Līga Ozoliņa-Mollā).edoc
III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme		
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)		
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period		
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard		
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)		
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme		
The curriculum of the study programme (for each type and form of the implementation of the study programme)		
Descriptions of the study courses/ modules		
Description of the organisation of the internship of the students (if applicable)		

III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)		



## Other annexes

Name of document	Document
Kvalitātes vadības rokasgrāmata	Kvalitātes_vadibas_rokasgramata_14_10_2022.zip
Quality Management Handbook	Quality Management Handbook_14_10_2022.zip
Latvijas Universitātes profesoru padomes nolikums	Latvijas Universitātes profesoru padomes nolikums.doc
Kārtība par nevēlēto mācībspēku un zinātnieku pieņemšanu darbā	Kartiba_par_neveleto_macibspeku_un_zinatnieku_pienemsanu_darba.doc
Procedures for the recruitment of unelected teaching and research staff at the UL	Procedures for the recruitment of unelected teaching and research staff at the UL.doc
Par plagiata kontroli.pdf	Par_plagiata_kontroli.pdf
Procedūra gadījumos, kad, veicot elektronisko pārbaudi, studiju darbā konstatētas plaģiāta pazīmes	Procedura_gadījumos_kad_veicot_elektronisko_pārbaudi_studiju_darbā_konstatētas_plaģiāta_pazīmes.doc
Doctoral_disertation_titles_old_programmes.xlsx	Doctoral_disertations_old_programmes.xlsx

# Biology (45421)

Study field	<i>Wildlife Sciences</i>
ProcedureStudyProgram.Name	<i>Biology</i>
Education classification code	<i>45421</i>
Type of the study programme	<i>Academic master study programme</i>
Name of the study programme director	<i>Nils</i>
Surname of the study programme director	<i>Rostoks</i>
E-mail of the study programme director	<i>nils.rostoks@lu.lv</i>
Title of the study programme director	<i>Dr.biol.</i>
Phone of the study programme director	<i>+371 26444186</i>
Goal of the study programme	<i>The aim of the Master's study programme in Biology is to provide up-to-date theoretical and methodological knowledge in a specific sub-discipline of biology, while providing an overview of the development of the field as a whole, preparing graduates for practical work in science, business or public administration, as well as for further studies at doctoral level.</i>
Tasks of the study programme	<i>The objectives of the Master's study programme in Biology are to develop and deepen a student's:</i> <ul style="list-style-type: none"> <li><i>• understanding of the overall trends in the development of modern biological science at the interface between natural, medical and social sciences;</i></li> <li><i>• up-to-date theoretical knowledge in one of the sub-disciplines of biology;</i></li> <li><i>• basic research skills, skills in the use of modern instrumental and information technologies in natural sciences;</i></li> <li><i>• understanding of the ethical principles of biological research;</i></li> <li><i>• understanding of the importance of international cooperation in scientific activity;</i></li> <li><i>• ability to communicate scientific knowledge;</i></li> <li><i>• ability to work in a team in research projects;</i></li> <li><i>• ability of carrying out scientific research under the supervision of experienced academic staff and summarising its results in a Master's Thesis;</i></li> <li><i>• innovative skills in biology and related fields.</i></li> </ul>

Results of the study programme	<p><b>Knowledge</b></p> <ol style="list-style-type: none"> <li>1. demonstrate knowledge of recent developments in biology in general and current problems in their chosen sub-discipline in particular, and can use this knowledge to answer non-standard questions about research or innovative activity in their chosen sub-discipline of biology;</li> <li>2. know the problems and requirements of professional ethics;</li> <li>3. manage the fundamental principles of science communication and innovative business in biology;</li> </ol> <p><b>Skills</b></p> <ol style="list-style-type: none"> <li>4. can formulate a research topic in the sub-discipline of biology, analyse the results of own and other scientific research in the context of the latest scientific knowledge, put forward testable hypotheses;</li> <li>5. can evaluate information in biology and in the sub-discipline as a whole as well as its interface with other fields of science; can find access to scientific data necessary for learning a subject, carrying out a research project or doing an innovative activity;</li> <li>6. can use scientific methods and technologies, applying them to a specific task, analyse own and others' results, make decisions in complex situations, search for solution and compare options, analyse the risks involved;</li> </ol> <p><b>Competence</b></p> <ol style="list-style-type: none"> <li>7. can conduct scientific research from hypothesis to results with scientifically accurate data collection and analysis in a specific sub-discipline of biology, including planning and implementation of a scientific project and interpretation of the results to other scientists and the public;</li> <li>8. use the acquired knowledge and skills to seek new technical solutions, methodologies, organisational support or ways of obtaining information when carrying out scientific research;</li> <li>9. can independently plan their work, take responsibility for the results of their work, plan their career growth and professional development in lifelong learning.</li> </ol>
Final examination upon the completion of the study programme	Master thesis

## Study programme forms

### Full time studies - 2 years - latvian

Study type and form	Full time studies
Duration in full years	2
Duration in month	0
Language	latvian
Amount (CP)	80
Admission requirements (in English)	Bachelor's degree in Natural Sciences, second level professional higher education (or education equaled to it) in Biology, Agricultural Sciences and Medicine, and entrance examination

Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Master's degree of Natural Sciences in Biology</i>
Qualification to be obtained (in english)	-

#### **Places of implementation**

<b>Place name</b>	<b>City</b>	<b>Address</b>
University of Latvia	RĪGA	RAIŅA BULVĀRIS 19, CENTRA RAJONS, RĪGA, LV-1050

## 3.1. Indicators Describing the Study Programme

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

In accordance with the Regulations of the Cabinet of Ministers No. 240 "Regulations on the State Academic Education Standard" of 13.05.2014, which increased the mandatory part of the Master's study programme to 24 CP (excluding the Master's Thesis); changes have been made to the MSP "Biology" study plan by creating a new study course "Scientific Communication for Biologists", increasing the CP of the study course "Bioethics" and moving the study course "Practical Biometrics for Biologists" to the compulsory part. These changes reflect the industry's demand for highly qualified specialists in the field of data analysis, as well as the need to improve the communication of scientific knowledge to the public. The changes are in line with the priorities of the LU Strategy in the area of operational development, namely: 1) Scientific Excellence; 2) Study Development; 3) Contribution to Society.

The changes in Part B "Restricted elective courses" reflect the need to improve the quality of studies in the field of bioinformatics. Bioinformatics is the field of biology, statistics, and information and communication technology synthesis dealing with the large-scale analysis of genomic, transcriptomic, proteomic, and metabolomic data. Specialists in this field are in high demand in the labour market, both in Latvia and abroad. Until now, such specialists were not trained in Latvia, but starting from 2018, in cooperation with the UL Faculty of Computing, study courses that allow specialisation in bioinformatics such as "Data Mining Algorithms", "Advanced Programming Technologies", etc., have been in the offer.

Other changes in the offer of Part B study courses reflect the need to coordinate the amount of courses in CP, as well as the removal of some courses from the study plan due to the lack of appropriate lecturers or lack of student interest in certain highly specialised courses.

Overall, these changes improve the quality of studies, provide students with courses on the most relevant issues in biology, and increase the competitiveness of graduates in the labour market.

In preparation for the SF LS accreditation, all study courses have been updated to ensure their compliance with the UL Procedure for Development and Updating of Study Courses issued in accordance with Article 56<sup>1</sup> of the Law on Higher Education Institutions and approved by the UL Order No. 1/277 of 10.08.2018. All study courses, as well as the MSP "Biology" as a whole, set common learning outcomes - knowledge, skills and competences. The aims and objectives of the MSP "Biology" have been adjusted and supplemented accordingly.

The MSP "Biology" has been implemented at the UL Academic Centre in Jelgavas iela 1, House of Nature, Torņakalns, since the academic year 2015/2016. As the director of the MSP "Biology" during the accreditation period, the UL Senate approved Prof. Nils Rostoks. 2013/2014.

2022/2023

Course Title	CP	CP	Course Title
<b>Part A - mandatory study courses</b>	36	44	<b>Part A - mandatory study courses</b>
Current Problems in Biology: Hypothesis I	2	2	Current Problems in Biology: Hypothesis I
		4	Practical Biometry for Biologists
Current Problems in Biology: Hypothesis II	3	3	Current Problems in Biology: Hypothesis II
Bioethics	2		
		3	Bioethics
		3	Science Communication for Biologists
Current Problems in Biology: Methods I	2	2	Current Problems in Biology: Methods I
Basic Skills for Innovation Activities	4	4	Basic Skills for Innovation Activities
Current Problems in Biology: Methods II	3	3	Current Problems in Biology: Methods II
Master's Thesis	20	20	Master's Thesis
<b>Part B - restricted elective study courses</b>	<b>44</b>	<b>34</b>	<b>Part B - restricted elective study courses</b>
Practical Biometry for Biologists	4		
Physiology of Blood circulation	4	4	Physiology of Blood circulation
Plant Tissue Cultures	4	4	Plant Tissue Cultures
Bioindication	4	4	Bioindication
Biological Oceanography	3	3	Biological Oceanography
Biological Taxonomy	2	2	Biological Taxonomy
Human Genome	4	4	Human Genome
Data Bases for Biologists I	3	3	Data Bases for Biologists
Data Bases for Biologists II	3		

Photosynthesis	4	4	Photosynthesis
Productivity of Aquatic Ecosystems	2	2	Productivity of Aquatic Ecosystems
Introduction to Bioinformatics	2	2	Introduction to Bioinformatics
Medical Microbiology	4	4	Medical Microbiology
Microbial Bioenergetics and Cultivation Theory	2	2	Microbial Bioenergetics and Cultivation Theory
		4	Advanced Programming Technologies
Molecular Biology and Genetics	4	4	Molecular Biology and Genetics
		2	Operating System
Parasitology	2	2	Parasitology
Food Microbiology	6		
		4	Food Microbiology for Biologists
Behavioural Ecology	3	3	Behavioural Ecology
Vascular Plant Taxonomy	4	4	Vascular Plant Taxonomy
Soil Ecology	4	4	Soil Ecology
Plant - Environment Interactions	4	4	Plant - Environment Interactions
Plant Ecology	4	4	Plant Ecology
Introduction and Breeding of Plants	4	4	Introduction and Breeding of Plants
Mineral Nutrition of Plants	4	4	Mineral Nutrition of Plants
Biocorrosion and Biodegradation	4	4	Biocorrosion and Biodegradation
Biotechnology III. Molecular biotechnology	4	4	Biotechnology III. Molecular biotechnology
Habitat and Species Conservation II	4	4	Habitat and Species Conservation II
Habitat and Species Conservation III	2	2	Habitat and Species Conservation III
Human Ethology (Biological Foundations of Human Behavior)	2	2	Human Ethology (Biological Foundations of Human Behavior)
		4	Human Microbiome
		3	Databases and Information Systems Fundamentals
Animal Ecology II Vertebrates	3	3	Animal Ecology II Vertebrates

Ecological Monitoring	2	2	Ecological Monitoring
Experiment in Plant Physiology	4	4	Experiment in Plant Physiology
Protection of Flora	2	2	Protection of Flora
Genetic Experiment	6		
		4	Genetic Experiment 2
Physiology of the Digestive System	4		
		4	Physiology of Digestion and Metabolism
The Topical Problems of Aquatic Ecology	3	3	The Topical Problems of Aquatic Ecology
Limnology	3	3	Limnology
		2	Linear Algebra I
		4	Selected Topics in Mathematical Statistics for Computer Science
Game Biology and Management	2	2	Game Biology and Management
Medical Biotechnology	2	2	Medical Biotechnology
Physiology and Biochemistry of Fungi	4	4	Physiology and Biochemistry of Fungi
Microbial Ecology	4	4	Microbial Ecology
Methods of Microscopy	3		
		4	Model Systems in Biomedicine
		4	Molecular Plant-Microbe-Invertebrate Interactions
Neurophysiology	4	4	Neurophysiology
Applied Hydrobiology	3	3	Applied Hydrobiology
		4	Deep Learning
Physiology, Cytology and Conservation of Strains-Producers	4	4	Physiology, Cytology and Conservation of Strains-Producers
Migration and Orientation of Birds	2	2	Migration and Orientation of Birds
Methods of Cell Biology	4		
Spatial Information Systems in Landscape Ecology and Planning	4	4	Spatial Information Systems in Landscape Ecology and Planning



Regulation of Visceral Functions	4	4	Regulation of Visceral Functions
Introduction to Fish farming	2	2	Introduction to Fish farming
		3	Principles of Development Biology
Plant Biochemistry	4	4	Plant Biochemistry
Bacterial Diversity	4	4	Bacterial Diversity
		2	Bioinformatics
Applied genetics	6		
		4	Modern Technologies in Biomedicine
Habitat and Species Conservation I	3	3	Habitat and Species Conservation I
		4	Data Mining Algorithms
		4	Data Processing Systems
Animal Ecology I Invertebrate	3	3	Animal Ecology I Invertebrate
Animal Evolution	2	2	Animal Evolution
Ichtiology and Fish Ecology	3	3	Ichtiology and Fish Ecology
Immunology II	4	4	Immunology II
Applied Entomology	3	3	Applied Entomology
		4	Seed Physiology and Ecology
Sports and Extreme Conditions Physiology	3	3	Sports and Extreme Conditions Physiology
Physiology of the Cell	4	4	Physiology of the Cell
Mammalian Cell Cultures	2	2	Mammalian Cell Cultures
Fundamentals of experimental methods in physiology I	4		
Plant Molecular Genetics	2		
Ecological Biochemistry and Toxicology	3		
Fundamentals of experimental methods in physiology II	4		
Biotechnology of Macromycetes	3		
Molecular Methods in Microbiology	4		

Applied Bioanalytics	4		
Yeast Biology	2		
Advanced Cell Biology	2		
Enzymology	4		
Phytocoenology	4		
Neuroscience	3		
<b>Part C - free elective study courses</b>	<b>0</b>	<b>2</b>	<b>Part C - free elective study courses</b>
	<b>80</b>	<b>80</b>	

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

The MSP "Biology" (code 45421) is fully compliant with the higher education standard (Cabinet of Ministers of the Republic of Latvia Regulations No.240 "Regulations on the State Academic Education Standard" as of 13 May 2014). The amount of the MSP is 80 CP, which is in line with the State Academic Education Standard. The duration of studies is 4 semesters, which, following the Bologna Declaration, is in line with the study programmes agreed in the European Higher Education Area. At the start of the studies, a contract shall be concluded between the student and the UL.

The MSP "Biology" is in line with the SF LS, because students acquire qualification in different branches of biology from molecules to ecosystems. Study form is full time presence, duration two years, four semesters, which corresponds to the international standards for master education. The duration is sufficient to provide students with the necessary high level theoretical knowledge, as well as provides them with sufficient time to work on their master theses - scientific study in a branch of biology. Upon graduation from the BSP Biology, graduates are eligible to study in the MSP "Biology" on a competitive basis. Upon graduation from the MSP "Biology", graduates are eligible to study in the DSP "Natural Sciences". These three study programmes, as well as the recently established BSP "Biotechnology and Bioengineering", form a logical continuity of academic education, ensuring the growth of students and the relevance of their qualifications to the needs of the labour market. Graduates of the MSP "Biology" are awarded a Master of Science degree in Biology, which is relevant to the field of science and study field. The aims, objectives and learning outcomes of the study programme are in line with the Master's level studies in Biology, as it allows acquisition of in-depth knowledge, skills and competences and corresponds directly to the Study Field and the title of the study programme. The first two digits of the programme code (45421) indicate the level of study - academic education (Master's degree), while the third to fifth digits (421) correspond to the field of study - life sciences. The programme code is correct and

corresponds to the programme parameters.

According to the Academic Education Standard, the main objective of the MSP Biology is to provide a set of knowledge, skills and competences in accordance with the knowledge, skills and competences of level 7 of the Latvian Classification of Education. Among other things, the MSP "Biology" provides up-to-date theoretical and methodological knowledge in a specific sub-field of biology, while providing an overview of developments in the field as a whole, preparing graduates for practical work in science, business or public administration, as well as for further studies at doctoral level. The study programme includes a mandatory (A) part of 24 CP for the study of theoretical knowledge in the chosen field and its validation in the aspect of current problems in the chosen field or sub-field of science. The courses from the restricted elective (B) part provides students with specialisation in a particular sub-discipline of biology, equipping them with necessary in-depth sub-discipline-specific knowledge, skills and competences. The aim of the Master's Thesis is to demonstrate the author's ability, with the help of qualified scientific advice, to obtain data to a large extent independently, to summarise, evaluate and generate new information of theoretical or practical significance in a sub-discipline of biology. Upon successful completion of the Master's study programme and the defence of the Master's Thesis, the student obtains the academic degree of Master of Science in Biology. In addition to specific knowledge in a sub-discipline, students also acquire generally applicable knowledge in such fields as, for example, bioethics, science communication and the foundations of innovative entrepreneurship.

The objectives of the study programme are designed to achieve the aim and the learning outcomes of the programme. To start studies in the MSP "Biology" requires a Bachelor's degree in Natural Sciences, second level professional higher education (or equivalent) in Biology, Agricultural Sciences or Medicine.

The entrance examination takes into account:

- 1) motivation for choosing the study programme, intended research direction;
- 2) experience in research - methods used and results obtained in the Bachelor's Thesis;
- 3) self-assessment of the applicant's knowledge in biology;
- 4) presentation of papers at scientific conferences;
- 5) internships in foreign universities and research institutions;
- 6) the topicality and relevance of the topic of the proposed Master's Thesis to current research directions in biological science;
- 7) the concept of the Master's Thesis.

The conducted mapping (see Annex 28-2-B) confirms that the defined aim, objectives and learning outcomes of the study programme are interlinked with the study course outcomes.

The aim of the MSP "Biology" is to provide up-to-date theoretical and methodological knowledge in a specific sub-discipline of biology, while providing an overview of developments in the field as a whole, preparing graduates for practical work in science, business or public administration, as well as for further doctoral studies.

The objectives of the MSP "Biology" are to establish and deepen the student's:

- understanding of the overall trends in the development of modern biological science at the interface between natural, medical and social sciences;
- up-to-date theoretical knowledge in one of the sub-disciplines of biology;
- basic research skills, skills in the use of modern instrumental and information technologies in

natural sciences;

- understanding of the ethical principles of biological research;
- understanding of the importance of international cooperation in scientific activity;
- ability to communicate scientific knowledge;
- ability to work in a team in research projects;
- ability of carrying out scientific research under the supervision of experienced academic staff and summarising its results in a Master's Thesis;
- innovative skills in biology and related fields.

The knowledge and skills acquired by students in the programme are sufficient to enable graduates to continue their studies in the DSP "Natural Sciences" (code 51421).

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

The rapid development of biology today supports many other fields of science, such as medicine and agriculture. In the European Commission report "European Commission, Directorate-General for Research and Innovation, Wydra, S., Hüsing, B., Aichinger, H., et al. "Life and biological sciences and technologies as engines for bio-based innovation: studies on support to research and innovation policy in the area of bio-based products and services", Publications Office, 2021, <https://data.europa.eu/doi/10.2777/046454> life sciences and technologies are placed among the main drivers and enablers of bio-based innovation. In the context of European Green Deal, innovations and solutions for sustainable use of natural resources, reducing dependence on fossil fuels, protecting the environment and climate, securing food resources and maintaining international competitiveness are becoming increasingly important. This report looks at the 50 most important innovations in biology for the next 5-20 years, which cover the fields of microbiology, genetics, molecular biology, environmental protection, and biodiversity. According to the Ministry of Economics' "Informative Report on Medium- and Long-Term Labour Market Forecasts" (2020), between 3,500 and 6,900 of Latvia's working-age population with higher education are currently employed in life sciences and related fields. The demand for such specialists is expected to remain high and possibly increase. In turn, Latvia's National Development Plan for 2021-2027 (NDP 2021-2027) under the action direction "Quality, accessible, inclusive education" indicates that the share of graduates in science, mathematics and information technology in the total number of higher education graduates should increase from 6.8% (2018) to 12% (2027).

The MSP "Biology" trains specialists in all major sub-fields of biology, from molecular biology to ecology. To increase the competitiveness of the programme, the sub-programme "Bioinformatics" has been created in cooperation with the UL Faculty of Computing. The fact that graduates with a Master's degree are in demand on the labour market is reflected in the graduate employment survey data, which shows that 92% of the graduates who participated in the survey are working in a field related to their specialisation. The main employers include research institutes, universities, public institutions, and various private companies. The MSP "Biology" graduates are in demand as teaching staff both at the UL and other higher education institutions of Latvia. 20-30% of MSP Biology graduates continue their studies in doctoral studies both in Latvia and abroad.

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

The statistical data on the students in the MSP “Biology” is summarised in Annex 24-2-B. There is a downward trend in student numbers between 2013 (124 students) and 2020 (82 students). There are several possible explanations for this trend:

1. The number of students enrolled in the MSP “Biology” has decreased, which is directly related to the number of graduates of the BSP “Biology”. Since the number of graduates has decreased in the BSP “Biology” it is not surprising that the number of students in the MSP “Biology” has decreased. In addition, it should be noted that graduates of the BSP “Biology” have ample opportunities to study for a Master's degree at foreign universities, and many are taking advantage of that opportunity.
2. A stricter control over study commitments has been introduced, with close following of deadlines for study breaks and other obligations. As a result, students who do not fulfil the requirements of their study programme are exmatriculated in a timely manner and do not appear in the statistics of the final years.
3. Most students are employed in jobs possibly related to the field, but not related to research. Thus, the development of the Master's Thesis often takes place in the time free from studies and work. This is confirmed by the fact that every year a number of students complete their degree programme but postpone writing their Master's Thesis for at least a year. It should also be noted that the development of the Master's Thesis and the students' employment depend on the existence of research projects involving the FB researchers and those of its cooperation partners.
4. The COVID-19 pandemic significantly hampered the students' ability to work in the laboratories of the FB and its partners, as well as worsened the students' financial situation, and, thus, reduced their motivation to complete their studies and obtain a Master's degree.

A range of measures are being taken to prevent further declines in student numbers:

1. The MSP “Biology” admits graduates of other UL study programmes as well as other higher education institutions of Latvia with related qualifications (medicine, agriculture, forestry). The number of such students tends to increase, but their qualifications and prior knowledge of biology are very uneven, and a significant proportion of them do not complete their studies. It is expected that from 2023 onwards, the number of students with a degree in biology will increase by 1.5%. The first graduates of the BSP “Biotechnology and Bioengineering” will be able to matriculate in the MSP “Biology” in 2023, which could increase the number of matriculated students.
2. There is a need to improve the explanatory work and motivation of students to continue their studies in higher level programmes. Statistics show that a Master's degree significantly improves employability and salaries. However, given the national shortage of life science professionals, students seem to lack motivation to pursue a Master's degree at the moment, as it requires a significant effort, whereas jobs can be found with a Bachelor's degree. This situation could be improved if students were provided with adequately paid work places in research projects, albeit science funding in Latvia is currently insufficient. Cooperation with other scientific institutions is very important in this respect, as it improves the possibility for students to develop their Master's Theses while working in scientific projects and being

remunerated.

3. Various indirect measures, such as renewing the teaching staff and attracting foreign guest lecturers, which could improve the quality of studies and make them more attractive to students, are being taken. Work will also continue on improving the study and research infrastructure in order to improve the study environment for students.

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

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

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

The content of the MSP "Biology" is developed on the basis of the following external and internal laws and regulations:

- Law on Higher Education Institutions of the Republic of Latvia;
- Cabinet of Ministers Regulation No 240 "Regulations on the State Academic Education Standard" (13.05.2014);
- UL Regulations on Study Programmes and Continuing Education Programmes (UL Senate Decision No. 102 as of 04.2017).

The content of the MSP "Biology" study programme complies with the State Academic Education Standard (Annex 25-2-B).

The content of the study programme is based on the best practice of foreign study programmes, EU documents on the content of study programmes in life sciences, as well as on the expectations of employers and the availability of lecturers. The mapping of the study courses included in the programme (Annex 28-2-B) shows how the study courses ensure the achievement of the study programme outcomes and how the study course outcomes overlap with the study programme outcomes. The programme provides academic education in all sub-disciplines of biology, which are the responsibility of the seven BF Departments, namely, Department of Plant Physiology, Department of Botany and Ecology, Department of Human and Animal Physiology, Department of Hydrobiology, Department of Microbiology and Biotechnology, Department of Molecular Biology, Department of Zoology and Animal Ecology. The programme is implemented in cooperation with

other UL Faculties, the UL and state research institutes, as well as employers.

The study plan of the MSP “Biology” can be found in Annex 26-2-B. In accordance with the Cabinet of Ministers' Regulations on the State Academic Education Standard, the mandatory part of the programme in the amount of 24 CP consists of four study courses “Current Problems in Biology” (10 CP in total), as well as individual study courses that provide all students with necessary knowledge in statistics, bioethics, science communication and innovative entrepreneurship. It should be emphasised that the courses “Current Problems in Biology” are taught in the form of lectures and seminars with the participation of leading experts in the field from both Latvia and abroad, and the content of the courses is updated every year according to current developments in the field, such as the Nobel Prize in Medicine and/or Chemistry.

The MSP “Biology” restricted elective (Part B) courses are mostly taught every two years, ensuring that every MSP student has the opportunity to take every course, while at the same time ensuring a sufficiently rich choice of B courses and a sufficient number of students per course for the programme budget. Taking into account student surveys, a significant amount of the courses employ the analysis of scientific literature in the form of seminars, which ensures that students are able to critically analyse the latest scientific literature from the perspective of both experimental methods and theoretical novelty. For financial reasons, the MSP “Biology” has a relatively low proportion of laboratory work in its courses of study, but during the Master's studies students are expected to work actively on their Master's Thesis under the supervision of leading Latvian and foreign experts. This ensures that students learn research methodologies that are relevant to their chosen specialisation. Accordingly, “green” biologists learn field research methodology, while “white” biologists learn experimental, laboratory biology methods appropriate to the topic.

During the SF LS accreditation period, changes have been made to the MSP “Biology” to ensure that the MSP meets the Academic Education Standard by providing courses in the compulsory part in the amount of 24 CP. Taking into account the requests from students and employers, as well as the competitiveness of similar study programmes, additional courses, namely, “Practical Biometry for Biologists” and “Science Communication for Biologists” have been included into the mandatory part of the MSP “Biology”, as well as the volume of the study course “Bioethics” has been increased to 3 CP. In addition, since 2018 it has been possible to specialise in Bioinformatics. For this purpose, some courses of the Faculty of Computing have been included in the MSP “Biology” and the content of some existing MSP “Biology” courses has been supplemented. The most significant changes have been introduced in the study course “Current Problems in Biology”, where new content (lectures, seminars and practical work) is provided for students of the bioinformatics sub-field. In addition to these changes, the course offer in the restricted elective part is regularly reviewed to ensure that it is in line with the latest trends in the field. This process is largely coordinated by the Heads of Departments, who are more familiar with the trends in the specific sub-discipline of biology. For example, in line with the latest scientific trends and taking into account the involvement of new, including foreign, specialists in the implementation of the MSP “Biology”, it is possible to offer the courses “Human Microbiome”, “Model Systems in Biomedicine”, “Principles of Developmental Biology”, and “Molecular Plant-Microbe-Invertebrate Interactions”.

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

All MSP Biology graduates receive a Master of Science degree in Biology, but during their studies they specialise in different sub-disciplines of biology and develop a Master's Thesis on a topic and with research methodology specific to that sub-discipline. A Master's Thesis is considered as a complete scientific study, often developed within the framework of a scientific project. The student is expected to carry out a largely independent scientific research work using research methodology appropriate to the sub-discipline, as well as to conduct the analysis and interpretation of the results of the scientific research under the supervision of a researcher (with a doctoral degree). The implementation of the MSP "Biology" involves 20 Professors (10 from the FB), 12 Associate Professors (9 from the FB) and 14 Assistant Professors (11 from the FB), which demonstrates high qualification of the lecturers. Leading experts in the field are involved in teaching individual courses, for example, Dr Jānis Ozoliņš in the course "Game Biology and Management", Dr Anete Boroduške -in "Microbial Ecology", or Dr Jānis Liepiņš in the course "Physiology, Cytology and Conservation of Strains-Producers". The courses of lectures on current problems in biology involve FB lecturers, as well as other leading Latvian and foreign specialists, who talk about the latest theoretical and methodological developments in various subfields of biology. The seminars in "Current Problems in Biology" include analysis of scientific publications in the relevant sub-discipline under the guidance of a specialist in the field. The restricted elective (Part B) courses analyse recent scientific research specific to a particular sub-discipline of biology. The assessment of the Master's Theses takes into account the existence of scientific publications and conference abstracts. All lecturers at the MSP "Biology" are actively engaged in scientific work as evidenced by their scientific publications and research projects.

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

Oral, written and combined assessment methods are used in the courses and examinations.

A variety of methods are used to acquire and consolidate knowledge, such as introductory lectures, interactive lectures, summative lectures, and problem-oriented lectures. Practitioners, professionals from different institutions, are invited to lecture in individual courses in order to promote the unity of theory and practice. Practical exercises, seminars, individual, pair and group work, discussions and project development, study tours to organisations in the field are widely used. Employers are involved in the implementation and development of the study courses (invited to lead individual seminars, which are often organised as exchange visits to workplaces, etc.).

To foster the development of students' research competence, students have the opportunity to analyse and study in-depth problems of interest in the field in successive courses. Senior students are involved in peer teaching-learning.

Seminars in the courses foster students' speaking, presentation, and discussion skills.



To achieve the learning outcomes - to acquire and consolidate knowledge, skills and develop competence - student-centred principles govern the study process. The study process uses methods that promote students' communication when performing study tasks, solving real problems in the field, modelling situations.

The physical environment of studies is also gradually changing: classrooms can be easily converted for group or individual work, students can use digital technologies. Lecturers mostly use methods that encourage students' active participation, critical thinking, and reflection. The e-learning environment is used to support the learning process and independent study. An e-learning environment (Moodle) created for each study course provides students with access to lesson materials, assignment descriptions in addition to study materials related to the course topics, as well as study tasks to be performed (tests, forums, seminars, conferences, etc.). with the reasons for the mark, All graded assessments in mid-term and final examinations are recorded and made available to students in the e-learning environment.

Updating study programmes and their study courses, the student-centred approach is followed with particular attention paid to the meaningful formulation of learning outcomes, so as to promote dialogue between lecturers and students on study content, forms of organisation and methods. Correctly formulated learning outcomes, in turn, promote students' understanding and ownership of their own learning, self-assessment and understanding of the assessment received. In the study process, lecturers use methods, forms of examination and assessment criteria that are appropriate to the study aim and the planned learning outcomes.

Students receive support and feedback from lecturers during the study process. The assessment criteria are made public in advance. Assessment provides students with the opportunity to demonstrate the extent to which they have achieved the expected learning outcomes.

The principles of student-centred learning encourage student mobility (recognition of learning outcomes), students engage in research and social activities in the community initiated by academic staff, and thus gain meaningful experience in applying what they have learned in their studies to practice. As part of the internal quality assurance policy, study programmes are implemented in such a way that students are encouraged to actively participate in the development of the study process. Policies and procedures are in place for submission of student suggestions and complaints and handling of student appeals. The results of student surveys are evaluated and considered in the development of the study process. Students willingly express their suggestions for the improvement of study programmes and study process in discussions with lecturers and programme directors.

The MSP "Biology" uses traditional and time-tested methods of student assessment, including various mid-term examinations, laboratory reports, as well as final examinations. Student work is assessed in accordance with the standard UL procedures. Depending on the requirements of the course, the emphasis on individual work, participation in seminars, theoretical knowledge, etc., may vary.

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

**outcomes of the study programme (if applicable).**

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

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

The themes of the Final (Master's) Theses of the MSP "Biology" reflect the diversity of subdisciplines of biology, from molecular to ecosystems. The Theses mostly have research and academic orientation, and often, their results have already been presented at local and international scientific conferences, as well as published in internationally cited journals. Most of the works are developed either in a laboratory or in the field, using industry-specific laboratory and field research methods. In recent years, especially in the context of the COVID-19 pandemic constraints, there have also been theoretical Theses with a focus on the analysis of existing or publicly available data. With the development of the sub-field of bioinformatics, it is expected that there will be more works developed outside the laboratory and entirely devoted to the analysis of genomic, transcriptomic, proteomic, or metabolomic data. Most of the Theses are related to current research projects both at the UL FB and in partner institutions. Thus, their novelty and relevance to the field are considered to be high. This is also reflected in the assessment results, which are usually in the range of 8 to 9. Almost 90% of students defend their Master's Theses with very good, excellent or outstanding grades (see Table 5.2.5.1). Excellent grades are reserved for those theses whose results have been published in the form of a scientific publication and for which the student is a co-author. As with research projects, the results of Master's Theses do not always have an immediate commercial application. This may partly explain the results of the employer survey, who value the theoretical training of the MSP "Biology" graduates but are more critical of their practical training. However, it should not be forgotten that the academic focus of the programme is on scientific excellence, while the highly valued ability of graduates to learn further enables them to quickly acquire practical skills relevant to employers.

Table 5.2.5.1.

*Distribution of marks (number and proportion) in Master's Theses by academic year*

Acad. Year / Assessment	4	5	6	7	8	9	10	Total
2013/2014		1 2,0%	1 2,0%	7 14,0%	11 22%	20 40,0%	10 20%	50 100%

2014/2015				2 4,5%	6 13,6%	26 59,1%	10 22,7%	44 100%
2015/2016		1 2,9%	1 2,9%	2 5,7%	6 17,1%	13 37,1%	12 34,3%	35 100%
2016/2017	1 2,3%			2 4,5%	7 15,9%	22 50,0%	12 27,3%	44 100%
2018/2018			1 3,2%	3 9,7%	3 9,7%	14 45,2%	10 32,3%	31 100%
2018/2019				3 10,7%	3 10,7%	16 57,1%	6 21,4%	28 100%
2019/2020				4 12,5%	3 9,4%	16 50,0%	9 28,1%	32 100%
2020/2021		1 2,9%		2 5,7%	7 20,0%	18 51,4%	7 20,0%	35 100%
Reporting Period	1 0,3%	3 1,0%	3 1,0%	25 8,4%	46 15,4%	145 48,5%	76 25,4%	299 100%

In the academic year 2020/2021, the defended Master's Theses in Biology had the following titles:

- Alterations in blood sera metabolome and blood transcriptome in hospitalized COVID-19 patients.
- Morphometric variation of brain, skull and lower jaw in steppe voles of group guentheri (*Arvicolinae*, subgenus *Sumeriomys*) due to geographical isolation.
- Development of African Swine Fever Virus vaccine candidates using ssRNA bacteriophage-derived virus-like particle platform.
- Comparison of human gut microbiome in patients with different durations of type 2 diabetes and antidiabetic therapies
- Changes in phenology of spring arrival of the common starling *Sturnus vulgaris* in North-East Europe from 1922 to 2017.
- The comparison of genetic diversity in the European populations of the white clover (*Trifolium repens* L.).
- Microfluidic field flow fractionation for high throughput extra-cellular vesicle separation.
- Effect of light on the accumulation of biologically active compounds in different tomato varieties.
- Genetic characterization and *in vitro* assay of ruminants and environmental *Listeria innocua* isolates.
- Expansion of root rot fungi *Heterobasidion spp.* infection in a Norway spruce *Picea abies* (L.) H. Karst. stand on a Oxalidosa turf. mel. forest type.
- Identification of stilbene and chalcone synthase gene sequences in the genome of high bush blueberry (*Vaccinium corymbosum*) and design of sgRNAs for their inactivation using CRISPR/Cas9 method.
- Occurrence of protozoan parasite *Toxoplasma gondii* in wild boars (*Sus scrofa*).
- Salt tolerance of climbing plants *Calystegia sepium* and *Calystegia soldanella* found on seashore: establishment and approbation of a model system.

- Assessment of the ecological status of Talsi and Vilkmuīža lakes according to phytoplankton and macrozoobenthos.
- Evaluation of whey as an alternative substrate for bacterial cellulose production.
- Evaluation of dietary habits, physical activity and physical health parameters in 5-7 year old children.
- The effect of meteorological conditions on radial increment of European larch (*Larix decidua*) in Latvia.
- The anti-tumor protection in mice DNA-immunized with rat TERT reverse transcriptase domain.
- Growth dynamics of *Quercus robur* following thinning in mixed stands.
- Media composition and growth temperature variation effect on antioxidative and antimicrobial activity of highbush blueberry *Vaccinium corymbosum* calli extracts.
- Performance assessment and verification for the chip-based multiplex digital PCR quantification method in the field of GMO testing.
- Characterization of the vascular miRome landscape and its implications for coronary artery disease.
- Identification and study of pituitary neuroendocrine tumor associated micro RNAs in patients' plasma.
- Spatial orientation abilities depending on daily physical activities in adults.
- Effects of plastic eluates on freshwater organisms: *in vivo* and *in situ*.
- Identification of the composition, stability and origin of the human blood-microbiome in healthy individuals.
- Stock assessment of Round goby *Neogobius melanostomus* on the Baltic sea coast of Latvia.
- Development of non-secreting pituitary neuroendocrine tumor classification, based on transcriptome de novo alignment and data dimension reduction.
- Formaldehyde removal efficiency by different plant species in a dynamic botanical biofilter system and the assessment of their physiological status.
- Recommendations for improving monitoring methods of the protected marine area "West coast of Riga bay".
- Factors affecting demographic parameters of eastern pasqueflower *Pulsatilla patens* (L.) Mill.
- Application studies of filamentous fungi for the biodegradation of cellulose and cellulose acetate.
- Assessment of students' static and dynamic balance abilities depending on the complexity of the cognitive tasks to be solved and general fitness.
- Formulation development of fruit and vegetable cleaners containing plant extracts and essential oils.
- Spring phenology phases of *Betula pendula* Roth in relation to wood anatomy and climate data.

### 3.3. Resources and Provision of the Study Programme

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

The MSP "Biology" is implemented in the new premises of the Academic Centre of the University of Latvia, which provides an excellent environment for lectures, seminars and laboratory work. All the resources available at the UL and FB are available for the implementation of the MSP "Biology". A detailed outline is given in Part II, subchapters 2.3.1 - 2.3.4 of the SF LS Self-Assessment Report. The information base, the material and technical base and the methodological support are adequate for the implementation of the study programme and achievement of the learning outcomes of the programme, which confirms the possibility of ensuring a quality study process in the future. Students have access to fast wireless Internet, individual study rooms, access to the resources of the UL Library. Overall, funding for higher education in Latvia is assessed as insufficient. However, it is possible to provide quality studies (lectures, seminars) within the existing funding. Due to limited funding, it is not possible to carry out laboratory work to the desired extent, which is also reflected in student surveys. The current funding base does not cover the real costs of production of Master's Theses. The FB allocates part of its research base and study funding to Thesis projects. However, a majority of the Master's Theses are developed within the framework of various Latvian and foreign funded research projects. Given the high competition for science funding in Latvia, no research group can offer guaranteed, long-term funding for Master's Thesis development. In addition, the topic of the Master's Thesis is closely related to the goals and outcomes of scientific projects. Additionally, link with the research groups provides students with the access to common facilities of the National Research Centres located in various Latvian scientific institutions.

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

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

**Programme Revenue**

To provide the funding needed for the implementation of the MSP "Biology", the UL uses:

- the state budget subsidy from the Ministry of Education and Science, set at EUR 4646 for full-time studies for the academic year 2021/2022;
- the tuition fee, taking into account all the factors listed under the heading "Financial Support", set for the academic year 2021/2022:
  - full-time studies - EUR 2400 per year.

In view of the above-stated, the total study programme budget is expected to be approximately EUR 344 000 per year, as summarised in Table 3.2.1.

*Table 3.2.1. Programme expected revenue per annum, EUR*

Study Type	Number of Students	Study Fee/ State Subsidy	Total Revenue
Full-Time (state-funded)	73	4646	339 158
Full-Time (fee-paying)	2	2400	4800
<b>Total</b>			<b>343 958</b>

### **Programme Costs**

In order to estimate the amount of funds required for financial support, the UL calculates the cost price for study programmes according to a methodology developed by the UL, which takes into account the costs of providing the study process as described in the section "SF Financial Provision" and information on the study programme plan, teaching staff involved, the planned number of students, etc., thus ensuring the reliability of the forecasts.

### **Programme costs for full-time studies**

For calculating costs, the implementors of the programme "Biology" use the data of the 75 students studying in the programme full time in the academic year 2021/2022, the existing programme plan and the existing structure of the academic staff involved in the programme. In view of the above, the estimated full-time cost of the programme per student is EUR 4282 per year, and the total cost of the programme is EUR 321 150 per year. A more detailed pro-rata breakdown of the costs is presented in Table 3.2.2.

*Table 3.2.2. Percentage breakdown of costs in the study programme*

<b>Expenditure heading</b>	<b>% of the total</b>
Teaching staff costs	47,9 %
General staff	13,2 %
Other costs	0 %
Infrastructure expenditure	11,3 %
Capital items and services	1,6 %
Indirect costs	26,0 %

Figure 3.2.1 shows the cost of the study programme depending on the number of students and compares it with the proposed study fee and the state budget subsidy.

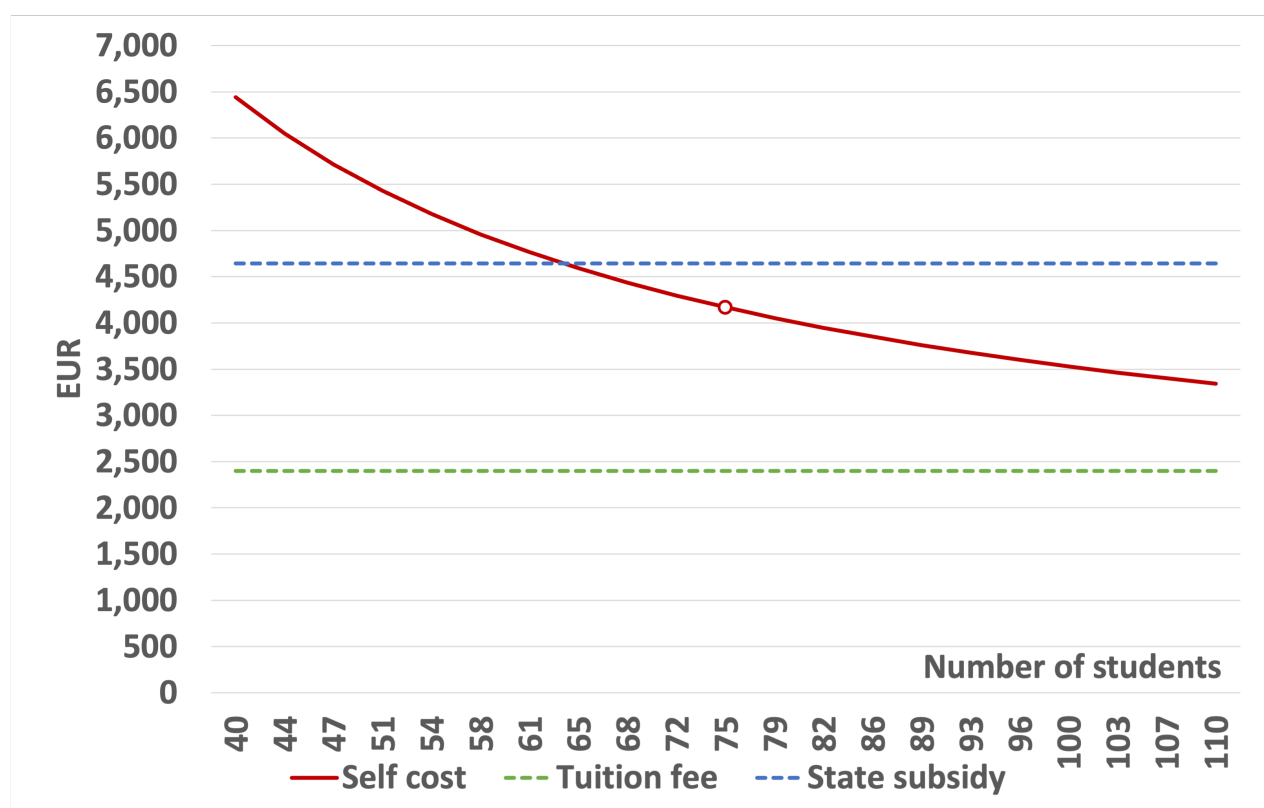


Figure 3.2.1. The MSP “Biology” cost per student

Based on the calculation, it can be seen that for the programme to be payable and for students to be provided with a quality study process, the number of fee-paying students in the programme (in all courses together) should be at least 64 (the intersection of the red (cost price) and green (tuition fees) lines projected onto the x axis).

### Summary of Programme Revenue and Costs

In table 3.2.3. summarises the programme revenue based on the number of students, state subsidy, study fees, and programme expenses for this number of students.

Table 3.2.3. Programme results

Study Type	Number of Students	Study Fee/ State Subsidy	Total Revenue	Total Costs
Full-Time (state-funded)	73	4646	339 158	312 586
Full-Time (fee-paying)	2	2400	4800	8564
<b>Total</b>			<b>343 958</b>	<b>321 150</b>

The data shown in the table clearly prove that the UL has sufficient funds to implement the study

programme and ensure its further development. In addition, the development of the programme can be financed from the income received from lifelong learning, and other services, as well as from the financial resources accumulated by the structural unit. Faculties also receive financial support for programme development from the UL Study Quality Improvement Fund. Although formally, a large number of teaching staff are employed (the ratio 1.3:1), it should be taken into account that the majority of them teach only a small part of a study course. Therefore, the high faculty-to-student ratio does not have a negative impact on the programme funding. For example, every autumn semester, the study courses "Current Problems in Biology: Hypothesis I" and "Current Problems in Biology: Methods I" are delivered by about 14 different lecturers, each giving one lecture. In addition, "Current Problems in Biology: Hypothesis II" and "Current Problems in Biology: Methods II" delivered in the spring semester are implemented in the form of seminars by the FB Departments (biology subfields), which is why at least 8 (including bioinformatics) different lecturers are usually involved in the course.

### **3.4. Teaching Staff**

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

The MSP "Biology" fully complies with the requirements of the first part of Article 55 of the Law on Higher Education Institutions (Annex 30-2-B). Highly qualified lecturers (Professors and Associate Professors) participate in the implementation of the MSP "Biology"; in exceptional cases lecturers and assistant professors are engaged to teach certain topics. Only scientists of biology or related fields with a doctoral degree are involved in the supervision of Master's Theses, while involving doctoral students with a Master's degree and specialists in the field as consultants. The knowledge of the English language of the teaching staff involved in the implementation of the programme makes it possible to teach study courses in English as well. The knowledge of the state language of the academic staff employed in the study programme complies with the regulations on the extent of knowledge of the state language and the procedure for testing the state language proficiency for the performance of professional and official duties and allows for teaching study courses in the state language. The teaching staff has scientific work experience both as authors of scientific publications and as participants in the implementation of scientific projects, related teaching staff as appropriate for achieving the aim of the study programme and attaining the objectives.

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



The reporting period is marked by significant changes in the composition of the teaching staff.. The lecturer renewal policy implemented by UL FB has promoted the involvement of new lecturers in the study process. Initially (2014-2018), this process was implemented within the framework of the development of the UL FB, using internal resources, but starting from 2018, within the SAM 8.2.2 project "Renewal and Competence Development of Academic Staff at the University of Latvia".

Table 5.4.2.1.

*Changes in the composition and number of lecturers in the implementation of the MSP "Biology"*

Position	2014	2022
Professors	6	20
Associate Professors	9	12
Assistant Professors	14	14
Lecturers	10	5
Assistants and instructors	4	8

During the reporting period, UL FB has significantly updated its teaching staff, both due to the change of generations, and by attracting new lecturers who were not employed by the UL until now. In this respect, the SAM 8.2.2 project funding was a major boost, as it enabled funding to be found for promising scientists with links to Latvia. It has been possible to strengthen the team of highly qualified lecturers by attracting excellent scientists from partner research institutes, as well as by fostering the growth of existing teachers. The change in the number of lecturers is also due to the fact that the MSP "Biology", together with the Faculty of Computing, is organising courses for students who wish to specialise in bioinformatics.

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

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

**Provide information on the reporting period (if applicable).**

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

The MSP “Biology” has a lower student ratio than the BSP Biology, reflecting the priority given to individual and group work. This ensures a higher quality of studies, as lecturers are able to devote more time to preparation and working individually with students. In the academic year 2021/2022, 59 teaching staff were involved. There were 78 students studying the programme, giving a student-to-faculty ratio of  $78:59 \approx 1.3$  students per teaching staff member. This ratio is due to the relatively high number of courses in the restricted elective part which are attended by a relatively small number of students. This certainly reduces the efficiency of the implementation of the study programme, but it provides ample opportunities for students to study interesting courses. In addition, many courses are taught by several lecturers in order to create a study environment as close to research as possible. Here, too, there is close collaboration between different lecturers, ensuring the acquisition of very specific topics, while at the same time maintaining a coherent course theme.

The study courses “Current Problems in Biology” are coordinated by the Director of the MSP Biology, maintaining an equitable representation of different sub-fields of biology. The study plan is coordinated with the Heads of the FB Departments, including the involvement of distinguished visiting lecturers.

# Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	20_2_B_Diploma_Biology_MSP.pdf	20_2_A_diploms_Biologijas_MSP.pdf
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)		
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period	24_2_B_statistic_number_students_Biology_MSP.pdf	24_2_A_statistika_studejoso_skaitis_Biologija_MSP.pdf
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard	25_2_B_compliance_standard_Biology_MSP.pdf	25_2_A_atbilstiba_valsts_standartam_Biologijas_MSP.pdf
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)		
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	28_2_B_mapping_Biology_MSP.xlsx	28_2_A_kartejums_Biologijas_MSP.xlsx
The curriculum of the study programme (for each type and form of the implementation of the study programme)	26_2_B_Study_plan_Biology_MSP.pdf	26_2_A_studiju_plans_Biologijas_MSP.pdf
Descriptions of the study courses/ modules	27_2_B_course_descriptions_Biology_MSP.pdf	27_2_A_kursa_apraksti_Biologijas_MSP.pdf
Description of the organisation of the internship of the students (if applicable)		
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)	30_2_B_section_55_Biology_MSP.pdf.pdf	30_2_A_pants_55_Biologijas_MSP.pdf

# Biology (43421)

Study field	<i>Wildlife Sciences</i>
ProcedureStudyProgram.Name	<i>Biology</i>
Education classification code	<i>43421</i>
Type of the study programme	<i>Academic bachelor study programme</i>
Name of the study programme director	<i>Iluta</i>
Surname of the study programme director	<i>Dauškane</i>
E-mail of the study programme director	<i>iluta.dauskane@lu.lv</i>
Title of the study programme director	<i>Dr.biol., asoc.profesore</i>
Phone of the study programme director	<i>+371 29733565</i>
Goal of the study programme	<i>Provide an academic education in biology and practical skills in research; to raise the general level of education of students by preparing academically educated spe-cialists who are able to carry independent research and solve theoretical questions in biology, its sub-disciplines, as well as in fields of science related to biology.</i>
Tasks of the study programme	<i>1. to increase students' knowledge, skills, and competences in theoretical and practical courses in biology, as well as in basic courses in other natural sciences (chemistry, mathematics, physics, and earth sciences)</i> <i>2. to promote the development of practical and research skills by ensuring the practical application of theoretical knowledge in the form of practical and laboratory work and field courses</i> <i>3. to provide advanced training in a relatively specialised field of molecular or organismal biology</i> <i>4. to develop modern research skills and the ability to carry out independent research under the supervision of academic staff in a chosen field of biology, and to summarise the results in a Bachelor's Thesis which level corresponds to the requirements for scientific publication</i>

Results of the study programme	<p><i>Knowledge:</i></p> <ol style="list-style-type: none"> <li>1. demonstrate a basic knowledge of the natural sciences and subfields of biology - molecular biology, microbiology, genetics, plant, animal and human anatomy and physiology, zoology and botany, ecology, and evolution;</li> <li>2. explain the basic concepts of natural sciences (mathematics, chemistry, physics, earth science);</li> <li>3. demonstrate knowledge and understanding of the patterns at the molecular, organismal and ecosystem levels of organisation of living nature.</li> </ol> <p><i>Skills:</i></p> <ol style="list-style-type: none"> <li>4. critically analyse concepts, theories, and problems in biology;</li> <li>5. independently obtain, select, and analyse information and use it to make decisions and solve problems in life sciences;</li> <li>6. be able to use modern laboratory and field equipment to collect data, apply acquired laboratory and field research methods, analyse research data, and interpret and present research results.</li> </ol> <p><i>Competence:</i></p> <ol style="list-style-type: none"> <li>7. integrate interdisciplinary knowledge from natural sciences to address scientific questions</li> <li>8. conduct scientific research from hypothesis to results with scientifically correct data collection and analysis</li> </ol>
Final examination upon the completion of the study programme	<i>Bachelor thesis</i>

## Study programme forms

### Full time studies - 3 years - latvian

Study type and form	<i>Full time studies</i>
Duration in full years	<i>3</i>
Duration in month	<i>0</i>
Language	<i>latvian</i>
Amount (CP)	<i>120</i>
Admission requirements (in English)	<i>Secondary educations</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Bachelor degree of natural sciences in biology</i>
Qualification to be obtained (in english)	<i>--</i>

### Places of implementation

Place name	City	Address
University of Latvia	RĪGA	RAIŅA BULVĀRIS 19, CENTRA RAJONS, RĪGA, LV-1050

## 3.1. Indicators Describing the Study Programme

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

Starting from the academic year 2015/2016, the BSP "Biology" is implemented in the new premises of the Academic Centre of the University of Latvia (the House of Nature, Jelgava street 1), which provides an excellent environment for lectures, seminars and laboratory work. Since the previous accreditation period, the directors of the BSP "Biology" have changed, namely, instead of Voldemārs Spuņģis, the Senate of the University of Latvia approved Prof. Didzis Elferts. In turn, for this accreditation period, Prof. Iluta Dauškane was approved as the Director of the BSP.

For the accreditation period, a new aim of the BSP was defined. In accordance with the Academic Education Standard, the main aim of the BSP "Biology" is to provide a set of knowledge, skills, and competences corresponding to the knowledge, skills, and competences of level 6 of the Latvian Qualifications Framework. The BSP has clearly defined objectives and outcomes to achieve at these levels of knowledge, skills, and competences.

Since the previous accreditation period, changes have been made to the scope and titles of the study courses in mandatory Part A, restricted elective Part B and free elective Part C (see Table 3.1.1.1) without changing the total amount of 120 credit points (CP). The changes have been made while maintaining the content of the programme and complying with the requirements of Cabinet of Ministers Regulations No 240 "[Regulations on the State Academic Education Standard](#)" (document only in Latvian), as well as in accordance with definite priorities in developing core activities set out in the UL strategy.

The mandatory part has increased since the previous accreditation from 68 CP to 74 CP. In the academic year 2018/2019, the mandatory part of the BSP "Biology" (including for students enrolled earlier) was supplemented with the course "Civil Protection" and "Environmental Protection for Biologists" (moved from the restricted elective Part B to the compulsory Part A, without changes of CP) to meet the requirements of the regulatory acts. The course "Introduction to Studies" has been moved from free elective Part C to mandatory Part A. This course introduces students to study methodology, information sources, current developments in the sub-fields of biology and other issues of interest to students.

A number of mandatory courses in Part A have had their titles changed to reflect changes in their course content with the amount of CP increasing or decreasing (e.g., "General Biology. Introduction to Ecology"). In such courses, the change in the amount of CP is justified by the fact that the amount of material to be covered was bigger or less than the amount of allocated CP.

The amount of restricted elective Part B has been reduced from 46 CP to 42 CP, while maintaining the aim of the study programme. In line with developments in the field, a number of new courses have been introduced to the programme, namely: "Introduction to Bioinformatics", "Big Data Analysis of Nucleic Acid Sequencing", "Cancer Biology I", "Principles of Psychophysiology". Some courses have been withdrawn from the programme offer, and they have been replaced by new courses or integrated into other courses. The title of the course "Computing" has been changed to

"Computers in Biology" in line with the changes in the course content.

Changes in the amount of course CP and course offer reflect the need to agree the amount of course CP, and the removal of certain courses from the study plan is due to the integration of their content into other courses, as well as a lack of adequate lecturers or a lack of student interest in certain highly specialised courses. Overall, these changes improve the quality of studies, provide students with courses on the most relevant issues in biology, and increase competitiveness of the graduates in the labour market.

In preparation for the accreditation of the SF LS, all study courses were updated, ensuring their compliance with the UL Procedure for Development and Updating of Study Courses, issued in accordance with Article 561 of the Law on Higher Education Institutions and approved by the UL Order No. 1/277 of 10.08.2018.

Table 3.1.1.1.

*Study plans in the academic years 2013/2014 and 2022/2023*

2013/2014		2022/2023	
Course Title	CP	CP	Course Title
<b>Part A - mandatory study courses</b>	<b>68</b>	<b>74</b>	<b>Part A - mandatory study courses</b>
Physics for Natural Sciences	5	5	Physics for Natural Sciences
		2	Introduction to Studies
General Biology. Introduction to Ecology	3		
		2	General Biology. Introduction to Ecology
General Biology. Introduction to Cell Biology	4	4	General Biology. Introduction to Cell Biology
General Biology. Introduction to Microbiology	2	2	General Biology. Introduction to Microbiology
General Biology. Introduction to Genetics	4	4	General Biology. Introduction to Genetics
		1	Civil Protection
Human and Animal Anatomy	2		
		3	General Anatomy of Human
Mathematics for Biologists	2		
		4	Mathematics for Biologists
General Biology. Introduction to Botany	3	3	General Biology. Introduction to Botany
General Biology. Introduction to Zoology	3	3	General Biology. Introduction to Zoology

Chemistry	5	5	Chemistry
Plant Anatomy	2		
		3	Plant Anatomy
Biometry	3	3	Biometry
Biochemistry I	4	4	Biochemistry I
Human and Animal Physiology	3	3	Human and Animal Physiology
Field Course in Botany and Zoology	2		
		3	Field Course in Botany and Zoology
Plant Physiology	3	3	Plant Physiology
Introduction in Earth Sciences	3	3	Introduction in Earth Sciences
Research Project	2	2	Research Project
Genetics and Evolution	3		
		2	Environmental Protection for Biologists
Biology Bachelors Thesis	10	10	Biology Bachelors Thesis
<b>Part B - restricted elective study courses</b>	<b>46</b>	<b>42</b>	<b>Part B - restricted elective study courses</b>
English I	2	2	English I
English II	2		
Computing	2		
		2	Computers in Biology
		2	Organic Chemistry
Invertebrate Diversity and Conservation	2	2	Invertebrate Diversity and Conservation
Methods of Instrumental Analysis in Biology	4	4	Methods of Instrumental Analysis in Biology
Cell Biology	3		
Vegetation and Habitats of Latvia	4	4	Vegetation and Habitats of Latvia
Field Course in Ecology I	3	3	Field Course in Ecology I
General Ecology I	2	2	General Ecology I



Biochemistry II	5	5	Biochemistry II
Botany and Latvian Flora	6	6	Botany and Latvian Flora
		2	Introduction to Bioinformatics
Field Course in Ecology II	2	2	Field Course in Ecology II
Microbiology I	5	5	Microbiology I
Genetic Engineering	4	4	Genetic Engineering
General Ecology II	3	3	General Ecology II
Zoology and Latvian Fauna	6	6	Zoology and Latvian Fauna
Introduction to Plant Mineral Nutrition	4	4	Introduction to Plant Mineral Nutrition
Biology of Plant Resources	4	4	Biology of Plant Resources
Biotechnology I (Industrial Biotechnology)	5	5	Biotechnology I (Industrial Biotechnology)
Biophysics	2		
Biology in the Internet	2		
Biogeography	2	2	Biogeography
Methods of Experiment in Biology	2	2	Methods of Experiment in Biology
Ethology	2	2	Ethology
Hydrobiology	4		Hydrobiology
Histology	2		
Physiology of Immune System	3	3	Physiology of Immune System
Microbiology II	4	4	Microbiology II
		2	Big Data Analysis of Nucleic Acid Sequencing
Ecology of Populations and Communities	2	2	Ecology of Populations and Communities
Applied Ecology I	3	3	Applied Ecology I
Preparation of Projects and Publications	2	2	Preparation of Projects and Publications
Physiology of Sensory Systems	4	4	Physiology of Sensory Systems
Species and Populations	2	2	Species and Populations

Bryophyte and Lichen Ecology and Systematics	2	2	Bryophyte and Lichen Ecology and Systematics
Environmental Microbiology	4	4	Environmental Microbiology
		4	Cancer Biology I
Plant Propagation Physiology	2	2	Plant Propagation Physiology
Bases for Plant Stress Physiology	4	4	Bases for Plant Stress Physiology
Biotechnology II (Environmental Biotechnology)	4	4	Biotechnology II (Environmental Biotechnology)
Photography of Nature Objects	2	2	Photography of Nature Objects
Animal Comparative Physiology	3	3	Animal Comparative Physiology
Genetics of Microorganisms	4	4	Genetics of Microorganisms
Applied Ecology II	3	3	Applied Ecology II
		2	Basic Psychophysiology
Genetic Analysis	3	3	Genetic Analysis
General Toxicology	2		
Environmental Protection for Biologists	2		
<b>Part C - free elective study courses</b>	<b>6</b>	<b>4</b>	<b>Part C - free elective study courses</b>
Introduction to Studies	2		
	<b>120</b>	<b>120</b>	

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

The BSP "Biology" (code 43421) is fully compliant with the [higher education standards](#) (document only in Latvian). The amount of the BSP is 120 CP, which is in line with the above-mentioned document. The duration of studies is 6 semesters, which, following the Bologna Declaration, is in line with the study programmes agreed in the European Higher Education Area. At the start of the

studies, a contract (see Annex 21-1-B) shall be concluded between the student and the UL.

The BSP "Biology" is in line with the SF LS. The aim, objectives and outcomes of the study programme are in line with the Bachelor's level studies in Biology, as they allow the acquisition of in-depth knowledge, skills and competences, and directly correspond to the title of the Study Field and study programme. The BSP "Biology" provides up-to-date theoretical and methodological knowledge in the sub-disciplines of biology, while giving an overview of the development of the field as a whole, preparing graduates for practical work in science, business or public administration, as well as for further studies at the Master's level. Graduates of the BSP "Biology" receive a Bachelor of Science degree in Biology, which is relevant to the field of science and the Study Field. The graduates are eligible to study in the MSP "Biology" on a competitive basis, creating a logical continuity of academic education that ensures student development and relevance of qualifications to the needs of the labour market.

The first two digits (43) of the programme code (43421) indicate the level of studies - academic (BA), while the third to fifth digits (421) correspond to the field of study - life sciences. The programme code is correct and corresponds to the programme parameters. According to the Academic Education Standard, the main objective of the BSP "Biology" is to provide a set of knowledge, skills, and competences in accordance with the knowledge, skills and competences of level 6 of the Latvian Classification of Education. The content of the BSP ensures the scientifically based achievement of a wide range of learning outcomes, as it includes the fundamentals, principles, structure, and methodology of biology (not less than 25 CP): courses of "General Biology", "Biochemistry I", "Plant Anatomy" and "Plant Physiology", "Human and Animal Physiology" and "General Anatomy of Humans", "Field Course in Botany and Zoology" (37 CP in total). The history of the development of biology and current issues are not given as a separate course but are integrated in the above-mentioned courses. The programme also includes an interdisciplinary aspect (not less than 15 CP): "Physics for the Natural Sciences", "Mathematics for Biologists", "Introduction in Earth Sciences", "Chemistry", "Organic Chemistry" (19 CP in total) (see Annex 25-1-B).

To enter the BSP "Biology", secondary education is required. Students are admitted based on their results in the centralised examinations (CE) in accordance with the [Law on Higher Education Institutions](#). The admission conditions and requirements of the study programme are in line with the aims and objectives of the study programme, i.e., secondary education, a successful annual assessment in chemistry or natural sciences, as well as a successful assessment in a centralised examination in biology - to ensure preparedness for the study programme.

The conducted mapping (see Annex 28-1-B) confirms that the defined aim, objectives and learning outcomes of the study programme are interlinked with the study course outcomes.

The aim of the study programme is to provide academic education in biology and practical skills in research. To raise the general level of education of students by preparing academically educated specialists able to independently carry out research and solve theoretical questions in biology, its sub-disciplines, as well as in branches of science related to biology.

Study programme objectives:

1. to increase students' knowledge, skills, and competences in theoretical and practical courses in biology, as well as in basic courses in other natural sciences (chemistry, mathematics, physics and earth sciences),
2. to promote the development of practical and research skills by ensuring the application of theoretical knowledge in practice through practical and laboratory work and field courses,
3. to provide in-depth study of topics in a relatively specialised field of molecular or organismal

biology,

4. to develop modern research skills and the ability to carry out independent research under the supervision of academic personnel in a chosen sub-discipline of biology, and to summarise the results in a Bachelor's Thesis at a level satisfying the requirements for scientific publication.

The knowledge and skills acquired by students are sufficient to enable graduates of the study programme to continue their studies in the academic MSP "Biology" (code 45421).

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

Biology is one of the most topical fields of modern science. Its rapid development in recent decades has also contributed to the development of other scientific fields such as agriculture, forestry medicine, etc., as well as to the development of innovative technologies and products used by different groups of society. [The 2021 Report of the European Commission](#) also identifies biosciences and technologies as one of the key drivers and enablers of bio-innovation. As the European Green Deal gains momentum, innovations and solutions for sustainable use of natural resources reducing dependence on fossil fuels, protecting the environment and climate, securing food resources and maintaining international competitiveness, are becoming increasingly important. This report looks at the 50 most important innovations in biology for the next 5-20 years, ranging from microbiology, genetics, and molecular biology to environmental protection and biodiversity. According to ["Informative Report on Medium and Long-Term Labour Market Forecasts"](#) prepared by the Ministry of Economics (ME), between 3.5 and 6.9 thousand of Latvia's working-age population with higher education are currently employed in life sciences and related fields. In the future, the demand for specialists is expected to increase towards 2027, but current trends suggest that the number of available specialists may even decrease. The programme can also be justified by [the National Development Plan for 2021-2027](#), with the action direction "Quality, accessible and inclusive education" stating that the share of graduates in science, mathematics, and information technology in the total number of graduates in higher education should increase from 6.8% (2018) to 12% (2027).

After graduating the BSP "Biology", most graduates go on to study at the UL or another university. The BSP "Biology" prepares specialists in all major sub-fields of biology, from molecular biology to ecology. Of the 14 BSP graduates surveyed in 2022, 93% are currently employed in fields related to their study programme, but only the survey of Master's graduates provides objective data on the employment status of BSP graduates, as working Bachelors are not always work in their permanent place of employment. The fact that demand varies by sector over the years shows that graduates do not change jobs that often; they are filled. Graduates with a Master's degree are in demand on the labour market. This is reflected in the graduate survey data on employment, which shows that 92% of the graduates who took part in the survey are working in a field related to their specialisation. The main employers include research institutes, environmental bodies, public authorities, medical or veterinary institutions, professional non-governmental organisations, and various private companies. The places of work for Masters vary from year to year, depending on demand, but the main ones are scientific institutions. Both BSP and MSP graduates also work in educational institutions, i.e., universities and schools. An analysis of the possibilities for the programme graduates to work in schools and the structure of STEM teachers' employment shows that, of all teachers employed in STEM fields, 20% (1061 teachers) teach biology in Latvian schools,

which is the second highest percentage in the structure of STEM teachers' employment after teachers of mathematics. The graduates of the MSP "Biology" are in demand as teachers at both the University of Latvia and other Latvian universities.

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

The dynamics of the number of students enrolled in the BSP "Biology" in the period between 2013 and 2021 is summarised in Annex 24-1-B. There is a tendency that the number of students matriculated in the 1st year of study is increasing during this period, except for 2017, when the number of students matriculated in the 1st year of study was the lowest, as well as many students were exmatriculated for non-fulfilment of their study contract obligations, which was manifested in the failure to fulfil the study programme requirements on time. In the BSP, there are self-funded students, and their number varies from year to year, depending on the number of state-funded study places.

There is a downward trend in the number of graduating students between 2013 and 2020. There are several possible explanations for this trend.

- The BSP "Biology" is a second choice, after applying and failing a priority competition (most often in a scientific field closely related to biology). After the first year of studies, these students re-submit their applications and pass the competition, and then enter other universities or UL faculties closely related to biology, such as, for example, the Faculty of Medicine.
- Lack of motivation to continue their studies, as too many interdisciplinary courses have to be taken in the first semester.
- A large proportion of students are employed in jobs most often unrelated to biology at the beginning of their BSP studies. The development of the Bachelor's Thesis often takes place in the time free from studies and work. This is confirmed by the data from the student survey that every year a number of students complete their degree programme but the defence of their Bachelor's Thesis is postponed.
- There is a strict monitoring of study obligations, with close following of deadlines for study breaks and other obligations. As a result, students who do not fulfil the requirements of the study programme are exmatriculated in a timely manner and do not appear in the statistics of the final years;
- The constraints imposed by the Covid-19 pandemic make it difficult to link the dynamics of student numbers to the effectiveness of the measures put in place to reduce student attrition. During the COVID-19 pandemic, there was a tendency for some BSP students to take advantage of the study break. This was due to the quality of distance learning in terms of laboratory and practical work and the opportunity to learn and practice biological techniques. No possibility for students to develop their final Thesis research in the UL and cooperation partners' laboratories also had a significant impact on the drop in the number of graduates. Another reason for this situation is the deterioration of the financial situation of students during the COVID-19 pandemic, which also reduced their motivation to complete their studies and obtain a Bachelor's degree.

The following measures to reduce student attrition have been implemented and planned:

- To increase students' motivation to continue their studies, the sequence of some interdisciplinary study courses has been changed by foregrounding the biology-related courses in the 1st semester. The course "Chemistry" has been transferred to the 2nd semester. The course "Introduction to Earth Sciences" has been carried over to Semester 4. New sub-programmes are planned to motivate students and ensure more efficient knowledge transfer.
- To introduce students to the content of the study programme and its requirements, principles for the choice of study courses, as well as to inform about the activities of each of the faculty departments, lectures are organised within the course "Introduction to Studies". One of the lectures given by a Student Council representative informs about the study, everyday, and social life from the students' point of view. The 2nd year students are given a separate lecture on writing a coursework and to give them advice on the choice of their Thesis topic, and the process and presentation of the Thesis. The Erasmus+ coordinator of the Faculty organises an information meeting on the opportunities to study abroad.
- To improve the quality of studies and make them more attractive to students, various indirect measures, such as updating the teaching staff and attracting foreign guest lecturers, have been implemented. To enhance the learning environment, further improvements of the study and research infrastructure have been carried on.
- There is a need to improve the explanatory work and motivation of students to continue their studies and, having graduated from the BSP, enter higher-level study programmes. Students could also be motivated if adequately remunerated jobs in research projects could be provided, albeit science funding in Latvia is currently insufficient. Cooperation with other scientific institutions is very important in this respect, as it improves the possibility for students to produce Bachelor's and Master's Theses while working in scientific projects and being paid.

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

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

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

The content of the BSP "Biology" is developed on the basis of the following external and internal laws and regulations:

- [Law on Higher Education Institutions of the Republic of Latvia](#);
- Cabinet of Ministers Regulation No 240 "[Regulations on the State Academic Education Standard](#)" (13.05.2014) (document only in Latvian);
- [UL Regulations on Study Programmes and Continuing Education Programmes](#) (UL Senate Decision No. 102 as of 04.2017).

The content of the BSP "Biology" study programme complies with the State Academic Education Standard (Annex 25-1-B). The content of the study programme is based on the best practice of foreign study programmes, EU documents on the content of study programmes in life sciences, as well as on the expectations of employers and the availability of lecturers. The mapping of the study courses included in the programme (Annex 28-1-B) shows how the study courses ensure the achievement of the study programme outcomes and how the study course outcomes overlap with the study programme outcomes. The programme provides academic education in all sub-disciplines of biology, which are the responsibility of the seven BF Departments, namely, Department of Plant Physiology, Department of Botany and Ecology, Department of Human and Animal Physiology, Department of Hydrobiology, Department of Microbiology and Biotechnology, Department of Molecular Biology, Department of Zoology and Animal Ecology. The programme is implemented in cooperation with the UL Faculties of Chemistry, Physics, Mathematics and Optometry, and Geography and Earth Sciences, as well as with the UL and state research institutes and employers.

The study courses in the programme are designed to avoid duplication of content and are implemented sequentially (see Annex 26-1-B), ensuring continuity and increasing complexity. In the first two semesters, students mainly study Part A courses (38 CP in total). The general biology courses comprise six separate courses and last for the first two semesters. The aim of these courses is to provide in-depth knowledge and skills in all sub-disciplines of biology and to prepare students for specialised courses, as well as to facilitate the choice of future Part B courses. The majority of academic staff are involved in the delivery of the general biology courses, thus giving students the opportunity of closer acquaintance.

The remaining mandatory Part A courses are taken between semesters 3 and 5, in the total amount of 26 CP. These 26 CP also comprise an independent coursework ("Research Project", 2 CP), which students are required to complete after Semester 4. In the coursework, the student learns the basics of scientific thesis writing, analyses methods and independently collects data.

At the end of their studies, students are required to write a Bachelor's Thesis (10 CP) and defend it publicly. The Thesis includes individual research - experiments, observations and their analysis - under the supervision of the Thesis supervisor. The Bachelor's Thesis should demonstrate the student's mastery of methodological approaches in biology, the ability to set goals and objectives, the ability to obtain objective results and to reach relevant conclusions.

In addition to the existing courses, four weeks of field or laboratory work ("Field Course in Ecology I" and "Field Course in Ecology II", "Methods of Experiment in Biology"), which take place at the Kolka base or at the Faculty and associated institutes, are devoted to practical training in the various methods used in biology.

The courses in Part B of the study programme are mainly taken during semesters 4 to 6 (42 CP in total). The choice of courses is determined by the student's own interests and specialisation in a sub-discipline of biology. The range of Part B courses is wide.

All BSP courses (except "Environmental Protection for Biologists") include laboratory/practical work.

Students may choose free elective or Part C courses from other study programmes in the amount of 4 CP, and they most often choose courses in social sciences and humanities, which harmoniously develop students' personalities.

The lecturers of the study courses gain experience and knowledge about the current issues in subfields of biology by participating in scientific conferences, reading and publishing scientific articles, cooperating with foreign scientists within the framework of project implementation and with employers. Based on their experience and knowledge, the BSP lecturers update the course content on a regular basis and in line with the trends in the field, the labour market and scientific developments. This process is largely coordinated by the Heads of the Faculty Departments. In line with the latest scientific trends and due to the involvement of new, including foreign, specialists in the implementation of the BSP "Biology", it has become possible to offer the course "Cancer Biology I", as well as, for example, to update the content of the study course "Introduction to Plant Mineral Nutrition". The content of the courses is being updated by experts and scientists from the UL and Latvian institutes, as well as governmental organisations such as the Nature Conservation Agency, and NGOs.

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

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

The BSP "Biology" uses a variety of teaching methods: lectures, laboratory work, seminars, group work. The main methods of knowledge acquisition and consolidation for undergraduates are lectures (introductory lectures, interactive lectures, summary lectures, problem-oriented lectures) and laboratory work. Practitioners, professionals from different institutions, are invited to lecture in individual courses in order to promote the unity of theory and practice. For example, the courses "Methods of Instrumental Analysis in Biology" and "Big Data Analysis for Nucleic Acid Sequencing" are taught by researchers from the Latvian Biomedical Research and Study Centre, and some laboratory work is carried out at the BMC. Employers are involved in the implementation and development of the study courses (invited to lead individual seminars, which are often organised as exchange visits to workplaces, etc.). A case in point is the course "Environmental Protection for



Biologists", with a representative from the Nature Conservation Agency invited during the course. Some BSP "Biology" courses also involve DSP students, e.g., "Environmental Protection for Biologists", "Field Course in Ecology II", "Botany and Latvian Flora".

Practical exercises, seminars, individual, pair and group work, discussions and project development, study tours to organisations in the field are widely used. Laboratory work reinforces the knowledge acquired in lectures and provides students with basic practical skills. Laboratory work includes descriptions and handouts for each student. Students work individually on simpler laboratory tasks, or in pairs or groups if they have to solve a complex problem. Individual courses fully implement group work, e.g., "Field Course in Botany and Zoology", "Field Course in Ecology II", "Practical Ecology I". The fieldwork in the undergraduate field courses is organised as a complete project cycle, i.e., from the idea to the presentation of results.

To achieve the learning outcomes, i.e., to acquire and consolidate knowledge, skills and develop competences, the study process is dominated by methods in which student activity plays an important role. The study process uses methods that promote student communication in performing study tasks, solving real problems in the field, modelling situations. Through the development of their research competence, students have the opportunity to analyse and study in-depth problems of interest in the field in successive courses. In turn, seminars promote students' speaking, presentation, and discussion skills.

In general, there is a coherence between theoretical and practical classes in the BSP courses, with laboratory work being completed after the relevant topics have been covered in lectures. An exception is the "General Biology" courses, where it is not possible to implement the lecture-lab scheme, as two to three lectures per week are matched by only one multi-component laboratory project of four to six academic hours.

The physical environment of study is also gradually changing. The House of Nature at Jelgava Street 1 has classrooms where workstations can be adapted for group work. The classrooms are also suitable for individual work. Students can use digital technologies. Lecturers mostly use methods that encourage students' active participation, critical thinking, and reflection. The e-learning environment is used to support the learning process and independent study. An e-learning environment (Moodle) created for each study course provides students with access to lesson materials, assignment descriptions in addition to study materials related to the course topics, as well as study tasks to be performed (tests, forums, seminars, conferences, etc.).

Updating study programmes and their study courses, the student-centred approach is followed with particular attention paid to the meaningful formulation of learning outcomes, so as to promote dialogue between lecturers and students on study content, forms of organisation and methods. Correctly formulated learning outcomes, in turn, promote students' understanding and ownership of their own learning, self-assessment and understanding of the assessment received. In the study process, lecturers use methods, forms of examination and assessment criteria that are appropriate to the study aim and the planned learning outcomes. The assessment criteria for awarding grades shall be made public in advance. Assessment provides an opportunity for students to demonstrate the extent to which they have achieved the expected learning outcomes. All assessments in mid-term and final examinations are recorded and made available to students in the e-learning environment. The justification for the grade is not provided in the e-learning environment for all courses, but the student can discuss it with the course tutor(s).

Oral, written and combined assessment methods are used in the BSP "Biology" courses and examinations, and they may include tests, colloquia, examinations, computer-based assignments, reports (essays), and seminars. Examinations, tests and other forms of exams are taken individually, as well as course papers and Bachelor's Theses are developed, defended and assessed

individually. In computer classes such as, for example, “Biometry” or “Practical Ecology I”, students are required to complete a number of practical tasks and at the end of the course, to write an examination on the theoretical and practical aspects. Laboratory and practical work in the BSP is assessed by both a mark and a pass/fail grade. The mark for the laboratory and practical work has an impact on the final grade in the course. The frequency of student assessment depends on the scope and specificity of the course. The assessment system for each specific course is detailed in the course description. All BSP courses have several assessments. This encourages students to attend lectures and work regularly throughout the semester, and enables lecturers to assess students' knowledge and skills more objectively.

Despite the fact that the methodology of course delivery and assessments has been improved in the recent update of the BSP courses, there is still a need to develop a common platform defining the requirements for each assessment in the BSP courses. Academic seminars addressing issues of academic integrity and ethics should also be introduced.

Students receive support and feedback from lecturers during their studies. The principles of student-centred learning encourage student mobility (recognition of learning outcomes), and students engage in research initiated by academic staff and social activities in the community, thus gaining meaningful experience in applying what they have learned in their studies to practice. Through the internal quality assurance policy, study programmes are implemented in such a way that students are encouraged to actively participate in the development of the study process. Policies and procedures are in place for the submission of student suggestions and complaints and for the handling of student appeals. The results of student surveys are evaluated and considered in the development of the study process. As an example, the results of the BSP student surveys show that students positively evaluate the conduct of certain courses (“Environmental Protection for Biologists”, “General Ecology I” and “General Ecology II”) in English, as the courses are often attended by Erasmus+ students. Students are willing to express their suggestions for the improvement of study programmes and study process in discussions with lecturers and programme directors.

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

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

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

The Bachelor's Thesis is the main evidence of the completion of the BSP, and it is an independently conducted research project in which an individual topic and specific tasks are defined for each student by a supervisor qualified to supervise the Bachelor's Thesis. The topic for the Bachelor's Theses are chosen or proposed to the students according to the content of the study programme and current trends in biology.

In the reporting period from the academic year 2013/2014 to 2020/2021, a total of 383 Bachelor's Theses have been defended, with topics reflecting all sub-fields of biology, from molecular to ecosystems and biodiversity. The Theses predominantly have research and academic orientation.

Table 3.2.6.1.

*Titles of Bachelor's Theses in BSP "Biology" in academic year 2020/2021*

Nr.p.k.	Field of Biology/Title of the defended Bachelor's Thesis
<b>Plant Physiology</b>	
1.	Establishment of a model system for study of effects of environmental factors on physiological status of hairy agrimony ( <i>Agrimonia pilosa</i> ) in controlled conditions.
2.	Comparison of salinity tolerance and ion accumulation of two coastal species, <i>Plantago maritima</i> and <i>Plantago coronopus</i> .
3.	Effect of wild oat and common barnyardgrass seed water extracts on the growth of <i>Fusarium</i> spp. fungi.
4.	Wild sorrel species as models in ecophysiological studies in conditions of vegetation experiment: effect of physiological gradients and mineral support.
<b>Botany and Ecology</b>	
5.	Vegetation succession after grey dune management.
6.	Differences in growth dynamics of two Norway spruce <i>Picea abies</i> (L.) H. Karst. stands with different initial stand densities.
<b>Human and Animal Physiology</b>	
7.	The impact of intermittent fasting diet on cognitive abilities in adults.
8.	Possibilities of using muscle oxygenation parameters in determining anaerobic threshold for BMX athletes.
9.	Interplay of smoking and perivascular adipose tissue in vascular health.
10.	Effect of the healthy "plate model" meals on body structure characterizing anthropometric parameters.
11.	The effect of beetroot juice concentrate on repeated sprint performance in soccer players.
<b>Hidrobiology</b>	

12.	Seasonal changes in fish community in the aquatorium of the Liepāja port due to economical activity.
<b>Mikrobiology and Biotechnology</b>	
13.	Effects of adenine biosynthesis pathway mutations on central carbon metabolism in the absence of nitrogen or purines in cultivation media.
14.	Characterisation of Japanese quince <i>Chaenomeles japonica</i> cell suspension culture for biotechnological applications.
15.	<i>Zymomonas mobilis</i> iron containing alcohol dehydrogenase isozyme role in oxidative stress.
16.	Mycocomposites as an alternative to traditionally used packaging material.
17.	Presence of human parvovirus B19 infection markers and activin B in patients with ME/CFS.
18.	Impact of mutations in adenine biosynthesis pathway on budding yeast heat and oxidative stress resistance.
<b>Molecular Biology</b>	
19.	Development of lung on a chip model for SARS-CoV-2 research.
20.	The role of host miRNAs in the gut microbiome composition changes in high-fat diet-induced type 2 diabetes mouse model of both sexes in the context of metformin therapy.
21.	Development of a precision medicine test for the diagnosis of breast cancer.
22.	Molecular microRNA factors in the development of pituitary adenoma.
23.	Subcutaneous canine and feline neoplasm <i>ex vivo</i> characterization using Raman spectroscopy.
24.	The possibility of cellular and iOS is in plant cells as a result of leaf dehydration.
25.	Analysis of antibody profile and correlation with disease severity in COVID-19 patients.
26.	Association between vitamin D receptor gene polymorphisms and bronchial asthma in Latvian population.
27.	Transcriptome study of tissue and cell models of pituitary and pancreatic neuroendocrine tumours.
28.	Application of ssRNA bacteriophage-derived virus-like particle platform for Lyme disease vaccine prototype development.
29.	A novel approach for selective isolation of circulating prostate cancer extracellular vesicles and analysis of their RNA biomarkers.
30.	Taxonomical and functional characterization of wastewater metagenomes of 15 cities of Latvia.
31.	Animal model systems for MYBPC1 associated myogenic tremor.
<b>Zoology and Animal Ecology</b>	
32.	Armored mite (Acari: Oribatida) family composition and influencing factors in pasture soil at the former collective farm "Valmiera".
33.	Influencing factors for current occurrence of the longhorn beetle <i>Nothorhina muricata</i> (Dalman, 1817).

34.	The diversity and seasonal succession of day butterflies (Rhopalocera) in the Grasslands of Ķemeri National park.
35.	Mishmi takin <i>Budorcas taxicolor taxicolor</i> characteristic behavior in European zoos.
36.	Ecological factors affecting diversity of bark beetles (Coleoptera: Curculionidae, Scolytinae) on Scots pine ( <i>Pinus sylvestris</i> L.) in burnt forests.
37.	Mercury levels in tissue of gray seal <i>Halichoerus grypus</i> in the Gulf of Riga.
38.	Seasonal and circadian activity of Eurasian beaver <i>Castor fiber</i> in urban environment – the case of Riga City canal.

Students' research works are done in the laboratory, or in the field, or in the field and the laboratory, using industry-specific laboratory and field research methods. In recent years, especially in the context of the COVID-19 pandemic constraints, there has also been work that is predominantly theoretical, with an emphasis on analysis of existing or publicly available data. At least half of the themes are related to current research projects both at the UL FB and in their partner institutions. For example, many of the Bachelor theses topics are encompassed in important themes like biological diversity, which is stated in the National Development Plan of Latvia for 2021-2027 under Priority 4: “Quality Living Environment and Regional Development” in the direction of action: “Nature and the environment - the Green Deal””. Thus, their novelty and relevance to the field can be considered high. This is also reflected in the scores of these papers, which are usually in the 8-9 range. Almost 81% of students defend their Bachelor’s Theses with very good, excellent and outstanding grades (see Table 3.2.6.2). This indicates that students can demonstrate a high level of knowledge, skills, and competences in line with the requirements of the Bachelor Thesis. When assessing the Bachelor’s Thesis, the reviewers and the final examination board pay attention not only to the content of the Bachelor’s Thesis (with the focus on the analysis of existing information and research data, as well as the quality of the discussion) and its compliance with the requirements set for the final Thesis, but also to the ability to present the results obtained in a reasoned manner and to answer the questions posed by the reviewer and the final examination board. To receive an excellent grade in the Bachelor’s Thesis, the Bachelor’s Thesis does not have to be in the form of a scientific publication. In the academic programme, the focus is on scientific excellence, with the ability of graduates to learn further highly valued, as it enables them to quickly acquire practical skills relevant to employers.

Table 3.2.6.2.

*Distribution of marks (number and proportion) in Bachelor’s Theses by academic year*

Acad. Year / Assessment	3 (number and %)	4 (number and %)	5 (number and %)	6 (number and %)	7 (number and %)	8 (number and %)	9 (number and %)	10 (number and %)	Total (number and %)
2013/2014					5 9,8%	16 31,4%	25 49,0%	5 9,8%	51 100%
2014/2015				2 3,5%	7 12,3%	17 29,8%	25 43,9%	6 10,5%	57 100%
2015/2016				5 9,8%	5 9,8%	8 15,7%	27 52,9%	6 11,8%	51 100%

2016/2017	1 2,1%	1 2,1%	2 4,2%		7 14,6%	12 25,0%	18 37,5%	7 14,6%	48 100%
2018/2018			3 5,7%	4 7,5%	10 18,9%	16 30,2%	14 26,4%	6 11,3%	53 100%
2018/2019	1 2,2%		1 2,2%		6 13,3%	17 37,8%	17 37,8%	3 6,7%	45 100%
2019/2020		1 2,5%		2 5,0%	5 12,5%	15 37,5%	16 40,0%	1 2,5%	40 100%
2020/2021				2 5,3%	5 13,2%	9 23,7%	13 34,2%	9 23,7%	38 100%
Reporting period	2 0,5%	2 0,5%	6 1,6%	15 3,9%	50 13,1%	110 28,7%	155 40,5%	43 11,2%	383 100%

### 3.3. Resources and Provision of the Study Programme

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

The BSP "Biology" is implemented in the new premises of the Academic Centre of the University of Latvia (House of Nature, Jelgava street 1), which provides an excellent environment for lectures, seminars and laboratory work. All the resources available at the UL and FB are available for the implementation of the BSP "Biology". A detailed outline is given in Part II, subchapters 2.3.1 - 2.3.4 of the SF LS Self-Assessment Report.

On the seventh floor of the House of Nature, there is a greenhouse available for scientific research and student training. The greenhouse is provided with modern equipment for optimal plant growth conditions and automatic regulation.

The FB training laboratories have microscopes connected to stationary computers, and individual workstations with micropipette sets. The laboratories have freezers (both -20° C and -80° C) for storage of samples and reagents.

The House of Nature has five computer rooms (the largest with a capacity of 20 workstations). Both Windows and Linux operating systems are available in the computer labs. Microsoft Office applications, statistical software (R, SPSS, PC-Ord) and domain-specific software are available.

There are special collections made available for research, and they are a biological agent collection, an entomological collection, an herbarium, a microorganism culture collection, the collections of the UL Botanical Garden.

The FB supervises a field training site, the former Kolka "Old School". The training site is used for the BSP "Biology" courses "Field Course in Botany and Zoology", "Field Course in Ecology I", "Bryophyte and Lichen Ecology and Systematics", and "Invertebrate Diversity and Conservation", as well as for accommodating students and faculty conducting research in the Kolka area. The training site has a lecture hall, training laboratories, student and lecturer lounges and a kitchen. The premises have been renovated in recent years with the contribution from the UL and Faculty funds.

The information base, the material and technical base and the methodological support are adequate for the implementation of the study programme and achievement of the learning outcomes of the programme, which confirms the possibility of ensuring a quality study process in the future. Students have access to fast wireless Internet, individual study rooms, access to the resources of the UL Library, which are in line with the UL study programmes and research directions. The UL Library is supplemented with up-to-date information resources by purchasing information resources on the orders of the UL academic staff, on the proposal of the Student Council or on the suggestions of the Library staff.

The academic and scientific activities of the UL FB are carried out in the departments, as well as in the UL Institutes, the UL Botanical Garden, the Latvian Biomedical Research and Study Centre (BMC), the Scientific Institute of Food Safety, Animal Health and Environment (BIOR), etc.

Overall, funding for higher education in Latvia is assessed as insufficient. However, it is possible to provide quality studies (lectures, seminars) within the existing funding. Due to limited funding, it is not possible to carry out laboratory work to the desired extent, which is also reflected in student surveys. The current funding base does not allow for the production of Bachelor's Theses to any extent approaching normality. The FB allocates part of its research base and study funding to Thesis projects. Only a small part of the Bachelor's Theses are developed within the framework of various Latvian and foreign funded research projects. Given the high competition for science funding in Latvia, no research group can offer guaranteed, long-term funding for Bachelor's Thesis development. Additionally, for research the access to common facilities of the National Research Centres located in various Latvian scientific institutions is provided.

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

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

**Programme Revenue**

To provide the funding needed for the implementation of the BSP "Biology", the UL uses:

- the state budget subsidy from the Ministry of Education and Science, set at EUR 3097 for full-time studies for the academic year 2021/2022;
- the tuition fees, taking into account all the factors listed under the heading "Financial Support", set for the academic year 2021/2022 full-time studies – 2200 EUR per year.

In view of the above-stated, the total study programme budget is expected to be EUR 514 thousand per year, as summarised in Table 3.3.1.

*Table 3.3.1. Programme expected revenue per annum, EUR*

Study Type	Number of Students	Study Fee/ State Subsidy	Total Revenue
Full-Time (state-funded)	146	3097	452 162
Full-Time (fee-paying)	28	2200	61 600
<b>Total</b>			<b>513 762</b>

## Programme Costs

In order to estimate the amount of funds required for financial support, the UL calculates the cost price for study programmes according to a methodology developed by the UL, which takes into account the costs of providing the study process as described in the section "SF Financial Provision" and information on the study programme plan, teaching staff involved, the planned number of students, etc., thus ensuring the reliability of the forecasts.

### Programme costs for full-time studies

For calculating costs, the implementors of the programme "Biology" use the data of the 174 students studying in the programme full time in the academic year 2021/2022, the existing programme plan and the existing structure of the academic staff involved in the programme. In view of the above, the estimated full-time cost of the programme per student is EUR 2873 per year, and the total cost of the programme is EUR 499 902 per year. A more detailed pro-rata breakdown of the costs is presented in Table 3.3.2.

*Table 3.3.2. Percentage breakdown of costs in the study programme*

<b>Expenditure heading</b>	<b>% of the total</b>
Teaching staff costs	47,9 %
General staff	13,2 %
Other costs	0 %
Infrastructure expenditure	11,3 %



Capital items and services	1,6 %
Indirect costs	26,0 %
<b>TOTAL COSTS</b>	<b>100 %</b>

Figure 3.3.1 shows the cost of the study programme depending on the number of students and compares it with the proposed study fee and the state budget subsidy.

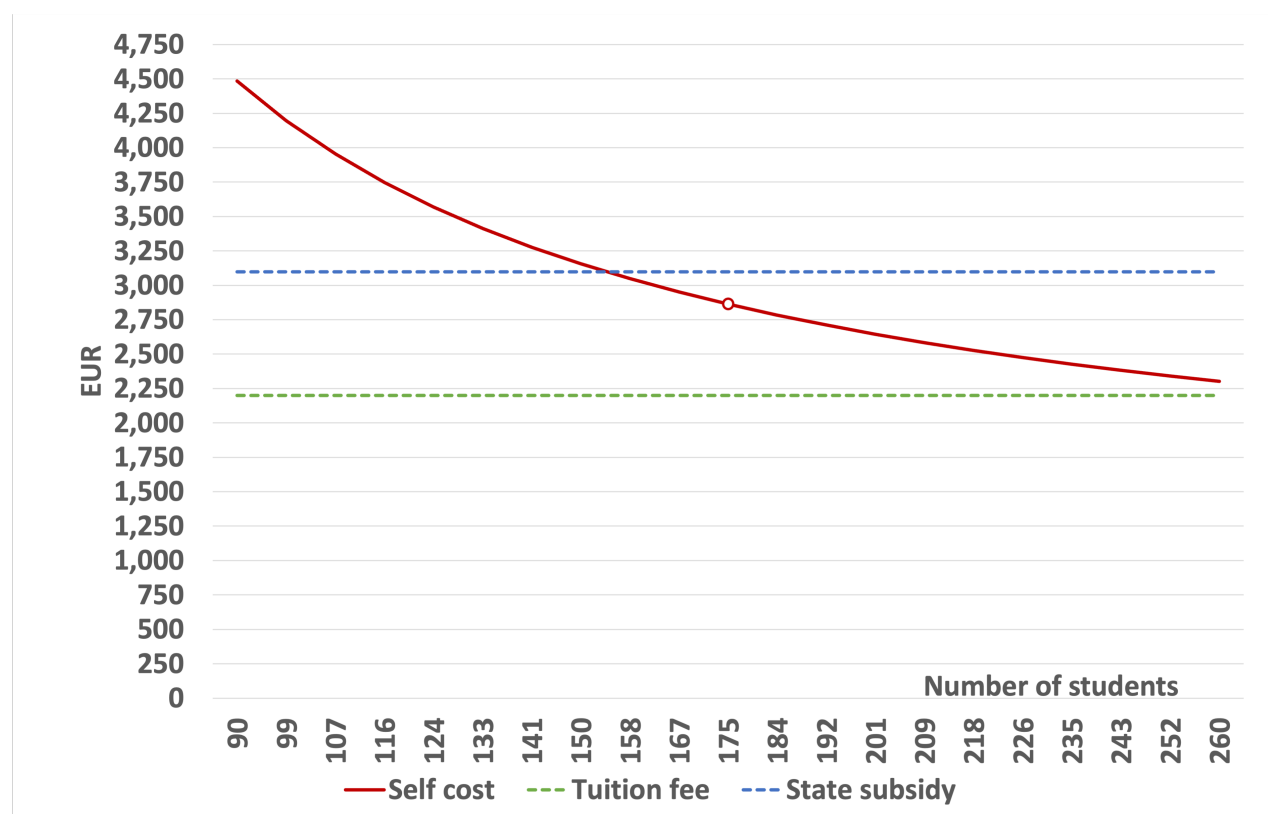


Figure 3.3.1. The BSP "Biology" cost per student.

Based on the calculation, it can be seen that for the programme to be profitable and for students to be provided with a quality study process, the number of fee-paying students in the programme (in all courses together) should be at least 270 (the intersection of the red (cost price) and green (tuition fees) lines projected onto the x axis). On the other hand, if there were only budget students in the programme, then their number should reach 153 students.

### Summary of Programme Revenue and Costs

Table 3.3.3. summarises the programme revenue based on the number of students, state subsidy, study fees, and programme expenses for this number of students.

Table 3.3.3. Programme results

Study Type	Number of Students	Study Fee/ State Subsidy	Total Revenue	Total Costs
Full-Time (state-funded)	146	3097	452 162	419 458

Full-Time (fee-paying)	28	2200	61 600	80 444
<b>Total</b>			<b>513 762</b>	<b>499 902</b>

The data shown in the table clearly prove that the UL has sufficient funds to implement the study programme and ensure its further development. In addition, the development of the programme can be financed from the income received from lifelong learning, and other services, as well as from the financial resources accumulated by the structural unit. Faculties also receive financial support for programme development from the UL Study Quality Improvement Fund.

### 3.4. Teaching Staff

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

The BSP "Biology" fully complies with the requirements of the first part of Article 55 of the Law on Higher Education Institutions (Appendix 30-1-B). 9 Professors and 11 Associate Professors, as well as 18 Docents and 12 lecturers, participate in the implementation of the BSP "Biology", and scientists of biology or related fields are also involved. Only scientists of biology or related fields with a Master's or doctoral degree are recruited for the supervision of Bachelor's Theses, while also giving the opportunity for doctoral students with a Master's degree and specialists in the field to give advice.

The lecturers involved in the programme combine pedagogical and research competence at a high level. The programme lecturers have scientific work experience both as authors of scientific publications and as participants in the implementation of scientific projects, which in general confirms the qualifications of the related teaching staff as appropriate for achieving the aim of the study programme and attaining the objectives, the qualifications being reflected in the CVs of study course lecturers.

The scientific activities of the programme staff are directly related to the areas of study covered by the programme, and they are active both in the management and implementation of projects and in the preparation of scientific publications. From 2017 till 2021, the programme staff have co-authored 419 scientific publications indexed in the Scopus database (see Annex 14-B for the full list of publications). Of the 419 publications, 205 are in the field of agriculture and biology, 111 in the field of immunology and microbiology, 76 in the field of environmental science and 75 in the field of biochemistry, genetics and molecular biology.

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

During the reporting period, the UL FB has significantly updated its teaching staff, both due to the change of generations, and by attracting new lecturers who were not employed by the UL until now. The lecturer renewal policy implemented by UL FB has promoted the involvement of new lecturers in the study process. It has been possible to strengthen the team of highly qualified lecturers by attracting excellent scientists from cooperation partners - scientific institutes, as well as by promoting the growth of existing lecturers. During the reporting period, the number of Assistant Professors has increased mainly at the expense of the number of lecturers, as well as new lecturers joining the programme. The same upward trend can be observed in the changes in the number of lecturers. Currently, 55 lecturers participate in the implementation of the BSP "Biology" (Table 3.4.2.1).

Table 3.4.2.1.

*Changes in the composition and number of lecturers in the implementation of the BSP "Biology"*

Position	2014	2022
Professors	7	9
Associate Professors	8	11
Docents	10	18
Lecturers	9	12
Assistents and instructors	2	5

Initially (2014-2018), this process was implemented within the framework of the development of the UL FB, using internal resources, but starting from 2018, the SAM 8.2.2 project "Renewal and Competence Development of Academic Staff at the University of Latvia" has become a source for funding prospective scientists with connections to Latvia. Since the beginning of the project, the BSP involved three scientists with academic experience, namely:

- 1) Dakir Taia El Habib, who as a visiting Associate Professor participated in teaching the course "Biochemistry II" in Spring 2019 and 2020, and also participated in teaching the course "Cancer Biology I" in Autumn 2019. At the time, "Cancer Biology I" was introduced as a new course, and it has remained in the BSP offer as a restricted elective course. Currently, the course is being delivered by a different lecturer.
- 2) Zigmunds Orlovskis participated in teaching the course "Introduction to Plant Mineral Nutrition" as a visiting Assistant Professor in Spring and Autumn 2021, and then was elected to the position of Assistant Professor. He is actively dealing with the UL FB organisational matters, sharing his experience gained in foreign universities.
- 3) Brandon Tyler Sinn participated in teaching the courses "General Ecology II" (for ERASMUS+ students) and "Genetic Analysis" as a visiting Professor in Spring 2022.

Changes in the composition of teaching staff have contributed to an increase in the quality of studies, as more associate professors and professors are involved in the implementation of the programme.

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

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

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

The cooperation of teachers for the improvement of the BSP "Biology" takes place at the following levels:

- personal contacts,
- cooperation within the department - department meetings,
- cooperation between departments at the UL FB level,
- cooperation between UL faculties – lectures, scientific research,
- cooperation with scientific institutions and employers - involving guest lecturers, agreeing on the content of lectures, the content and course of laboratory and practical work, as well as solving topical issues in the sub-sectors of biology, implementing scientific research.

The BSP lecturers regularly update the content of study courses, adapting them to the latest trends and current issues in biology. However, the cooperation between the lecturers involved in the BSP "Biology" is not regular enough, so in the future, to ensure the exchange of experience, the

following measures are envisaged:

- supervision of classes (responsible – the FB dean, heads of departments, programme directors),
- scientific seminars or think tanks, in which teaching staff and scientists from various sub-fields of the Study Field are involved in scientific discussion and discussion of research results (responsible – the FB dean and public relations specialist).

In the academic year 2021/2022, 55 lecturers were involved in the implementation of the programme. With 171 students studying in the programme, the student-to-faculty ratio was 171:55  $\approx$  3.1 students per lecturer.

# Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	20_1_B_diploma_Biology_BSP.pdf	20_1_A_diploms_Biologijas_BSP.pdf
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)		
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period	24_1_B_statistic_number_students_Biology_BSP.pdf	24_1_A_statistika_studejoso_skaitis_Biologijas_BSP.pdf
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard	25_1_B_compliance_standard_Biology_BSP.pdf	25_1_A_atbilstiba_valsts_standartam_Biologijas_BSP.pdf
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)		
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	28_1_B_mapping_Biology_BSP.xlsx	28_1_A_kartejums_Biologijas_BSP.xlsx
The curriculum of the study programme (for each type and form of the implementation of the study programme)	26_1_B_Study_plan_Biology_BSP.pdf	26_1_A_studiju_plans_Biologijas_BSP.pdf
Descriptions of the study courses/ modules	27_1_B_Course_descriptions_Biology_BSP.pdf	27_1_A_kursa_apraksti_Biologijas_BSP.pdf
Description of the organisation of the internship of the students (if applicable)		
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)	30_1_B_section_55_Biology_BSP.pdf	30_1_A_pants_55_Biologijas_BSP.pdf

# Biotechnology and Bioengineering (43421)

Study field	<i>Wildlife Sciences</i>
ProcedureStudyProgram.Name	<i>Biotechnology and Bioengineering</i>
Education classification code	<i>43421</i>
Type of the study programme	<i>Academic bachelor study programme</i>
Name of the study programme director	<i>Didzis</i>
Surname of the study programme director	<i>Elferts</i>
E-mail of the study programme director	<i>didzis.elferts@lu.lv</i>
Title of the study programme director	<i>Dr.biol., prof.</i>
Phone of the study programme director	<i>+371 28678724</i>
Goal of the study programme	<i>To prepare highly qualified specialists and scientists able to compete on both the local and inter-national scientific labour markets in the various sectors of biotechnology and bioengineering.</i>
Tasks of the study programme	<ul style="list-style-type: none"> <li><i>• Ensuring the possibility of learning the theoretical and practical courses of biology, as well as basic courses of mathematics, physics and chemistry;</i></li> <li><i>• Ensuring the possibility of conducting in-depth courses in a relatively specialised direction of molecular or organism biology;</i></li> <li><i>• Developing capabilities related to critical thinking, analysis and reasoning;</i></li> <li><i>• Developing skills in the design of biotechnological equipment and processes and product development;</i></li> <li><i>• Developing the skills to carry out independent studies in a selected biology subsector and bringing results into a bachelor's thesis, and obtaining a Bachelor of Natural Sciences degree.</i></li> </ul>

Results of the study programme	<p><b>Knowledge:</b></p> <ol style="list-style-type: none"> <li>1. demonstrate basic and specialised knowledge in the working directions related to biotechnology and bioengineering, understand the key concepts of the field and legal relationship in the context of the basic concepts of biology, other natural sciences and engineering;</li> <li>2. have knowledge of intellectual property issues, professional ethical problems and requirements in the field;</li> </ol> <p><b>Skills:</b></p> <ol style="list-style-type: none"> <li>3. use modern laboratory equipment to carry out studies, analyse the results of studies, interpret them, use them in the planning of further studies and present the results of studies;</li> <li>4. independently acquire, select and analyse information and use it when taking decisions and when dealing with problems in the scientific sector or in the profession related to biotechnology and bioengineering;</li> <li>5. explain the knowledge gained and discuss them in a reasoned way with both specialists and non-specialists;</li> </ol> <p><b>Competence:</b></p> <ol style="list-style-type: none"> <li>6. assess the environmental and societal impact of their professional activities and participate in the development of the relevant professional field, apply scientific ethical principles in practice;</li> <li>7. carry out scientific studies, from hypothesis to results, with careful data collection, analysis and presentation;</li> <li>8. demonstrate a scientific approach to solving complex problems, take responsibility and take responsibility for working individually or on a team, including with specialists from other sectors, and find creative solutions in changing or uncertain circumstances;</li> <li>9. displays the skills needed to commercialise the results of biotechnological studies.</li> </ol>
Final examination upon the completion of the study programme	Bachelor's thesis

## Study programme forms

### Full time studies - 3 years - latvian

Study type and form	Full time studies
Duration in full years	3
Duration in month	0
Language	latvian
Amount (CP)	120
Admission requirements (in English)	Secondary education
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	Bachelor degree of natural sciences in biology
Qualification to be obtained (in english)	-

### Places of implementation



Place name	City	Address
University of Latvia	RĪGA	RAIŅA BULVĀRIS 19, CENTRA RAJONS, RĪGA, LV-1050

### Full time studies - 3 years - english

Study type and form	<i>Full time studies</i>
Duration in full years	<i>3</i>
Duration in month	<i>0</i>
Language	<i>english</i>
Amount (CP)	<i>120</i>
Admission requirements (in English)	<i>Secondary education and English language skills at least level B2</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Bachelor degree of natural sciences in biology</i>
Qualification to be obtained (in english)	<i>-</i>

### Places of implementation

Place name	City	Address
University of Latvia	RĪGA	RAIŅA BULVĀRIS 19, CENTRA RAJONS, RĪGA, LV-1050

## 3.1. Indicators Describing the Study Programme

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

Since the programme was licensed the number of achievable study results reduced to nine. The learning outcomes have been revised to highlight only the main outcomes to be achieved during the programme and to avoid fragmentation of learning outcomes. The mapping of courses and learning outcomes has been repeated as learning outcomes have changed (Annex 28-3-B). In accordance with the decision of the Study Quality Commission of 4 October 2022, the degree to be granted from the Bachelor of Natural Sciences to the Bachelor of Natural Sciences in Biology has been changed in order to comply with the programme code and the requirements of the Cabinet of Minister regulation.

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

The joint academic BSP "Biotechnology and Bioengineering" is in line with the SF LS, as of the total study programme in credits, biology courses account for about 40%, other science courses account for 12%, and engineering courses account for about 20%. Additional consideration is given to how biotechnology in its general form (not narrowly specific industrial biotechnology, medical biotechnology, or agricultural biotechnology) relates to biology, more specifically to its sub-fields of microbiology and molecular biology, as well as how it integrates with other fields of natural sciences.

The programme code according to the Latvian Classification of Education ([Latvijas izglītības klasifikāciju](#), document only in Latvian) is 43421, and graduates are awarded a Bachelor of Science degree. Students will acquire knowledge, skills and competence corresponding to level 6 of the European Qualifications Framework (EQF).

In accordance with the Regulations on the National Standard for Academic Education ([Noteikumiem par Valsts akadēmiskās izglītības standartu](#), document only in Latvian), the study programme is 120 CP, and the study duration is three years (six semesters, 20 CP per semester). The studies are conducted only in the form of full-time studies. The scope and duration of studies in the BSP "Biotechnology and Bioengineering" are identical for both languages of its implementation - Latvian and English. The programme is planned to be implemented in English with a view to achieving the

goals of internationalisation of studies set out in the UL Strategy, as well as taking into account the global prospects of the field of biotechnology and the potential interest in the study programme.

The objectives of the study programme are designed to achieve the aim and the learning outcomes of the programme. The objectives of the study programme are: (1) to provide the opportunity to study theoretical and practical biology, as well as fundamentals of mathematics, physics and chemistry; (2) to provide the opportunity to study advanced courses in a relatively specialised field of molecular or organismal biology; (3) to develop abilities related to critical thinking, analysis and reasoning; (4) to develop skills in the design of biotechnological equipment and processes and in product development; (5) to develop skills to carry out independent research in a chosen sub-field of biology and to summarise the results in a Bachelor's Thesis leading to a Bachelor of Natural Sciences in Biology degree.

The admission conditions and requirements of the study programme are in line with the aims and objectives of the study programme, i.e., secondary education, successful assessment in biology or natural sciences, mathematics or chemistry or physics, as well as an additional centralised examination in one of the three subjects - biology or physics or chemistry - to ensure preparedness for the study programme. For the programme in English application also requires English skills at least level B2.

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

With reference to the European Federation of Biotechnology, the following definition of biotechnology has been established: "Bio-technology is the science which, based on knowledge of microbiology, biochemistry, genetics, genetic engineering, immunology, chemical technology, plant and mechanical engineering, uses bio-biological objects (micro-organisms, animal and plant tissue cells) and molecules (nucleic acids, proteins, enzymes, hydrocarbons, and others) to industrially produce substances and products needed by humans and animals" ([Princten, definitions](#)). It encompasses many fields of activity, such as: red or medical biotechnology, green or agricultural and environmental biotechnology, white or industrial biotechnology, blue or marine biotechnology, and grey or virological biotechnology. Thus, biotechnology has applications in important fields such as medicine, pharmaceuticals, agriculture, environmental protection, food and chemical industries, energy, etc. As pointed out in a study by the German National Academy of Science and Engineering acatech ([acatech \(ed.\) Innovation potential of biotechnology](#)), biotechnology is one of the key technologies for the 21st century, with applications in healthcare, manufacturing, and agriculture.

Red or medical biotechnology is represented by more than 1700 companies and a market of more than €17 billion in Europe alone. It has already been predicted that 50% of all medicines will be obtained by biotechnological means in 2015. Among the four well-established biotech hubs (USA, Europe, Canada, and Australia), the USA and Europe lead the way in 2012 in terms of the number of medical biotech companies, with 1,799 private and 165 public companies in Europe ([Ernst&Young. Biotechnology Industry report 2013. Beyond borders. Matters of evidence.](#)).

According to the United Nations, the world population is projected to increase from 7.71 billion in 2019 to an average of 8.18 billion in 2024 and 10.88 billion in 2100 ([United Nations. Worlds population prospects 2019](#) ). Adequate food security is thus a new challenge for societies, based on the data (2017) that already now around 811.7 million people are chronically hungry and undernourished ([Food and Agriculture Organization of the United Nations](#)). Alongside other

agricultural technologies, green or agricultural biotechnology will also have to face these challenges and to enable increasing productivity of smaller plots of available land and less available water, while minimising the potential negative impact of these activities on the environment. According to a report by Zion Market Research, the agricultural biotechnology market was worth USD 32.89 billion in 2018 and is forecast to grow to USD 67.01 billion in 2025 ([Zion. Global Agricultural Biotechnology Market Will Reach USD 67.01 Billion By 2025: Zion Market Research](#)). So, there is an evident need to equip young people with innovative ideas to tackle these challenges.

Europe is a world leader in white or production biotechnology, producing more than 60% of the world's enzymes. Enzymes and other micro-organisms are used to produce bio-based products in industries such as chemicals, food, paper and printing, detergents, textiles, and bioenergy (biogas, biofuels), among others, with the increasing move towards renewable resources. The industrial biotechnology sector continues to grow in the EU. Sales of products derived from biotechnological processes amounted to €91.9 billion in 2010, accounting for 6.2% of total chemical sales, and are expected to grow substantially to €515 billion by 2020 ([Ernst&Young. Biotechnology Industry report 2013. Beyond borders. Matters of evidence..](#)). This raises the issue of training and availability of new biotechnology specialists in the EU, including Latvia.

Based on the European Commission Communication, additional efforts are needed to boost growth, competitiveness, and job creation in Europe. Thus, in March 2012, at the European Council the European heads of states and governments reinforced these efforts by supporting the development of Key Enabling Technologies (KETs). Industrial biotechnology, or white biotechnology, has been identified as a Key Enabling Technology (KET) to be specially supported. The European Commission defines KETs states as "knowledge intensive and associated with high R&D intensity, rapid innovation cycles, high capital expenditure and highly skilled employment. They enable process, goods and service innovation throughout the economy and are of systemic relevance. They are multidisciplinary, cutting across many technology areas with a trend towards convergence and integration. KETs can assist technology leaders in other fields to capitalise on their research efforts [...] Based on current research, economic analyses of market trends and their contribution to solving societal challenges, micro-/nanoelectronics, nanotechnology, photonics, advanced materials, industrial biotechnology and advanced manufacturing technologies (recognised as a "cross-cutting" KET) have been identified as the EU's KETs" (["A European strategy for Key Enabling Technologies – A bridge to growth and jobs"](#)). This highlights the important role of the biotechnology sector in delivering innovative products, new workplaces, and growth in the EU. The need to develop the biotechnology segment points at a growing need for new highly qualified specialists capable of working in the above-listed sectors, which the study programme will be able to satisfy by training young scientists capable of working in both biotechnology and bioengineering. Biotechnology expertise requires a combination of knowledge in life sciences and engineering.

Statistics on graduates are impossible to provide because the first graduates of the program will only be in June 2023.

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

The programme was launched in the academic year 2020/2021, with a unified admission for two

state-funded places and 28 fee-paying places open for application. For the two budget places there were 173 applications in total, 50 of which were of the first priority; for the 28 fee-paying places there were 86 applications, five of which were of the first priority. A total of 27 students signed a study contract. In the academic year 2021/2022, the unified admission for two budget places and 38 paid places received 194 applications (of which 38 with priority 1) and 105 applications (of which seven with priority 1) respectively, with 26 students signing study contracts. Enrolments are close to the target of around 30 students in the first year of the programme. The number of applicants to the study programme, including the number of the first priority applicants, showed that potential students are interested in the study programme. The interest may be increased if the number of budget places continues to increase too (not all students are willing or able to pay for their studies), or when the study programme is included in an accredited field of study (each year before the admission, several students have questions about the accreditation status of their study programme). Starting from the academic year 2022/23, the study programme will have a total of 10 state-funded places at the UL and 8 places at RTU.

In the first two academic years, five of the enrolled students have discontinued their studies. Three of them dropped out due to their own volition (personal reasons) and two due to their failure to fulfil the requirements of the study programme on time.

Due to the COVID-19 pandemic and various restrictions on the organisation of face-to-face studies, and the restrictions and requirements for foreign students (vaccination and recognition of certificates), in the first two years of the study programme existence only the Latvian language stream has been implemented. The study programme in English is planned to start in the academic year 2023/2024.

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

The BSP "Biotechnology and Bioengineering" has been developed within the framework of the project "Design of Internationally Competitive Study Programmes Promoting the Development of the National Economy of Latvia at the University of Latvia" of the Specific Support Objective 8.2.1 of the Operational Programme "Growth and Employment" in cooperation between the University of Latvia and Riga Technical University. The aim of the joint study programme is to combine two subfields of science - biotechnology (a subfield of natural sciences) and bioengineering (a subfield of engineering sciences) - into one programme. As RTU is the leading engineering university in Latvia, it was decided to develop the joint programme with RTU. In bachelor's or master's programmes, biotechnology is integrated only as one of the subfields, for example, in the bachelor and master programmes "Biology" of the University of Latvia, or in the "Chemical Technology" bachelor programme of the RTU, but the existing study programmes are not able to prepare specialists who have knowledge at the same time from both natural sciences field and engineering field.

In October 2019, in the framework of the project an agreement was signed between the University of Latvia and Riga Technical University for the development of the BSP "Biotechnology and Bioengineering".

The development of the study programme has involved faculty members from the relevant faculties

of the University of Latvia (FB, Faculty of Chemistry, Faculty of Physics, Mathematics and Optometry, Faculty of Business, Management and Economics, Faculty of Medicine) and Riga Technical University faculties (Faculty of Computer Science and Information Technology, Faculty of Materials Science and Applied Chemistry, Institute of Business Engineering and Management, Faculty of Civil Engineering, Faculty of Energy and Electrical Engineering).

On 28 February 2020, the University of Latvia and Riga Technical University signed an agreement on the implementation of a joint academic Bachelor's study programme.

The joint programme is implemented as full-time studies in Latvian and English. The implementation of the study programme is supervised both by the relevant study field councils and by the study programme council established in accordance with the agreement between the UL and RTU. The programme council consists of two representatives (programme directors and vice-rectors) from each university. The programme council shall determine and monitor the common quality requirements for the implementation of the study programme, including student matriculation requirements and uniform course descriptions.

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

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

The content of the study programme is developed in accordance with the objectives defined in the project "Design of Internationally Competitive Study Programmes Promoting the Development of the National Economy of Latvia at the University of Latvia" of specific support Objective 8.2.1 of the Operational Programme "Growth and Employment" and based on the [Law on Higher Education Institutions](#) of the Republic of Latvia and the requirements for academic Bachelor's programmes set out in the UL Regulations on Study Programmes and Continuing Education Programmes (UL Senate Decision No. 102 as of 24.04.2017).

The compulsory part of the study programme includes 26 study courses (including Bachelor's Thesis) of the total amount of 92 CP, including study courses in compliance with the requirements of the Law on Civil Protection and Disaster Management and the Environmental Protection Law. The restricted elective part comprises a total of 22 CP and includes seven study courses of a total amount of 30 CP. In addition, the study programme has an elective part of 6 CP. At the end of the study programme, students shall produce a Bachelor's Thesis of 10 CP.

The compulsory part of the study programme (Part A) consists of the following study courses:

1. Introduction to the Design of Biological Systems (UL) 3 CP
2. Information Technologies (RTU) 2 CP

3. Biophysics (UL) 4 CP
4. Mathematical Basics of Biotechnology(RTU) 5 CP
5. Basic Latvian (for the study programme implemented in English) or English I (for the study programme implemented in Latvian) (UL) 2 CP
6. Basics of Economics and Management (UL) 4 CP
7. General and Physical Chemistry (UL) 4 CP
8. Genetics and Genomics (UL) 4 CP
9. Materials Science (RTU) 2 CP
10. Biomolecules and Cells (UL) 6 CP
11. Data Analysis and Mathematical Statistics (UL) 2 CP
12. Principals of Entrepreneurship (RTU) 2 CP
13. Basics in Microbiology (RTU) 6 CP
14. Cultivation and Physiology of Microorganisms (UL) 2 CP
15. Metabolism (UL) 4 CP
16. Introduction to Cell and Gene Engineering (UL) 4 CP
17. Electrical Processes and Equipment in Biotechnology (RTU) 2 CP
18. Gene and Cell Technologies (UL) 4 CP
19. Mathematical Modeling of Metabolism (UL) 2 CP
20. Biological Reactors (RTU) 4 CP
21. Fermentation – Product Identification and Purification (RTU) 4 CP
22. Organisation of Biotechnological Processes (UL) 6 CP
23. Environmental Protection for Biotechnologists (UL) 1 CP
24. Civil Protection (UL) 1 CP
25. Legal Regulation of Biotechnological Processes and Bioethics (UL) 2 CP
26. Biotechnology and Bioengineering Bachelor Thesis (UL/RTU) 10 CP

In the restricted elective part (Part B) of the study programme, students may choose the following study courses:

1. Challenges in Medical Biotechnology (UL) 4 CP
2. Introduction to Industrial and Environmental biotechnology 6 CP
3. Topics in Plant Tissue, Cell Culture and Agrobiotechnology (UL) 6 CP
4. Eukaryotic Genetic Engineering (UL) 6 CP
5. Big Data Analysis of Nucleic Acid Sequencing (UL) 2 CP
6. Vertically Integrated Project (VIP) (RTU) 2 CP
7. Teamwork for Business Design (RTU) 4 CP

Elective study courses are chosen centrally by students registering in the UL or RTU information system.

The courses are arranged in the study programme plan in such a way as to initially provide students with fundamental knowledge of biology, biotechnology, bioengineering and natural sciences (chemistry, physics, mathematics), as well as economics and management sciences. In the further study process, students acquire in-depth knowledge of various issues related to biotechnology and bioengineering, of the equipment/facilities used, practical experience in the organisation of work in enterprises, as well as the legal framework thereof. In the restricted elective part, students can choose specific examples of biotechnology applications (medical biotechnology, industrial biotechnology, genetic engineering, agrobiotechnology) or acquire additional knowledge in data processing and teamwork. The learning outcomes of the study courses are defined in such a

way as to ensure the achievement of the overall results of the study programme, according to the knowledge, skills, and competences to be acquired. The contribution of each course to the achievement of the overall programme outcomes is given in the course mapping (Annex 28-3-B).

The updating of study courses in line with the latest trends in the field is foreseen at least every three years, every time taking into account the results of student surveys on the content of study courses.

As an academic study programme, it does not include study practice in a classical sense. However, the programme includes a number of study courses which, in terms of the Regulations on Study Programmes and Continuing Education Programmes of the University of Latvia, can be equated to academic practice study courses, as they provide students with knowledge and skills necessary for the development of professional competence. Among such study courses is the course "Organisation of Biotechnological Processes", in which students have not only theoretical studies, but also face-to-face visits to biotech companies and waste treatment plants to acquire practical skills on how the work in these companies is organised. Courses such as "Topics in Plant Tissue, Cell Culture and Agrobiotechnology", "Gene and Cell Technology", "Challenges in Medical Biotechnology", "Introduction to Industrial and Environmental Biotechnology", and others include a wide range of practical and laboratory work in which students learn and apply practical skills in planning and conducting research, working with scientific equipment.

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

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

Oral, written and combined study and assessment methods are used during coursework and examinations.

A variety of methods of knowledge acquisition and consolidation are used, such as introductory lectures, interactive lectures, summary lectures, problem-oriented lectures. In the study course "Introduction to the Design of Biological Systems", individual lectures introduce students to the study process at the UL. Practitioners, professionals from different institutions are invited to lecture in individual courses in order to promote the unity of theory and practice. Practical tasks, seminars, individual, pair and group work, discussions and project development, study excursions to industry



organisations are widely used. Employers are involved in the implementation and development of study courses (they are invited to lead individual seminar sessions, and the sessions are often organised as exchange visits to workplaces, etc., as, e.g.. in the study course "Organisation of Biotechnological Processes").

In order to foster the development of students' research competence, students are given the opportunity to analyse and study in-depth problems of interest in the field in successive courses.

In the seminars, students enhance their speaking, presentation and discussion skills.

To achieve the learning outcomes of acquiring and consolidating knowledge, skills and developing competences, the study process is dominated by methods in which student activity plays an important role. The study process uses methods that promote students communication in performing study tasks, solving real problems in the field, modelling situations.

The physical environment of studies is also gradually changing: classrooms can be easily converted for group or individual work, students can use digital technologies. Lecturers mostly use methods that encourage students' active participation, critical thinking, and reflection. The e-learning environment is used to support the learning process and independent study. An e-learning environment (Moodle) created for each study course provides students with access to lesson materials, assignment descriptions in addition to study materials related to the course topics, as well as study tasks to be performed (tests, forums, seminars, conferences, etc.) with the reasons for the mark. All graded assessments in mid-term and final examinations are recorded and made available to students in the e-learning environment.

Updating study programmes and their study courses, the student-centred approach is followed with particular attention paid to the meaningful formulation of learning outcomes, so as to promote dialogue between lecturers and students on study content, forms of organisation and methods. Correctly formulated learning outcomes, in turn, promote students' understanding and ownership of their own learning, self-assessment and understanding of the assessment received. In the study process, lecturers use methods, forms of examination and assessment criteria that are appropriate to the study aim and the planned learning outcomes.

Students receive support and feedback from lecturers during the study process. The assessment criteria are made public in advance. Assessment provides students with the opportunity to demonstrate the extent to which they have achieved the expected learning outcomes.

The principles of student-centred learning encourage student mobility (recognition of learning outcomes), students engage in research and social activities in the community initiated by academic staff, and thus gain meaningful experience in applying what they have learned in their studies to practice. As part of the internal quality assurance policy, study programmes are implemented in such a way that students are encouraged to actively participate in the development of the study process. Policies and procedures are in place for submission of student suggestions and complaints and handling of student appeals. The results of student surveys are evaluated and considered in the development of the study process. Students willingly express their suggestions for the improvement of study programmes and study process in discussions with lecturers and programme directors. Meetings with students with the participation of UL and RTU programme directors are held twice a semester to discuss the study process and identified shortcomings in conducted study courses.

To ensure the implementation of the BSP "Biotechnology and Bioengineering" in English, only lecturers whose English language proficiency is at minimum B2 level (most have C1 and C2 level) are involved in the programme implementation. There will be no difference in delivery methods between the implementation in English and Latvian.

As this is joint study programme between LU and RTU, students are students of both universities at the same time, with access to all resources offered by both universities. Each of the universities is responsible for teaching certain study courses. Study courses within one semester are provided by both universities, but in planning the lectures list, in one day only classes are planned in one of the universities, so that students do not have to move between buildings. Regular meetings between teaching staff from both universities are organised to ensure that the content of studies is not overlapped and that the principles of teaching are applied equally. Both universities are equally responsible for ensuring the quality of studies and the student-centred study process.

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

Nav attiecināms

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

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

The first final theses are not scheduled until the spring semester of the academic year 2022/2023, so it is not possible to analyse.

### **3.3. Resources and Provision of the Study Programme**

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

All the resources available at the UL and FB are available for the implementation of the BSP "Biotechnology and Bioengineering". A detailed outline is given in Part II, subchapters 2.3.1 - 2.3.4 of the SF LS Self-Assessment Report.

For the implementation of the BSP "Biotechnology and Bioengineering", a greenhouse available for scientific research and training of students on the seventh floor of the House of Nature of the UL Academic Centre is of particular note. The greenhouse has modern equipment for optimum plant growth conditions and automatic regulation. In the training laboratories, there are microscopes connected to stationary computers, and individual workstations with micropipette sets. The laboratories have cold rooms (both -20° C and -80° C) for storage of samples and reagents. In the framework of project No 8.1.1. 0/17/I/010 "Modernization of the Infrastructure and Concentration of Resources of the University of Latvia STEM Study Areas", there have been acquired a Sartorius Biostat fermentation equipment set (8 fermenters with equipment), UHPLC ("Waters") and gas chromatography ("SCION Instruments") systems for chromatographic analysis of fermentation metabolites, spectrophotometer, laboratory benchtop centrifuge for processing fermentation samples, as well as other laboratory equipment necessary for practical work (incubator-shaker, weighing scale, thermostats, plate reader, autoclave). A fermentation training laboratory for practical work by groups of students, equipped with a set of Sartorius Biostat fermenters, has been set up in room 432 of the UL House of Nature. The laboratory allows groups of up to 20-24 students to carry out fermentation training.

Additionally, all resources available at RTU are available for the implementation of the study programme too. The information base, the material and technical base and the methodological support are adequate for the implementation of the study programme and achievement of the learning outcomes of the programme, which confirms the possibility of ensuring a quality study process in the future.

RTU studies take place in Ķīpsala, where the RTU Ķīpsala student campus is located. Its construction began in 1965 with the aim of creating a single study and science center. Construction will continue and it is planned to concentrate the majority of university students in Ķīpsala by the end of 2022. After the completion of the construction, RTU Ķīpsala student campus will become the most modern engineering study center in the Baltics. During the development of the campus, sustainability is taken into account at all aspects. Confirming the concern for the sustainable development of the environment and the desire to get involved in its promotion, RTU has joined the Sustainable Development Solutions Network, which aims to achieve the 17 goals set by the UN for sustainable global development in 2030. RTU is currently the only organization from the BalticStates admitted to this network. The University is also committed to promoting the creation and distribution of sustainable products that are directly related to the results of the study program.

RTU buildings are equipped with modern climate control equipment, technical solutions, buildings are controlled remotely and it is possible to monitor energy consumption to make the buildings more comfortable for students, teachers, scientists and guests. One of the results achieved in developing RTU infrastructure is participation in the Green Metric rating, where RTU Ķīpsala student campus is recognized as the 59th greenest in the world, and RTU as the 129th greenest university in the world, thus confirming the connection with the goal of the study program "Biotechnology and Bioengineering". RTU is a leader in the Baltic region with a green thinking infrastructure. The infrastructure of Ķīpsala student campus is provided with everything necessary for students, staff and guests to park their bicycles, cars and quench their thirst at drinking water points without paying for it. When developing the infrastructure, all groups of people are considered, including people with special needs: parking spaces are provided near each building, access to

auditoriums, laboratories and other premises without hindrance, braille for obtaining information and inspecting buildings, all sanitary facilities are designed as required. The association of disabled people and their friends "APEIRONS" has praised RTU's achievements in infrastructure issues related to the provision of people with special needs.

RTU Kipsala student campus currently has 54 classrooms, 187 laboratories, 19 special study rooms, 10 computer classes, 12 workshops and several research centers of national importance, which are available for the implementation of various study programs, including "Biotechnology and Bioengineering". There is also a student service hotel on the campus with 950 beds and a special block for people with special needs to ensure a favorable and comfortable living. Other elements of RTU infrastructure are also available for the needs of students and teachers - canteens and cafes, photocopiers, student hotels, RTU sports and recreation centers, swimming pool, etc. Vending machines for the purchase of various drinks and snacks are installed in the premises of RTU.

RTU Water Systems and Biotechnology Institute provides the necessary equipment (e.g. microscopes, bioreactors) and materials for laboratory work and research in the study courses "Fundamentals of Microbiology", "Biotechnological Reactors", "Introduction to Environmental and Industrial Biotechnologies". The study course "Fermentation - identification and purification of end products" takes place in the premises of the Institute of Organic Chemical Technology.

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

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

#### **Programme Revenue**

To provide the funding needed for the implementation of the BSP "Biotechnology and Bioengineering", the UL uses:

- the state budget subsidy from the Ministry of Education and Science, set at EUR 3097 for full-time studies for the academic year 2021/2022;
- study fees, taking into account all the factors listed under the heading "Financial Support", set for the academic year 2021/2022:
- full-time studies EUR 2400 per year (starting academic year of 2023./2024. ak.g. study fee will be increased to EUR 2700 EUR);

- full-time studies for foreigners – EUR 3200 per year.

In view of the above-stated, the total study programme budget is expected to be EUR 259,7 thousand per year, as summarised in Table 3.3.1 (as the implementation of the study programme only started in the academic year 2020/2021, and the English language studies will only start in the academic year 2023/2024, the total number of students for the academic year 2023/2024 is assumed to be 83 for the Latvian language stream and 15 for the English language stream).

*Table 3.3.1. Programme expected revenue per annum, EUR*

Study Type	Number of Students	Study Fee/ State Subsidy	Total Revenue
Full-Time (state-funded)	18	3097	55 746
Full-Time (fee-paying)	65	2400	156 000
Foreign students	15	3200	48 000
<b>Total</b>			<b>259 746</b>

### Programme Costs

In order to estimate the amount of funds required for financial support, the UL calculates the cost price for study programmes according to a methodology developed by the UL, which takes into account the costs of providing the study process as described in the section "SF Financial Provision" and information on the study programme plan, teaching staff involved, the planned number of students, etc., thus ensuring the reliability of the forecasts.

### Programme costs for full-time studies

For calculating costs, the implementors of the BSP "Biotechnology and Bioengineering" use the data on the students in the academic year 2021/2022, as well as the number of students to be enrolled in the academic year 2022/2023 (as it is only the second year of the programme) - there are 83 full-time students in the programme, the existing study plan and the existing structure of the academic staff involved in the programme. Taking into account the above, the estimated full-time cost of the programme per student is EUR 2705 per year and the total cost of the programme is EUR 224 515 per year. A detailed pro-rata breakdown of the costs is presented in Table 4.3.3.2.

*Table 3.3.2. Percentage breakdown of costs in the study programme*

Expenditure heading	% of the total
Teaching staff costs	47,9 %
General staff	13,2 %
Other costs	0 %
Infrastructure expenditure	11,3 %

Capital items and services	1,6 %
Indirect costs	26 %
<b>TOTAL COSTS</b>	<b>100%</b>

Figure 3.3.1 shows the cost of the study programme depending on the number of students and compares it with the proposed study fee and the state budget subsidy.

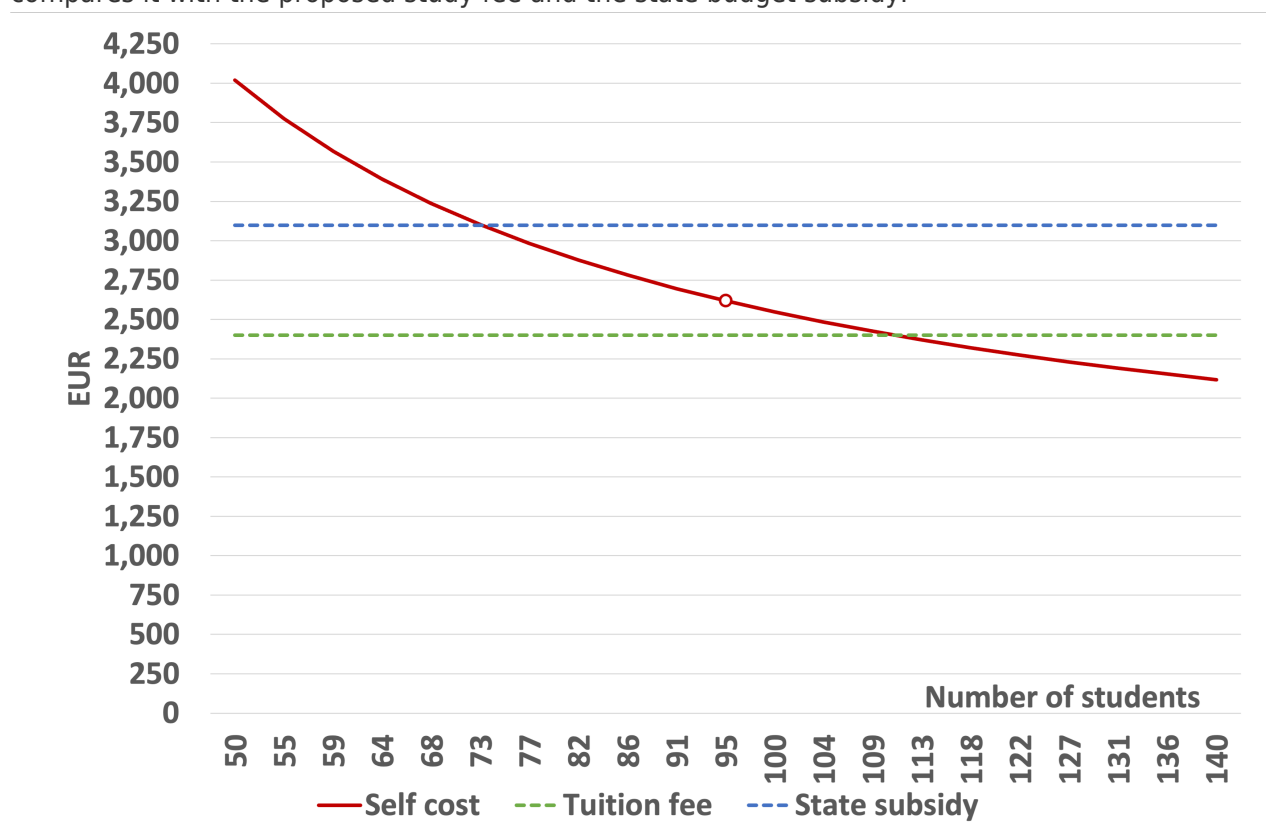


Figure 3.3.1. The BSP “Biotechnology and Bioengineering” cost per student

Based on the calculation, it can be seen that for the programme to be profitable and for students to be provided with a quality study process, the number of fee-paying students in the programme (in all courses together) should be at least 110 (the intersection of the red (cost price) and green (tuition fees) lines projected onto the x axis). In turn, if there were only state-funded students in the programme, then their number should reach 73 students.

### Programme costs for foreign students

The programme developers expect 75 international students to study in the programme. With this number of students, the estimated cost of the full-time studies in the BSP “Biotechnology and Bioengineering” per student is EUR 3103 per year and the total cost of the programme is EUR 232,725 per year.

A more detailed pro-rata breakdown of the costs is presented in Table 3.3.3.

Table 3.3.3. Percentage breakdown of costs in the study programme

Expenditure heading	% of the total
---------------------	----------------

Teaching staff costs	47,9 %
General staff	13,2 %
Other costs	0 %
Infrastructure expenditure	11,3 %
Capital items and services	1,6 %
Indirect costs	26 %
<b>TOTAL COSTS</b>	<b>100%</b>

Figure 3.3.2 shows the cost of the study programme depending on the number of students and compares it with the proposed study fee and the state budget subsidy.

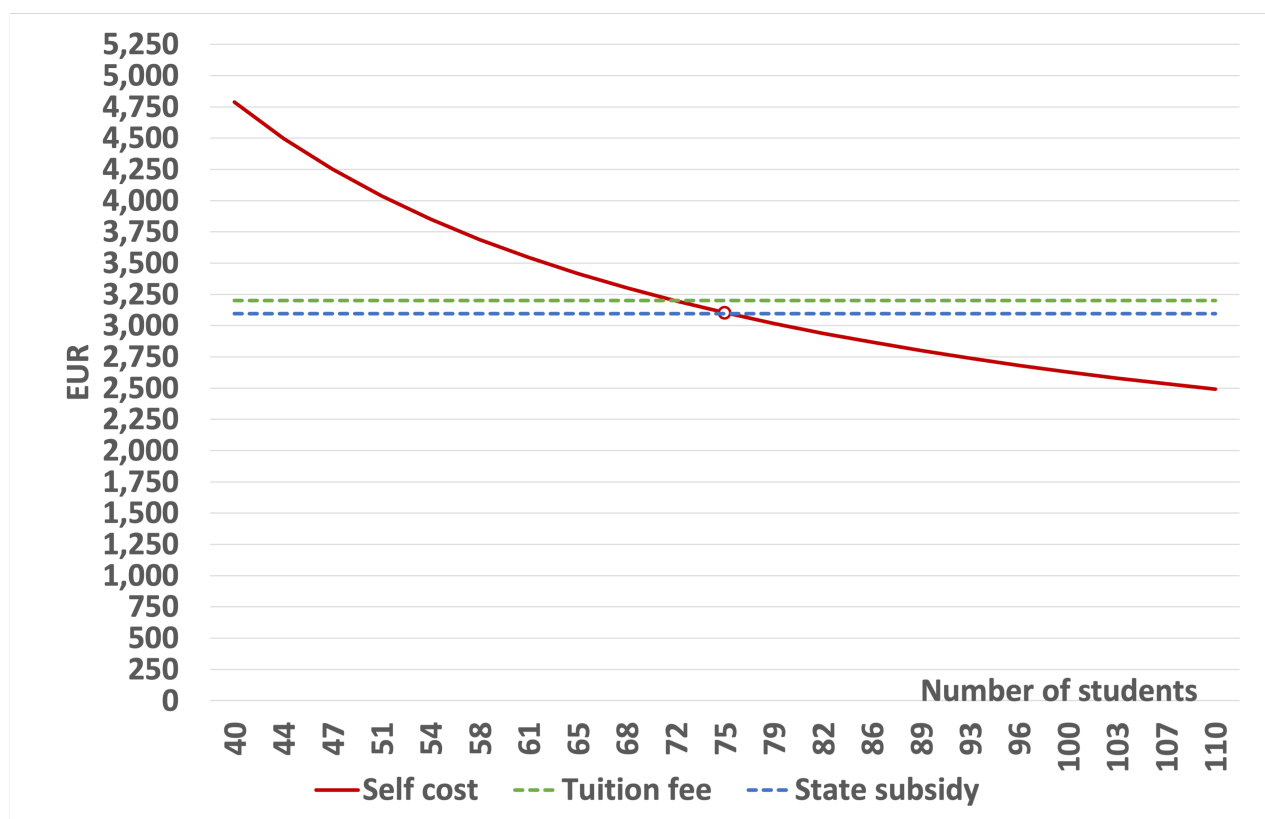


Figure 3.3.2. The BSP “Biotechnology and Bioengineering” cost per student

Based on the calculation, it can be seen that for the programme to be profitable and for students to be provided with a quality study process, the number of fee-paying students in the programme (in all courses together) should be at least 72 (the intersection of the red (cost price) and green (tuition fees) lines projected onto the x axis).

### Summary of Programme Revenue and Costs

In table 3.3.4. summarises the programme revenue based on the number of students, state subsidy, study fees, and programme expenses for this number of students.

*Table 3.3.4. Programme results*

Study Type	Number of Students	Study Fee/ State Subsidy	<b>Total Revenue</b>	<b>Total Costs</b>
Full-Time (state-funded)	18	3097	55 746	48 690
Full-Time (fee-paying)	65	2400	156 000	175 825
Foreign students	15	3200	48 000	46 545
<b>Total</b>			<b>259 746</b>	<b>271 060</b>

The data shown in the table demonstrate that the cost-effectiveness of the study programme requires an increase in the number of foreign students (the programme is yet to be launched in English, so the number of students in the first years of study might be lower than optimal). There are also plans to revise tuition fees to bring them closer to the real cost of the programme. In addition, the work is underway to increase the number of funded study places, both by requesting additional state-funded places and by reallocating places between programmes within the UL. Until a positive result is achieved, the programme may be additionally financed from the income received from lifelong learning and other services, as well as from the financial resources accumulated by the structural unit. The faculties also receive financial support for programme development from the UL Study Quality Improvement Fund.

## 3.4. Teaching Staff

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

25 lecturers are involved in the implementation of the study programme, including 6 Professors, 4 Associate Professors, 4 Docents, 4 lecturers and 7 university teachers. The number of Professors and Associate Professors (10) fully complies with the first part of Article 55 of the Law on Higher Education Institutions, which requires that at least five Professors and Associate Professors participate in the implementation of the programme. Of the 25 lecturers, 18 hold doctoral degrees.



All the lecturers involved in the programme have English language proficiency of B2 level, and 16 have English language proficiency of C1 or C2 level.

The scientific activities of the programme staff are directly related to the areas of study covered by the programme, and they are active both in the management and implementation of projects and in the preparation of scientific publications. In 2020 and 2021, the programme staff have co-authored 146 scientific publications indexed in the Scopus database (see Annex 14-B for the full list of publications). Of the 146 publications, 60 are in the field of agriculture and biology, 38 in the field of biochemistry, genetics and molecular biology, and 35 in the field of immunology and microbiology.

Since the licensing of the study programme, eight of the faculty members involved in its implementation have participated in various continuing professional development courses ("E-Learning Environment", "Distance Learning", "Digital Media Literacy", "Research and Publication Skills", "Project Preparation", "Commercialisation", "Leadership", "Laboratory Management", "Research Ethics for Academics", "Academic Integrity", "Curriculum Development and Management"), with some skills acquired in the courses directly applicable to the study process. Four lecturers have improved their English language skills by obtaining C1 level certificates. This demonstrates the readiness of the teaching staff to support the study process also in English when needed.

The qualifications of the teaching staff and their previous experience in academic and scientific work, including in areas directly related to the study courses included in the BSP "Biotechnology and Bioengineering", generally confirm that the qualifications of the teaching staff involved in the programme are appropriate to achieve the aim and objectives of the study programme.

In the implementation of the study programme, RTU has involved a total of 13 lecturers, of which 8 are professors, 1 associate professor, 2 assistant professors, 1 lecturer and one foreign visiting docent. Everyone has a PhD in engineering, economics or mathematics. Accordingly, teaching staff with appropriate qualifications and knowledge in the relevant fields have been selected to provide the study programme.

All involved teachers have multifaceted knowledge and skills in the academic, scientific and practical fields, including in cooperation with industry, which provides students with the opportunity to go on study visits during their studies. 57% of RTU teaching staff are experts of the Latvian Science Council in such sub-sectors as environmental biotechnology, mathematics, economics and business, political science, electrical engineering, electronics, information and communication technologies, construction and transport engineering, chemistry, chemical engineering, materials science, which certifies the competence of the teaching staff topics in scientific news. The qualification is also confirmed by active participation in the study courses of other study programmes, their teaching and participation in various institutional positions not only at RTU, but also at the international level.

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

Since the licensing of the study programme, five additional lecturers have been involved in its implementation: Associate Professor Ģirts Barinovs ("Biophysics"), senior researcher Jeļena Kosmača ("Biophysics"), lecturer Ilona Mandrika ("Introduction to Cell and Gene Engineering",

“Metabolism”, “Biomolecules and Cells”), lecturer Kārlis Švirksts (“Cultivation and Physiology of Microorganisms”), and lecturer Zane Ozoliņa (“Gene and Cell Technology”). The additional lecturers (except for the course “Biophysics”) work alongside the lecturer in charge of the course, simultaneously lifting part of the workload of the senior lecturers, as well as gaining experience in teaching specific courses, so that they can replace the other lecturer if necessary. All newly recruited lecturers have appropriate qualifications (experience in academic work, or experience in scientific projects and scientific publications) so that the recruitment of new lecturers does not reduce the quality of lecturing in the study programme. Three of the five newly recruited lecturers have English language skills at C1 level and two at B2 level.

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

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

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

Cooperation between teaching staff in the implementation of the study programme takes place regularly and at different levels.

Regular meetings were held during the development of the study programme in order to prepare both the overall content of the programme and the content of individual study courses, to form a unified, complementary study course offer, as well as to prevent duplication of study course content in study courses (both within the UL and with study courses taught by RTU faculty members).

Every semester, meetings of the UL and RTU lecturers involved in the implementation of the programme are held to evaluate the lessons learnt from the implementation of the study courses in the previous semester, to assess the feedback on the study courses provided by students, as well as to assess the need to adapt the way of teaching to the students of a particular study year, taking into account their prior knowledge and level of preparedness. At the regular meetings, the student-centred teaching methods that should be integrated in each of the study courses are also pointed out.

25 UL faculty members are involved in the implementation of the programme in the academic year 2022/2023. The programme has 72 students, resulting in a student-to-faculty ratio of  $72:25 \approx 2.9$  students per faculty member.

# Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	20_3_B_diploma_Biotechnology.pdf	20_3_A_diploms_Biotehnologijas_BSP.pdf
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)		
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)	23_B_compliance_joint_programme_Biotechnology_BSP.pdf	23_A_atbilstiba_kopigai_programmai_Biotehnologijas_BSP.pdf
Statistics on the students in the reporting period	24_3_B_statistic_number_students_Biotechnology_BSP.pdf	24_3_A_statistika_studejoso_skaits_Biotehnologijas_BSP.pdf
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard	25_3_B_compliance_standard_Biotechnology.pdf	25_3_A_atbilstiba_valsts_standartam_Biotehnologijas_BSP.pdf
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)		
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	28_3_B_mapping_Biotechnology_BSP.xlsx	28_3_A_kartejums_Biotehnologijas_BSP.xlsx
The curriculum of the study programme (for each type and form of the implementation of the study programme)	26_3_B_study_plan_Biotechnology_BSP.pdf	26_3_A_studiju_plans_Biotehnologijas_BSP.pdf
Descriptions of the study courses/ modules	27_3_B_course_descriptions_Biotechnology_BSP.pdf	27_3_A_kursa_apraksti_Biotehnologijas_BSP.pdf
Description of the organisation of the internship of the students (if applicable)		
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)	30_3_B_section_55_Biotechnology_BSP.pdf	30_3_A_pants_55_Biotehnologijas_BSP.pdf

# Natural sciences (51421)

Study field	<i>Wildlife Sciences</i>
ProcedureStudyProgram.Name	<i>Natural sciences</i>
Education classification code	<i>51421</i>
Type of the study programme	<i>Doctoral study programme</i>
Name of the study programme director	<i>Didzis</i>
Surname of the study programme director	<i>Elferts</i>
E-mail of the study programme director	<i>didzis.elferts@lu.lv</i>
Title of the study programme director	<i>Dr.biol., prof.</i>
Phone of the study programme director	<i>+371 28678724</i>
Goal of the study programme	<i>To train scientists and academics, as well as professionals in applied research, eco-nomic or public management work, whose knowledge, skills, and competences are appropriate to the requirements of the international market, taking into account the needs of the Latvian labour market.</i>
Tasks of the study programme	<i>1. to learn the theory and practice of university pedagogy: to learn and apply the principles and skills of lecturing and seminar supervision, student independent work and research project management;</i> <i>2. to pass the doctoral examinations, thus confirming the doctoral competence in the scientific field and in the chosen sub-field;</i> <i>3. to publish research results and theoretical findings in well-established peer-reviewed scientific publications and scientific journals in the field;</i> <i>4. to participate in international scientific conferences, seminars, doctoral schools, etc;</i> <i>5. to acquire information technology, data processing, and presentation skills and competences;</i> <i>6. to develop creative and critical thinking, analysis and reasoning abilities and skills, to enrich the country's intellectual potential;</i> <i>7. to prepare an independent research work (Doctoral Thesis) and successfully present it at the Doctoral Studies Council.</i>

Results of the study programme	<p><i>Knowledge:</i></p> <ol style="list-style-type: none"> <li><i>1. understand the theory and research methods of the discipline, sub-discipline and field of research, and be aware of trends in the development of theoretical and applied concepts;</i></li> <li><i>2. explain the principles of research organisation;</i></li> <li><i>3. understand the basics of intellectual property and copyright, Latvian science legislation, Latvian and EU science policy.</i></li> </ol> <p><i>Skills:</i></p> <ol style="list-style-type: none"> <li><i>4. communicate both orally and in writing about their field of scientific activity (their sector) in academic circles and society in general,</i></li> <li><i>5. independently improve their scientific qualification, implement scientific projects with achievements that meet international criteria in the field of science;</i></li> <li><i>6. perform independent critical analysis, synthesis, and evaluation, solve significant research or innovation tasks in fundamental science, economics, or management, independently propose a research idea, plan, structure and conduct research and large-scale scientific projects, including in an international context.</i></li> </ol> <p><i>Competence:</i></p> <ol style="list-style-type: none"> <li><i>7. know and employ research methodology and modern research methods, independently plan, organise, conduct and manage research in relation with other natural sciences;</i></li> <li><i>8. contribute to the creation of new knowledge, extend the frontiers of knowledge or develop new understanding of existing knowledge and its application in practice, as well as solve professional tasks of a practical nature;</i></li> <li><i>9. contribute to the development of the scientific field and integrate into the global environment of scientific research;</i></li> <li><i>10. determinedly and independently improve their scientific qualifications and pedagogical skills.</i></li> </ol>
Final examination upon the completion of the study programme	<i>Three doctoral examinations. Successful defence of a Doctoral Thesis required for the degree.</i>

## Study programme forms

### **Part time studies - 4 years - latvian**

Study type and form	<i>Part time studies</i>
Duration in full years	<i>4</i>
Duration in month	<i>0</i>
Language	<i>latvian</i>
Amount (CP)	<i>144</i>

Admission requirements (in English)	<i>Specialising in the Natural sciences field Biology: Master's degree in biology, chemistry, forestry, agriculture, as well as medical doctor professional degree or higher education equivalent to those degrees, and entrance examination Specialising in the Natural sciences field Physics and astronomy: Master's degree in physics, optometry, chemistry, engineering or referred to degrees equated to higher education, and entrance examination Specialising in the Natural sciences field Earth sciences, physical geography and environmental sciences: Master's degree in Natural science, engineering, agricultural sciences, forest sciences or social sciences, or higher education equivalent to those degrees, and entrance examination Specialising in the Natural sciences field Chemistry: Master's degree in physics, chemistry, engineering or referred to degrees equated to higher education, and entrance examination</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Doctoral Degree of Science Doctor of Science (Ph.D.) in Natural Sciences</i>
Qualification to be obtained (in english)	-

#### Places of implementation

Place name	City	Address
University of Latvia	RĪGA	RAIŅA BULVĀRIS 19, CENTRA RAJONS, RĪGA, LV-1050

#### Full time studies - 3 years - latvian

Study type and form	<i>Full time studies</i>
Duration in full years	<i>3</i>
Duration in month	<i>0</i>
Language	<i>latvian</i>
Amount (CP)	<i>144</i>
Admission requirements (in English)	<i>Specialising in the Natural sciences field Biology: Master's degree in biology, chemistry, forestry, agriculture, as well as medical doctor professional degree or higher education equivalent to those degrees, and entrance examination Specialising in the Natural sciences field Physics and astronomy: Master's degree in physics, optometry, chemistry, engineering or referred to degrees equated to higher education, and entrance examination Specialising in the Natural sciences field Earth sciences, physical geography and environmental sciences: Master's degree in Natural science, engineering, agricultural sciences, forest sciences or social sciences, or higher education equivalent to those degrees, and entrance examination Specialising in the Natural sciences field Chemistry: Master's degree in physics, chemistry, engineering or referred to degrees equated to higher education, and entrance examination</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Doctoral Degree of Science Doctor of Science (Ph.D.) in Natural Sciences</i>
Qualification to be obtained (in english)	-

#### Places of implementation

Place name	City	Address
University of Latvia	RĪGA	RAIŅA BULVĀRIS 19, CENTRA RAJONS, RĪGA, LV-1050

### Part time studies - 4 years - english

Study type and form	<i>Part time studies</i>
Duration in full years	4
Duration in month	0
Language	<i>english</i>
Amount (CP)	144
Admission requirements (in English)	<i>Specialising in the Natural sciences field Biology: Master's degree in biology, chemistry, forestry, agriculture, as well as medical doctor professional degree or higher education equivalent to those degrees, and entrance examination Specialising in the Natural sciences field Physics and astronomy: Master's degree in physics, optometry, chemistry, engineering or referred to degrees equated to higher education, and entrance examination Specialising in the Natural sciences field Earth sciences, physical geography and environmental sciences: Master's degree in Natural science, engineering, agricultural sciences, forest sciences or social sciences, or higher education equivalent to those degrees, and entrance examination Specialising in the Natural sciences field Chemistry: Master's degree in physics, chemistry, engineering or referred to degrees equated to higher education, and entrance examination English language skills at least at level B2</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Doctoral Degree of Science Doctor of Science (Ph.D.) in Natural Sciences</i>
Qualification to be obtained (in english)	-

### Places of implementation

Place name	City	Address
University of Latvia	RĪGA	RAIŅA BULVĀRIS 19, CENTRA RAJONS, RĪGA, LV-1050

### Full time studies - 3 years - english

Study type and form	<i>Full time studies</i>
Duration in full years	3
Duration in month	0
Language	<i>english</i>
Amount (CP)	144



Admission requirements (in English)	<i>Specialising in the Natural sciences field Biology: Master's degree in biology, chemistry, forestry, agriculture, as well as medical doctor professional degree or higher education equivalent to those degrees, and entrance examination Specialising in the Natural sciences field Physics and astronomy: Master's degree in physics, optometry, chemistry, engineering or referred to degrees equated to higher education, and entrance examination Specialising in the Natural sciences field Earth sciences, physical geography and environmental sciences: Master's degree in Natural science, engineering, agricultural sciences, forest sciences or social sciences, or higher education equivalent to those degrees, and entrance examination Specialising in the Natural sciences field Chemistry: Master's degree in physics, chemistry, engineering or referred to degrees equated to higher education, and entrance examination English language skills at least at level B2</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Doctoral Degree of Science Doctor of Science (Ph.D.) in Natural Sciences</i>
Qualification to be obtained (in english)	-

#### Places of implementation

Place name	City	Address
University of Latvia	RĪGA	RAIŅA BULVĀRIS 19, CENTRA RAJONS, RĪGA, LV-1050

#### Part time studies - 4 years - latvian

Study type and form	<i>Part time studies</i>
Duration in full years	<i>4</i>
Duration in month	<i>0</i>
Language	<i>latvian</i>
Amount (CP)	<i>144</i>
Admission requirements (in English)	<i>Specialising in the Engineering and technology science field Material science: Master's degree in physics, chemistry, engineering or referred to degrees equated to higher education, and entrance examination</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Doctoral Degree of Science Doctor of Science (Ph.D.) in Engineering and Technology</i>
Qualification to be obtained (in english)	-

#### Places of implementation

Place name	City	Address
University of Latvia	RĪGA	RAIŅA BULVĀRIS 19, CENTRA RAJONS, RĪGA, LV-1050

#### Part time studies - 4 years - latvian

Study type and form	<i>Part time studies</i>
Duration in full years	<i>4</i>
Duration in month	<i>0</i>
Language	<i>latvian</i>
Amount (CP)	<i>144</i>

Admission requirements (in English)	<i>Specialising in the Social Sciences field Social and Economic Geography: Master's degree in Natural science, social sciences or higher education assimilated to those degrees, and entrance examination</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Doctoral Degree of Science Doctor of Science (Ph.D.) in Social Sciences</i>
Qualification to be obtained (in english)	-

### Places of implementation

Place name	City	Address
University of Latvia	RĪGA	RAIŅA BULVĀRIS 19, CENTRA RAJONS, RĪGA, LV-1050

### Part time studies - 4 years - english

Study type and form	<i>Part time studies</i>
Duration in full years	<i>4</i>
Duration in month	<i>0</i>
Language	<i>english</i>
Amount (CP)	<i>144</i>
Admission requirements (in English)	<i>Specialising in the Engineering and technology science field Material science: Master's degree in physics, chemistry, engineering or referred to degrees equated to higher education, and entrance examination English language skills at least at level B2</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Doctoral Degree of Science Doctor of Science (Ph.D.) in Engineering and Technology</i>
Qualification to be obtained (in english)	-

### Places of implementation

Place name	City	Address
University of Latvia	RĪGA	RAIŅA BULVĀRIS 19, CENTRA RAJONS, RĪGA, LV-1050

### Part time studies - 4 years - english

Study type and form	<i>Part time studies</i>
Duration in full years	<i>4</i>
Duration in month	<i>0</i>
Language	<i>english</i>
Amount (CP)	<i>144</i>
Admission requirements (in English)	<i>Specialising in the Social Sciences field Social and Economic Geography: Master's degree in Natural science, social sciences or higher education assimilated to those degrees, and entrance examination</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Doctoral Degree of Science Doctor of Science (Ph.D.) in Social Sciences</i>
Qualification to be obtained (in english)	-

### Places of implementation

Place name	City	Address
University of Latvia	RĪGA	RAIŅA BULVĀRIS 19, CENTRA RAJONS, RĪGA, LV-1050

#### Full time studies - 3 years - latvian

Study type and form	<i>Full time studies</i>
Duration in full years	3
Duration in month	0
Language	<i>latvian</i>
Amount (CP)	144
Admission requirements (in English)	<i>Specialising in the Engineering and technology science field Material science: Master's degree in physics, chemistry, engineering or referred to degrees equated to higher education, and entrance examination</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Doctoral Degree of Science Doctor of Science (Ph.D.) in Engineering and Technology</i>
Qualification to be obtained (in english)	-

#### Places of implementation

Place name	City	Address
University of Latvia	RĪGA	RAIŅA BULVĀRIS 19, CENTRA RAJONS, RĪGA, LV-1050

#### Full time studies - 3 years - latvian

Study type and form	<i>Full time studies</i>
Duration in full years	3
Duration in month	0
Language	<i>latvian</i>
Amount (CP)	144
Admission requirements (in English)	<i>Specialising in the Social Sciences field Social and Economic Geography: Master's degree in Natural science, social sciences or higher education assimilated to those degrees, and entrance examination</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Doctoral Degree of Science Doctor of Science (Ph.D.) in Social Sciences</i>
Qualification to be obtained (in english)	-

#### Places of implementation

Place name	City	Address
University of Latvia	RĪGA	RAIŅA BULVĀRIS 19, CENTRA RAJONS, RĪGA, LV-1050

#### Full time studies - 3 years - english

Study type and form	<i>Full time studies</i>
Duration in full years	3
Duration in month	0
Language	<i>english</i>
Amount (CP)	144

Admission requirements (in English)	<i>Specialising in the Engineering and technology science field Material science: Master's degree in physics, chemistry, engineering or referred to degrees equated to higher education, and entrance examination English language skills at least at level B2</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Doctoral Degree of Science Doctor of Science (Ph.D.) in Engineering and Technology</i>
Qualification to be obtained (in english)	-

#### Places of implementation

Place name	City	Address
University of Latvia	RĪGA	RAIŅA BULVĀRIS 19, CENTRA RAJONS, RĪGA, LV-1050

#### Full time studies - 3 years - english

Study type and form	<i>Full time studies</i>
Duration in full years	<i>3</i>
Duration in month	<i>0</i>
Language	<i>english</i>
Amount (CP)	<i>144</i>
Admission requirements (in English)	<i>Specialising in the Social Sciences field Social and Economic Geography: Master's degree in Natural science, social sciences or higher education assimilated to those degrees, and entrance examination English language skills at least at level B2</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Doctoral Degree of Science Doctor of Science (Ph.D.) in Social Sciences</i>
Qualification to be obtained (in english)	-

#### Places of implementation

Place name	City	Address
University of Latvia	RĪGA	RAIŅA BULVĀRIS 19, CENTRA RAJONS, RĪGA, LV-1050

### 3.1. Indicators Describing the Study Programme

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

The study programme was licensed on 13 October 2020. The implementation of the programme started in the autumn semester of 2021. Since licencing the reduction of the learning outcomes is performed. The learning outcomes of the programme have been revised to foreground only the main outcomes to be achieved during the programme and to avoid their fragmentation. After the change of learning outcomes, the mapping of courses and learning outcomes has been repeated (Annex 28-4-B).

In accordance with the changes to the Law on Scientific Activities, changes have been made to the degrees to be granted, further granting:

- 1) Doctoral Degree of Science Doctor of Science (Ph.D.) in Natural Sciences, replacing Doctor of Science (PhD) in Biology, or Doctor of Science (PhD) in Physics and Astronomy, or Doctor of Science (PhD) in Chemistry, or Doctor of Science (PhD) in Earth Sciences, Physical Geography and Environmental Sciences;
- 2) Doctoral Degree of Science Doctor of Science (Ph.D.) in Engineering and Technology, replacing Doctor of Science (PhD) in Materials Science;
- 3) Doctoral Degree of Science Doctor of Science (Ph.D.) in Social Sciences, replacing Doctor of Science (PhD) in Social and Economic Geography.

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

The DSP "Natural Sciences" was created using the experience of European Union countries in the implementation of studies in natural sciences (biology, physics, geography, geology, physics, environmental science), the priority science sources recognised in Latvia and the existing academic education traditions at the University of Latvia (UL). The aim of doctoral studies is to prepare highly qualified specialists for independent work in science, higher education, and the economy. The establishment of the study programme was also justified by the need to consolidate the existing UL doctoral study programmes ("Biology", "Physics, Astronomy and Mechanics", "Geography", "Geology", "Chemistry" and "Environmental Science") and ensure a unified, interdisciplinary

approach to the training of young specialists, the acquisition of generally applicable competences, the promotion of cooperation between individual scientific fields, as well as the efficient use of resources.

The DSP "Natural Sciences" was created by consolidating several existing doctoral study programmes, all of which belong to the field group of Natural Sciences (in accordance with the Regulations on Latvian Scientific Field Groups, Fields and Sub-fields, ("[Noteikumi par Latvijas zinātnes nozaru grupām, nozarēm un apakšnozarēm](#)", document in Latvian)) but represent different sub-fields of science (Physics and Astronomy, Chemistry, Earth Sciences, Physical Geography and Environmental Sciences, Biology). According to the Regulation on the of Latvian Education Classification ("[Noteikumi par Latvijas izglītības klasifikāciju](#)", document in Latvian), existing study programmes have different study programme codes and represent different fields of study. As the existing legislation in Latvia does not allow the creation of study programme codes representing several fields and sub-fields at the same time, the DSP "Natural Sciences" has selected the most appropriate and relevant for the fields and programme codes of the study programmes to be consolidated ("Natural Sciences" and study programme code 51421), which is unifying and binding for all specialisations included in the DSP.

The aim of the DSP "Natural Sciences" is to train scientists and academics, as well as professionals in applied research, economic or public management work, whose knowledge, skills, and competence are appropriate to the requirements of the international market, taking into account the needs of the Latvian labour market.

In line with the aim of the programme, programme objectives have been developed to ensure the achievement of the aim:

1. to learn the theory and practice of university pedagogy: to learn and apply the principles and skills of lecturing and seminar supervision, student independent work and research project management;
2. to pass the doctoral examinations, thus confirming the doctoral competence in the scientific field and in the chosen sub-field;
3. to publish research results and theoretical findings in well-established peer-reviewed scientific publications and scientific journals in the field;
4. to participate in international scientific conferences, seminars, doctoral schools, etc;
5. to acquire information technology, data processing, and presentation skills and competence;
6. to develop creative and critical thinking, analysis and reasoning abilities and skills, to enrich the country's intellectual potential;
7. to prepare an independent research work (Doctoral Thesis) and successfully present it at the Doctoral Studies Council.

The DSP "Natural Sciences" is considered to be successfully completed if the doctoral student has obtained a total of 144 credit points (CP) by completing the study courses included in the study programme, successfully passing three doctoral examinations (examination in a foreign language, examination in a scientific discipline, examination in a specialisation), as well as developing a research dissertation and presenting it (at a pre-defence) to the Doctoral Council of Natural Sciences. A dissertation is a doctoral thesis, a monograph, or a set of at least three thematically coherent scientific publications published in journals indexed in Scopus and/or Web of Science.

The programme provides the possibility to specialise in different subfields of science, but it takes place within the framework of a single study programme (without sub-programmes). The specialisation and the degree to be obtained, as appropriate, is determined by the research subject selected by the doctoral student by which the doctoral student applies for studies in this programme.

The admission requirements for the DSP "Natural Sciences" are as follows:

The programme admits students with a Master's degree in Biology, Physics, Geography, Geology, Engineering Sciences, Chemistry, Forestry, Agriculture, Optometry, Social Sciences, Environmental Sciences, as well as a professional medical degree or higher education equivalent to the degrees above. Prior education requirements depend on the intended degree to be obtained (natural science, engineering and technology, social science), which in turn depends on the subject of the doctoral study.

Matriculation takes place after the topic of the doctoral thesis is presented at the Doctoral Council, the quality of the planned scientific research, its relevance to the priority research areas of the UL and Latvian science, as well as the applicant's qualifications are assessed. During the entrance interview, the applicants are ranked according to the total points obtained. The general admission criteria for the UL doctoral programmes are listed at: <https://www.lu.lv/gribustudet/uznemsanas-kartiba/doktorantura/> (information in Latvian);

Entrance interviews are held in Latvian or English, for studies in Latvian and English respectively.

According to the Latvian Education Classification ("*Noteikumi par Latvijas izglītības klasifikāciju*", document in Latvian), the code number of the DSP "Natural Sciences" is 51421.

According to the UL Regulations on Study Programmes and Continuing Education Programmes, the DSP "Natural Sciences" is 144 CP. In full-time intramural studies, students acquire 24 CP in each of the six semesters. The part-time intramural studies last eight semesters, each of which provides students with around 18 CP. The Regulations stipulate that the compulsory part of the doctoral study programme consists of studies and the development of a thesis (literature analysis, research, conferences, preparation of publications), a general skills module, doctoral examinations, as well as participation in UL doctoral schools or obtaining equivalent experience in foreign universities. The aim of implementing the DSP "Natural Sciences" in full-time and part-time modes of study is to offer doctoral students flexible study approaches, to reduce student attrition, especially when doctoral students are employed full-time in research institutes and when their work tasks are not in line with the thesis topic. The implementation of the DSP for full-time and part-time studies is regulated by the relevant UL regulations, and for doctoral studies, by Order 13.10.2000 1/ 100 "On the status of doctoral student and the organisation of doctoral studies at the University of Latvia". Doctoral studies in full-time and part-time study modes differ in the duration of studies (3 years and 4 years respectively), which increases the possibility of developing a high-quality doctoral thesis if the doctoral student's direct work duties also include other work tasks not related to the development of the doctoral thesis. The DSP in full-time and part-time study modes also differs in the flexibility of studies and the possibility to study the subjects offered in the programme according to an individual study plan.

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

The existence and development of the DSP "Natural Sciences" is obvious from the point of view of the development of the Republic of Latvia, as it is a study programme of the highest level, providing training of specialists in several fields of natural sciences (Biology, Physics, Geography, Geology, Chemistry, Environmental Science), contributing to the implementation of the sustainable development strategy of Latvia. The content of the DSP "Natural Sciences" fully complies with the

policies set out in [the Guidelines for the Development of Education and the National Concept for the Development of Higher Education and Institutions of Higher Education of Latvia for 2013-2020](#) (Council of Higher Education, 2013).

The implemented DSP "Natural Sciences" is fully in line with the [Sustainable Development Strategy of Latvia until 2030](#), where higher education issues are addressed in close connection with human capital development and productivity growth, which in the field of natural sciences is only possible through the development of doctoral studies. The study programme is geared towards achieving the objectives of the European growth strategy Europe 2020 and is in line with [the National Development Plan of Latvia for 2021-2027](#) and a number of relevant action directions within its priority "Knowledge and Skills for Personal and National Growth", notably, " Science for the development of society, the economy and security".

[The 2019 OECD Education Report](#) shows that in OECD countries, on average, 1.1% of the population aged 25-64 has a doctoral degree, compared to 0.4% in Latvia. Employees with a doctoral degree are 5% more likely to be employed in Latvia, 10% more likely in Finland and Hungary, and 12% more likely in Italy. The results of the [European Science Foundation study](#) show that, at European level, 46% of Doctors in Natural Sciences are employed in universities, 22% in research institutes, and 15% in industry, so that 83% of people with a doctoral degree in sciences have a job directly related to their field of education.

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

The programme started in the autumn semester of 2021, with 54 students enrolled and four of them from abroad (studying together with the Latvian stream).

To analyse the dynamics of the number of students, it is also necessary to look at the total number of students in the DSP "Biology", "Physics", "Astronomy and Mechanics", "Geography", "Geology", "Chemistry" and "Environmental Science" in the period from the academic year 2013/2014, as these six study programmes were consolidated in the DSP "Natural Sciences". The number of matriculated students varies widely from year to year, ranging from 34 to 54. The variation in the number of matriculated students is due to several factors: (1) the number of study places offered for admission, which in each academic year depends on the total number of students in the programme and the number of state-funded places in the programmes; (2) the change in students' interest in doctoral studies: thus, in some years the number of applications for studies is lower than the number of study places offered, with students doubting successful completion of their doctoral studies. As doctoral studies in the natural sciences involve serious research activities, which also require definite financial resources, the number of potential students tends to be lower in years when there are no new project calls (e.g., LCS, ERDF, or other projects).

There is a very high variability in the number of graduates (degree holders). The highest number of graduates was between 2013 and 2015, which is directly attributable to the activities of the European Social Fund project "Support for Doctoral Studies at the University of Latvia". At that time, the project provided students with the opportunity to receive large scholarships, which also facilitated the completion and defence of doctoral theses for students who had previously been on sabbatical leave or had terminated their studies prematurely. The low number of graduates in 2021



is largely due to the impact of the COVID crisis: students had limited opportunities to visit laboratories, attend conferences and, in some cases (e.g., Biology), there were significant delays in the supply of raw materials needed for research, making it impossible to complete research in the allotted time.

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

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

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

The content of the DSP "Natural Sciences" is developed in accordance with the objectives defined in the project "Design of Internationally Competitive Study Programmes Promoting the Development of the National Economy of Latvia at the University of Latvia" of specific support Objective 8.2.1 of the Operational Programme "Growth and Employment" and based on the following external and internal laws and regulations:

1. [Law on Higher Education Institutions of the Republic of Latvia](#);
2. Cabinet of Ministers Regulation No.595 of 27.09.2022 "Regulations on Latvian Scientific field groups, Scientific Fields and Sub-fields" ("[Noteikumi par Latvijas zinātnes nozaru grupām, zinātnes nozarēm un apakšnozarēm](#)", document in Latvian)
3. UL Regulations on Study Programmes and Continuing Education Programmes (UL Senate Decision No. 102 as of 04.2017);
4. Regulations on Doctoral Councils and Doctoral Dissertations at the University of Latvia (Order No.1/95 of 12.04.2006.).

According to the Regulations on Latvian Scientific field groups, Scientific Fields and Sub-fields, Natural Sciences comprise all fields of the consolidated PhD programmes, namely: Physics and Astronomy, Chemistry, Earth Sciences, Physical Geography and Environmental Science, and Biology.

According to the Latvian Education Classification ([Latvijas izglītības klasifikāciju](#), document in Latvian), the code number of the DSP "Natural Sciences" is 51421.

According to the UL Regulations on Study Programmes and Continuing Education Programmes, the DSP "Natural Sciences" is 144 CP. In full-time studies, students acquire 24 CP in each of the six semesters. The part-time studies last eight semesters, each of which provides students with around 18 CP. The Regulations stipulate that the compulsory part of the doctoral study programme consists of studies and the development of a thesis (literature analysis, research, conferences, preparation of publications), a general skills module, doctoral examinations, as well as participation in UL doctoral schools or obtaining equivalent experience in foreign universities.

The compulsory part of the DSP "Natural Sciences" is 120 CP, and it comprises:

1. development of the doctoral thesis (84 CP), presentation of results at conferences (4 CP), and preparation of scientific publications (8 CP);
2. three doctoral examinations - an examination in science (4 CP), an examination in the specialty (4 CP), and an examination in English (4 CP);
3. participation in doctoral schools (6 CP), assisting in courses (4 CP), and supervising and reviewing student research papers (2 CP).

The volume of the restricted elective part of the DSP "Natural Sciences" is 20 CP, and it includes:

1. general skills courses - courses in science ethics, science communication, university didactics, cognitive science, publication preparation, project preparation;
2. a course in scientific English and a course in Latvian (for the programme in English);
3. Statistics in Natural Sciences.

The DSP "Natural Sciences" includes an elective part of 4 CP, as well as additional courses "Civil Protection" and "Environmental Protection" for students who have not completed these specific study courses at the previous stages of education.

The DSP "Natural Sciences" includes courses necessary to enable doctoral students to acquire the knowledge, skills, and competence indispensable for successful research. The mandatory and restricted elective courses are designed to ensure interdisciplinarity and to provide doctoral students with general skills relevant to the labour market. The programme does not include study courses specific to the sub-fields of science, because each of the students is working on a very specific research topic.

Both compulsory and restricted elective courses may be equivalent to courses at the corresponding level of the programmes of study which doctoral candidates have taken or passed at other universities, provided that the courses and their evidence (certificates, attestations) have been recognised by the Doctoral Study Council of the field.

The content and scope of the doctoral examination shall be determined by the Doctoral Study Council of the field. The doctoral examination in a foreign language is compulsory, and it allows to verify the doctoral candidate's knowledge and ability to prepare scientific publications in a foreign language, as well as to orally present the results of their research at international conferences. At the doctoral candidate's request, the Doctoral Study Council of the field may agree to all doctoral examinations being conducted in a foreign language.

Each doctoral candidate shall prepare their individual study plan in accordance with this programme, which shall be approved by the supervisor of the Thesis and the Doctoral Study Council of the field.

The mapping of the study courses included in the programme (Annex 28-4-B) verifies and demonstrates how the individual study courses contribute to the achievement of the learning outcomes of the programme. The study courses have been designed in such a way as to avoid duplication of content and to ensure continuity. The mapping of learning outcomes shows that in

the study courses of the DSP "Natural Sciences", all programme outcomes are achieved.

Therefore, it can be concluded that the doctoral student will have achieved all the learning outcomes planned in the study programme upon graduation.

The study courses are to be updated at least every three years, taking into account student feedback on the content of the study course, as well as the latest scientific trends.

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

The DSP "Natural Sciences" is a consolidation of the six doctoral programmes with long-standing traditions in their respective fields. The programme covers a number of priority research directions previously identified by the UL and involving doctoral students of the consolidated doctoral programmes, as well as research and theses of the new PhD students related to: (1) Atomophysics, Optical Technologies and Medical Physics; (2) Nano and Quantum Technologies, Innovative materials; (3) Biomedicine, Pharmacy; (4) Climate Change and Sustainable Use of Natural Resources; (5) Ecology and Biodiversity. The research areas are also related to the two areas of strategic specialisation identified in the UL Strategy - (1) Natural Sciences and (2) Medical and Health Sciences.

The impact of the programme on research is demonstrated by the fact that, similarly to the consolidated study programmes, to successfully defend their thesis, each doctoral student is required to publish scientific papers in internationally refereed journals included in the Web of Science or Scopus databases, as well as to participate in scientific conferences, thus contributing to the development of science in a given research area. The impact on other levels of education comes from doctoral students being involved in assisting courses and supervising coursework and undergraduate work of students in their field.

The faculty members involved in the implementation of the study programme actively publish, participate in conferences, and implement projects in all the fields indicated above, while involving doctoral students in the projects and publications. For a list of active projects and recent scientific publications of the teaching staff, see sub-sections 3.4.3 and 3.4.4.

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

Oral, written and combined teaching and assessment methods are used in the courses and examinations.

A variety of methods are used to acquire and consolidate knowledge, such as introductory lectures, interactive lectures, summative lectures, and problem-oriented lectures. Practitioners, professionals from different institutions, are invited to lecture in individual courses in order to promote the unity of theory and practice. Practical exercises, seminars, individual, pair and group work, discussions and project development, study tours to organisations in the field are widely used. Employers are involved in the implementation and development of the study courses (invited to lead individual seminars, which are often organised as exchange visits to workplaces, etc.).

To foster the development of students' research competence, students have the opportunity to analyse and study in-depth problems of interest in the field in successive courses. Senior students are involved in peer teaching-learning.

Seminars in the courses foster students' speaking, presentation, and discussion skills.

To achieve the learning outcomes - to acquire and consolidate knowledge, skills and develop competence - student-centred principles govern the study process. The study process uses methods that promote students' communication when performing study tasks, solving real problems in the field, modelling situations.

The physical environment of studies is also gradually changing: classrooms can be easily converted for group or individual work, students can use digital technologies. Lecturers mostly use methods that encourage students' active participation, critical thinking, and reflection. The e-learning environment is used to support the learning process and independent study. An e-learning environment (Moodle) created for each study course provides students with access to lesson materials, assignment descriptions in addition to study materials related to the course topics, as well as study tasks to be performed (tests, forums, seminars, conferences, etc.). with the reasons for the mark, All graded assessments in mid-term and final examinations are recorded and made available to students in the e-learning environment.

Updating study programmes and their study courses, the student-centred approach is followed with particular attention paid to the meaningful formulation of learning outcomes, so as to promote dialogue between lecturers and students on study content, forms of organisation and methods. Correctly formulated learning outcomes, in turn, promote students' understanding and ownership of their own learning, self-assessment and understanding of the assessment received. In the study process, lecturers use methods, forms of examination and assessment criteria that are appropriate to the study aim and the planned learning outcomes.

Students receive support and feedback from lecturers during the study process. The assessment criteria are made public in advance. Assessment provides students with the opportunity to demonstrate the extent to which they have achieved the expected learning outcomes.

The principles of student-centred learning encourage student mobility (recognition of learning outcomes), students engage in research and social activities in the community initiated by academic staff, and thus gain meaningful experience in applying what they have learned in their studies to practice. As part of the internal quality assurance policy, study programmes are implemented in such a way that students are encouraged to actively participate in the development of the study process. Policies and procedures are in place for submission of student suggestions and complaints and handling of student appeals. The results of student surveys are evaluated and considered in the development of the study process. Students willingly express their suggestions for the improvement of study programmes and study process in discussions with lecturers and programme directors.

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

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

Each of the fields of science that the DSP "Natural Sciences" brings together has a Doctoral Council - the Doctoral Council of Biology, the Doctoral Council of Physics and Astronomy, the Doctoral Council of Geography, the Doctoral Council of Geology, the Doctoral Council of Chemistry, and the Doctoral Council of Environmental Science. According to the Cabinet of Ministers Regulation No. 1000 "Regulations on the Delegation of the Right to Grant Doctoral Degrees (Promotion) to Higher Education Institutions" ("[Noteikumi par doktora zinātniskā grāda piešķiršanas \(promocijas\) tiesību deleģēšanu augstskolām](#)", document in Latvian), the UL has the right to grant degrees in Biology, Physics and Astronomy, Chemistry, Earth Sciences, Physical Geography and Environmental Sciences, Social and Economic Geography. The programme's teaching staff, thesis supervisors and the UL academic and scientific staff have a sufficient number of LCS experts to ensure the work of the Doctoral Councils.

The promotion process takes place after the student has successfully completed the study programme (obtained the required amount of CP, passed the three examinations), as well as prepared a dissertation (a monograph or a set of articles), and it has been examined (preliminary defence) by the appropriate department. The promotion process consists of the preparation of the documentation (the UL Academic Department provides support to the Doctoral Councils in the preparation of the documentation), a report on the dissertation by the author of the dissertation, reports by three reviewers, the author's answers to the reviews and questions from the audience. This is followed by a vote of the Doctoral Council on the award of the degree in the relevant scientific field.

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

No Doctoral Thesis defence has yet taken place in the DSP "Natural Sciences", as the programme only started in the academic year 2021/2022.

The six PhD programmes that were consolidated to form the DSP "Natural Sciences" have a total of 187 theses defended in the period 2013-2021 (between 5 and 39 theses in a single year). Of these, 50 theses have been defended in the DSP "Biology", 42 in the DSP "Chemistry", 60 in the DSP "Physics, Astronomy and Mechanics", 10 in the DSP "Geography", 5 in the DSP "Geology", and 20 in the DSP "Environmental Science".

Taking the example of 2021, the thesis in the consolidated study programmes have been developed on topical and practical topics such as: the new concept of structural health monitoring (SHM) of composite part; sapropel for the development of biocomposite materials: properties and application possibilities; to develop sensitive procedures for mass spectrometric determination of glyphosate and its metabolites in different plant and animal origin products, as well in biological and environmental objects; studies contributing to the advancement of non-target mass spectrometry and the development of enzymatic bioassays; identify taxonomic and functional gut microbiome biomarkers as well as epigenetic signatures of the host for metformin pharmacodynamics, therapy efficacy and tolerance.

### **3.3. Resources and Provision of the Study Programme**

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

All the resources available at the UL and FB are available for the implementation of the DSP "Natural Sciences". A detailed outline is given in Part II, subchapters 2.3.1 - 2.3.4 of the SF LS Self-Assessment Report.

The information base, the material and technical base and the methodological support are adequate for the implementation of the study programme and achievement of the learning outcomes of the programme, which confirms the possibility of ensuring a quality study process in the future.

The faculties implementing the DSP "Natural Sciences", as well as the scientific institutes associated with the field, have at their disposal modern equipment in all fields of natural sciences, which in many cases is unique not only at the national level, but also in the Baltics or a wider region. Examples of the most valuable equipment include a closed-loop, liquid cryogen-free device for measuring physical properties; an X-ray diffractometry system; an inductively coupled plasma triple quadrupole mass spectrometer ICP-QQQ; a single frequency titanium-sapphire laser system with frequency doubling, variable wavelength, high power solid state laser; liquid chromatograph with TOF detector; a CELL IQ v2 SLF System for live cell research, visualisation and functional characterisation; an isotope ratio mass spectrometer for elemental analysis; a frequency comb, material testing system MTS 5T and MTS 809.40; a probe scanning microscope; a Nikon C2 PLUSS confocal microscope system with a Ti-E fluorescence microscope; TEM 2100A tritium and noble gas monitors; a Tri-Carb 2900TR liquid scintillator spectrometer; a Hositrad MGT 6-300 thermal desorption multi-gas analyser with 1-300 amu and 1-6 amu mass spectrographs, etc. Special

collections for research are also available, and they are a biological agent collection, an entomological collection, a herbarium, a microorganism culture collection, the collections of the UL Botanical Garden.

Additionally, for research the access to common facilities of the National Research Centres located in various Latvian scientific institutions is provided.

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

The UL provides access to the necessary scientific databases, including SpringerLink, ScienceDirect, Scopus and Web of Science. The library provides the Primo Discovery database search tool, which allows searching for literature by subject in all available databases. In addition, doctoral students have access to the study and scientific resources of the research institutes where their theses are being developed. Among the institutes where doctoral theses are developed are the following UL research institutes: the UL Institute of Astronomy, the UL Institute of Atomic Physics and Spectroscopy, the UL Institute of Biology, the UL Institute of Geodesy and Geoinformatics, the UL Institute of Physics, the UL Institute of Chemical Physics, the UL Institute for Mechanics of Materials, the UL Institute of Microbiology and Biotechnology; the UL Institute of Solid State Physics. Dissertations (with appropriate access to resources) are also developed in the following scientific institutes: the Latvian Institute of Organic Synthesis, the Biomedical Research and Study Centre, the Scientific Institute of Food Safety, Animal Health and Environment "BIOR", the Latvian State Forest Research Institute "Silava".

Detailed information on the material and information support of the study and scientific process can be found in Part II, subchapters 2.3.1 - 2.3.4 of the SF LS Self-Assessment Report.

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

#### **Programme Revenue**

To provide the funding needed for the implementation of the DSP "Natural Sciences", the UL uses:

- the state budget subsidy from the Ministry of Education and Science, set at EUR 9292 for full-time studies for the academic year 2021/2022 (taking into account the coefficients for the level and field of study);
- the tuition fees, taking into account all the factors listed under the heading "Financial Support", set for the academic year 2021/2022:
- full-time studies - EUR 2134 per year;

- part-time studies - EUR 2134 per year;
- for foreigners, full-time studies - EUR 6500 and part-time studies - EUR 5000;

In view of the above, the total study programme budget is expected to be EUR 530 thousand per year, as summarised in Table 3.3.1.

*Table 3.3.1. Programme expected revenue per annum, EUR*

Study Type	Number of Students	Study Fee/ State Subsidy	Total Revenue
Full-Time (state-funded)	57	9292	529 644
Full-Time (fee-paying)	0	2134	0
Foreign students	0	6500	0
<b>Total</b>			<b>529 644</b>

## Programme Costs

In order to estimate the amount of funds required for financial support, the UL calculates the cost price for study programmes according to a methodology developed by the UL, which takes into account the costs of providing the study process as described in the section "SF Financial Provision" and information on the study programme plan, teaching staff involved, the planned number of students, etc., thus ensuring the reliability of the forecasts.

### Programme costs **for full-time studies**

For calculating costs, the implementors of the DSP "Natural Sciences" use the data of the 57 students studying in the programme full time in the academic year 2021/2022, the existing programme plan and the existing structure of the academic staff involved in the programme. In view of the above, the estimated full-time cost of the programme per student is EUR 8654 per year, and the total cost of the programme is EUR 493 278 per year. A more detailed pro-rata breakdown of the costs is presented in Table 3.3.2.

*Table 3.3.2. Percentage breakdown of costs in the study programme*

<b>Expenditure heading</b>	<b>% of the total</b>
Teaching staff costs	30,7 %
General staff	8,4 %
Other costs	22,0 %
Infrastructure expenditure	11,3 %



Capital items and services	1,6 %
Indirect costs	26,0 %
<b>TOTAL COSTS</b>	<b>100 %</b>

Figure 3.3.1 shows the cost of the study programme depending on the number of students and compares it with the proposed study fee and the state budget subsidy.

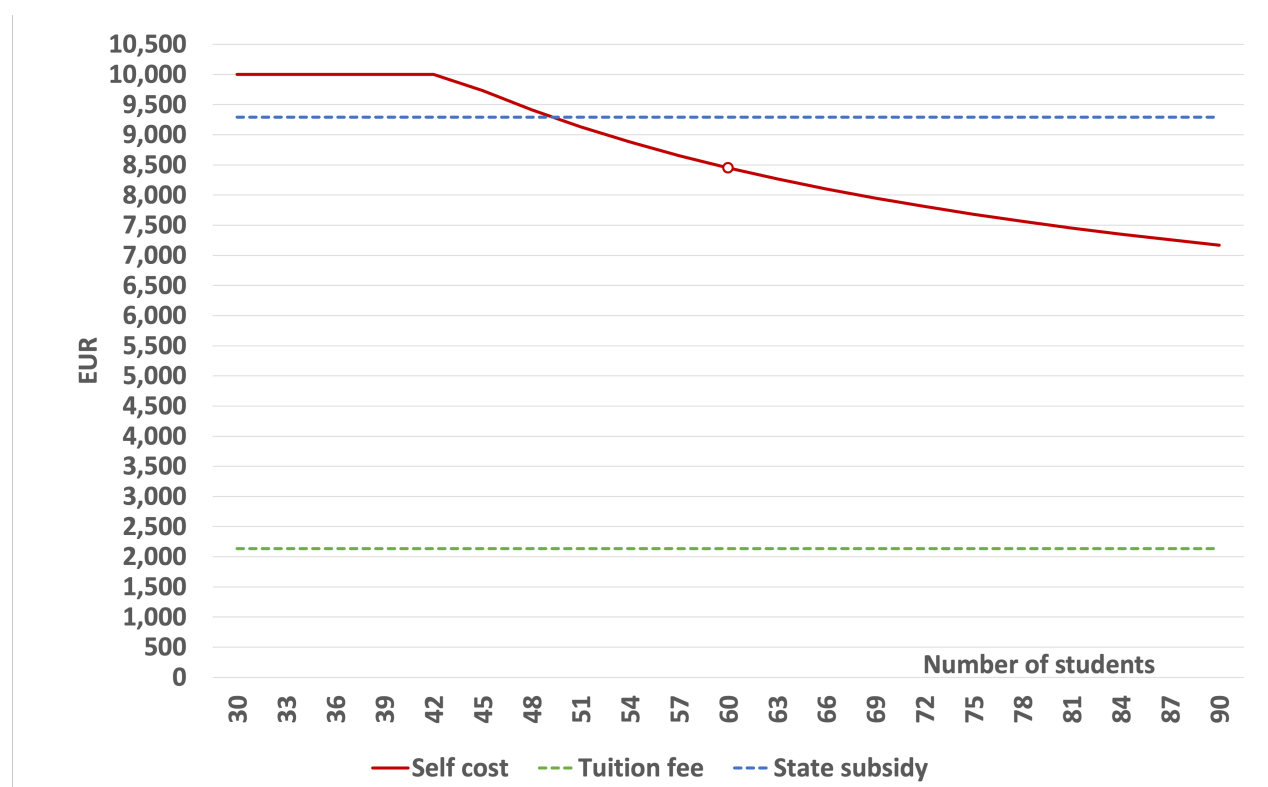


Figure 3.3.1. The DSP “Natural Sciences” cost per student

Based on the calculation, it can be seen that for the programme to be payable and for students to be provided with a quality study process, the number of state-funded students in the programme should be at least 50 (independent of the language of implementation).

#### Programme costs **for part-time studies**

There are no part-time students in the DSP “natural Sciences” at this point. The cost of the programme in the academic year is assumed to be the same as in full-time studies, because if the programme includes such students, the study courses will be taken together with full-time students, only by taking study courses over a longer period of time.

#### Summary of Programme Revenue and Costs

Table 3.3.3. summarises the programme revenue based on the number of students, state subsidy, study fees, and programme expenses for this number of students.

Table 3.3.3. Programme results

Study Type	Number of Students	Study Fee/ State Subsidy	Total Revenue	Total Costs
------------	--------------------	--------------------------	---------------	-------------

Full-Time (state-funded)	57	9292	529 644	493 278
Full-Time (fee-paying)	0	0	0	0
Part-Time	0	0	0	0
Foreign Students	0	0	0	0
<b>Total</b>			<b>529 644</b>	<b>493 278</b>

The data shown in the table clearly prove that the UL has sufficient funds to implement the study programme and ensure its further development. In addition, the development of the programme can be financed from the income received from lifelong learning, and other services, as well as from the financial resources accumulated by the structural unit. Faculties also receive financial support for programme development from the UL Study Quality Improvement Fund.

### 3.4. Teaching Staff

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

22 academic staff members are involved in the implementation of the DSP "Natural Sciences". Of the staff involved in the programme, 13 are Professors, five Associate Professors, two senior researchers and one Docent. All academic staff members involved in the implementation of the DSP "Natural Sciences" have a doctoral degree in: Biology (4), Philology (1), Philosophy (1), Physics (3), Geography (4), Geology (3), Chemistry (3), Pedagogy (2), and Sociolinguistics (1). 20 members of academic staff have a current status of expert in the LCS.

The English language skills of the academic staff involved in the implementation of the programme allow them to teach courses also in English. The knowledge of the state language of the academic staff employed in the study programme complies with the regulations on the scope of knowledge of the state language and the procedure for testing the knowledge of the state language for the performance of professional and official duties, and allows for teaching study courses in the state language.

The teaching staff have experience of scientific work both as authors of scientific publications and

as participants in the implementation of research projects, which generally confirms the qualifications of the teaching staff involved as appropriate for achieving the aim and objectives of the study programme.

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

Since the licensing of the study programme, one Professor - Jānis Kloviņš - has been added to the teaching staff due to the inclusion of a new study course "Project management in research and development" in the study programme. Jānis Kloviņš' scientific (a LCS expert in three fields, about 120 publications indexed in the Scopus database) and pedagogical experience is in line with the requirements of the doctoral study programme.

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

22 Doctors participate in the implementation of the study programme, 19 of whom are Latvian Council of Science (LCS) experts:

- Auziņš, Mārcis - LCS expert in Physics and Astronomy (till 06.04.2025)
- Baranova, Sanita - LCS expert in Education Sciences (till 02.02.2025)
- Briede, Agrita - LCS expert in Earth Sciences, Physical Geography and Environmental Sciences (till 18.12.2022)
- Cēbers, Andrejs - LCS expert in Physics and Astronomy (till 04.05.2025)
- Elferts, Didzis - LCS expert in Biology (till 03.09.2023), LCS expert in Agriculture, Forestry and Fishery (till 06.10.2024)
- Ieviņš, Ģederts - LCS expert in Biology (till 06.07.2025)
- Jaudzems, Kristaps - LCS expert in Biology (till 03.03.2024), LCS expert in Chemistry (till 03.03.2024)
- Karapetjana, Indra - LCS expert in Linguistics and Literature (till 01.09.2024)
- Kļaviņš, Māris - LCS expert in Environmental Engineering and Energy (till 25.05.2023), LCS expert in Earth Sciences, Physical Geography and Environmental Sciences (till 31.03.2024), LCS expert in Chemistry (till 31.03.2024)
- Kloviņš, Jānis - LCS expert in Medical Biotechnology (till 04.05.2025), LCS expert in Basic Medical Sciences, including Pharmaceutical Sciences (till 04.05.2026), LCS expert in Biology (till 04.05.2025)

- Krievāns, Māris – LCS expert in Earth Sciences, Physical Geography and Environmental Sciences (till 18.09.2022)
- Krišjāne, Zaiga – LCS expert in Earth Sciences, Physical Geography and Environmental Sciences (till 05.01.2025), LCS expert in Sociology and Social Work (till 06.10.2024), LCS expert in Social and Economic Geography (06.10.2024)
- Krūmiņa, Gunta – LCS expert in Other Natural Sciences (till 17.06.2023), LCS expert in Health and Sports Sciences (till 17.06.2023), LCS expert in Physics and Astronomy (till 03.09.2023)
- Līsmāne, Inta
- Lukševics, Ervīns - LCS expert in Earth Sciences, Physical Geography and Environmental Sciences (till 03.03.2024)
- Mežinska, Signe – LCS expert in Health and Sports Sciences (till 07.10.2023), LCS expert in Sociology and Social Work (till 01.09.2024)
- Muižnieks, Indriķis
- Nikodemus, Oļģerts - LCS expert Earth Sciences, Physical Geography and Environmental Sciences (till 05.05.2024), LCS expert in Agriculture, Forestry and Fishery (till 05.05.2024), LCS expert in Social and Economic Geography (till 05.05.2024)
- Paiders, Juris
- Šķilters, Jurgis – LCS expert in Computer and Information Sciences (till 19.02.2023), LCS expert in Psychology (till 19.02.2023), LCS expert in Media and Communication (till 03.09.2023)
- Stinkulis, Ģirts - LCS expert in Earth Sciences, Physical Geography and Environmental Sciences (07.10.2023)
- Vīksna, Arturs – LCS expert in Chemistry (till 01.12.2024)

In 2020 and 2021, the faculty members of the programme co-authored 209 scientific publications indexed in Scopus.

Below are the 30 papers by faculty members published in 2020 and 2021 with the highest citation count in the Scopus database:

- Abelein A., Chen G., Kitoka K., Aleksis R., Oleskovs F., Sarr M., Landreh M., Pahnke J., Nordling K., Kronqvist N., **Jaudzems K.**, Rising A., Johansson J., Biverstål H., 2020. High-yield Production of Amyloid-β Peptide Enabled by a Customized Spider Silk Domain. Scientific Reports: 10. DOI:10.1038/s41598-019-57143-x
- Alm E., et al., The WHO European Region sequencing laboratories and GISAID EpiCoV group, 2020. Geographical and temporal distribution of SARS-CoV-2 clades in the WHO European Region, January to June 2020. Eurosurveillance: 25. DOI:10.2807/1560-7917.ES.2020.25.32.2001410
- Altincekic N., Korn S.M., Qureshi N.S., Dujardin M., Ninot-Pedrosa M., Abele R., Abi Saad M.J., Alfano C., Almeida F.C.L., Alshamleh I., de Amorim G.C., Anderson T.K., Anobom C.D., Anorma C., Bains J.K., Bax A., Blackledge M., Blechar J., Böckmann A., Brigandat L., Bula A., Bütikofer M., Camacho-Zarco A.R., Carlomagno T., Caruso I.P., Ceylan B., Chaikuad A., Chu F., Cole L., Crosby M.G., de Jesus V., Dhamotharan K., Felli I.C., Ferner J., Fleischmann Y., Fogeron M.-L., Fourkiotis N.K., Fuks C., Fürtig B., Gallo A., Gande S.L., Gerez J.A., Ghosh D., Gomes-Neto F., Gorbatyuk O., Guseva S., Hacker C., Häfner S., Hao B., Hargittay B., Henzler-Wildman K., Hoch J.C., Hohmann K.F., Hutchison M.T., **Jaudzems K.**, Jović K., Kaderli J., Kalniņš G., Kaņepe I., Kirchdoerfer R.N., Kirkpatrick J., Knapp S., Krishnathas R., Kutz F., zur Lage S., Lambert R., Lang A., Laurents D., Lecoq L., Linhard V., Löhr F., Malki A., Bessa L.M., Martin R.W., Matzel T., Maurin D., McNutt S.W., Mebus-Antunes N.C., Meier B.H., Meiser N., Mompeán M., Monaca E., Montserret R., Mariño Perez L., Moser C., Muhle-Goll C., Neves-Martins T.C., Ni X., Norton-Baker B., Pierattelli R., Pontoriero L., Pustovalova Y., Ohlenschläger O., Orts J., Da Poian A.T.,

- Pyper D.J., Richter C., Riek R., Rienstra C.M., Robertson A., Pinheiro A.S., Sabbatella R., Salvi N., Saxena K., Schulte L., Schiavina M., Schwalbe H., Silber M., Almeida M.D.S., Sprague-Piercy M.A., Spyroulias G.A., Sreeramulu S., Tants J.-N., Tārs K., Torres F., Töws S., Treviño M.Á., Trucks S., Tsika A.C., Varga K., Wang Y., Weber M.E., Weigand J.E., Wiedemann C., Wirmer-Bartoschek J., Wirtz Martin M.A., Zehnder J., Hengesbach M., Schlundt A., 2021. Large-Scale Recombinant Production of the SARS-CoV-2 Proteome for High-Throughput and Structural Biology Applications. *Frontiers in Molecular Biosciences*: 8. DOI:10.3389/fmolb.2021.653148
- Alves F., Leal Filho W., Casaleiro P., Nagy G.J., Diaz H., Al-Amin A.Q., de Andrade Guerra J.B.S.O., Hurlbert M., Farooq H., **Klavins M.**, Saroar M., Lorencova E.K., Suresh J., Soares A., Morgado F., O'Hare P., Wolf F., Azeiteiro U.M., 2020. Climate change policies and agendas: Facing implementation challenges and guiding responses. *Environmental Science and Policy*: 104. DOI:10.1016/j.envsci.2019.12.001
  - Bente K., Bakenecker A.C., von Gladiss A., Bachmann F., **Cēbers A.**, Buzug T.M., Faivre D., 2021. Selective Actuation and Tomographic Imaging of Swarming Magnetite Nanoparticles. *ACS Applied Nano Materials*: 4. DOI:10.1021/acsanm.1c00768
  - Bobiļeva O., Bobrovs R., Kaņepe I., Patetko L., Kalniņš G., Šišovs M., Bula A.L., Grī Nberga S., Boroduškis M.R., Ramata-Stunda A., Rostoks N., Jirgensons A., Tā Rs K., **Jaudzems K.**, 2021. Potent SARS-CoV-2 mRNA Cap Methyltransferase Inhibitors by Bioisosteric Replacement of Methionine in SAM Cosubstrate. *ACS Medicinal Chemistry Letters*: 12. DOI:10.1021/acsmchemlett.1c00140
  - Bobrovs R., Drunka L., Auzins A.A., **Jaudzems K.**, Salvalaglio M., 2021. Polymorph-Selective Role of Hydrogen Bonding and  $\pi$ - $\pi$ Stacking in p-Aminobenzoic Acid Solutions. *Crystal Growth and Design*: 21. DOI:10.1021/acs.cgd.0c01257
  - Elbere I., Silamikelis I., Dindune I.I., Kalnina I., Ustinova M., Zaharenko L., Silamikele L., Rovite V., Gudra D., Konrade I., Sokolovska J., Pirags V., **Klovins J.**, 2020. Baseline gut microbiome composition predicts metformin therapy short-term efficacy in newly diagnosed type 2 diabetes patients. *PLoS ONE*: 15. DOI:10.1371/journal.pone.0241338
  - Filho W.L., Barbir J., Sima M., Kalbus A., Nagy G.J., Paletta A., Villamizar A., Martinez R., Azeiteiro U.M., Pereira M.J., Mussetta P.C., Ivars J.D., Salgueirinho Osório de Andrade Guerra J.B., de Silva Neiva S., Moncada S., Galdies C., **Klavins M.**, Nikolova M., Gogu R.C., Balogun A.-L., Bouredji A., Bonoli A., 2020. Reviewing the role of ecosystems services in the sustainability of the urban environment: A multi-country analysis. *Journal of Cleaner Production*: 262. DOI:10.1016/j.jclepro.2020.121338
  - García-Calzón S., Perfilyev A., Martinell M., Ustinova M., Kalamajski S., Franks P.W., Bacos K., Elbere I., Pihlajamäki J., Volkov P., Vaag A., Groop L., Maziarz M., **Klovins J.**, Ahlqvist E., Ling C., 2020. Epigenetic markers associated with metformin response and intolerance in drug-naïve patients with type 2 diabetes. *Science Translational Medicine*: 12. DOI:10.1126/SCITRANSLMED.AAZ1803
  - **Jaudzems K.**, Kurbatska V., Jekabsons A., Bobrovs R., Rudevica Z., Leonchiks A., 2020. Targeting Bacterial Sortase A with Covalent Inhibitors: 27 New Starting Points for Structure-Based Hit-to-Lead Optimization. *ACS Infectious Diseases*: 6. DOI:10.1021/acsinfecdis.9b00265
  - Kamitaki N., et al., Schizophrenia Working Group of the Psychiatric Genomics Consortium, Psychosis Endophenotypes International Consortium, Wellcome Trust Case-Control Consortium 2, 2020. Complement genes contribute sex-biased vulnerability in diverse disorders. *Nature*: 582. DOI:10.1038/s41586-020-2277-x
  - Klavins L., **Klavins M.**, 2020. Cuticular wax composition of wild and cultivated northern berries. *Foods*: 9. DOI:10.3390/foods9050587
  - **Klavins M.**, Bisters V., Burlakovs J., 2020. Small scale gasification application and perspectives in circular economy. *Environmental and Climate Technologies*: 22.

DOI:10.2478/rtuect-2018-0003

- Krisans O., Matisons R., Rust S., Burnevica N., Bruna L., **Elferts D.**, Kalvane L., Jansons A., 2020. Presence of root rot reduces stability of Norway spruce (*Picea abies*): Results of static pulling tests in Latvia. *Forests*: 11. DOI:10.3390/F11040416
- Krisans O., Saleniece R., Rust S., **Elferts D.**, Kapostins R., Jansons A., Matisons R., 2020. Effect of bark-stripping on mechanical stability of Norway Spruce. *Forests*: 11. DOI:10.3390/f11030357
- Lamsters K., Karušs J., **Krievāns M.**, Ješkins J., 2020. High-resolution orthophoto map and digital surface models of the largest Argentine Islands (the Antarctic) from unmanned aerial vehicle photogrammetry. *Journal of Maps*: 16. DOI:10.1080/17445647.2020.1748130
- Ni G., et al., Major Depressive Disorder Working Group of the Psychiatric Genomics Consortium, 2021. A Comparison of Ten Polygenic Score Methods for Psychiatric Disorders Applied Across Multiple Cohorts. *Biological Psychiatry*: 90. DOI:10.1016/j.biopsych.2021.04.018
- Niemi M.E.K., et al., COVID-19 Host Genetics Initiative, 2021. Mapping the human genetic architecture of COVID-19. *Nature*: 600. DOI:10.1038/s41586-021-03767-x
- Ozola-Davidane R., Burlakovs J., Tamm T., Zeltkalne S., Krauklis A.E., **Klavins M.**, 2021. Bentonite-ionic liquid composites for Congo red removal from aqueous solutions. *Journal of Molecular Liquids*: 337. DOI:10.1016/j.molliq.2021.116373
- Porshnov D., Ozols V., **Klavins M.**, 2020. Thermogravimetric analysis as express tool for quality assessment of refuse derived fuels used for pyro-gasification. *Environmental Technology (United Kingdom)*: 41. DOI:10.1080/09593330.2019.1584648
- Rendenieks Z., Nita M.D., **Nikodemus O.**, Radeloff V.C., 2020. Half a century of forest cover change along the Latvian-Russian border captured by object-based image analysis of Corona and Landsat TM/OLI data. *Remote Sensing of Environment*: 249. DOI:10.1016/j.rse.2020.112010
- Rubika A., Luoto S., Krama T., Trakimas G., Rantala M.J., Moore F.R., Skrinda I., **Elferts D.**, Krams R., Contreras-Garduño J., Krams I.A., 2020. Women's socioeconomic position in ontogeny is associated with improved immune function and lower stress, but not with height. *Scientific Reports*: 10. DOI:10.1038/s41598-020-68217-6
- Shtangeeva I., **Viksna A.**, Grebnevs V., 2020. Geochemical (soil) and phylogenetic (plant taxa) factors affecting accumulation of macro- and trace elements in three natural plant species. *Environmental Geochemistry and Health*: 42. DOI:10.1007/s10653-019-00337-z
- Silamiķele L., Silamiķelis I., Ustinova M., Kalniņa Z., Elbere I., Petrovska R., Kalniņa I., **Kloviņš J.**, 2021. Metformin Strongly Affects Gut Microbiome Composition in High-Fat Diet-Induced Type 2 Diabetes Mouse Model of Both Sexes. *Frontiers in Endocrinology*: 12. DOI:10.3389/fendo.2021.626359
- Smol M., Preisner M., Bianchini A., Rossi J., Hermann L., Schaaf T., Kruopiene J., Pamakštys K., **Klavins M.**, Ozola-Davidane R., Kalnina D., Strade E., Voronova V., Pachel K., Yang X., Steenari B.-M., Svanström M., 2020. Strategies for sustainable and circular management of phosphorus in the baltic sea region: The holistic approach of the inPhos project. *Sustainability (Switzerland)*: 12. DOI:10.3390/su12062567
- Snepsts G., Kitenberga M., **Elferts D.**, Donis J., Jansons A., 2020. Stem damage modifies the impact of wind on Norway Spruces. *Forests*: 11. DOI:10.3390/F11040463
- Ustinova M., Ansonē L., Silamikelis I., Rovite V., Elbere I., Silamikele L., Kalnina I., Fridmanis D., Sokolovska J., Konrade I., Pirags V., **Klovins J.**, 2020. Whole-blood transcriptome profiling reveals signatures of metformin and its therapeutic response. *PLoS ONE*: 15. DOI:10.1371/journal.pone.0237400
- Vincevica-gaile Z., Teppand T., Kriipsalu M., **Krievāns M.**, Jani Y., Klavins M., Hendroko Setyobudi R., Grinfelde I., Rudovica V., Tamm T., Shanskiy M., Saaremae E., Zekker I.,

Burlakovs J., 2021. Towards sustainable soil stabilization in peatlands: Secondary raw materials as an alternative. Sustainability (Switzerland): 13. DOI:10.3390/su13126726

- Viter R., Kunene K., Genys P., Jevdokimovs D., Ertis D., Sutka A., Bisetty K., **Viksna A.**, Ramanaviciene A., Ramanavicius A., 2020. Photoelectrochemical Bisphenol S Sensor Based on ZnO-Nanoroads Modified by Molecularly Imprinted Polypyrrole. Macromolecular Chemistry and Physics: 221. DOI:10.1002/macp.201900232

For a full list of the scientific publications by the faculty members, see Annex14-A

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

The academic staff implementing the doctoral programme participate in both local and international research projects. The table below shows the most important projects implemented at the UL with the programme's faculty members as project leaders or principal investigators in the period 2020-2021. For the individual involvement of each faculty member in research projects, see the CVs of the faculty members.

Faculty Member	Project Name	Source of Funding
Mārcis Auziņš	Coherent Optical Control of Atomic Systems	Latvia – Lithuania-Taiwan Trilateral Scientific Cooperation Programme project, 2022-2024
Mārcis Auziņš	Development of an Optical Magnetic Sensing System for Security Checkpoints, NATO Emerging security challenges divisions	Grant ESC(2020) 0188 SPS MYP G5794, 2020-2023
Mārcis Auziņš	Feasibility study of spacecraft magnetometers based on nitrogen-vacancy centres in diamond	European Space Agency project, 2020-2021
Mārcis Auziņš	Quantum Technologies in Space	COST action CA15220, 2016-2020
Andrejs Cēbers	Magnetics and Microhydrodynamics - from guided transport to delivery (MAMI)	Horizon 2020 (H2020-MSCA-ITN-2017), 2018-2022
Andrejs Cēbers	Biologically inspired models of active matter driven by electromagnetic field (BIMs)	FARP, 2021-2023
Didzis Elferts	Optimising the Governance and Management of the Natura 2000 Protected Areas Network in Latvia	LIFE, 2020-2028
Ģederts Ieviņš	Molecular, physiological and ecological evaluation of Latvian genetic resources of valuable wild legume species, <i>Trifolium fragiferum</i> , in a context of sustainable agriculture	FARP, 2020-2021
Indra Karapetjana	Mitigate the Impact of Fourth Industrial Revolution on Indian Society: Education Reform for Future and In-Service School Teachers/Edureform	ERASMUS, 2020-2023
Māris Kļaviņš	Innovation of the waste-to-energy concept for the low-carbon economy: Development of novel carbon capture technology for thermochemical processing of municipal solid waste (Carbon Capture and Storage from Waste – CCSW)	ERDF, 2020-2023
Māris Kļaviņš	Properties and structure of peat humic substances and possibilities of their modification	FARP, 2018-2021
Zaiga Krišjāne	Towards sustainable development and inclusive society in Latvia: response to demographic and migration challenges	NRP, 2018-2022

Gunta Krūmiņa	Development of a Vision Screening and Training Facility	ERDF, 2020-2022
Ervīns Lukševics	Influence of tidal regime and climate on the Middle-Late Devonian biota in the epeiric Baltic palaeobasin	FARP, 2018-2021
Signe Mežinska	Ethically and socially responsible governance of research biobanks in Latvia: analysis of opinions of public, donors and researchers	FARP, 2018-2021
Indriķis Muižnieks	<i>Implementation and Sustainability of Microbial Resource Research Infrastructure for the 21st Century (IS-MIRRI21)</i>	H2020, 2020-2023
Artūrs Vīksna	Recognition of monofloral honey of Latvian origin using nuclear magnetic resonance, chromatographic, isotope ratio mass spectrometry and chemometry methods	FARP, 2020-2021

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

The teaching staff collaborated on the design of the new study programme and the courses to be included in it. Regular meetings were held to discuss the courses to be included and their content. In the future, it is foreseen that any changes in the programme plan, courses and their content will be subject to consultation of the teaching staff involved in the implementation of the programme, the Directors of the consolidated doctoral programmes, as well as to review by the SF LS Council. This will ensure that there is no overlap between the content of the courses, and that the principles of student-centred education are respected in the design of the courses.

The study programme has one study programme director, but since the study programme covers six fields, each field currently has its own Doctoral Study Council. The programme director is responsible for working with the Doctoral Study Councils as well as secretaries of the councils.

In the academic year 2021/2022, 22 teaching staff (excluding Thesis supervisors) were involved in the programme implementation. With 57 students enrolled in the programme, this translates into a ratio of  $57:22 \approx 2.6$  students per faculty member.



# Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	20_4_B_diploma_Natural_Sciences_DSP.pdf	20_4_A_diploms_Dabaszinatnu_DSP.pdf
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)		
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period	24_4_B_student_statistics_Natural_sciences_DSP.pdf	24_4_A_statistika_studejoso_skaitis_Dabaszinatnu_DSP.pdf
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard		
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)		
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)	25_4_B_Correspondence_normative_regulation_Natural_Sciences_DSP.pdf	25_4_A_atbilstiba_normativiem_Dabaszinatnu_DSP.pdf
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	28_4_B_mapping_Natural_sciences_DSP.xlsx	28_4_A_kartejums_Dabaszinatnu_DSP.xlsx
The curriculum of the study programme (for each type and form of the implementation of the study programme)	26_4_B_study_plan_Natura_Sciences_DSP.pdf	26_4_A_studiju_plans_Dabaszinatnes_DSP.pdf
Descriptions of the study courses/ modules	27_4_B_course_descriptions_Natural_sciences_DSP.pdf	27_4_A_kursa_apraksti_Dabaszinatnu_DSP.pdf
Description of the organisation of the internship of the students (if applicable)		
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)	29_B_number_doctors_Natural_sciences_DSP.pdf	29_A_doktoru_skaitis_Dabaszinatnes_DSP.pdf
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)	30_4_B_section_55_Natural_sciences_DSP.pdf	30_4_A_pants_55_Dabaszinatnes_DSP.pdf