

APPLICATION

Study field "Power Industry, Electrical Engineering, and Electrical Technologies"
for assessment

Study field	<i>Power Industry, Electrical Engineering, and Electrical Technologies</i>
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Self-evaluation report

Study field "Power Industry, Electrical Engineering, and
Electrical Technologies"

Latvia University of Life Sciences and Technologies

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I - Information on the Higher Education Institution/College

1.1. Basic information on the higher education institution/ college and its strategic development directions, including the following information:

Latvia University of Life Sciences and Technologies (LLU) is the fourth largest university in Latvia (established in 1936 as an independent higher education institution) which implements studies and research for various industries of the national economy and which has developed relevant educational and research competence and expertise in:

- the following unique fields: agriculture, forestry, veterinary medicine, food technology and landscape architecture;
- the following universal fields: information technology, economics and social sciences, agricultural engineering, environmental sciences, civil engineering and pedagogy.

LLU:

Vision - Latvia University of Life Sciences and Technologies is one of the leading science and technology universities of the Baltic Sea region, with a specialisation in the sustainable use of natural resources to improve the life quality of society.

Mission - to build internationally competitive intellectual potential based on excellence in research, application of research results in the national economy, high quality of studies and effective university management.

LLU long-term goals:

1. Excellence in research that promotes technology and innovation and is integrated into the study process.
2. High-quality studies that provide the development of internationally competitive specialists.
3. Effective university management that ensures the targeted and efficient use of resources for high-quality studies and excellence-focused research.

LLU medium-term objectives are subordinated to the vision, the mission and the long-term goals and are as follows:

1. Excellence in research.
2. Application of research results in the national economy (research results are understood to mean the university's knowledge, technology and innovation accumulated and generated).
3. Integration of studies and research.
4. Internationalisation of studies and lifelong education.
5. High quality and competitive studies that meet the current demand.
6. Diversified supply of lifelong education that meets the current demand.
7. Effective university management at all the levels.

The LLU Development Strategy for 2015-2022 (<https://www.llu.lv/index.php/en/mission-and-vision>) prescribes three action programmes with relevant targets to achieve the long-term goals:

1. Research Programme;
2. Education Programme;
3. Management Programme.

LLU is comprised of the following eight faculties:

1. **LF** – the Faculty of Agriculture (established in 1863);
2. **VMF** – the Faculty of Veterinary Medicine (established in 1919);
3. **MF** – the Forest Faculty (established in 1920);
4. **TF** – the Faculty of Engineering (established in 1944);
5. **VBF** – the Faculty of Environment and Civil Engineering (established in 1947);
6. **PTF** – the Faculty of Food Technology (established in 1948);
7. **ESAF** – the Faculty of Economics and Social Development (established in 1968 as the Faculty of Agricultural Economics; in 2013, the Faculty of Economics merged with the Faculty of Social Sciences);
8. **ITF** – the Faculty of Information Technologies (established in 2001).

Totally, the Faculties of LLU implement 61 study programmes within **14** study directions (as of October 1, 2020).

Number of students and programmes in LLU study directions

B – bachelor programmes; M – master programmes; D – doctoral programmes

No	Study direction	Number of programmes				Number of students (01/10/2020)	Faculties
		Total	B	M	D		
1	Agriculture, Forestry, Fishery, and Food Hygiene	12	6	3	3	1,140	LF, MF, VMF
2	Architecture and civil engineering	9	5	2	2	434	VBF
3	Production and processing	8	4	2	2	443	PTF, MF, TF
4	Information technology, computer engineering, electronics, telecommunications, computer management and computer science	4	2	1	1	286	ITF
5	Environmental protection	3	1	1	1	98	VBF
6	Health care – a joint programme with LU and RSU	1		1		22	PTF
7	Mechanics and metal working, heat power engineering, heat engineering and mechanical engineering	6	4	1	1	272	TF
8	Power industry, electrical engineering and electrical technologies	1	1			85	TF

No	Study direction	Number of programmes				Number of students (01/10/2020)	Faculties
		Total	B	M	D		
9	Sociology, Political Science, and Anthropology	2	1	1		68	ESAF
10	Economics	3	1	1	1	389	ESAF
11	Management, administration and real estate management	5	2	3		342	ESAF
12	Hotel and restaurant service, tourism and recreation organisation	1	1			141	PTF
13	Internal security and civil defence	1		1		53	MF
14	Education, pedagogy and sports - the direction to be closed in 2023	5	2	2	1	118	TF
Total		61	3 0	1 7	1 2	3,891	

LLU personnel, job positions and age group statistics information are in the table.

LLU personnel, job position and age group statistics (as of October 1, 2020)

	Total	incl. women
University personnel	957	652
incl. academic staff members who have been elected at LLU	305	190
professors	57	33
associate professors	53	36
assistant professors	64	47
lecturers	40	30
assistants	0	0
leading researchers and researchers	91	44

Academic staff members – professors, associate professors, assistant professors, lecturers or assistants – who are also elected as leading researchers and researchers	156	105
Other personnel	652	462
Academic staff who have not been elected at LLU (visiting professors, visiting assistant professors, visiting lecturers)	253	153
of which foreign visiting professors, visiting assistant professors, visiting lecturers	21	4
Distribution of <i>academic staff members</i> by age:		
under 25 years	0	0
25–29 years	4	3
30–34 years	21	12
35–39 years	49	24
40–44 years	39	28
45–49 years	46	32
50–54 years	30	24
55–59 years	31	23
60–64 years	41	26
65 years and over	44	18

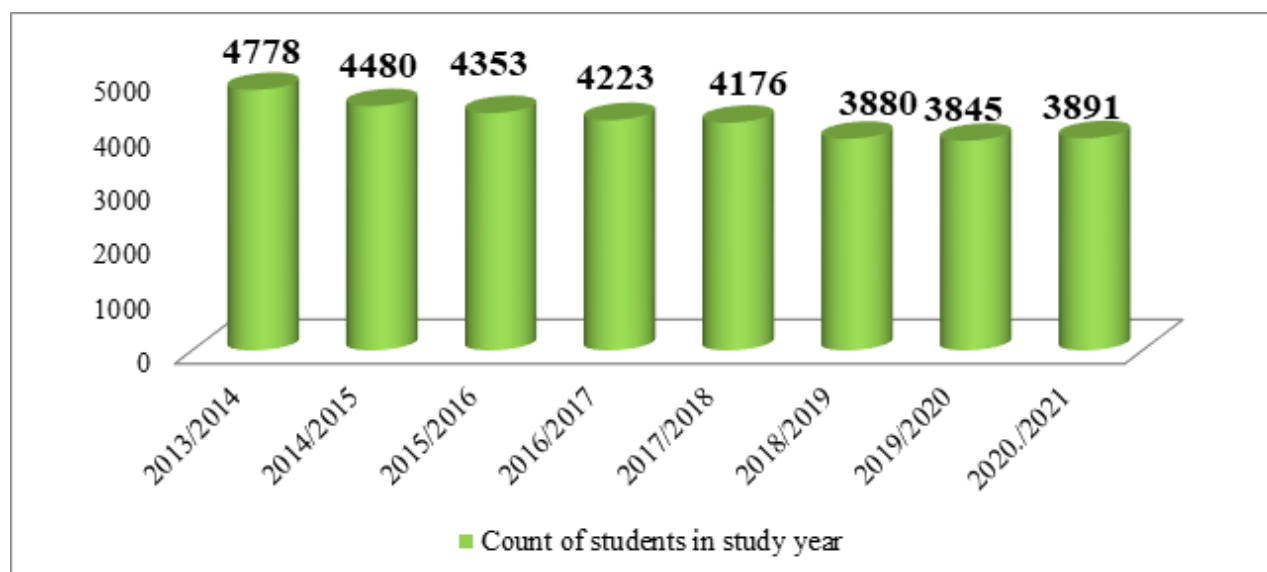
227 members of the total academic staff have a scientific degree (74.43%).

LLU promotes and supports the engagement of young teaching staff in academic work. Of the current academic staff, 52% are less than 50 years old, 33% are from 50 to 65 years old and only 14% are over 65 years old.

Changes in the number of students at LLU in the period 2013-2020 (October 1 of each year)

In the period from the academic year 2013/2014 to the academic year 2020/2021, the total number of students accounted for more than 4,000. The decrease in the number of students over the six-year period reflects overall negative demographic trends concerning natural increase of population and migration. The total number of students at LLU decreased by 18% over the six-year period, yet a positive fact is that the number of students tends to remain stable in last years. Overall, the total number of students was affected by the processes occurring in the country: 1) the number of individuals who finished the secondary school decreased by 20% in the reference period; 2) the

number of individuals who finished their secondary school and continued their education at university was very volatile from year to year: a 5% decrease in 2015 and 2017 and a 1-2% increase in 2014 and 2018. Currently (in 2020), the number of students has levelled off, and there has even been a slight increase in the total number of students studying at LLU compared with the previous year.



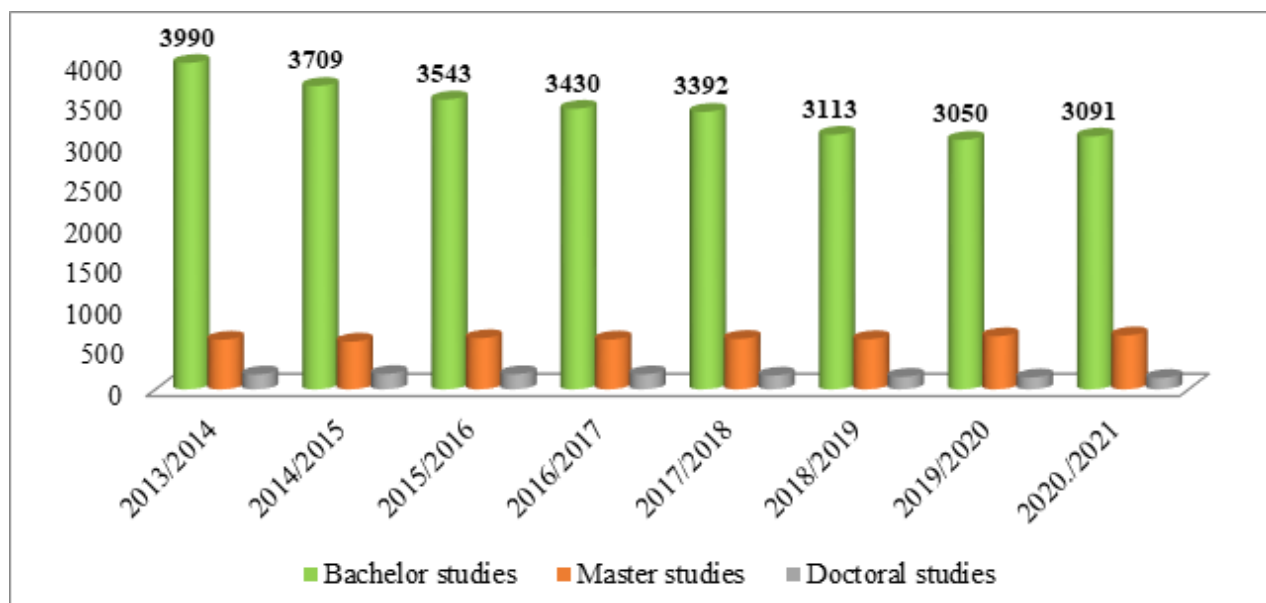
After the university had succeeded in tackling with the external factors affecting the number of students, a number of reasons for the decrease in the number of students were established; the reasons were identified from the analysis of the matriculation of students.

The major reasons are as follows:

1. There was a considerable increase in the amount of students who discontinued their studies during the first semesters owing to the wrong study programme or study direction chosen, their jobs or private life problems;
2. Some students could not continue their studies because of financial problems or due to the schedule requirements (especially working part-time students), since they could not combine studies with their working hours;
3. Master's degree students were unable to combine studies with their jobs;
4. Interest in doctoral studies tended to decrease because financial support for doctoral students was insufficient (a monthly scholarship determined by the state was EUR 113.83), and the availability of funding for research was limited.

The distribution of the number of students by level of studies at LLU in the reference period was as follows:

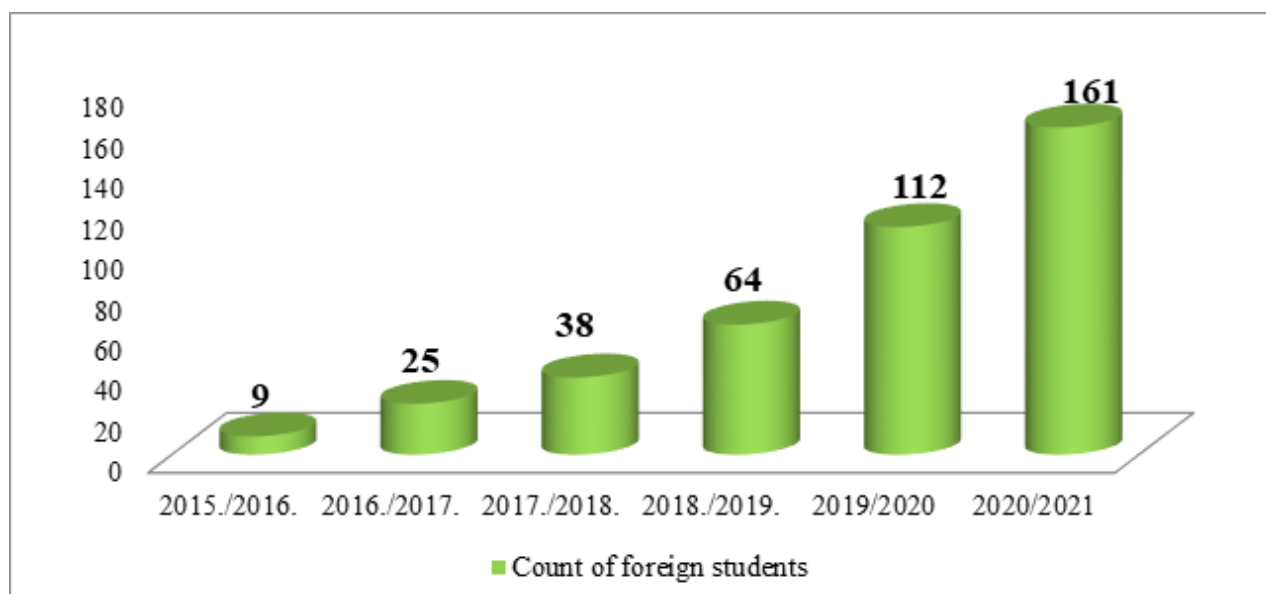
1. Bachelor's degree studies - 79-84%;
2. Master's degree studies - 13-17%;
3. Doctoral studies - 4%.



The analysis of changes in the number of students distributed by level of studies allows concluding that the numbers of undergraduate and doctoral students were the most volatile (a negative trend). The decrease in the number of undergraduate students could be rationally explained as follows: over the six-year period, several study programmes were consolidated; the regional affiliates of LLU were closed; the decrease in numbers of part-time students was observed in particular. The decrease in the number of doctoral students could be explained by the insufficient amount of funding allocated to science and research as well as the fragmented nature of that funding.

Main activities implemented by LLU to increase its number of students:

1. In the academic year 2015/2016, LLU began admitting international students for studying in English. Thus 161 international students studied at LLU in 11 study programmes (at all the levels of studies) in the academic year 2020/2021.



2. Students are given an opportunity to acquire a bachelor's degree of social sciences in sociology in the form of e-studies.
3. As regards the conventional study process, teaching staff members use the Moodle online system intensively as a support tool for e-studies (learning materials, multiple choice tests, tests, homework etc.);
4. Infrastructure for studies and research has been improved and modernised.

5. Opportunities to receive scholarships funded by patrons tend to increase.
6. LLU provides doctoral students with internal research grants.

Research activities and motivation measures for the academic staff are defined in the LLU Development Strategy, the relevant targets set have to be achieved by the Faculties, administrative centres and scientific institutes and laboratories. Each organisational unit of LLU approves these plans for an annual period. The decision-making bodies of the organisational units have to approve the targets set and the procedure to achieve the targets. Each organisational unit collegially reports on the progress to the LLU Rectorate, and the details of the implementation of the plans are published on the LLU intranet: <https://mans.llu.lv/lv>, they and are available to the academic staff and students.

1.2. Description of the management 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 following key (collegial) institutions are involved in making **strategic decisions** at LLU:

The **Council** is a supreme collegial representation, management and decision-making body for academic and scientific matters authorised by the personnel of LLU.

The **Council**:

- approves and amends the Constitution of LLU;
- elects and dismisses the members of the Senate of LLU;
- elects and dismisses the rector of LLU;
- elects the Academic Arbitration Court of LLU and dismisses its members;
- hears reports by the Senate, the Rector and the Academic Arbitration Court;
- approves and amends regulations on electing the Council, electing and dismissing the Rector and the statutes of the Senate and the Academic Arbitration Court;
- discusses and makes decisions on conceptual matters on the performance and development of LLU.

The Council is composed of 240 members who are elected by the organisational units of LLU by secret ballot for three-year terms in the following composition:

- 160 academic staff (67%);
- 50 students (21%);
- 30 other personnel (13%).

The Council functions in accordance with its Statute.

The **Senate** is a collegial management and decision-making body of the personnel of LLU, which approves the rules and regulations that govern all the spheres of LLU activity, with the exception of those that fall within the remit of the Council in accordance with the Constitution of LLU.

The Senate is approved by the Council for a period of three years. The Senate consists of 60 senators, of which:

- 41 are representatives of academic staff who represent all the Faculties (68%);

- one representative of other personnel (2%);
- the Rector of LLU, the Vice-Rectors for studies and science and the chair of the Council as representatives of academic personnel, the director and the Chancellor of LLU as representatives of other personnel (10%);
- 12 representatives of students who have been nominated by the Student Self-government (20%).

The Senate functions in accordance with its Statute.

Regulations, decisions and procedures in relation to the matters pertaining to the basic activity of LLU are also passed, within the scope of competence, by:

1. Rector;
2. Vice-Rectors for studies and science;
3. Chancellor;
4. Director;
5. Deans of the Faculties

Annex 1 – List of main internal documents of LLU.

Annex 2 – LLU Management Structure.

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, as well as the stakeholders involved in the development and improvement of the quality assurance system and their role in these processes.

Quality management system at the University.

The quality management of study processes is part of the overall quality management system of LLU. Since 2016, the quality management system of LLU has been based on the international standards for excellence (see Investors in Excellence Standard, www.investorsinexcellence.com).

The quality management system of LLU is externally audited every two years (audits may be done by the organisations recognised by the Investors in Excellence organisation, which either grant or do not grant an Investors in Excellence certificate to the organisation audited). Such a certificate was granted to LLU both in 2016 (the first audit) and in 2018 (the repeated audit).

The quality management system of LLU is part of the overall LLU Development Strategy and covers a broad spectrum of matters. A brief general description of the LLU Quality Management System and quality policy is available here:

<https://www.llu.lv/sites/default/files/2020-08/Quality%20Assurance%20System.pdf>

Quality management system in the context of studies

LLU has developed a detailed joint scheme of study processes that includes 90 major study processes, their sequence and interaction. Each of the 90 processes is described and arranged sequentially. The description contains the following parts: activities; responsible organisational units and employees; reference to the legislative or regulatory framework governing the activities.

The detailed joint scheme of study processes provides a common approach to study processes across all the organisational units.

The descriptions of quality of studies at LLU are restricted access documents and are intended for internal use at LLU as well as are part of the management and strategic documents of LLU. The detailed information on the internal quality management system and its effectiveness is contained in Section 2.2 of the self-assessment report where the quality management system is described, assessed and defined in the context of a particular study direction.

The characteristics of stakeholders and their role in the development and improvement of quality assurance system.

The quality management system of LLU covers all the spheres of LLU activity. The academic staff and other personnel of LLU are involved in the quality management system. The coordinating body of the quality management system is the Administrative Centre of LLU, which is subordinate to the Rector.

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 21 of the Law on Institutions of Higher Education 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 evidence for the full compliance, partial compliance or non-compliance.

1.	The higher education institution/ college has established a policy and procedures for assuring the quality of higher education.	Complies
		nvestor in Excellence certificate issued in 2016 Detailed information is provided in Section 1.3 of the report

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>Complies</p> <p>New study programmes are developed in accordance with the Regulation on Study programme Development, Approval and Amendment at LLU (No. 10-5 as of 13 March 2019) approved by the Senate.</p> <p>The Regulation stipulates that:</p> <ol style="list-style-type: none"> 1. A programme shall be developed by a Faculty, discussed by the Methodological Commission of the Faculty and approved by the Board of the Faculty; 2. The programme developed shall be discussed by the Board of Studies and recommended for approval by the Senate; 3. The Senate shall approve the programme and a director for the programme; 4. Relevant documents shall be submitted to the Academic Information Centre for being licensed; 5. New students shall be admitted to LLU and enrolled in the programme after the licence has been granted. <p>Every year, annual reports are drawn up for all study programmes; the reports are approved by the Senate and published on the LLU website (only in Latvian): https://www.llu.lv/lv/studiju-virzienu-parskati-un-pasnovertejuma-zinojumi</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>Complies</p> <p>The students' learning outcome assessment system is described in:</p> <ul style="list-style-type: none"> • Regulation of Studies (bachelor's and master's degree studies): www.llu.lv/sites/default/files/2021-05/Study_regulation_2021_EN.pdf . • Regulation of Doctoral Studies :https://www.llu.lv/sites/default/files/2018-03/Regulation%20of%20doctoral%20studies_0.pdf <p>The requirements for assessing students' learning outcomes for each particular course are given in the descriptions of course study programmes available in Latvian and English in the LLU IS course register at https://lais.llu.lv/pls/pub/kursi.startup?!=1</p>

4.	Internal procedures and mechanisms for assuring the qualifications of the academic staff and the work quality have been developed.	<p>Complies</p> <p>LLU has developed procedures and regulations (approved by the Senate) to guarantee the qualifications and work quality of academic staff:</p> <ol style="list-style-type: none"> 1. The LLU Regulations on Academic Positions (see Annex in chapter 3.5: LLU_Regulations_on_Academic_positions_EN.pdf). 2. The Regulation regarding the Calculation of Academic Workload (see Annex in chapter 3.5: Regulation_on_Calculation_of_Academic_Workload.pdf). 3. The Motivation System for LLU Academic Staff. 4. Classes for students are scheduled in accordance with the procedures approved by the Rector: classes are scheduled in a centralised way for full-time studies, while for part-time studies it is done by each Faculty. The schedules are publicly available two weeks before the beginning of a semester (for part-time studies – before the beginning of the examination period).
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>Complies</p> <p>LLU uses an information system that aggregates information about the entire study process of each student (decisions regarding the student, grades earned, payments made). Every semester, a survey of students is conducted to find out students' opinion regarding the courses taken, satisfaction with the way the courses are organised, the content of the courses, the teaching staff delivering the courses (an electronic questionnaire). The survey results are available to each teaching staff member, directors of study programmes, department/institute directors, deans of the Faculties and the Vice-Rector for studies.</p> <p>For financial planning and accounting, LLU employs the accounting system Horizont that is a single system connected with the Ministry of Agriculture. The achievement of the goals and targets set by the LLU Development Strategy is reported each year at different levels:</p> <ul style="list-style-type: none"> Faculties – during the dean's office meetings; Administrative units – at the Board of Studies; The Vice-Rectors, the Chancellor and the LLU Director – during the Rectorate meetings; The Rector – during the Council meetings.

6	The higher education institution/ college shall ensure continuous improvement, development, and efficient performance of the study direction whilst implementing their quality assurance systems.	Complies Reports of the study directions are produced every year, reviewed by the Board of Studies and approved by the Senate. Once approved, the reports are made public on the LLU (only in Latvian): https://www.llu.lv/lv/studiju-virzienu-parskati-un-pasnovertejuma-zinojumi
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II - Description of the Study Direction (1. Management of the Study Direction)

1.1. Economic and/or social grounds for the creation of the study direction and the relevant study programmes, the assessment of the interrelation among the study programmes, as well as the analysis of the significance (singularity) of the study programmes in comparison with other similar study programmes in Latvia and abroad.

The study direction of Power industry, electrical engineering and electrical technologies implemented at Latvia University of Life Sciences and Technologies (hereinafter referred to as LULST) includes one study programme: professional Bachelor's degree study programme: Applied Energy Engineering .

This study programme is unique and differs from all other programmes in Latvia in that it covers knowledge, skills and competences both in electrical power engineering, which has the main emphasis in the study process, and heat power engineering, thus allowing a graduate engineer to understand and ensure work performance in both fields, as well as in combined energy equipment and systems.

Other similar study programmes in universities of Latvia have a narrow specialization and basically prepare specialists in either electrical power engineering or heat power engineering. Such programmes are listed below:

1. A three-year 1st level academic higher education study programme at Riga Technical University "Power and Electrical Engineering", where graduates are awarded Bachelor's degree in electrical power engineering science, which includes study courses of heat power engineering in the amount of only 3 CP (4.5 ECTS);
2. A two-year 2nd level professional higher education study programme at Riga Technical University "Power and Electrical Engineering" (the continuation to the 1st level programme) where graduates are awarded the qualification of an engineer in power and electrical engineering. The programme in heat power engineering includes only elective courses.
3. The study programme "Heat Power and Thermal Engineering" at Riga Technical University where graduates are awarded professional Bachelor's degree in heat power engineering and thermal engineering, and the qualification of an Engineer in Heat Power and Thermal Engineering. This programme differs much more due to its emphasis on heat power engineering. Study courses of electrical power engineering account only for 4 CP (6 ECTS).

To compare, the amount of CP in the study programme Applied Energy Engineering dedicated to heat power engineering is 11 CP or 16.5 ECTS), which account for 25% of the total of field professional specialization courses (44 CP or 66 ECTS).

The need for engineers trained in the Applied Energy Engineering programme is also substantiated by labor market research on qualification requirements for employees providing service of energy systems, where employers indicated in questionnaires that the labour market requires universal engineers competent in various fields of energy engineering.

The content of the study programme corresponds to the professional standard of Engineer of Energy Systems, which defines the areas of competence, basic tasks and responsibilities of professional activity and covers both fields of energy engineering.

Such employees are required in small and medium-sized enterprises, where it is not economically feasible to employ engineers in both fields, i.e., one specialist for electrical engineering and the other one for heat engineering, as well as in organizations (including municipalities) where there is a combined generation and utilization of heat and electrical energy entitling the engineer responsible for this work to understand and link these two energy engineering areas. An energy system engineer also plays an important role in the design, operation and maintenance of combined power supply systems.

Other professional standards are narrower, for example:

- The professional standard of electrical engineer PS0228 does not include competences in heat power engineering,
- The standard PS0252 heat power engineer and heat installation engineer does not include the competence in electrical power engineering

In Estonia an electrical power engineering degree is offered in Tallinn University of Technology in the study programme “Electrical Engineering”. Similarly to the programme of Applied Energy Engineering, the volume of programme is 240 ECTS, the volume of traineeship is 36 ECTS (Applied Energy Engineering has 39 ECTS). However, this programme also focuses on the field of electrical engineering. The graduates earn the Bachelor’s degree in engineering sciences.

In Lithuania an electrical power engineering degree is offered in Kaunas University of Technology in the study programme “Electrical Engineering”. The programme lasts four years and graduates earn the Bachelor’s degree in engineering sciences. The volume is 240 ECTS. Professional traineeship accounts for 15 ECTS, which is much less than in the programme of Applied Energy Engineering. The curriculum does not include separate study courses of heat power engineering.

1.2. Aims of the study direction and their compliance with the scope of activities of the higher education institution/ college, the strategic development directions, as well as the needs and the development trends of the society and the national economy.

LULST strategy:

According to the key technologies determined by the European Union, Latvia has identified RIS3 specialization fields in which the country’s innovation capacity needs to be developed, and four of them are related to the specialization chosen by Latvia University of Life Sciences and Technologies. One of them is technologies and engineering systems (particularly power engineering, electrical engineering and electronics, ceramics and composites materials science, mechanical engineering, biotechnology and food technology) (available only in Latvian: LULST Development Strategy 2015-2022, p.32, <https://www.LLU.lv/lv/strategija>);

The aims of the study direction are:

- Provide energy supply and electrical equipment service entities in rural areas, cities and small towns with the help of specialists of electrical power engineering and heat power engineering by implementing professional studies with focus placed on practical application;
- Educate competent engineers in accordance with the needs of the national economy, so that they are able to solve topical problems of rational use of energy and implementation of modern power supply technologies, and that they are able to successfully work in engineering, management, public administration and municipal positions related to energy engineering;
- Promote balanced development of rural areas by preparing well-educated young people – future specialists in energy engineering, who would meet the requirements of an engineering career, who after the graduation would return to their native regions to work in the important and prestigious field of power engineering, and who are knowledgeable and patriots of their profession, region and the country.

The tasks of the study direction:

1. Prepare energy engineering specialists of the fifth level professional qualification (LPQ) and the sixth level of Latvian Qualifications Framework (LKI), competitive in the labor market, with emphasis on the current and prospective requirements of the energy supply systems and their rational use in agricultural and industrial technologies;
2. Develop and strengthen self-directed learning and self-education skills of students which would serve as the basis for the lifelong learning process;
3. Develop problem-solving skills, skills to define strategic and tactical goals and to find motivation to achieve them.
4. Develop and strengthen students' professional skills in engineering innovation.
5. Ensure the compliance of the study procedure with the legislation of the Republic of Latvia and the LULST Constitution, as well as the compliance of the study procedure with the internal regulations of LULST.
6. Develop an in-depth understanding of energy engineering of Latvia, especially in rural areas: its historical development, the current and prospective situation, energy economics, transmission and distribution, entrepreneurship in energy sector, design and operation of energy generation, transmission and distribution facilities and systems.
7. Develop the necessary skills and in-depth knowledge in the specialization of energy supply on:
 - electrical networks and substations, their design and operation considering also the specifics of the rural environment;
 - heat supply sources and systems, their design and operation considering also the specifics of the rural environment;
 - the use of energy installation in accordance with the technical instructions and work safety regulations;
 - operation and repair work organization and supervision of energy equipment.
8. Develop the necessary skills and in-depth knowledge in the specialization of energy economics on:
 - economics of operation of different types of energy installation considering the specifics of the rural environment;
 - entrepreneurship in energy sector, management and marketing;
 - computerized accounting and payments of energy consumption;
 - energy tariffs and their selection criteria.

1.3. SWOT analysis of the study direction 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 direction 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 direction for the next assessment period shall be provided.

S – Strengths of the implementation of the study direction:

1. The study process has a practical professional approach; graduates are required in all sectors of national economy;
2. students obtain professional Bachelor's degree simultaneously with a professional qualification;
3. a long traineeship period in companies in the framework of the study process (the total amount is 24 weeks) to obtain practical skills and understand the organization of engineering work;
4. a large volume of traineeship allows students to gain experience in a relevant position while studying and find their future employment after the graduation;
5. the programme emphasizes both electrical power engineering field and heat energy engineering field thus noticeably increasing and diversifying graduates' opportunities in the labour market;
6. the number of companies where students have traineeships is very large, there are more than 90 companies;
7. both full-time and part-time studies are implemented;
8. topics of final theses are often related to real-life issues important for companies and companies' representatives are involved in the supervision of the writing process of theses;
9. the State Examination Commission performs the assessment of final theses; more than a half of its members are representatives of companies;
10. compliance with the Bologna Process, because students can start doing practical work after the 3rd or 4th year of studies;
11. the majority of academic staff members in the field of engineering simultaneously performing research activities.

W- Weaknesses:

1. the lack of sufficient financing to invite highly qualified foreign guest lecturers;
2. the laboratory equipment has been improving slowly, mainly on the basis of funding of submitted and approved projects and donations.
3. students often combine work with their studies, which sometimes affects the quality of their studies;
4. the most capable students of the direction are not willing to stay after the graduation and work as academic staff members due to low salary

O- Opportunities:

the development of final theses promotes the strengthening of the university's scientific potential and cooperation with companies;

1. LULST has signed cooperation agreements with 161 partner universities within the framework

of the Erasmus+ exchange programme;

2. Each year Ltd "Latvenergo", Ltd "Sadales tīkls" and other energy supply companies offer topics for final theses and research activities, as well as announce scholarship competitions;
3. Assistance of graduates in the improvement of the university facilities.
4. Research projects that facilitate the recruitment of new academic staff members by involving them in paid positions in projects.

T – Threats:

1. a low level of previous knowledge of applicants, especially in science subjects (mathematics, physics etc.);
2. prestige of higher education has declined among people and especially young people;
3. the acquired education does not guarantee a higher standard of living;
4. difficulties to attract fee-paying students due to the low purchasing power of the population in Latvia;
5. large load of academic staff members which is not possible to decrease due to the funding from the state budget;
6. salaries of new academic staff members is not competitive with salaries outside the university, therefore it is very difficult to attract young promising lecturers;
7. a large amount of bureaucratic work that must be carried out by those that are involved in the implementation of the study programme, which in turn can affect the quality of studies;
8. decrease in the number of applicants in recent years, including due to the demographic situation.

In order to improve weaknesses and reduce threats for the implementation of the study direction, the following measures have been planned and performed:

- both at present and it is also planned to prepare and submit applications for financing within the framework of various projects for the continuation of the modernization of the facilities, material and technical provision;
- to offer young academic staff members participation in research projects, if possible, thus providing opportunities in increasing their remuneration;
- the work of a lecturer is offered to specialists from companies to deliver lectures in specific study course;
- LULST Communication and Marketing Centre, Studies Centre etc. provide informative events promoting all the level study programmes at LULST; several informative videos have been filmed, information is posted in social media to attract students to LULST;
- LULST participated in the annual trade show "The School" where degree study programmes were promoted;
- To tackle with the problem of insufficient applicants' knowledge in Science subjects, the number of contact lessons have been increased in Physics and Mathematics to fill in the gaps of knowledge in case it was not fully acquired in the previous stages of education;
- Plans for the development and improvement of the study field are developed
- Each year "Open door" days were organized for potential applicants for several times, "shadowing" events took place, online live video broadcasts were aired in the Internet, and academic staff members told about the programme and graduates shared their experience about their profession.

The development plan of the study field for the next period is given in the annex:
2_1_2_annex_Study direction development plan 6 Years

On the basis of the evaluation performed by an expert of the professional organization "Latvia Association of Electric Power Engineers and Energy Installation Builders" (LEEA) and an

international expert from Department of Energy Application Engineering of Estonian University of Life Sciences, the activity plan was worked out to improve the study programme and some experts' recommendations have already been implemented, for example, the content of particular study courses was updated by including recent innovative developments. In addition, in the framework of the ESF project No. 8.2.3.0/18/A/009 "Management Improvement of Latvia University of Life Sciences and Technologies", the professional growth of academic staff members was developed where they attended different professional growth courses, including English language and IT skills improvement courses.

1.4. The structure of the management of the study direction and the relevant study programmes, and the analysis and assessment of the efficiency thereof, including the assessment of the role of the director of the study direction 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 direction.

The name of the entity	The task
LULST Council of Counselors	The Council of Counsellors promotes the development of the university in accordance with the needs and interests of Latvia, participates in the working out of the development strategy (including directions of study), as well as give advice concerning the issues of the development of the university.
The Senate of LULST	The Senate is a collegial management and decision-making body comprising LULST staff members, which approves the procedures and rules that regulate all spheres of activity of the university.

Boards

Board of Studies
Board of Science
Operation and
Maintenance Council

The Board of Studies supervises and tackles the issues of coordination of the organization and procedure of studies, as well as the preparation and qualification improvement of the academic staff. The Board of Studies develops, reviews and submits draft documents to the Senate of the Latvia University of Life Sciences and Technologies for approval, evaluates the reports of deans of faculties on the procedures of studies and other issues. It makes decisions on the regulations and organization procedure of the LULST competitions dedicated to studies and methodological work, examines various proposals submitted by students or academic staff members related to studies, submits draft decisions to the Senate, recommendations to faculties or LULST structural units.

LULST Operation and Maintenance Council is the management body that manages and coordinates all maintenance activities of the university. The main tasks of the Operation and Maintenance Council are decision-making on LULST property management and use in accordance with LULST tasks, coordination of economic activities among LULST structural units, elaboration and approval of overall decisions of LULST economic activities, estimation of pricing for LULST energy resources, heat energy, water, electricity, etc., evaluation of construction and repair plans of LULST objects, identification of LULST working environment conditions and coordination of their improvement, evaluation of students' living and study process conditions.

LULST Board of Science is a representative body of science branches and sub-branches, which coordinates scientific work at the university. The main responsibilities of the board are to determine the priority directions of research activities, to plan and coordinate the research of academic staff and students, to promote international scientific cooperation, to evaluate and summarize research results. The functions of the board are to supervise the development and implementation of the scientific strategy of the university, the process of scientific development, the use of funding for scientific development, the implementation of doctoral theses' defence processes, as well as the work of professors' boards.

The Board of the faculty (Dome)

The **Board of the faculty** is the highest decision-making body of the faculty, which operates in accordance with the Constitution of LULST. The board decides on strategic issues of academic and research activities; approves the development strategy of the faculty, accepts and submits the study programmes for approval to the Senate; reviews and accepts research projects; determine the basic principles of financing and use of resources; examines and accepts the candidates of the academic staff for the current study year; suggests questions and issues for consideration in the Senate, the Council and boards of the university.

Methodology Commission	<p>The key functions of the Methodology Commission are as follows: examining and approving programme plans in accordance with the applicable legal acts of the Republic of Latvia and LULST internal regulatory documents; reviewing and assessing new study courses and plans; evaluating programme licensing, accreditation and self-assessment reports; reviewing and coordinating study plans; reviewing and evaluating the programme, its curriculum in accordance with the guidelines for the programme/specialisation, review and approval of academic recognition. A Methodology Commission is established for each level of studies (bachelor, master and doctoral).</p>
Head of the study direction	<p>Head of the study direction monitors and coordinates the work of the directors of the study programmes included in the direction, preparation of annual self-evaluation reports, cooperates with the programme directors and the management of the faculty, Methodology Commission. The study direction of Power industry, electrical engineering and electrical technologies includes one programme “Applied Energy Engineering”, therefore the head of the study direction and the director of the study programme is one person.</p>
Director of the study programme	<p>Main tasks of the director of the study programme are the following: to organize the development of the study programme; to prepare information for the annual report of the self-evaluation of the study programme’s direction; to organize and ensure the development of the programmes of study courses in accordance with the requirements; to coordinate the improvement of programmes’ study courses, succession of courses and their compatibility; to co-operate with the dean of the faculty and the heads / directors of the departments / institutes / centres, teaching staff, students in the improvement of the study programme; to perform academic recognition of study courses, traineeships or their parts; to inform students about current processes, activities and requirements in studies procedures on regular basis; to organize surveys of graduates, employers and students, to analyze the results of the surveys and to propose the elimination of the revealed shortcomings; to follow the evaluation available on LULSTIS of the teaching staff involved in the study programme, to evaluate the results; to accept and review appeals in accordance with the LULST Regulation of Studies.</p>

In case of significant changes in the study program, changing the amount of CP of study courses, distribution by semesters, changing study courses, performing academic recognition and deciding other similar issues, the director of the study program in coordination with the head of the study direction (in this case the same person) submits proposals to the Methodological Commission. what includes heads of other study directions. After that, these proposals with possible additions and changes, adopted by the Methodology Commission, are forwarded to the Faculty Board, where they are considered and approved at the Board meeting. Such a system effectively provides a broader view of the issues to be addressed and an objective justification for activities within the study directions and program, as well as mutual exchange of good practice with managers of other engineering education fields, allowing to take over positive experience in their field.

The Board of Studies of the LULST examines and approves the basic issues related to the parameters of the study direction and programs, the organization of the study process, the annual reports of the study field, develops draft decisions of the Senate. The order of consideration of important issues, eg. change of the program name or the like, is as follows: the proposal is prepared by the program director, then coordinated with the head of the direction, then it is considered by the Methodology Commission, the Faculty Board and finally the LULST Study Board. Only then such issues are taken forward in accordance with appropriate regulations. Thus, important issues are addressed in several stages, which ensures the versatility of the examination and the efficiency of decision-making.

The administrative staff of the LULST (eg, the Personnel Department, Chancellery, etc.) is responsible for issues related to the employment of the academic staff as employees, forming employment contracts, resolving financial issues, etc.

The technical staff in the relevant departments takes care of the maintenance of the infrastructure in laboratories, auditoriums, etc. As a result, teachers can effectively devote their time to direct responsibilities and not worry about technical infrastructure issues.

1.5. 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 the study period, professional experience, and the options for the students to have their previously acquired formal and non-formal education recognised within the study direction by providing specific examples of the application of these procedures.

Admission rules for all LULST study programs are approved by the Senate in October every year and published on the LULST website. For those interested, the regulations in English are available here: <https://www.LULST.lv/en/degree-programmes>.

The Senate's decision with annexes from *October 14th, 2020, No. 10-117*

Undergraduate students, master's degree students and doctoral students are admitted on a competitive basis in accordance with the competition criteria set out in the admission regulations.

According to the admission regulations for the professional bachelor's degree programme in Applied Energy Engineering, undergraduate applicants are required to have **general secondary education or professional secondary education**. Students are admitted on the competitive basis based on the results of their centralized examinations. Applications are accepted from applicants who in their secondary education documents have successful scores in the following secondary school centralized examinations (CE) determined by LULST: Latvian language, a foreign language (English, German, French or Russian) and mathematics, and successful scores in the centralized examinations or a positive final grade in the compulsory subject determined by the faculty. It is possible to replace a score of the centralized examination with the score of the international language test, according the Regulation No. 543 of the Cabinet of Ministers from September 29, 2015.

If the secondary education has been obtained in the time period from 2004 to 2008 including, and the centralized examination in mathematics has not been taken, a final grade in mathematics shall be taken into account.

The admission requirements in the study programme “Applied Energy Engineering”:

For individuals who have obtained the secondary education since 2004:

- the centralised examination (CE) in the Latvian language is mandatory;
- the centralised examination in a foreign language is mandatory. It is possible to replace a score of the CE with the score of the international language test, according the Regulation No. 543 of the Cabinet of Ministers from September 29, 2015;
- the centralised examination in mathematics is mandatory;
- Additional points for the centralized examination in physics.

For individuals who have obtained the secondary education before 2004 or were removed from the CE:

- a final grade in the certificate/diploma or centralised examination in Latvian language is mandatory;
- a final grade in the certificate/diploma or centralised examination in a foreign language is mandatory;
- a final grade in the certificate/diploma or centralised examination in mathematics is mandatory
- Additional points for a final grade in physics.

Applicants can apply for study programmes via the government e-service (the website: latvija.lv) and the unified admission system, in which applicants' applications are processed simultaneously by 12 higher education institutions of Latvia (Latvia University of Life Sciences and Technologies, University of Latvia, Riga Technological University (RTU), Daugavpils University, Liepāja University, Vidzeme University of Applied Sciences, Rēzekne Academy of Technologies, Ventspils University of Applied Sciences, Ba School of Business and Finance), EKA University of Applied Sciences, , “RISEBA University of Applied Sciences”, ISMA University of Applied Sciences). The unified admission system has the following advantages:

- universities have an opportunity to forecast the amount of students who are expected to sign an agreement
- applicants have an opportunity to submit applications for studies closer to one's place of residence, to examine options to study in the chosen study program, to promptly receive the results of the entrance competition.

Prospective students of the study direction can also start studies in later stages of studies, if they have previously acquired knowledge, skills and competences in formal education or in non-formal education. LULST has approved regulations and procedures on starting studies in later stages and the recognition of knowledge, skills and competences acquired outside formal education or during professional experience.

LULST Vice-Rector for Studies approves the commission for the evaluation and recognition of the results obtained outside formal education or during professional experience. The commission's activities are based on the Regulation on recognition of knowledge, skills and competences acquired outside of formal education or obtained during professional experience” approved by LULST Senate's decision No. 9-188, as of February 13, 2019.

For example, in 2018, the results of the traineeship of a student were recognized taking into account the applicant's documented work experience in the design of electrical equipment.

The recognition of previously acquired formal education and a previous study period is regulated by the Rector's regulation Nr. 4.3. 8/78 "On academic recognition procedure at LULST" from 02.11.2016. (see in Annex: Academic Recognition at LLU.pdf).

Accordingly, the director of the study programme prepares a protocol, which is examined and approved by the methodology commission of the respective faculty. The methodology commission of the Faculty of Engineering approves protocols of the recognition of the results of previous education in this study direction every year, such as study courses acquired in other higher education institutions, for example, Riga Technical University or Riga Technical College, as well as the study courses acquired at LULST in previous study periods.

Number of academic recognition protocols

Academic year	Number of academic recognition protocols in programme "Applied Energy Engineering"
2014/2015	22
2015/2016	24
2016/2017	29
2017/2018	21
2018.2019	11
2019/2020	16

Admission rules for students studying in Latvian are available in the annex (Admission_regulation_2021_2022.pdf)

It is possible to start studies in later phases or resume studies on the basis of academic recognition. The table below summarizes statistical data on starting the studies at later stages.

Number of students starting studies at later stages

Academic year	Number of students starting studies at later stages
2013/2014	15
2014/2015	5
2015/2016	8
2016/2017	7

2017/2018	11
2018/2019	6
2019/2020	5

1.6. 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.

The LULST assessment criteria, conditions and binding procedures are described in the Regulation of Studies, in English available: httpwww.llu.lv/sites/default/files/2021-05/Study_regulation_2021_EN.pdf
s://www.LLU.lv/sites/default/files/2020-06/16_Study_Regulation_0.pdf

Study results are evaluated according to two indicators: qualitative and quantitative:

10-point scale is used for the qualitative evaluation (minimum successful evaluation 4) or the assessment is passed / failed.

The quantitative indicator is the amount of the study course in credit points (KP).

The final assessment in the study course can also be cumulative (a continuous assessment type of the performance of constituent parts of a study course), which means that regular work during the semester affects the final assessment. The compliance of the completed assignments with the curriculum and learning outcomes is evaluated at the end of each semester. The study course is successfully acquired if all the requirements specified in the study course programme have been met and the learning outcomes have been achieved.

Laboratory works, practical classes, individual work, seminars, tests and colloquia are organized gradually during the whole semester. The assessment "pass/fail" can be obtained by summarizing the results of the semester until the end of the individual study and examination session. It stimulates regular work during the semester.

There are two types of examinations: a cumulative examination means receiving grading according to the results of passed individual assignments during a semester; an examination is given during the period of individual studies and examinations checking students' knowledge of the whole course or part of it.

Learning outcomes of the most important study courses of the study direction are assessed in an examination, other study courses are assessed by a formal test.

A course work / project is part of a respective study programme or a course with an individual or combined assessment. An academic staff member / members assess and organise public or individual its defense.

The Examination Commission evaluates the results of learning outcomes obtained and developed

during the studies and makes a decision to award the degree and qualification corresponding to the study direction.

The Examination Commission of the study programme “Applied Energy Engineering” includes four representatives from companies and three LULST academic staff members.

1.7. Description and assessment of the academic integrity principles, the mechanisms for the 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.

Academic integrity means conducting academic work according to the highest standards of professionalism and accuracy, objectivity and truthfulness, moral and ethical principles, integrity, including prevention of plagiarism, providing truthful information and accuracy in academic publications, during communication and publicity activities that shape the image of academic environment.

The academic integrity principles are defined in LULST Senate decision “Regulations for Academic Integrity” (see in annex: Regulations for Academic Integrity.pdf).

The tasks of academic integrity are the following:

- to observe high academic and scientific integrity in the academic environment,
- to promote public confidence in the quality of education and the results of scientific research,
- to prohibit and prevent academic integrity offences,
- to determine the responsibility for dishonest actions and academic misconduct.

Students and LULST academic, general, scientific and administrative staff are equally responsible for observance of the principles of academic integrity, and they are responsible for academic integrity offences.

The university has worked out and observes the procedures for checking plagiarism in final theses and actions if it has been detected:

- The Rector’s decision – “The procedure on submission of electronic copies of final theses and their control in a plagiarism checker system”;
- The regulation of LULST Rector “On violation of academic integrity in final / doctoral theses”.

In 2014, LULST concluded an agreement on the use of the inter-university unified computerized plagiarism detection system (hereinafter referred to as the System) and started the examination of all final theses for plagiarism in both undergraduate and master’s degree studies. From 2017/2018 academic year LULST announced that plagiarism checking is compulsory also for doctoral theses.

The procedure stipulates that if the System finds 10% coincidence of the text of a final thesis with another work, then the thesis by a LULST student is reviewed by the Methodology Commission of a faculty, then a decision is made regarding the presence or absence of plagiarism, having received explanations from an author and supervisor in advance. Since an introduction of the unified computerized plagiarism control system, LULST has detected 124 suspicious works in total. Discussions were conducted with the authors of all of the above mentioned theses, and 18 were suspended from the final examination and exmatriculated, two of them were exmatriculated in 2018/2019 academic year.

173 theses were checked by the Programme in the study direction Power industry, Electrical Engineering and Electrical Technologies in the time period from 2014 to 2020. Plagiarism was not detected in any of them.

Number of theses checked for plagiarism

Year	Number of checked theses	Plagiarism was detected
2014	23	0
2015	32	0
2016	24	0
2017	19	0
2018	19	0
2019	29	0
2020	27	0

1.8. Specify the websites (e.g. the homepage) on which the information on the study direction 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.

Information about study directions and study programmes is published on the website of the Latvia University of Life Sciences and Technologies www.LLU.lv , including latest updates on what is happening in the respective study programmes, as well as basic information about each study programme. The detailed information (descriptions of study programmes) **only in Latvian** is available in the section: *Studijas / Studiju programmas* -> <https://www.LLU.lv/lv/studiju-programmas> in the section: *Nāc studēt / Ko studēt? Palīgs studiju programmu izvēlē* -> <https://www.llu.lv/lv/nac-studet-llu>

The information **in English** about the study programmes is available in the English version of the university's website: *Studies / Degree Studies / Degree Programmes* -> <https://www.LLU.lv/en/degree-programmes>

In addition, the access to the descriptions of all the study programmes is available via the website of the LULST Faculty of Engineering: <http://www.tf.LLU.lv/en> .

Information about study programmes in Latvian is also available in electronic informative materials (brochures), including an overview of the study programme and graduates' testimonials.

- Undergraduate programme brochure (only in Latvian): <https://www.LLU.lv/sites/default/files/2019-02/LLU-pamatstudiju-buklets-2019-WEB.pdf>
- Master's degree programme brochure (only in Latvian):

The responsible structural units which supervise the LULST website content are given below:

- Studies Centre (1st level, undergraduate and master's degree study programmes),
- Studies Centre (doctoral programmes),
- International Cooperation Centre (study programmes in English).

The content for LULST website is prepared in cooperation with directors of degree programmes.

In addition, the information in Latvian on study programmes at LULST is also available on the website (only in Latvian): **www.prakse.lv**:
<https://www.prakse.lv/edu/profile/84/latvijas-lauksaimniecibas-universitate>

The person who is responsible for the posting information is from the Centre of Lifelong Learning.

The information on study programmes at LULST is also available in **the national database of educational opportunities (only in Latvian)** www.niid.lv:

http://niid.lv/niid_search?qy=Latvijas%20Lauksaimniec%C4%ABbas%20universit%C4%81te&level_1=7

The LULST website provides information in Latvian and English required for Erasmus+ academic mobility conditions and procedures in accordance with the Erasmus Charter for Higher Education and its framework guidelines:

- <https://www.LLU.lv/en/exchange-studies> - in English

The university subscribes to online marketing websites:

- <https://www.masterstudies.com/universities/Latvia/LLU/>
- <https://www.educations.com/search/jelgava>

For international students

- The LULST website provides comprehensive and detailed information to potential and existing full-time students from abroad:
- The degree programmes in English offered by LULST are included in the page <http://www.LLU.lv/en/degree-programmes>, where a detailed description of each programme is given, including a curriculum:
- The step-by-step admission process is given, see the section: <http://www.LLU.lv/en/how-to-apply>
- The immigration procedure is available in the section: <http://www.LLU.lv/index.php/en/immigration>
- Information on study and living conditions are included in the section: <http://www.LLU.lv/sites/default/files/2018-11/LLU-Celvedis-EN-2018-17.10.pdf> ;
<http://www.LLU.lv/index.php/en/before-arrival> ;
http://www.LLU.lv/index.php/en/about-university-0_ ;
- Testimonials of international students are found in the section: <http://www.LLU.lv/en/student-testimonials-7>

The director of the study programme or a coordinator of international relations of a faculty are responsible for the compliance of the content on the website or its changes with the official information, but a coordinator of international relations of the LULST International Cooperation Centre is responsible for the publication of the information.

LULST International Cooperation Centre has prepared and published informative brochures:

"Erasmus+ Mobility Information Handbook", "Degree Studies", infopages and other materials, which promote degree programmes and mobility programmes during marketing events.

II - Description of the Study Direction (2. Efficiency of the Internal Quality Assurance System)

2.1. Assessment of the efficiency of the internal quality assurance system within the study direction 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 direction and the relevant study programmes.

One of the essential elements of the control system at LULST is the self-assessment report prepared annually by faculties, including the Faculty of Engineering. The Self-Assessment Report is also prepared every year in Latvian by directors of study programmes and heads of directions. The reports **only in Latvian** are available on the website of LULST: www.ltu.lv/lv/studiju-virzientu-parskati-un-pasnovertejuma-zinojumi

Surveys of students and graduates serve to improve the quality, develop the direction and to evaluate its quality from the point of view of students and graduates. Maintaining the high quality of studies is also facilitated by professional development activities of the teaching staff. Each year, the self-assessment report includes the data collected from academic staff members about professional training activities they have participated. This information is also available in the lecturers' online profile of LULST Information System.

The professional development of academic staff members is supported by the premium system for the scientific and methodological work, including professional development activities.

At the end of 2020 the quality management system of LULST achieved the international "Investors in Excellence" standard for the 3rd time and the repeated certificate was awarded which will be in force until December 2022. The activities to achieve the standard was initiated in the summer of 2015, and the first positive assessment was received in January, 2017. The repeated assessment of LULST quality management system was performed at the end of 2018, and the repeated certificate was awarded in February, 2019.

The European Social Fund project (8.2.3.0/18/A/009) "Management Improvement of Latvia University of Life Sciences and Technologies" (September, 2018 - August, 2021) is being implemented with the purpose to promote professional growth of the academic staff members. Its aim is to improve the quality of the university's study programmes and ensure better management of the higher education institution and improvement of competences and skills of management staff. The total amount of funding of the project is EUR 1,059,598.00.

The academic staff members are provided with courses in the English language, IT technologies; directors of study programmes participated in the courses of the study programmes' quality improvement and quality management, etc. The information about the attended courses is available in the Curriculum Vitae of each academic staff member in annexes.

In the framework of the project, the evaluation of study courses of study programme "Applied Energy Engineering" from the study direction "Power industry, Electrical Engineering and Electrical Technologies", and the assessment of the study programme itself on the whole were performed by

an international expert from Department of Energy Application Engineering, Estonian University of Life Sciences, and an expert of the professional organization “Latvia Association of Electric Power Engineers and Energy Installation Builders”.

Study course programmes have been improved following the experts’ recommendations and current issues in the energy sector, for example, in 2019, the topic on decentralized frequency regulation was included the study courses “Electricity Supply Technologies” and “Electric Power Stations and Networks”, thus emphasizing its topicality for Latvia’s electricity grid after Latvia will leave Russia's unified energy grid in 2025.

In 2020 the descriptions, format and content of all study courses of the programme were updated, thus students are offered more detailed and user-friendly explanations of requirements, assessment criteria, content, number of hours corresponding to topics, etc., for each study course.

Upon completion of any study course, students express their opinions or evaluate the teaching staff by filling in an online questionnaire, which include such points as, for example, the ability of academic staff members to explain the teaching material, the methods used, the level of students’ involvement, providing feedback, if a teaching staff member is available for students. The questions focus on the following: whether the lecturer explained the aim and learning outcomes of the course, whether the content was explained clearly, whether the selected teaching methods helped to acquire the content, whether the lecturer managed to engage students, whether the feedback was given. The survey results are available to directors of study programmes and heads of structural units.

The study process in pandemic conditions is provided remotely via LULST e-learning environment, where students listen to online lectures, meet academic staff members, perform various assignments, tests, quizzes and submit home assignments remotely. E-learning environment was also used before the pandemic. The study courses in e-learning environment contain lecture notes, presentations, assignments and quizzes, students submit completed home assignments, write online tests.

The director of the study programme has the right to observe classes if there is a need to evaluate the performance of an academic staff member. The so-called “open classes” are held before elections to an academic position when the commission can participate in a lecture and assess the suitability of an applicant for a position.

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 procedures for the development of new study programmes within the study direction (including the approval of study programmes), the review of the study programmes, the aims, and regularity, as well as the stakeholders and their responsibilities. Description of the mechanism for obtaining and providing a feedback, including with regard to the work with the students, graduates, and employers.

The development of new study programmes is regulated by the decision No 10-5 of the Senate from March 13, 2019 and its supplement “Regulations on development, approval and changes in the study courses at LULST” (see annex Regulations on Study Programme Development.pdf).

According to the regulation, the new programme is discussed and analyzed during the meetings of Methodology Commission, the Board of a faculty and LULST Board of Studies before its approval by

the Senate.

The existing study programmes are regularly reviewed in each study year, as a result of which the annual report of the study direction is created. The reports only in Latvian are available on the LULST website: <https://www.LLU.lv/lv/studiju-un-reglamentejosie-dokumenti>. The reports are analysed in the meetings of Boards of faculties, the Studies Centre, the Board of Studies and approved by the Senate.

Every year the content of study courses included in the programme is reviewed, new information is added, bibliography is reviewed and updated by a responsible member of academic staff.

In the time period from 2018 – 2021 in the framework of the project “Management Improvement of Latvia University of Life Sciences and Technologies” all study programmes were carefully analysed and evaluated. International experts and employers’ representatives of a respective industry participated in the evaluation of programmes. Based on the experts’ recommendations from the professional organization “Latvia Association of Electric Power Engineers and Energy Installation Builders” (LEEAA) and the Department of Energy Application Engineering of Estonian University of Life Sciences and consulting firm Dynamic University, the activity plan was worked out to improve the study programme, which is being implemented now.

In 2016, the decision was made to change the title of the programme from “Agricultural Power Engineering” to “Applied Energy Engineering”, which more accurately reflects the content of the programme and sounds more attractive to young people and is based on the results of graduates’ and students’ surveys.

Surveys of students, graduates and employers are organized to obtain feedback. A more detailed analysis of the surveys can be found in Section 3 of the Self-Assessment Report. Program, Chapter 2.6. Analysis of the results of surveys of students, graduates and employers.

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 direction and the relevant study programmes are communicated by providing the respective examples.

Students have the opportunity and the right to submit proposals and complaints about the study process and related matters during their studies. Students can submit proposals:

- in a written or oral form at the level of a faculty – to an academic staff member responsible for the respective group, a director of the study programme, Vice-dean, or the Dean;
- in a written or oral form at the level of LULST management – to the Studies Centre, Vice-Rector for Studies, the Board of Studies and the Senate during review and approval of various internal documents.
- Using anonymous alert reporting system (in Latvian): <https://www.LLU.lv/lv/trauksmes-celsana>

The Regulation of Studies, which is available to all students on the LULST website: www.llu.lv/sites/default/files/2021-05/Study_regulation_2021_EN.pdf and in the intranet “My LLU”,

determines the procedure for submitting and reviewing complaints (appeals).

If a student has submitted a written complaint, then a written response have to be sent to the student after examining the complaint, if the review of the complaint has taken place without the student's presence.

A student can submit a complaint to LULST Academic Arbitrage, which operates according to the regulation.

No official complaints from students of the study direction "Power industry, Electrical Engineering and Electrical Technologies" have been received during the reference period. Unclear issues have been resolved by means of negotiations.

2.4. Provide information on the mechanism for collecting the statistical data, as developed by the higher education institution/ college. Specify the type of the data to be collected, the collection frequency, and the way the information is used to improve the study direction.

LULST collects and analyzes statistics from different angles and perspectives and with different regularity.

Once every month:

1. The number of students in study programmes, types and modes of studies, study directions and faculties; the compiled statistical data shall be submitted to the management of LULST and deans of faculties. Statistical data are used to follow the dynamics of the number of students at LULST.
2. The number of students in state-funded places: data are collected from study programmes in order to monitor the number of students in state-funded places. The statistical data are used to forecast the number of state-funded places for the next academic year and the number of places for student rotation (competition for state-funded study places) in each semester; the collected statistics shall be submitted to LULST management and deans of faculties, vice-deans of faculties if needed.

Once an academic year

1. The number of graduates in study programmes, study directions and faculties; the compiled statistical data are used to write various reports (for example, LULST annual report only in Latvian: <https://www.llu.lv/sites/default/files/2021-05/LLU-publiskais-parskats-2020.pdf>)
2. The admission results; the admission results from different angles. The admission results are used for planning admission limits and forecasts for the next academic year.
3. LULST statistical data compilation *Augstskola-1* for the Central Statistical Bureau (CSB). The data collection is based on the forms specified by the CSB. The statistical data shall be submitted to the Ministry of Education and Science and they are publicly available in Latvian in Ministry Homepage. The data are used to develop various reports (e.g., LULST annual report).

Once a year:

1. The compilation of statistical data by study directions for the previous study year; the number of students by study programmes, types and modes of studies, the number of

graduates, dropouts and reasons for suspending studies, statistics of international students. These data are received by all study programme directors and they are used for the drafting of annual reports of study directions for evaluation (reports are available only in Latvian on LULST home page).

2. The number of students in state-funded study places during a year; these data are used to prepare reports for LULST, Ministry of Agriculture and Ministry of Education and Science.
3. Summary of the performance indicators of the Educational programmes of the LULST Development Strategy 2015-2022. The data are used for the annual reports on the implementation of the Development Strategy and for the cascading of the performance indicators for the next year. Strategy implementation reports by faculties take place in face-to-face meetings.

2.5. Description and assessment of the integration of the standards set forth in Part 1 of the ESG. Specify which of the standards are considered a challenge and which require special attention.

Quality assurance policy

LULST Quality assurance policy system includes:

- responsibility of management of institutes, departments, faculties and other structural units as well as the management of the university, personnel members in charge and students for the quality assurance (see section 2.1);
- academic integrity and freedom, intolerance of academic misconduct (see section 1.7);
- combating all forms of intolerance and discrimination against students or staff;
- involvement of stakeholders in quality assurance by conducting surveys of employers and taking into account the recommendations of the LULST Advisory Board.

A brief general description of the LULST Quality Management System and assurance plan can be found here: <https://www.llu.lv/sites/default/files/2020-08/Quality%20Assurance%20System.pdf>

Development of programmes and approval

There is a precise procedure at LULST for the development of study programmes and their approval. The programmes correspond to the goals set for them, including the expected learning outcomes comprising knowledge, skills, competences. The qualification awarded after the completion of the programme “Applied Energy Engineering” is determined and described, and it corresponds to the professional standard “Engineer of Energy Systems” which corresponds to the 6th level of higher education in the national qualifications framework, therefore it is also applicable to the corresponding level of the European Higher Education Area qualifications framework.

Student-centred learning

Student-centred learning in the framework of the study direction and at LULST on the whole takes into account the students and respects their diverse needs by creating relevant learning pathways, for example, developing an individual approach for each student based on the offer by selecting options of programme implementation, including full-time or part-time studies. Various pedagogical methods are used according to the circumstances; Bloom’s taxonomy is applied in the development of study course programmes; students’ willingness to study independently is facilitated, at the same time the guidance and support of the teaching staff are ensured, for

example, out of every 40 working hours, which correspond to 1 CP (1.5 ETC), 24 hours are provided for students' individual work; students work on course projects and do homework independently, they receive consultations from the academic staff; relationship building is based on mutual respect between students and members of academic staff; there are appropriate procedures for dealing with student complaints (see section 1.1.7.).

Assessment criteria and methods as well as grading criteria are explained by academic staff in advance according the Regulation of Studies in English: www.llu.lv/sites/default/files/2021-05/Study_regulation_2021_EN.pdf , the assessment evaluates the achieved result of the learning outcomes.

There is a procedure for dealing with students' appeals, which is described in detail in the Regulation of Studies. It determines that students have the right to complain regarding a grade in the examination / final thesis, the organization and procedure of the study process, tuition fees, exmatriculation.

The matriculation, study process, recognition and certification of qualifications

Upon completion of their studies, students receive a diploma that explains the qualification obtained, including the learning outcomes achieved, as well as the context, level, content and status of the studies. (See Section 1.5)

. Students are entitled to fair recognition of their higher education qualifications, periods of study and previously acquired education, including recognition of non-formal and informal learning. (See Section 1.1.5).

Academic staff

The university offers opportunities and encourages academic staff members to improve their professional growth, which has received **increased attention** in recent years . In the time period 2019-2021, the ESF project No. 8.2.2.0/18/A/014 "LULST academic staff improvement" is being implemented, in the framework of which internship in a company is envisaged in the amount of 100h and 200h. In 2020 the training course "Training for study content improvement and quality management skills" was held in the volume of 32h for the directors of study directions and study programmes. There were also English language, ICT and other courses for academic staff members.

The university promotes research activities thus strengthening the link between education and science; there is a system of scientific motivation; the university promotes application of innovative teaching methods and ICT technologies in the organization of the study process: the university provides the training course "Innovations in didactics of higher education insitutions" in the volume of 160h, which is compulsory for academic staff members once in six years.

Learning resources and student support

LULST provides a wide range of resources for students: LULST fundamental library (see Section 1.3.3), learning infrastructure, laboratory equipment, there are specialized classrooms and laboratories, developed IT infrastructure, including computer classes, free WiFi, etc. (see Section 1.3.2), human resources – teaching staff, staff members for supporting students to solve various problems that are especially important for the first year students.

Modern updated infrastructure has always been a challenge due to funding, but funds are found both through infrastructure improvement projects and through collaboration with graduates and companies that help modernize laboratory equipment.

Information management

LULST collects, analyzes and uses the information needed for effective programme management. Every year, as of October 1, the information on students' progress, grades and dropout rates is collected both on the whole at LULST and in study programmes, which is included in annual self-evaluation reports. To find out students' opinion regarding a programme and its content, students are asked to fill in an anonymous online questionnaire on the LULST website. In addition, at the end of each semester students are entitled to fill in the questionnaire and express their opinion concerning academic staff members. This information becomes available to the director of the relevant institute or the head of the department, who evaluates the work of the academic staff member. The results of the survey are also taken into account in the elections of academic staff members to the academic position. The availability and the amount of text books and teaching aids for the study process is analyzed together with the staff of the fundamental library.

Publicity

LULST provides information on different activities, including the programmes offered and the selection criteria for university admissions on its website, in English: www.llu.lv/en/studies ; There is information on qualifications to be awarded, career opportunities, expected learning outcomes in the programme; the Regulation of Studies defines the organisation of the study process and assessment procedures, including minimum successful grade and requirements. The description of each study course contains requirements that must be satisfied in order to obtain credit points and a grade.

There is an increasing focus on informing the public. Recent statistics show a decrease in the number of students in Latvian universities and also in this direction of study. Therefore, video materials are prepared at LLU, in which study program directors and graduates participate, online programs with participation of graduates, virtual tours of faculties are prepared, information is placed on social networks, the website has a section on implementation of research projects at LLU, etc.

Evaluation and regular review of programmes

Study programmes were regularly evaluated and updated; students' opinion was found out both in interviews and in surveys. The collected information was analyzed, and the programme underwent improvements to reflect the development in the subject field, for example, in 2016 the name of the programme "Agricultural Power Engineering" was changed to "Applied Energy Engineering", but in 2020/2021, the corresponding professional standard for awarding a professional qualification was revised based on the latest developments and the employers' survey. Moreover, certain study courses were improved and additional themes were added following the recommendations of professional organizations. The changes were reflected in the annual self-assessment reports, which are available only in Latvian on the LULST website: <https://www.llu.lv/lv/studiju-virzienu-parskati-un-pasnovertejuma-zinojumi>

II - Description of the Study Direction (3. Resources and Provision of the Study Direction)

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

direction. Provide information on the costs per one student (for each relevant study programme of the study direction) by specifying the headings indicated in the calculation of costs and the percentage of the funding among the indicated headings.

The number of state-funded study places are approved in a tripartite agreement among the Ministry of Education and Science, Ministry of Agriculture and Latvia University of Life Sciences and Technologies (LULST). The tripartite agreement on funding determines that costs of one basic study place is 1,518.98 EUR, the study level coefficient for bachelor's degree programme is 1 and the social provision of the study place for bachelor's degree programmes is 164.34 EUR, the study cost coefficient for the thematic field of education for the professional bachelor's degree programme "Applied Energy Engineering" (since there is one programme in the direction, the above information on the direction refers also to the programme and vice versa) is 1.7 (the coefficients are different for each thematic field of education; they are determined in the regulations "Procedures for financing higher education institutions and colleges from the state budget" of the Cabinet of Ministers), the costs per student in the professional bachelor's degree programme "Applied Energy Engineering" account for 2,746.16 EUR

Every year the Senate of LULST approves the distribution of revenues and expenditures of the general budget of the university, which are drafted in accordance with the annual law "On the State Budget" adopted by the Saeima (the parliament) of the Republic of Latvia. The control and audit of the general budget is performed by an independent sworn auditor, whose analysis and report are examined and approved by the Senate.

Before the approval of the distribution of revenues and expenditures of the general budget by the Senate, it is reviewed, discussed and approved by the Working Group on Resource Use and Development, which consists of the Rector, Vice-Rectors, Chancellor, LULST Director, deans of all faculties, Head of Resources Accounting Center / Chief Accountant, Head of Finance Planning Centre, key economists, key specialists in real estate and legal issues.

The distribution of revenues and expenditures approved by the LULST Senate states that 80% of the state funding is allocated to remuneration and the remaining 20% to other costs. From privately funded study expenditures, 60% are allocated to remuneration and 40% to other costs, of which 20% are directly at the disposal of the faculty that implements the respective study programme. The base amount of funding for scientific research is calculated and allocated annually from active research activities. 50% of the base funding for scientific research is at the direct disposal of the faculty and the other 50% is to cover centralized costs. Research funding consists of funding attracted from projects.

The tuition fee in full-time studies for one semester is EUR 950.0, and in part-time studies is EUR 650.0.

The total distribution of the LULST general budget is made up by budgets of structural units / faculties which include costs by type of expenditure.

The expenditures for the bachelor's degree programme "Applied Energy Engineering" in 2020 consisted of:

- Salaries – 77%
- Scholarships – 6%
- Goods and services – 16% including utilities – 6%
- Equity capital formation – 1%

State funding by years

The tripartite agreement on state-funded study programmes determines that costs in the study direction and professional bachelor's degree programme "Applied Energy Engineering" ("Agricultural Power Engineering" until 2016) for one basic study place is 1,518.98 EUR, the study level coefficient for bachelor's degree programme is 1 and the social provision of a study place for bachelor's degree programmes is EUR 164.34, the study cost coefficient for the thematic field of education for the professional bachelor's degree programme "Applied Energy Engineering" is 1.7, costs per one student in the professional bachelor's programme "Applied Energy Engineering" account for EUR 2,745.96 (if there is a question why there is a difference in several cents for one student when figures are equal in 2020 and 2019 (in 2020 costs accounted for EUR 2746.16, the reason is that decimal numbers of percentage of study coefficient are slightly different. Rounding decimal numbers, the provision is 100%, but figures in the agreement in 2020 -, but in 2019 -%). The funding by years are included in Table 5.

Funding by years

Year	Basic costs of one study place, EUR	study level coefficient	Social provision of one study place, EUR	Study cost coefficient for the thematic field	Costs per one student, Eur
2020	1,518.98	1	164.34	1.7	2,746.16
2019	1,518.98	1	164.34	1.7	2,745.96
2018	1,458.51	1	164.34	1.7	2,642.77
2017	1,393.33	1	164.34	1.7	2,532.82
2016	1,333.11	1	164.34	1.7	2,078.35
2015	1,333.11	1	164.34	1.7	2,078.47
2014	1,333.11	1	164.34	1,7	2,061.90
2013	1,333.36	1	164.34	1,7	2,068.12

The costs per one student are also different in 2016, 2015, 2014 according to the study coefficient are: in 2016 – 84.45564%, in 2015 – 84.46058%, 2014 – 83.7295803%.

3.2. Provide information on the infrastructure and the material and technical provision required for the implementation of the study direction and the relevant study programmes. Specify whether the required provision is available to the higher education institution/ college, availability to the students, and the teaching staff (the specific equipment required for the relevant study programme shall be indicated in Part III, Chapter 3 below the respective study programme).

The infrastructure of the Faculty of Engineering is used for the implementation of the study direction as well as research and material facilities of the Institute of Power Engineering. It includes, for example, Laboratory of Digital Electronics, Laboratory of the Renewable Energy, Laboratory of Electric Drive and Heat Power Processes, Laboratory of Electric Installation and Maintenance, Laboratory of Computer Modelling, Laboratory of Electrical Engineering, Laboratory of General Electrical Engineering, Automation Laboratory, Laboratory of Alternative Energy and Laboratory of Heat Engineering. More detailed explanation on specific laboratory equipment is included in Section 3.1 of Chapter “Description of the Study programme” of the report.

High-quality standard of the study process is ensured by using a high level of digitization and application of information technology solutions. They are used in the study process and research activities. Students and academic staff members are provided with information technology infrastructure and services of high quality. LULST has developed an online system that provides each user with his or her own electronic identity (for accessing LULST IS system, e-studies system and LULST e-mails). Students register for online study courses in the LULST Moodle e-studies system.

To ensure high-quality study process, LULST e-learning system is used, which has open source learning platform MOODLE. This administration system of the platform is special in that it is designed by its users and is specially adapted to facilitate the pedagogical and study processes. LULST e-learning system offers various tools to make the course more effective. It provides an opportunity to upload and publish study materials, create online tests and conduct surveys, communicate between academic staff members and students, submit and evaluate assignments, and deliver lectures remotely. The e-learning system provides an opportunity to implement the learning process both online and using blended learning approach by combining traditional teaching methods that take place in classrooms with the possibilities offered by the Internet tools. The learning material posted online by teaching staff provides students with an opportunity to get acquainted with lecture materials in advance, thus having more time for discussions and problem-solving activities during contact lessons therefore it is possible to encourage in-depth understanding of the topic. The availability of teaching materials online provides access to materials for students and teaching staff at the desired time and place, thus it is not necessary to prepare and distribute copies of handouts and resources to students.

The schedule of classes is published online in LULST information system (IS). In IS students can see the title of a study course, the venue and the time where the classes or lectures are scheduled and the name of an academic staff member delivering the course. Students are entitled to apply for elective courses in the system.

LULST Fundamental Library is intended for informative and methodological support for students (See Section 3.3).

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 direction 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 direction, 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 options for the subscription to the databases.

Suitability of the library opening hours for students' needs

The opening hours of the library are adjusted to the needs of the main users of the library - students and academic staff. On weekdays, the library is open from 8.30 to 19.00, on Fridays from 8.30 to 17.00. The library is open also on the 1st Saturday of each month from 9.00 to 14.00. The Reading Room and Inquiry and Information Centre during the examination session are open until the midnight. The catalogue and online data bases are available without restrictions 24/7: <https://llufb.llu.lv/en>

Information about the premises in the LULST Fundamental Library

Room No.	Premises	Area, m²
161.	Loan desk	26.9
254.	Reading Room	396
	The balcony of the reading room	223
255-1.	Silent Reading Room	34.3
255.	Inquiry and Information Centre	57.6
76.	Text book lending service	49.3
Total:		787.1

The Reading Room has comfortable work places both in the hall and on the balcony. Internet and WI-FI are available. The reading room also has a seating area with comfortable sofas. There is also a quiet reading room. The Inquiry and Information Centre has computers and the services of a qualified consultant.

Library services

LULST FB offers such services **free of charge**:

- use of a computer with the Internet connection and wireless Internet,
- software *Autodesk EDU Master suite 2018 (AutoCAD, AutoCAD Structural Detailing, Autodesk Robot Structural Analysis professional etc..), CorelDRAW X7, SPSS Statistics v21, VISIO 2013,*
- use of the databases created, subscribed by the library and free-of-charge databases 24/7,
- borrowing/lending of books, periodicals and other documents,

- training to work with full-text and bibliographic databases, advice for the work with a computer and the Internet,
- classes for LULST academic staff, including online, on information search, retrieval, creation of personal accounts, uploading of publications from the LULST academic staff and researchers' publications database to the LULST IS personal account, creation of for training work with full-text and bibliographic database, *Mendeley*, creation of the researcher's ID number for *ORCID* and *Research ID*,
- classes for doctoral students, master students, undergraduate students, including to international students in English,
- development of handouts tailored specifically for each target audience (researchers, students, other users) and sending by e-mail upon request,
- answering to inquiries and consultations about the library and its services,
- editing bibliographies, sending examples of descriptions by e-mail upon request,
- exhibitions if requested.

LULST FB offers such services **for a fee**:

- copying (color, black and white),
- printing (color, black and white),
- scanning,
- written thematic inquiries,
- intercity library subscription and international library subscription (expenses of the mail service should be covered)
- delivery of the copies of documents (suppliers' price),
- spiral binding.

LULST FB offers such services **e-services**:

- Use of electronic catalogue 24/7,
- electronic reservation of books, extension of the delivery deadline 24/7,
- use the joint information search tool *PRIMO DISCOVERY*,
- use of library-created, subscribed and free online databases (both full-text and bibliographic) 24/7, the service: "*Ask a librarian*" of the database *EBSCO*,
- possibilities to connect to the subscribed e-journal and e-book databases outside the LULST network, using *EZproxy* and LULST IS user account 24/7,
- use of search tool *Mendeley* for scientific resources,
 - opportunities to use other online information resources from the library website
 - possibilities to connect from the library website to the electronic catalogues of information centres of the faculties of LULST (BIS *ALEPH500*),
 - possibilities from the library' website to use instructions and support materials offered by the LULST Fundamental Library and administration of databases
- delivery of electronic documents,
- "*Ask a librarian*" *Skype*,
- "*Book request form*" in the library's website.

Available databases in the relevant field, statistics of their use

LULST Fundamental Library offers its users a variety of online databases and databases in other browsers. The library has purchased the joint information search tool *PRIMO DISCOVERY*, which provides simultaneous search in subscribed and open access online databases, the electronic Joint Catalogue of the country' libraries, databases created by LULST FB (publications of LULST academic staff and researchers, master theses of LULST students, etc.). After having registered the LULST IS user account, it is possible to see one's own account and extend the deadlines for borrowed books,

order publications, access full texts in subscribed online databases, save your search results. "Assistance to find information PRIMO" is available on the library's website. Access to online databases is provided 24/7 in the LULST network, as well as to authorized users outside the LULST network, using the *EZproxy* and LULST IS user account.

Before offering databases to users, they are analyzed for search options, thematic coverage, chronological coverage, and access options. Information about databases is prepared and their descriptions are posted on the LULST FB website.

LULST FB users have the opportunity to search for information in the following subscribed foreign and Latvian online databases:

- *CAB Abstracts*,
- *CRC Press* e-books,
- *EBSCO eBook Academic Collection* datubāzē, a database covering a wide range various topics and areas and containing more than 228,515 e-books,
- *EBSCO host* databases *Academic Search Complete*, *MasterFILE Premier* and others,
- *ScienceDirect Journals*,
- *Scopus*,
- *SciVal*,
- *Web of Science*,
- *Wiley Online Journals*,
- *Lursoft*.

Use of subscribed international databases in LULST Fundamental Library (example 2018)

Database	Number of connections	Number of searches
<i>Britannica</i>	873	207,755
<i>CAB Abstracts</i>	1,806	5,434
<i>EBSCO</i>	31,725	100,300
<i>EBSCO e-book</i>	4,538	14,552
<i>ScienceDirect Journal</i>	21,212	53,634
<i>Scopus</i>	7,451	13,586
<i>Web of Science</i>	3,733	6,822
<i>Wiley Online Journals</i>	2,284	6,658

In cooperation with the Cultural Information System Centre, various online databases are also regularly offered for information during the trial period.

Readers are also offered databases created by the employees of the LULST Fundamental Library:

- *"Publications of LULST academic staff and researchers",*
- *"Defended doctoral theses at LULST"*
- *"The proceeding of conferences at LULST",*
- *"Patent publications of LULST academic staff members and researchers",*
- *"Publications on Latvia University of Life Sciences and Technologies".*

LULST Fundamental Library participates in the development of the international AGRIS database as the Depository Library of the Food and Agriculture Organization of the United Nations and the AGRIS National Centre.

Procedure of adding stock and database subscription in the library and opportunities

The library's stock is mainly compiled according to the recommendation of the academic staff members. "The book request form" is available on the library's website. Based on requests of academic staff and other library users, LULST Fundamental Library purchases the requested editions. "The Stock Acquisition Policy" has been worked out for LULST Fundamental Library, which determines that the main priority in the purchase of the stock is given to study programmes and research directions of LULST. In accordance with the "Rule of Compulsory Copies", the LULST Fundamental Library, as a library of national significance, receives one copy of each printed edition and electronic publication in the subject fields of the LULST.

In cooperation with the Cultural Information Systems Centre, the library offers its users to try many databases available in the world. The library employees carefully evaluate the statistics of the use of both subscribed and trial databases. As a result, based on the trial statistics and recommendations of the academic staff, a decision is made as to which database the library is willing to subscribe.

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

The recruitment and employment procedure of the members of academic staff at LULST (announcement of vacancies, hiring process, election procedure to academic position, etc.) is regulated by "LULST Regulation on Academic Positions" approved by the Senate of LULST. (see annex LLU_Regulations_on_Academic_positions_EN.pdf)

Selection

The number of positions for professors, associate professors and assistant professors in the relevant sub-branch of science in accordance with the funding possibilities and the need for the implementation of respective study programmes is determined by the Senate of LULST based on the decision of the board of a faculty. The academic position at LULST is taken in accordance with the procedure of an open competition determined in "LULST Regulation on Academic Positions".

Requirements

It is required that applicants for an academic position has a scientific or academic degree specified

for the specific position. Requirements for applicants for academic positions are determined by the Law on Higher Education Institutions.

Requirements common to all applicants for academic positions are as follows:

- knowledge of the official language (Latvian) in accordance with the requirements of regulatory enactments;
- knowledge of foreign languages at the level required for the fulfilment of the duties of the academic position (including delivering lectures in these languages)
- continuous improvement of one's academic and scientific qualification.

Election

Based on the proposals on the vacant academic positions received from the academic structural units, the Personnel Department shall prepare a draft announcement and submit it to the Committee for Academic Staff and Structural Policy (hereinafter referred to as "Committee") for approval. Following the decision made by the meeting of the Committee, the Personnel Department shall prepare a draft decision on the vacant positions and submit it to the Senate of LULST for approval. Having received the decision issued by the Senate of LULST, the Personnel Department shall announce an open competition for the vacant academic positions in the official publisher of Latvia "Latvijas Vēstnesis" and LULST website.

Elections of professors and associate professors take place by secret ballot in the respective professors' boards not later than 4 months after the day of the announcement of the competition, election of assistant professors, leading researchers, researchers, lecturers, assistants and scientific assistants take place in the boards of faculties not later than 3 months after the day of the announcement of the competition, elections to the positions of leading researchers, researchers, and scientific assistants take place in the scientific boards of research institutes not later than 2 months after the day of the announcement of the competition.

The Rector concludes an agreement with an elected person to the academic position for the determined time period.

If LULST has a vacant academic position, the Senate of LULST may decide not to announce a competition upon the proposal of the board of a faculty. In this case, the Rector may hire a visiting professor, visiting associate professor, visiting assistant professor, guest lecturer or visiting assistant for a period of up to two years.

Individual academic work of academic staff in each academic year is planned according to "*Regulation on Calculation of Academic Workload*" and the Rector's regulation "*On Planning, Accounting and Control of Individual Load of Academic Staff in an Academic year*" which determine the components of academic workload, its calculation, procedures of accounting and control.

The salary of academic positions is determined according to the regulations of the Cabinet of Ministers "*Regulations on Teaching Staff Salaries*" and the Rector's regulation "*On Teaching Staff Salaries*".

3.5. 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

qualification (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 university has developed procedures and regulations (approved by the Senate) to ensure the qualification and quality of work of the academic staff:

1. *LULST Regulation on academic positions* (Senate decision No. 10-155 from 14.04.2021, see annex: *Regulation on academic positions-2021-2022.pdf*)
2. *Regulation on Calculation of Academic Workload* (see annex: *Regulation_on_Calculation_of_Academic_Workload.pdf*)
3. LULST academic staff motivation system
4. Lectures for students are scheduled in accordance with the procedure approved by the Rector's regulation: as regards full-time studies, lectures are planned centrally, as regards part-time studies, lectures are planned by a faculty. The schedules are publicly available 2 weeks before the beginning of each semester (in part-time studies before the beginning of the session).

An open competition is announced for vacancies for elected positions, information about which is published in the official media *Latvijas Vēstnesis* and on the LLU website. Applicants apply within a month.

The regulation on academic positions ensures that academic staff with qualifications relevant to the position shall be hired, but the motivation system stimulates the quality of work.

The professional development of the academic staff envisages both the acquisition of appropriate professional development training programmes and the exchange of experience and participation in conferences and seminars, also internship outside LULST which is confirmed by the documents issued at the end of them.

To improve professional qualification of academic staff, the ESF project No8.2.3.0/18/A/009 "Management Improvement at Latvia University of Life Sciences and Technologies" was launched in 2019, and it will finish in August, 2021. Its aim is to improve the quality of the content of LULST study programmes and to ensure better management of the higher education institution and to develop the competences and skills of the management staff by means of effective use of available resources. The total funding of the project is EUR 1,059,598.00.

Training courses for academic staff were envisaged in a foreign language, IT technologies, but training courses for directors of study programmes were envisaged in improvement of the study process, quality management, etc.

The teaching staff involved in the study direction actively uses opportunities for professional growth. Professional development activities of academic staff members are available in the annexes of their CVs, certificates evidencing in-service training can be viewed in the e-environment in the individual accounts of LULSTIS. For example, Director of the study programme "Applied Energy Engineering" in 2019 and 2020 participated in several professional growth activities: professional qualification improvement in the heat power engineering company Ltd "Salaspils Siltums", amount 100 h, participation in the conference "LULST on the Way to Assessment of Study Directions and Accreditation"; participation in the seminar "The research results on demand trends

for labour market for 2030” by "Dynamic University, Ltd., in several seminars organized by Zemgale Regional Energy Agency, participation in the training course by "Forceo Consulting", Ltd., “Training for study content improvement and quality management skills” etc. These events allow academic staff to get acquainted with the current trends in power engineering and to improve the management of the study programme and its content.

In 2019/2020, the professor of the Institute of Energetics participated in 14 professional development activities in Latvia, Germany, Russia, e.t.c.

Every six years, academic staff members are entitled to paid academic leave of six calendar months for scientific research or scientific work outside their place of work.

The procedure of professional development activities is determined in the regulations “*On the education and professional qualifications required for educators and the procedure for improving the professional competence of educators*” of the Cabinet of Ministers. These regulations stipulate that the pedagogical qualification required for the teaching staff of higher education institutions must be obtained in further education in professional development programmes on innovations in the higher education system, higher education didactics or educational work management in the amount of 160 academic hours (including at least 60 contact hours) until the end of the term in the elected academic position. LULST has established a professional development programme for academic staff of the university "Innovations in Didactics of Higher Education Institutions", that is mandatory for teachers every 6 years. The aim of the programme is to improve the knowledge of university teaching staff in didactics of higher education and its application in pedagogical activities. Upon completion of this programme, participants receive a certificate.

3.6. Provide information on the number of the teaching staff members involved in the implementation of the relevant study programmes of the study direction, as well as the analysis and assessment of the academic and research workload. Provide the assessment of the incoming and outgoing mobility of the teaching staff over the reporting period, the mobility dynamics, and the issues which the higher education institution/ college must tackle with regard to the mobility of the teaching staff.

The statistical data of 2020 shows the distribution of the number of the university teaching staff involved in the implementation of the study programme across academic positions:

The number of academic staff involved in the implementation of the programme in 2020

Position	Number
Professors	5
Associate Professors	8
Assistant Professors (Docents)	7
Visiting Assistant Professors (Docents)	3

Lecturers	7
Guest lecturers	14
Total:	48

The total number of academic staff members involved in the implementation of the programme at mentioned year is 48 (including three lecturers and one assistant professor (docent) in Sports and Practical Farm, these courses are taken out from study program in Year 2021), but it varies from year to year. 62% of academic staff take elected positions and 38% account for the staff which is not elected. Altogether there are 6.33 staff loads. Accordingly, 0.51 of the load is taken by professors (including Professor Emeritus), the load for associate professors' positions accounts for 1.19, the load for assistant professors' positions accounts for 0.96, the load for lecturers' positions accounts for 3.6. The student-teacher ratio is 13.4, which is similar to the student-teacher ratio at LULST on the whole which is 13.2.

Number of academic workloads in positions:

	Profesors	Asoc.profesors	Docents	Lektors	Total
Academic load	0.51	1.19	0.96	3.6	6.33

14 lecturers are at the same time leading researchers and 4 lecturers are researchers. There are 6 leading researchers outside the teaching staff of the Institute of Energetics, which is the profiling unit of the field. As can be seen, out of a total of 48, 13 are the most qualified teachers, i. professors and assoc.profesors, which makes up 25%. 5 professors and associate professors are involved in the implementation of professional specialization courses.

The largest part of the academic workload consists of lecturers - 3.6, then associate professors - 1.19, and docents - 0.96.

The most important role in the study process and reaching the results of direction is given by the teaching staff of the Institute of Energetics, as they are responsible for both the theoretical basic courses of the field and the special and limited choice study courses of the field.

Correspondingly, from the total academic workload of the involved teaching staff in the implementation of the study field, 6.33, almost 70% is the workload of the teaching staff of the Energy Institute (4.22).

The table gives a description of the academic and research workload of the teaching staff of the Institute of Energetics, in the 2020/2021 study year:

Possition	Number	Academic workload	Research workload
Professors	3	0,55	1,73
Asoc.profesorss	2	1,14	0,73
Docents	2	0,77	0,2
Lecturers	5	1,76	0,35
Total:	12	4,22	3,01

The table shows that professors have the largest share of research workload, while lecturers have the largest share of academic workload. This is fully in line with the nature of the positions, which determine the role of the professor in research and, accordingly, the role of other positions in the implementation of the study process.

In the reference period academic staff members participated in the 23 outgoing international mobilities (see. annex "Teaching staff mobility") to higher educational institutions abroad either to deliver lectures or to training courses. There were two incoming international mobilities (see Section 5.2). The international mobility of staff is generally evenly distributed over the years, a slight increase is observed at the end of the reporting period. Incoming mobility of high-level academic staff is mainly hampered by financial considerations, there is no particular interest in participating in mobility activities by representatives of universities from abroad. Outgoing mobility is mainly influenced by the current workload of teachers (the lack of time in addition to investing work in preparing lectures and materials in a foreign language), as well as self-assessment of foreign language proficiency skills (sometimes staff members underestimate themselves).

3.7. 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.).

Financial support

During the period of studies, students can receive financial support in the form of scholarships (see annex "Awarding Scholarships")). The following scholarships are provided on competitive basis:

1. The state scholarships in undergraduate and master's degree studies in the amount of EUR 99.60 per month (during COVID-19 it was raised to EUR 200 EUR per month);
2. One-time scholarship - students can apply for a one-time scholarship in the amount of 2 minimum scholarships during a semester;
3. A scholarship for obtaining a scientific degree; it is a scholarship equivalent to a loan in the amount of EUR 85.37 (granting of scholarships was suspended from March 1, 2020).
4. A scholarship provided by the LULST Foundation "*Attīstības fonds*". The foundation offers a total of 18 scholarship programs to students (from EUR 40 to 1,500). Scholarships range from monthly to one-time.

Support and exemptions from paying a tuition fee

LULST offers exemptions from paying a tuition fee (50-100%) for successful students in the following cases:

1. LULST employees who study in the doctoral programmes.
2. Children of LULST employees.
3. The first and second groups of people with special needs.
4. Orphans or persons without parental support
5. Sportsmen who study at LULST.

Part-time students are given the opportunity to take examinations, submit colloquia, etc. also outside the session time, in teacher reception times, etc. The tuition fee can also be paid by dividing it into several payments.

Full-time students of the study direction **“Power industry, Electrical Engineering and Electrical Technologies”** are entitled to apply for various scholarships which are reflected in annex Scholarships for Students). The regulation is available in annex Awarding Scholarships.pdf.

To help first-year students get used to the study environment, a tutor is appointed for the course, usually from the youngest lecturers, who help to solve various issues related to studies, everyday life, etc.

LULST provides the support to international students(incl. mobility students) in the following issues:

- application for studies is implemented using the e-admission system “Dream Apply”, which provides partially formalized admission procedures and thus significantly facilitates communication of an applicant with LULST; International Cooperation Centre coordinators individually answer applicants’ individual questions;
- all international students are provided with accommodation in comfortable dormitories;
- in order to acquaint international full-time and exchange students with the study and living environment of LULST and the culture heritage of Latvia, a “Welcome Week” is organized for international students in the first week of each semester, during which corporate team building activities are arranged;
- LULST International Cooperation Centre provides technical support for obtaining / extending visas, residence permits and insurance;
- LULST International Cooperation Centre and external relations coordinators of faculties as well as study programme directors inform international students about LULST internal regulations and their application in traineeship, provide consultations on study process and household issues, help to draw up documents and solve problems, etc.
- There is a group of “Erasmus Student Network” and LULST Student Self-government which organizes student leisure and cultural events.
- External relations coordinators of faculties inform students about available health care at general practitioners and Jelgava polyclinic, and, if necessary, perform the functions of a companion;
- From 2019/2020 a survey of international students was introduced to find out their opinion on the quality of the study courses.

LLU Students 'Self-Government (LLU SP) is an organization representing university students, which deals with important issues of academic, social, cultural and sports life, represents and defends students' opinions and rights. Student self-government provides significant support in student involvement, adaptation and study process:

1. Organizing the introductory event for freshmen “On the starting line at LLU”, as well as the freshmen seminar “LLU & CHILL”, during which young students get acquainted with the study environment, faculty, each other and senior students;
2. Representing the opinion of LLU students in the Latvian Students' Union, LULST Senate, Convention, Study Board;
- 3.. Enables students to relax outside their studies by organizing educational cohesion events, sports events, as well as more informal atmosphere events, “Smart Owls”, “LLU SP street sports games”, “FSP sports games”, “Meet & Greet”, “Loco Fiestos” ;
4. Participating in events organized by other HEI institutions, as well as organizing events together with other HEIs “KUBS”, “KRS?”;
5. Organizing the “LLU annual award” together with other faculty student self-governments, thus promoting better communication exchange between LLU faculties.

The following LLU SP events serve career support: Creating twinning events with other HEIs, which give students a greater opportunity to get acquainted with future professionals from similar fields; Seminars "Breakthrough", in which every LLU student can participate in order to gain experience for their growth and future career; By cooperating with Jelgava companies, organizing joint events, giving students the opportunity to participate in events outside the university (eg "On the starting line LLU"), etc. The study program "Applied Energy" is not implemented in foreign languages, therefore there are no foreign students in this program. Consequently, it is not possible to talk about career support for foreign students within the program.

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- Creating twinning events with other HEIs, which give students a greater opportunity to get acquainted with future professionals from similar fields;
- Seminars "Breakthrough", in which every LLU student can participate in order to gain experience for their growth and future career;
- By cooperating with Jelgava companies, organizing joint events, giving students the opportunity to participate in events outside the university (eg "On the starting line LLU"), etc.

The study program "Applied Energy Engineering" is not implemented in foreign languages, therefore there are no foreign students in this program.

Consequently, it is not possible to talk about career support for foreign students within this program.

Psychological support for students is provided by the Directors of Study Programs, for foreign students by Erasmus coordinators of the Faculties, curators of student groups from among the teaching staff, with the help of which various problems can be solved, incl. those related to everyday life, psychological comfort, helping, for example, a foreign student (including a mobility student) to get acquainted with the study process, environment, relations with course members outside it, etc. LLU SP organizes events in which foreign students are also invited to participate. An example is the "English Club", organized by the LULST Language Center, where local and foreign students met, as well as invited guests from abroad.

II - Description of the Study Direction (4. Scientific Research and Artistic Creation)

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

22 projects and contract research have been completed or are in the process of implementation in the reference period from 2013-2020 in the relation to the study direction and which involve academic staff of the study direction (see annex "Research and Projects")

The directions of scientific research are closely related to power engineering, i.e., both power supply and energy use, including in agriculture. They fully correspond to certain priority research directions of LULST, including engineering:

https://www.LLU.lv/sites/default/files/2020-12/StrategijaENG_8_12_2020.pdf), which has the following sub-fields:

- Use of sustainable energy in vehicles – 3 projects;
- Smart technologies and robots biosystems – 4 projects;
- Production and use of renewable energy – 5 projects;
- Decrease and rational use of production by-products and residues – 2 projects;
- Information technology solutions, mathematical modelling and application of statistics in agricultural, environmental and forestry sciences – 3 projects;
- Research of biologically active substances in food raw materials and products – 1 project.

In addition, four contract research activities have been conducted related to power supply provision on behalf of power supply companies:

- The contract research between LULST and AS "Latvenergo" No. 010000/17-451 "Feasibility study of energy storage and sources of distributed generation in electrical distribution network and customer power supply".
- The contract research between LULST and AS "Latvenergo" No. 010000/15-574AS "Testing the properties of nanocoatings for electrical equipment"
- The contract research between LULST and AS "Latvenergo" No.010000/15-573. "Experimental testing of selective operation of low voltage short circuit and overload protection equipment".
- The contract research between LULST and AS "Latvenergo" No: 04.4-08/L-TPK-08-007/66. "Improving the microclimate of switchboards and compact transformer substations".

Research directions fully support the vision of development: LULST as a university specializing in the sustainable use of natural resources to improve the quality of life in society

Likewise, research directions are closely related to the goals of the study direction (see Section 1.1.2).

Academic staff members participate or manage various scientific research projects both at LULST and in cooperation with other institutions and universities.

It should be noted that other research projects in other directions have been implemented as well. This report does not mention staff members who involved in the research projects implemented in other fields of science (e.g., Food Technology, Chemistry, Metalworking, Social Sciences, etc.).

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.

The directions of scientific research carried out by the academic staff members can be divided into three parts:

1. Academic staff outside Institute of Energetics conduct research activities in their fields of science, for example, Chemistry, Mathematics, Social Sciences. It develops competence in their subject field and the acquired knowledge is transferred to the study process through the taught courses.

2. Scientific activities closely related to the energy sector. They are mainly conducted by academic staff of the leading institutions of the study program, i. Institute of Energetics (IE) in collaboration with others, and the obtained research results are applied in the study process and the acquired knowledge is delivered to students in the field of power engineering. For example, results of research conducted in the Laboratory of Biofuels is included in the study course "Bioenergy", solar energy research results conducted by IE academic staff are used in the study course "Renewable Energy and Energy Economy", heat supply system research results are integrated in the course "Heat sources", and the results of the research initiated by AS "Latvenergo" enrich the study courses related to power supply, e.g. "Electric Power Stations and Networks", "Maintenance of Electrical Equipment", etc.
3. Interdisciplinary research carried out by IE researchers and academic staff in collaboration with researchers from other fields, such as research on the power supply of agricultural robots, makes it possible to link autonomous power supply solutions with agricultural technologies, etc.

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.

In the reference period of 2013-2020 the following cooperation in research activities was carried out in the fields corresponding to the content of the study programme:

1. International cooperation with the University of Scotland Strathclyde in Glasgow was implemented in the research on wind energy and wind turbine design solutions, in particular on the design and control principles of vertical axis wind turbines <http://www.strath.ac.uk/>. A doctoral student of the Institute of Energetics of the Faculty of Engineering (LULST) was involved in the research and then he took part in the delivery of the course "Renewable energy and energy economics" in the programme "Applied Power Engineering".
2. Participation in the international project "VAWT - FlyFox-B-Phase". The project was ordered by the company „WindFire B.V." from the Netherlands which is represented by the company "WindFire", Ltd, in Latvia. A doctoral student of the Institute of Energetics of the Faculty of Engineering (LULST) was involved in the research and then he took part in the delivery of the course "Alternative Energy and Energy Economics" in the programme "Applied Energy Engineering".
3. A professor of the Institute of Energetics worked as an expert in the EUROPEAN COMMISSION CORDIS Seventh Framework Programme, FP7 Programme for Research and Innovation, (Brussels from 2002) CT EX 2002B064544, FP6-FP7, an expert - EUROPEAN COMMISSION. RTD / T/ 4 EXPERT CT EX 2002B064544-101, conducted ES FP7, 2012-2013 FP7-SME-2013-1 "Research for SMEs".
4. A professor of the Institute of Energetics worked as an expert in: EUROPEAN COMMISSION. HORIZON 2020. The EU Framework Programme for Research and Innovation, Expert. EX2012D127968.
5. A professor of the Institute of Energetics managed INTERREG IV A co-funded by the cross-border cooperation programme "Concepts of using reed biomass for energy production and

construction - COFREEN". New concepts and knowledge were integrated in the study course "Alternative Energy and Energy Economics" in the programme "Applied Energy Engineering".

6. A professor of the Institute of Energetics participated in INTERREG IV A cross-border cooperation programme co-funded by Baltic Sea Region project 2007-2013 "Use Science: Leveraging Practical Use of Science for Innovation-Driven Entrepreneurship"
7. A professor of the Institute of Energetics cooperated with a leading agricultural scientific centre in Bavaria "LfL- Institut für Landtechnik (Freising-Weihenstephan)", as well as "LfL -IfA Institut für Agrobiologie (Freising)" in the field of agricultural mechatronics.
8. A professor of the Institute of Energetics participated in the scientific expertise of EU European Commission project HORIZON 2020. An expert No. H2020 EIC-FTI 2019 - CT-EX2012D127968-101, EIC-Fast Track to Innovation (FTI).

The teaching staff has many joint publications with scientists from other countries (see the annex "Publications of the teaching staff" at section 4.4. as well as in individual CV of teaching staff).

The teaching staff of the field actively participate in the organization of the international scientific conference "Engineering for Rural Development" and in the preparation and review of the proceedings. This is one of the largest conferences of its kind in the region, which attracts a large number of participants from many countries of the world, the program committee includes representatives from 15 countries, incl. Australia, Great Britain, Czech Republic, Ukraine, Italy, etc. Conference papers are indexed in databases such as AGRIS; CAB ABSTRACTS; CABI full text; EBSCO Academic Search Complete; Thomson Reuters Web of Science; Elsevier Scopus; PROQUEST et al. the volume is 1849 pages.

Participation in cooperation activities facilitates the professional growth of the academic staff, which has a positive effect on the implementation of any study programme.

Present cooperation initiatives will be continued, as well as new opportunities for international cooperation in scientific research will be sought.

Further plans for the development of international cooperation in scientific research:

- The Institute of Energetic, in cooperation with "Latvenergo AS", is investigating the possibilities of installing electrical microgrids using renewable resources in remote private facilities. Similar research is being conducted at the Estonian University of Life Sciences in Tartu. In the future, joint publications and scientific projects are planned;
- to initiate and develop cooperation with Aberdeen University, Scotland - for the purification and storage of biogas and hydrogen obtained from it in a porous environment (environment similar to the Inčukalns gas storage). Joint participation in the Horizon 2020 project is being discussed at the time of submission of the report;
- to develop cooperation with the Czech University of Life Sciences and the Canadian manufacturer of Fuel Cells "Ballard" by conducting research on the use of hydrogen cells in the energy supply of agricultural machinery (especially for mobile machinery - tractors, transport equipment);
- to participate in the development of the energy island, based on renewable energy resources (wind, solar, biomass) (microgrid) in separate free territories - bogs, barren soils, etc. - cooperation with private entrepreneurs - entrepreneurs in Latvia, Germany and Uzbekistan (currently partners "Latvenergo AS", Ltd "Laflora" (German and Latvian joint venture, possibilities to attract a corresponding university in Germany are being considered), Nukushu University in Uzbekistan);
- to continue participation in the potential cooperation plan of Latvian science institutions and the company "Infineon Technologies" organized by Investment and Development Agency of Latvia. Institute of Energetic research would cover precision plant-level agricultural robot

sensor and mechanical manipulator equipment research and development;

- to develop co-operation with the Estonian University of Life Sciences in the field of application of alternative energy sources, to conduct joint research with colleagues in the field of energy and to create joint scientific publications, as well as to participate in conferences;
- to continue and develop the direction of agricultural robotics, focusing on the control of weeds and pests. Currently, two doctoral candidates from Lithuania are working in this direction at the Institute of Energetics,

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 direction by providing examples and the summary of the quantitative data on the activities in the field of scientific research and/or artistic creation relevant to the study direction over the reporting period, for instance, the publications, participation in conferences, activities in the field of artistic creation, participation in projects by the academic staff members, etc., by listing the aforementioned according to the relevance.

According to the requirements for the elected positions, the teaching staff applying for the respective position has a certain amount of scientific work to be performed. It is determined by the "Regulation on Academic Positions" for professors and associate professors, which have been approved by the Senate of LULST (see annex in section 3.4.). Requirements include scientific publications, reports, research projects, work as an expert, patents and licenses, reviewing of doctoral theses.

In addition, the contribution of the academic staff in research is evaluated every year and there is remuneration based on the performance achievement.

The involvement of the teaching staff in scientific research is promoted as follows:

- the above-mentioned Regulations for the Election of Professors and Associate Professors determine the mandatory requirements to perform scientific research activities in these positions;
- as already mentioned above, the contribution of any lecturer to scientific research is materially stimulated by summarizing the achievements in scientific research for a particular year, creating a supplement to the basic salary, it promotes the involvement of lecturers in research.

In the time period of 2013- 2020 the academic staff members of the study direction "Energy Engineering, Electrical Engineering, Electrical Technologies" have produced **145 scientific publications**, including 124 in international peer-reviewed and anonymously reviewed international scientific editions, 9 patents, 10 international conference proceedings (Abstracts) and 2 other scientific publications (See annex "Publications"). The staff members have delivered 38 reports in the scientific conferences (in the time period of 2015-2020), implemented 22 projects (See annex in Section 4.1.) In addition, there are research in other fields of science that are not included here.

Main directions of research are as follows:

- Renewable energy (biogas, biomass, solar and wind energy);
- Electric power transmission and use (transition processes of power transmission elements,

microclimate of transformer substations, research of operation of low voltage short-circuit and overload protection devices, research of nanocoating properties of electrical elements, etc.);

- Energy storage;
- Electric power supply for mobile units (electric power supply and control of agricultural robots);
- Electric transport (charging options, emission-free heating solutions);
- Heat supply (optimization of heating network operating modes, innovative heating system solutions);
- and others.

4.5. Specify how the involvement of the students in scientific 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 direction in scientific research and/or artistic creation activities by giving examples of the opportunities offered to and used by the students.

Students are involved in research activities in several ways. In the program “Applied Energy Engineering” there is a compulsory study course “Fundamentals of Engineering Work”, within which an experimental or analytical study must be performed, data must be collected and processed, and a job description / report must be written. Sometimes active students have their own ideas, and they approach academic staff members, who help to implement the ideas. It happens during the process of working on a final thesis or in the development of the course project in “Fundamentals of Engineering Work”.

In the research section of “Fundamentals of Engineering Work”, students engage in research activities on various topics. Examples of topics of course projects: "Application of pilot drones in AS "Augstsprieguma tīkls" power line maintenance", "20 kV overhead line solutions, costs, operation", "Development of interior lighting control software with motion sensors", where real life measurements were performed, data were analyzed, conclusions were drawn and proposals were made.

As a matter of fact, academic staff members involved in the research projects invite students to become participants of the projects. For example, a student participated in the project of a research contract “Compact Transformer Substations”, which resulted in the elaboration of a final thesis.

During the work on final theses authors conducted research on the spot, for example, measured microclimate parameters in buildings to optimize heat energy supply, monitored the operating parameters of a specific energy equipment and obtained data for statistical processing and further calculations.

In the framework of some studies, experimental devices in laboratories of the faculty were created. For example, a student made a prototype of a fuel briquette press on his own, then produced briquettes from cardboard packaging waste and studied their properties using a calorimeter in the laboratory of Institute of Energetics. Another student analyzed and performed experiments to investigate possibilities of using a laser to improve the safety of pedestrian crossings. Another student conducted research activities on the causes and diagnosis of electric engine failure, developed a methodology for determining bearing wear in the electric engine and its relationship with the working resource. An interesting study was conducted by a student who investigated the

use of aluminum for hydrogen production, where an experimental cell was created, and hydrogen production processes were studied. To sum up, different analytical and experimental research activities have been conducted.

Faculties organize annual scientific conferences for students where they present the results of their research activities in the form of presentation and a summary of theses. In addition, the university organizes the annual international conference “Students on Their Way to Science” comprising work in sections and the publication of abstracts in the conference proceedings. The 15th such conference was held in 2020.

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 study direction subject to the assessment, by giving the respective examples and assessing their impact on the study process.

Starting from 2019, employees of the Institute of Energetics with the help of students have been organizing the event “Latvian Robotics Championship in Jelgava”, within the framework of the machinery and innovation festival “Mehatrons”. During the day, robot sumo fights took place, in which an opponent's robot had to be pushed out of the ring, line-following competition where the robot had to move along a certain route by using sensors, and other disciplines, including the VEX challenge, which develops computer-based thinking using programmable educational robots as well as “Folkrace” which was a robot race to overcome obstacles. Both students and schoolchildren took part in the event. The robotics championship in Jelgava is a special event, because the city has a rich engineering history and nowadays the field of engineering is being developed at all levels of education. The information on the activities of the last event is available in: <http://robotuskola.lv/en/jrc2019-en/> .

Employees of the Institute of Energetics and students of the study programme “Applied Energy Engineering” actively participate in various activities, including “Scientists’ Night”, when researchers explain and promote their science achievements, for example, young scientists (students – future scientists) presented robots – weed killers in home gardens and large farms, etc. Another year, the visitors of the Scientists’ Night had the opportunity to participate in lectures, practical classes, experiments as well as to watch various demonstrations and light shows. Families with children and young people of school age take part in such activities, it is a great opportunity to attract children’s attention to the direction of power engineering.

Academic staff members of Institute of Energetics regularly organize study visits for students of different years to different companies related to the chosen fields of study. Students visit hydroelectric power stations, thermal power plants, wind farms, sewage treatment plants, cogeneration power plants, the companies “Jauda” SC, “ABB”, Ltd, “Latvenergo Energoefektivitātes centrs”, and others. Study visits are very useful in the study process, because students see and discover in real life what they have studied theoretically in classrooms, and realize theoretical knowledge acquired in the lectures what is learned in studies is considered and studied in life. Students get acquainted with the development of innovations in a real production company.

II - Description of the Study Direction (5. Cooperation and

Internationalisation)

5.1. Provide the assessment as to how the cooperation with different institutions from Latvia and abroad (higher education institutions/ colleges, employers, employers' organisations, municipalities, non-governmental organisations, scientific institutes, etc.) within the study direction contributes to the achievement of the aims and learning outcomes of the study direction. Specify the criteria by which the cooperation partners suitable for the study direction 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 employers.

At the national level in Latvia, cooperation with institutions within the study field takes place in the following ways:

- every year agreements are concluded with various companies all over Latvia to provide a work place for traineeship (traineeships); such agreements have been concluded with more than 90 companies in total. (see annex "provision of practice" in section 5.3.) During traineeships, students acquire practical skills that is very important in the context of achieving learning outcomes. The partners for traineeships are evaluated in relation to their ability to provide the trainee with conditions to complete traineeship programme;
- employers participate in the assessment of the programme (for example, Latvian Association of Electric Power Engineers and Energy Installation Builders"); it helps to upgrade the content of study courses in compliance to the recent development in the industry;
- professionals specialists and managers from energy supply companies representing professionals have been invited to participate in the State Examination Commission to evaluate students' final theses as well as involved as advisors to supervise the elaboration of final theses (for example, from the companies AS "Sadales tīkls", "Fortum Latvia", Ltd., etc.); companies also offer topics for the research in students' theses; this creates opportunities to build a bridge between academic environment and real life, and the results can be applied into traineeship;
- LULST Council of Counsellors participated in the design of the LULST development strategy, the members of the council give advice on LULST development issues, support LULST material and financial resources. The council's activities are based on the regulation (approved by the decision No.7-179 of the Senate of LULST as of May 9, 2012), available in Latvian online: www.LLU.lv/sites/default/files/2016-05/PK_NOLIKUMS-2012..pdf . The direction of energy engineering is represented by the chairman of the company SC "Latvenergo AS".

In cooperation with employers students participated in the study visits, for example, students of "Applied Energy Engineering" in the reference period have visited the heat company "Salaspils Siltums", Ltd., the wastewater treatment plant with biogas and biobutanol pilot equipment in the territory of Sigulda city, a production facility of the company AS "Jauda", Riga Hydroelectric Power Plant, a production facility of "ABB" Ltd. in Riga, Zemgale Regional Energy Agency, an energy efficiency center of "Electrum", Ltd., in Jūrmala, etc.

Employers are involved in the study process by establishing contacts based on the initiative of academic staff members, on the one hand, and entrepreneurs and companies offer research topics, job vacancies and work places for traineeships, on the other hand.

In 2015 LULST Internationalization plan was worked out which determined the goals, priorities and

performance indicators of the university's international cooperation concerning international mobility, the study process and accommodation conditions for full-time international students.

1) The plan determines priority cooperation with higher education institutions with a similar study and research profile in the EU member states and partner countries, whose study directions correspond to those implemented by the Latvia University of Life Sciences and Technologies.

2) The plan envisages priority cooperation with international associations of universities, where LULST is an active member: the European Association of Universities of Life Sciences (ICA), Baltic University Programme (BUP), Baltic - Nordic Forestry, Veterinary and Agricultural University Network (BOVA), Association of Nordic Agricultural Scientists (NJF), etc., which implement academic activities in similar fields of studies and research.

3) As there is a wide range of opportunities for international cooperation with universities abroad, LULST focuses its activities on those partners with whom cooperation is long-lasting and productive. LULST study directions have established close cooperation ties with partner universities or their faculties abroad, with which there is a regular exchange of students and lecturers (Erasmus + mobility programme, etc.), participation in joint projects both in the study process (for example, SAM 8.2.3.) and research activities, participation in each others' research and methodological conferences, etc.

The cooperation agreements concluded by LULST are included in Supplement 4, but the list of universities with which LULST has Erasmus+ bilateral agreements are available here: https://www.ltu.lv/sites/default/files/2018-10/LLU%20ligumi%20_Erasmus%2B%20partneraugstskolas_HEIs%2027.03.18.xls

Cooperation with other institutions ensures the achievement of the goals of the direction and the program as follows:

- cooperation with traineeship companies provides results in acquiring practical knowledge and skills of students;
- cooperation with employers allows to adapt the content of study courses to current events in the field, which ensures the achievement of the results of the respective course and program;
- cooperation with the members of the State Examination Commission from industry companies as well as attraction of consultants from outside ensures the achievement of results in competences;
- cooperation with foreign scientists broadens the horizons of the teaching staff, raises their qualification, which as a result is reflected in the teaching of study courses and allows the student to achieve higher quality knowledge and skills;
- study tours in companies allow to achieve the results of the respective study courses in the acquisition of knowledge and its use in reality.

5.2. Specify the system or mechanisms, which are used to attract the students and the teaching staff from abroad and provide a description of the dynamics of the number of the attracted students and the teaching staff.

The information for international students about the programmes offered by LULST is found on the websites (See Section 1.8). In order to attract international students, LULST implemented various

marketing activities: agreements were concluded with recruitment agents (the agreements envisaged evaluation of agents' work efficiency), e-marketing activities, participation in international educational fairs and agent forums, etc. LULST is a member of the Latvian Higher Education Export Association which provides an opportunity to participate in activities organized by the association.

Study programmes in the English language are not offered in this direction of study. However, the lecturers, involved in the direction, deliver study courses in English for international exchange students of the Erasmus+ programme from other study programmes. Erasmus students from Germany, Czech Republic, Turkey, Kazakhstan, Russia and other countries have participated in the study process.

Thus in this study direction, for example, in 2014 lectures were delivered in the framework of the study course "Renewable energy and energy economics" by Assoc. Professor from the Engineering faculty, Energy Systems Engineering Department of the university *Karamanoglu Mehmetbey* (Turkey), but in 2018 lectures were delivered in the framework of the study course Bioenergy by Assoc. Professor from Engineering faculty, Department of Environmental Technology of the university of *Artvin Coruh* (Turkey).

In order to prevent limited funding for foreign lecturers, which is one of the reasons hindering the attraction of foreign lecturers, a project was launched with the support of the European Social Fund "Improvement of LLU academic staff" (8.2.2.0/18/A/014), one of the goals of which is to attract foreign academic staff by 2021, providing financial resources for it. Within the framework of the project, international competitions are announced and opportunities are created to share experience and mutually improve the content of study courses, its teaching and methodology. The lecturer is involved not as a guest lecturer and giving separate lectures, but for teaching the entire study course.

5.3. In the event that the study programme entails a traineeship, provide a description of the traineeship options offered to the students, as well as the provision, and work organisation. Specify whether the higher education institution/ college provides assistance in finding traineeships.

The study programme "Applied Energy Engineering" included professional traineeship in the amount of 26 CP (39 ECTS) or 26 weeks in the work places outside LULST in production companies (in accordance with the regulations on the content of the 2nd level higher professional education, the traineeship volume must be not less than 20 CP (30 ECTS)). The traineeship is divided into 4 parts across the study years: 6 weeks each year in the 1st, 2nd and 3rd study year, and 8 weeks in the 4th study year.

The procedure of traineeship is regulated by the Regulations on Traineeship (see annex "Traineeship regulation").

Each annual traineeship has a programme that includes the issues to be learned during a respective traineeship period. Learning outcomes are defined for the traineeship and the schedule is indicated, which can be found in the course catalogue.

The traineeship place is mostly selected by students themselves according to their interests and approved by an academic staff member in charge, who assesses the suitability of the work place for aims of the traineeship programme.

If students have difficulties in finding a traineeship place, it is recommended by the academic staff member, as well as companies themselves express a desire to invite a trainee by offering a place for traineeship.

In order for the traineeship to take place, a tripartite agreement is concluded between a trainee, LULST and the company offering traineeship. The company appoints an employee from the company to supervise the traineeship.

Upon completion of the traineeship, the student drafts a traineeship report in accordance with the requirements of the traineeship program and defends it. The traineeship is evaluated with a grade.

In the period from 2013 to 2020, traineeship agreements have been concluded with more than 90 companies throughout Latvia. (see annex "Provision of practice")

LULST International Cooperation Centre provides funding for international traineeships in the framework of Erasmus+ mobility programme based on individual agreements.

5.4. In the event that joint study programmes are implemented in the study direction, provide the justification of the creation of the joint study programmes and a description and assessment of the selection of the partnering higher education institutions by including information on the principles and the procedures for the creation and implementation of these joint study programmes. In the event that no joint study programmes are implemented in the study direction, provide a description and assessment of the plans of the higher education institution/ college for the creation of such study programmes within the study direction.

(Not applicable)

II - Description of the Study Direction (6. Implementation of the Recommendations Received During the Previous Assessment Procedures)

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 direction, 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 direction and the relevant study programmes.

Recommendations and their implementation

- **Greater international involvement is needed in a wider range of activities**

During the reporting period, 124 publications were published in international publications, incl. joint publications with foreign scientists. There are co-authors from other faculties of LULST, research institutes and other universities, eg the University of Latvia, Riga Technical University, Rezekne University of Technology and scientific institutes, for example, the Institute of Polymer Mechanics, etc. (see the annexes of the report part "Assessment of the study field" to section 4.4.)

Lectures have been given at foreign universities (see the section of the report "Assessment of the study direction" in the annexes to section 3.6 and annex 2_5_annex_Teaching_Staff_mobility),

within the Erasmus program the lecturers performed 23 activities. The teaching staff has the status of an Expert and a member in scientific institutions and universities of Germany, Russia, Singapore, Belgium and other countries. (see the CVs of the lecturers in the annex: CV PDF_ENG.zip).

The achievements promote the international recognition of LULST. The publications of the teaching staff increase the level of their competence in their field and allow to include the findings gained in research in the topic of the respective study course, which in turn increases the level of preparation of the students.

- There must be a system that allows and regularly provides appropriate pedagogical, economic and production courses for teachers and other staff.

The teaching staff involved in the field regularly participates in different courses (including outside LLU). This is confirmed by the obtained certificates (see the CV of the lecturers in the Annex CV PDF ENG.zip).

LLU organizes courses:

- in a foreign language,
- Information technology (IT),
- for program directors in the improvement of the study process and quality management,
- Higher education didactics (courses are obligatory for all teaching staff once in 6 years).

ESF project no. 8.2.3.0/18/A/009 "Improvement of the management of the Latvia University of Agriculture" in the section, related to directions and programs, study program directors and direction managers participated in various course modules that increased their qualification in managing study programs and directions, e.g. "Training for study content improvement and quality management skills acquisition" (32 h), etc .

Within the framework of the ESF project No. 8.2.2.0 / 18 / A / 014 "Improvement of LLU academic staff", individual traineeships of teachers in companies are envisaged, which were used by many teachers (see the CV in annex: CV PDF ENG.zip). For example, traineeship in the Heatenergy company "Salaspils Siltums AS" (100 h), etc.

- **The university should play an active role in visualizing potential new ideas for the future progress of local industry and supporting them in better fulfilling their current development challenges by implementing the results of university research and other research.**

Implemented 4 research contract projects by concluding agreements with "Latvenergo AS" and 18 research projects in different directions, incl. European funded research projects. (see appendix "2_6_annex_Research_and_projects").

Part of the funds brought in by the projects is used for the development of LULST. The infrastructure of LULST and financial support for the involved teaching staff are strengthening. Their competence in their field will increase.

- **For the continuous development of the study program, a suitable forum should be created for obtaining feedback from local industries.**

During the reporting period, surveys of representatives of companies in the direction were conducted, as well as discussions with representatives of employers.

The analysis of the surveys is given in section 2.6 of the study program report. "Analysis and evaluation of the results of surveys of students, graduates and employers, their use in the improvement of study content and quality, providing examples."

Based on the recommendations, the study program is being improved, this process will continue, for example, with 2022/2023. study year, in accordance with the recommendation, it is planned to include the study course "Programmable Logic Controllers" in the study plan as a compulsory course. Every year, after the defense of the final theses, discussions take place with the representatives of the industry, which is part of the State Examination Commission, during which their vision on the development of the program is heard.

It promotes the compliance of the study field with the current trends in the field and the labor market.

- **Further develop and modernize study laboratories**

Modernized, as well as equipped with new modern equipment laboratories:

- In 2018, the General Electrical Engineering Laboratory was completely renovated. Replaced infrastructure - furniture and mains voltage distribution. Workbenches were replaced (in 2015, stands with connected panels were purchased FE-1-LLU-1), installed display Samsung 65in UHD 16: 9 QM65H edge-LED 500 for lectures. A new board has been installed. Various new measuring instruments for laboratory work have been purchased.
- In 2020, the capital repair for the Electrical Engineering laboratory was completed. It was equipped with new infrastructure - furniture, whiteboard, projector 1410053 P, white magnetic board.
- A new display Samsung 65in UHD 16:9 QM65H edge-LED 500 has been installed in the computer modeling laboratory for lectures, purchased new furniture. In 2017, for better provision of the study process, 21 computers were purchased DELL OptiPlex 5050 SFF with Win10Proun. Monitors Samsung SyncMaster 204B (20"CRT), TB2016 and 5gg, purchased Microcontrollers with peripheral equipment.
- In the electrical engineering laboratory, the stands were completely replaced with new ones with modern equipment.
- DC power supplies AX-3020L have been installed in the digital electronics laboratory, prototype production equipment for experimental research models printed circuits, microcontroller research equipment PIC-AVR, automatic control system model ACS-1000, Robot manipulator UR 10 purchased within the project in 2018;
- In 2015, stands with a connected panel FE-1-LLU-1 were installed in the Renewable Energy Laboratory, in 2014 the Interactive Screen Kit ME65B with Samsung MD65C "and Samsung 65" Touch Overlay was installed, in 2018 a Microchip development kit was purchased;
- DC power supplies AX-3020L was installed in the digital electronics laboratory, prototype production equipment for experimental research models printed circuits was purchased in 2015, PIC-AVR microcontroller research equipment, Automatic control system model ACS-1000, Robot manipulator UR 10, Universal robot purchased in 2018;
- In 2015, workbenches with connected panel FE-1-LLU-1 were installed in the Renewable Energy Laboratory, in 2014 Interactive screen set ME65B with Samsung MD65C "and Samsung 65" Touch Overlay was installed, in 2018 Microchip development board set was purchased;
- In the Digital Electronics Laboratory, several devices were purchased and installed in 2015: 5 Digital desktop oscilloscopes TBS1052B-EDU, 5 Function generators AFG-2005, Passive and active component analyzer set LCR40 and DCA55, Linear motion model with limit switches

DCNS BelIDrive Module, Positioning model DCNC BeltDrive Module 30, Soldering station TENMA-21-10130;

- Samsung Energy ME multifunction display with Samsung 65 "Tpuch Overlay, Optical and floor stand installed in the alternative energy laboratory;
- In the artificial intelligence laboratory, in addition to the existing equipment, a set of data loggers for measuring physical processes was purchased cDAG-9174, National instrument.

As a result, a modern study infrastructure is used in the study process.

- **Some examples of new developments in this area are open electricity markets and the regulation of the electricity business (to replace the monopoly). An appropriate new course on these topics can be developed to provide opportunities for research contracts.**

Improved study courses (eg, "Power supply technologies", "Transient Processes and Relay Protection", "Power plants and networks", etc., including topics on the free electricity market, decentralized frequency regulation, courses follow trends in electricity tariffs, etc. (relevant courses see the appendix to the study program report "Studiju kursi.zip").

4 research contract projects were implemented by concluding agreements with "Latvenergo AS" and 18 research projects in different directions (see Annex "2_6_annex_Research_and_projects").

Thus, the compliance of the study program and study courses with the actualities in field is promoted.

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

In 2016, the name of the study program "Agricultural Energetics" was changed to "Applied Energetic" which was clarified to "Applied Energy Engineering".

In 2016, the name of the study program "Agricultural Energetics" was changed to "Applied Energy Engineering".

During the process of renaming, the experts developed the following recommendations:

No.	Rekomendation	Execution
1.	In all official documents, one of the LLU TF institutes should be called the Institute of Energetics.	Done

2.	In the professional standard, change the name of the profession to another according to the acquired knowledge.	Done: a new professional standard “Engineer of Energy Systems” was developed and approved at the June 9, 2021 in PINTSA (Tripartite Cooperation Sub-Council for Vocational Education and Employment) meeting.
3.	Change the qualification to be awarded to the graduates of the program in accordance with the new name of the program and the change in the professional standard.	Will be replaced in the next study year after the current accreditation in 2022.
4.	Continue work on improving the technical base of laboratories.	It is done continuously. Detailed information on the progress made in the development of the laboratories is described in the table in the mandatory Annex 2_part_14_Implementation of Recommendations.docx.

Annexes

I. Information on the Higher Education Institution/ College		
List of the governing regulatory enactments and regulations of the higher education institution/ college	1_1_annex_EN_Main internal legal acts and regulations.docx	1_dala_1_pielikums_Galveno_normativo_dokumentu_saraksts-1.docx
Information on the implementation of the study direction in the branches of the higher education institution/ college (if applicable)		
Management structure of the higher education institution/ college	2_Annex_LLU_management_structure_EN.docx	2_Pielikums_LLU_parvaldibas_shema_LV.docx
II. Description of the Study Direction - 1. Management of the Study Direction		
Plan for the development of the study direction (if applicable)	2_1_pannex_Study direction improvement plan.docx	2_dala_1_pielikums_TF_SP_pilnveides_plans_LietEnerg.docx
Management structure of the study direction	2_2_annex_Direction and program management structure.docx	2_dala_2_pielikums_Virziena_un_programmas_parvaldibas_struktura.docx
II. Description of the Study Direction - 3. Resources and Provision of the Study Direction		
Basic information on the teaching staff involved in the implementation of the study direction	2_3_annex_Teaching_staff_2021_EN.xlsx	2_dala_3_pielikums_Macibspeku_saraksts_2021.xlsx
Biographies of the teaching staff members (in Europass Curriculum Vitae format)	CV PDF Eng.zip	CV PDF Latviski.zip
Summary of the statistical data on the incoming and outgoing mobility of the teaching staff over the reporting period	2_5_annex_Teaching_Staff_mobility.docx	2_dala_5_pielikums_Studiju_virziena_macibspeki_mobilitate.docx
II. Description of the Study Direction - 4. Scientific Research and Artistic Creation		
List of the publications, patents, and artistic creations of the teaching staff over the reporting period	2_7_annex_Publications.docx	2_dala_7_pielikums_Publikacijas.docx
II. Description of the Study Direction - 5. Cooperation and Internationalisation		
List of cooperation agreements	2_8_annex_Cooperation_agreements.docx	2_dala_8_pielikums_Sadarbibas_ligumi.docx
Statistical data on the teaching staff and the students from abroad	2_9_annex_Foreign_teaching_staff_and_students.docx	2_dala_9_pielikums_Arvalstu_macibspeki_un_studentsi.docx
Statistical data on the mobility of students (by specifying the study programmes)	2_10_annex_Mobility_of_students.docx	2_dala_10_pielikums_Studejoso_mobilitate.docx
Description of the organisation of the traineeship of the students	2_11_annex_Traineeship_regulation.pdf	2_dala_11_pielikums_Praksu_nolikums.pdf
Information on the agreements and other documents confirming the traineeship of the students in companies	2_13_annex_Agreement_on_traineeship.docx	2_dala_13_pielikums_prakses_liguma_paraugs.docx
II. Description of the Study Direction - 6. Implementation of the Recommendations Received During the Previous Assessment Procedures		
Overview of the implementation of the provided recommendations	2_14_annex_Implementation_of_recommendations.docx	2_dala_14_pielikums_Rekomendaciju_izpilde.docx
Description of the Study Programme - Other mandatory attachments		
Confirmation signed by the rector, director or the head of the study programme or the study direction of the higher education institution/ college which states that the official language proficiency of the teaching staff involved in the implementation of the relevant study programmes of the study direction complies with the regulations on the level of the official language knowledge and the procedures for testing official language proficiency for performing professional duties and office duties.	LLU_apliecinajumi_Energetika_EN.docx	LLU_apliecinajumi_Energetikas_virzienam.edoc
III. Description of the Study Programme - 1. Indicators Describing the Study Programme		
Compliance of the joint study programme with the provisions of the Law on Institutions of Higher Education (table)		
Statistics on the students over the reporting period		
III. Description of the Study Programme - 2. The Content of Studies and Implementation Thereof		
Compliance of 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 (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		
Curriculum of the study programme (for each type and form of the implementation of the study programme)	3_5_annex_Study_plan_full_and_part_time.docx	
Descriptions of the study courses/ modules		
Description of the Study Direction - Other mandatory attachments		
Sample of the diploma to be issued for the acquisition of the study programme.		
Description of the Study Programme - Other mandatory attachments		
Document confirming that the higher education institution/ college will provide the students with the options to continue the acquisition of education in another study programme or at another higher education institution/ college (a contract with another accredited higher education institution/ college), in case the implementation of the study programme is discontinued		
Document confirming that the higher education institution/ college guarantees to the students a compensation for losses if the study programme is not accredited or the licence of the study programme is revoked due to the actions of the higher education institution/ college (actions or failure to act) and the student does not wish to continue the studies in another study programme		

Confirmation of the higher education institution/ college that the teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of a related foreign language according to European language levels (see the levels under www.europass.lv), if the study programme or any part thereof is to be implemented in a foreign language.		
If the study programmes in the study direction subject to the assessment are doctoral study programmes, a confirmation that at least five teaching staff members with doctoral degree are among the academic staff of a doctoral study programme, at least three of which are experts approved by the Latvian Science Council in the respective field or sub-field of science, in which the study programme has intended to award a scientific degree.		
If academic study programmes are implemented within the study direction, a document confirming that the academic staff of the academic study programme complies with the provisions set out in Section 55, Paragraph one, Clause three of the Law on Institutions of Higher Education		
Sample (or samples) of the study agreement		
If academic study programmes for less than 250 full-time students are implemented within the study direction, the opinion of the Council for Higher Education shall be attached in compliance with Section 55, Paragraph two of the Law on Institutions of Higher Education.		
Description of the Study Direction - Other mandatory attachments		
Electronically signed application form for assessment of a study direction	iesniegums_studiju_virzienam_Energetika_novertesana_EN.docx	iesniegums_studiju_virzienam_Energetika_novertesana-precizets.edoc

Other annexes

Name of document	Document
Akademiskie amati_Nolikums_14_04_2021.pdf	Akademiskie amati_Nolikums_14_04_2021.pdf
Akademiskie amati_Nolikums_14_04_2021.pdf	Akademiskie amati_Nolikums_14_04_2021.pdf
Admission_regulation_2021_2022.pdf	Admission_regulation_2021_2022.pdf
Academic Recognition at LLU.pdf	Academic Recognition at LLU.pdf
Regulations for Academic Integrity.pdf	Regulations for Academic Integrity.pdf
Regulations on Study Programme Development.pdf	Regulations on Study Programme Development.pdf
LLU_Regulations_on_Academic_positions_EN.pdf	LLU_Regulations_on_Academic_positions_EN.pdf
Akademiska_darba_aprekina_nolikums_2021_2022.pdf	Akademiska_darba_aprekina_nolikums_2021_2022.pdf
Regulation_on_Calculation_of_Academic_Workload.pdf	Regulation_on_Calculation_of_Academic_Workload.pdf
LLU_Regulations_on_Academic_positions_EN.pdf	LLU_Regulations_on_Academic_positions_EN.pdf
Stipendijas_virziena_studentiem.docx	Stipendijas_virziena_studentiem.docx
Sholarships_for_students.docx	Sholarships_for_students.docx
Awarding Scholarships.pdf	Awarding Scholarships.pdf
2_6_annex_Research_and_projects.docx	2_6_annex_Research_and_projects.docx
2_dala_6_pielikums_Petijumi_un_projekti.docx	2_dala_6_pielikums_Petijumi_un_projekti.docx
2_dala_12_pielikums_Prakses_nodrosinajums.docx	2_dala_12_pielikums_Prakses_nodrosinajums.docx
2_12_annex_Provision_of_traineeship.docx	2_12_annex_Provision_of_traineeship.docx
2_dala_14_pielikums_Rekomendaciju_izpilde.docx	2_dala_14_pielikums_Rekomendaciju_izpilde.docx
2_14_annex_Implementation_of_recommendations.docx	2_14_annex_Implementation_of_recommendations.docx
LLU Dokumenti latviešu valodā	LLU Dokumenti latvisu valoda.zip
LLU Documents in English	LLU Documents in English.zip
2_dala_1_2_pielikums_TF_SP_attīstības_plans_Energ 6 gadiem.docx	2_dala_1_2_pielikums_TF_SP_attīstības_plans_Energ 6 gadiem.docx
2_1_2_annex_Study direction development plan 6 Years.docx	2_1_2_annex_Study direction development plan 6 Years.docx
CV_ENG 23 sept.zip	CV_ENG 23 sept.zip
CV_LV 23 sept.zip	CV_LV 23 sept.zip
Studiju kursi ENG 23 sept.zip	Studiju kursi ENG 23 sept.zip
Studiju kursi LV 23 sept.zip	Studiju kursi LV 23 sept.zip
2_5_annex_Teaching_Staff_mobility_add_15_sept.docx	2_5_annex_Teaching_Staff_mobility_add_15_sept.docx
2_6_annex_Research_and_projects add 15 sept.docx	2_6_annex_Research_and_projects add 15 sept.docx
2_dala_6_pielikums_Petijumi_un_projekti Papildinātais 15 sept.docx	2_dala_6_pielikums_Petijumi_un_projekti Papildinātais 15 sept.docx
3_4_annex_Mapping of study courses add 15 sept.xlsx	3_4_annex_Mapping of study courses add 15 sept.xlsx
3_dala_4_pielikums_Studiju kursu kartejums papild 15 sept.xlsx	3_dala_4_pielikums_Studiju kursu kartejums papild 15 sept.xlsx
About Similar programs corrections.docx	About Similar programs corrections.docx
Additional information to report.docx	Additional information to report.docx

Detailed analysis of SWOT 15_09.docx	Detailed analysis of SWOT 15_09.docx
Equipment for laboratories_LV_Eng.xlsx	Equipment for laboratories_LV_Eng.xlsx

Applied Energy Engineering (42522)

Study field	<i>Power Industry, Electrical Engineering, and Electrical Technologies</i>
ProcedureStudyProgram.Name	<i>Applied Energy Engineering</i>
Education classification code	<i>42522</i>
Type of the study programme	<i>Professional bachelor study programme</i>
Name of the study programme director	<i>Raimunds</i>
Surname of the study programme director	<i>Šeļegovskis</i>
E-mail of the study programme director	<i>raimunds.selegovskis@llu.lv</i>
Title of the study programme director	<i>asoc.profesors, Dr.sc.ing.</i>
Phone of the study programme director	
Goal of the study programme	<p><i>Objectives of the professional bachelor's program "Applied Energy Engineering":</i></p> <ul style="list-style-type: none"> <i>- to provide rural and urban energy supply and energy equipment operation organizations with specialists in the fields of electricity and heat;</i> <i>- to train competent engineers who are well acquainted with production and product processing technologies, are able to solve topical issues of rational use of energy and introduction of modern energy supply technologies and can successfully work in engineering, management, public administration and municipal positions related to energy;</i> <i>- to promote the balanced development of rural areas by training comprehensively educated young people - specialists in energy engineering who return to their native side after university to work in the important and prestigious energy sector, high culture people, patriots of their professions, county and state.</i>

Tasks of the study programme	<p><i>The tasks of the study program:</i></p> <ol style="list-style-type: none"> <i>1. Prepare energy engineering specialists of the fifth level professional qualification (LPQ) and the sixth level of Latvian Qualifications Framework (LKI), competitive in the labor market, with emphasis on the current and prospective requirements of the energy supply systems and their rational use in agricultural and industrial technologies;</i> <i>2. Develop and strengthen self-directed learning and self-education skills of students which would serve as the basis for the lifelong learning process;</i> <i>3. Develop problem-solving skills, skills to define strategic and tactical goals and to find motivation to achieve them.</i> <i>4. Develop and strengthen students' professional skills in engineering innovation.</i> <i>5. Ensure the compliance of the study procedure with the legislation of the Republic of Latvia and the LULST Constitution, as well as the compliance of the study procedure with the internal regulations of LULST.</i> <i>6. Develop an in-depth understanding of energy engineering of Latvia, especially in rural areas: its historical development, the current and prospective situation, energy economics, transmission and distribution, entrepreneurship in energy sector, design and operation of energy generation, transmission and distribution facilities and systems.</i> <i>7. Develop the necessary skills and in-depth knowledge in the specialization of energy supply on:</i> <ul style="list-style-type: none"> <i>• electrical networks and substations, their design and operation (considering also the specifics of the rural environment);</i> <i>• heat supply sources and systems, their design and operation (considering also the specifics of the rural environment);</i> <i>• the use of energy installation in accordance with the technical instructions and work safety regulations;</i> <i>• operation and repair work organization and supervision of energy equipment.</i> <i>8. Develop the necessary skills and in-depth knowledge in the specialization of energy economics on:</i> <ul style="list-style-type: none"> <i>• economics of operation of different types of energy installation considering the specifics of the rural environment;</i> <i>• entrepreneurship in energy sector, management and marketing;</i> <i>• computerized accounting and payments of energy consumption;</i> <i>• energy tariffs and their selection criteria.</i>
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Results of the study programme	<p><i>Knowledges: knows and understands electrical and heat energy processes, equipment and their operating principles, current and future requirements of Latvia in urban and rural areas, as well as production technology in energy supply and rational use of energy;</i></p> <p><i>Skills: able to apply the acquired knowledge, choosing energy equipment corresponding to the necessary tasks, their operation, operational and energy economy parameters, to choose rational modes of energy equipment operation, to perform computerized accounting of energy consumption and balance assessment; to design and operate energy facilities and systems, to conduct business in the energy sector, to service, develop, regulate and improve energy technical equipment and systems; able to communicate about professional field and energy industry issues with professional industry circles and the public in conferences and seminars, is able to independently increase his / her professional qualification, implement enterprise energy system development and improvement projects, manage energy management tasks in companies and organizations.</i></p> <p><i>Competences: to solve topical issues of rational use of energy and introduction of modern energy supply technologies, to perform tasks of management, public administration and local government positions related to energy, as well as to create new creative approaches to performing these tasks in the context of Latvian and EU development, independently put forward project ideas, plan, structure and manage energy system improvement and development projects, participate in the implementation of international projects.</i></p>
Final examination upon the completion of the study programme	<i>Elaboration and defense of the final (bachelor's) thesis in the State Examination Commission.</i>

Study programme forms

Full time studies - 4 years - latvian

Study type and form	<i>Full time studies</i>
Duration in full years	<i>4</i>
Duration in month	<i>0</i>
Language	<i>latvian</i>
Amount (CP)	<i>160</i>
Admission requirements (in English)	<i>General secondary education or vocational secondary education</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Professional Bachelor Degree in Energy Engineering</i>
Qualification to be obtained (in english)	<i>Engineer of Energy Systems</i>

Places of implementation

Place name	City	Address
Latvia University of Life Sciences and Technologies	JELGAVA	LIELĀ IELA 2, JELGAVA, LV-3001

Part time extramural studies - 5 years - latvian

Study type and form	<i>Part time extramural studies</i>
Duration in full years	<i>5</i>

Duration in month	0
Language	<i>latvian</i>
Amount (CP)	160
Admission requirements (in English)	<i>General secondary education or vocational secondary education</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Professional Bachelor Degree in Energy Engineering</i>
Qualification to be obtained (in english)	<i>Engineer of Energy Systems</i>

Places of implementation

Place name	City	Address
Latvia University of Life Sciences and Technologies	JELGAVA	LIELĀ IEĻA 2, JELGAVA, LV-3001

III - DESCRIPTION OF THE STUDY PROGRAMME (1. Indicators Describing the Study Programme)

1.1. Description and analysis of changes in study programme parameters that have taken place since the issue of the previous accreditation certificate of study direction or the license of study programme if study programme is not included in the accreditation page of the study direction

Nr.	Nosaukums	Studiju veids	KP	legūstamais grāds un/vai kvalifikācija
1.	Applied Energy Engineering, p(b) professional bachelor's degree programme	Full-time Part-time	160	Professional Bachelor Degree in Energy Engineering, Engineer of Energy Systems

The language of tuition is Latvian.

Since the previous accreditation of the study direction the following changes have been made based on the decision of the study accreditation committee No. 08-A "On the change of the name of the programme and the degree of the corresponding study direction" as of March 30, 2016, Riga:

1. The name of the study programme was changed from "Agricultural Energy Engineering" to "Applied Energy Engineering";
2. The name of the degree was changed from "Professional Bachelor in Agricultural Power Engineering" to "Professional Bachelor Degree in Energy Engineering".

Qualification to be awarded changed from "Engineer of Agricultural Energetics" to "Engineer of Energy Systems "

In 2020 a new professional standard "Engineer of Energy Systems" was worked out and professional qualification "Engineer of Energy Systems" was established and included in the qualification structure of energy sector based on the decision of the Tripartite Cooperation Sub-board for Vocational Education and Employment as of December 9, 2020.

The professional standard "Engineer of Energy Systems" has been approved by PINTSA in 2021 June 9 meeting, protocol no.4.

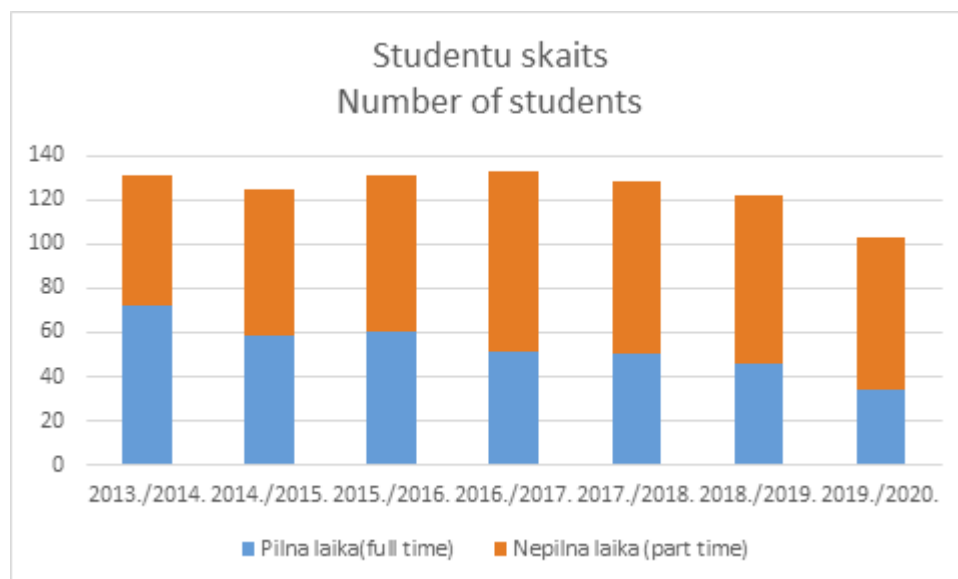
The learning outcomes and content of the study programme "Applied Energy Engineering" fully comply with the requirements of the professional standard "Engineer of Energy Systems".

The name of the study program in English has been clarified by changing "Applied Energetics" to "Applied Energy Engineering", because the program prepares engineers and the changed name, which includes the term *Engineering*, reveals the essence of the program much more precisely.

1.2. Analysis and assessment of the 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 in the

different study forms, types, and languages.

Dynamics of the number of students in the programme by study year is shown in the figure below.



The statistics show that there has been a decreasing trend in number of students since 2017. It is in line with the general trend in Latvia, where the total number of students in universities has been declining according to the statistics which reveal that the number of enrolled students in universities in Latvia in 2020 decreased by 2.4%: <https://www.csb.gov.lv/en/statistics/statistics-by-theme/social-conditions/education/search-in-theme/2927-topicalities-higher-education-school>

A large part of students of the programme belong to part-time students due to the following reasons:

1. the vast majority of part-time students work in the energy sector and their career growth opportunities depend on the law on regulated professions, e.g., electrical engineer,
2. part-time students choose the programme because they understand what the energy sector is and purposefully select this programme,
3. the schedule of studies (sessions are twice a year) is arranged in the way that it is possible to combine work with studies,
4. employers are willing to pay a tuition fee for the studies (it was more common at the beginning of the reference period though).

The dropout rate by academic year is given in Table.

The dropout rate by academic years

2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	Total
13	11	11	28	20	16	13	112

The main reasons for students to drop out of the programme during study Years from 2013/2014 to 2019/2020 are the following:

1. failure to fulfil the requirements of the study agreement by failing to comply with the requirements of the study programme – 33;
2. of their own free will - 31
3. failure to fulfil the requirements of the study agreement by failing to comply with the financial obligations – 17;

The highest number of dropouts occurred in the 1st year of studies, i.e., 10 students per year on average in the reference period dropped out mainly due to the fact that they understood that they had not chosen the profession that suited their wishes. Either they had enrolled following the recommendations of friends or parents, or they were unable or unwilling to meet the requirements of study courses due to the lack of previous knowledge. Although teaching staff included additional classes for repeating the learning material of the secondary school courses in the most difficult study courses (Physics and Mathematics) even working in addition to their workload, it did not always help. Another reason for students to drop out was not attending classes after the enrollment procedure.

1.3. Analysis and assessment of the interrelation between the name of the study programme, the degree or professional qualification to be acquired or the degree and professional qualification to be acquired, the aims, objectives, learning outcomes, and the admission requirements.

The title of the study programme “Applied Energy Engineering” reflects its essence, i.e., it means the application of electrical power engineering and heat power engineering in energy systems and facilities ranging from energy supply systems to energy consumers. “Applied Energy Engineering” is a professional programme which prepares specialists who deal with energy application solutions which is emphasized by the word “applied”. The aim of the programme is to provide energy supply and electrical equipment service entities in rural areas, cities and small towns with specialists of electrical power engineering and heat power engineering, educate competent engineers who are able to solve topical issues of rational use of energy and implementation of modern energy supply technology. The degree to be obtained “Professional Bachelor Degree in Energy Engineering” substantiates graduates’ ability to tackle with the above mentioned tasks, but the qualification to be awarded “Engineer of Energy Systems” allows them to work in regulated professions as an engineer. The content and learning outcomes of the study programme fully comply with the requirements of the professional standard “Engineer of Energy Systems”.

The mentioned professional standard was approved at the June 9, 2021 meeting of PINTSA. (Tripartite Cooperation Sub-Council for Vocational Education and Employment)

At the time of submitting the report, the latest classification of professions has not yet been officially published, as the latest classification of Profession standards was updated in 2021. February 23, this is before the standard approval date.

The admission requirements fully correspond to the requirements of the programme:

- the centralised examination in the Latvian language is mandatory to prove an applicant’s ability to participate in the study process and fulfill the requirements for the correct use of the Latvian language;
- the centralised examination in a foreign language is mandatory to be able to follow the recent developments in the study field and the progress in technologies achieved globally;

- the centralised examination in mathematics is mandatory to be able calculate measurements for equipment performance; mathematics is the language of engineers therefore it is widely used in modern engineering processes;
- Additional points for the centralized examination in physics because heat and power engineering are branches of physics that is why serious basic knowledge is necessary to succeed in the study process.

III - DESCRIPTION OF THE STUDY PROGRAMME (2. The Content of Studies and Implementation Thereof)

2.1. Assessment of the relevance of the content of the study course/ module and the compliance with the needs of the relevant industry and labour market and with the trends in science. Provide information on how and whether the content of the study course/ module is updated in line with the development trends of the relevant industry, labour market, and science. In 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.

The content of the study courses corresponds to the needs of the industry and the labour market because:

- it ensures the achievement of learning outcomes of the study programme developed on the basis of the demand of the industry and the labour market (See Section 2.2.);
- the content and learning outcomes of the study programme “Applied Energy Engineering” and consequently the study courses and their content correspond to the professional standard of “Engineer of Energy Systems” (see annex "Compliance with the professional standard"); the professional standard was examined and approved in the experts' board of the energy sector in 2020 and in the National Centre for Education, Republic of Latvia, as well as a group of experts from the Ministry of Education and Science in 2021.

The content of study courses was updated as a result of the following activities:

- the academic staff included the information in the courses they had obtained in the process of their professional development (for example, during the internship in a heat power supply company it was found out that the use of large storage tanks, fields of solar panels and flue gas condensing equipment in heat production companies is widespread, consequently this topic was developed in more detail in the course “Heat Power Supply Sources”; moreover, during the training course offered by Zemgale Regional Energy Agency the information on the 4th generation heating systems in buildings was obtained which was included in the study courses “Operation of Heating Systems” and “Design of Heat Power Supply Systems” etc;
- the experts' recommendations were taken in account (for example, a representative of “Latvian Association of Electric Power Engineers and Energy Installation Builders” recommended to include a more detailed explanation of decentralized frequency control in power networks in the respective study courses);

- the current issues in the industry were discussed during meetings with employers' representatives (including personal contacts) as well as what employers currently expect from graduates was found out;
- the results of the employers' and graduates' surveys were taken into account;
- as academic staff members regularly published their research results, the findings of the research activities were included in the content of study courses (for example, research results in the Laboratory of Biogas of the Faculty of Engineering were included in the study course "Bioenergy" etc.).

2.2. Assessment of the interrelation between the information included in the study courses/ modules, the intended learning outcomes, the set aims and other indicators, the relation between the aims of the study course/ module and the aims and intended outcomes of the study programme. In 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.

The distribution of study courses corresponds to Regulation No. 512 of the Cabinet of Ministers "Regulation on the state standard of the 2nd level professional higher education". The programme comprises general study courses in the amount of 20 CP (30 ECTS), field study courses and Information technology (IT) study courses in the amount of 36 KP (54 ECTS) and professional specialization courses in the amount of 60 CP (90 ECTS), including differences depending on the specialization in Energy Supply or Energy Economics which account for 16 CP (24 ECTS). In addition, there are elective courses 6 KP (9 ECTS), traineeships (practice) 26 KP (39 ECTS), the elaboration of the bachelor thesis takes 12 KP (18 ECTS). Study courses Sports 3 KP (4.5 ECTS) and Practical Farming 1 KP (1.5 ECTS) were extra-curriculum study courses. Since 2021, the study course Practical Farming is no longer implemented within the program. LULST provides students with opportunities to do Sports, which is a free opportunity for those who want it.

General study courses include knowledge, skills and competences that are necessary for an engineer and a manager, as well as for doing business. Therefore, in accordance with Cabinet Regulation no. 512. Paragraph 11 the study program includes study courses for the development of business professional competence (innovations, organization and establishment of enterprises, management methods, basics of business economics, project development and management, record-keeping and financial accounting system, knowledge of labor relations regulation, including social dialogue in society, as well as knowledge of other innovations in running a business or institution). They are: Basics of Management, Entrepreneurship, Basics of Law, Psychology of Engineering, also Professional English / German which is necessary for an engineer today. Since the work with energy installations has an impact on the environment, there is a study course "Ecology and Environmental Protection". Since the task of the programme is to prepare specialists who will manage people, the programme includes study courses "Psychology of Engineering" and "Labour and Civil Protection".

Field study courses and IT courses provide overall theoretical foundation for professional specialization courses and therefore they are included in the study plan prior to professional specialization courses. The field study and IT courses include Computer Science, Physics, Mathematics, Technology of Structural Materials, Computer Graphics in Energy. Achieved learning

outcomes in Mathematics are used in the required calculations in further study courses, the learning outcomes of computer graphics can be used to draw electrical circuits required according to the standards. Computer Science is necessary in practically any further study course, including the analysis and processing of course information. The field electrical basic courses include such important courses for a specialist in energy engineering as Applied Electrical Engineering, Theoretical Electrical Engineering, which provide for such further professional specialization courses as Electrical Vehicles and Electric Drive, Lighting and Electrical Technology, Basics of Automation, Power Supply Technologies, Electric Power Plants and Networks etc.

As regards the theoretical framework of “Heating Studies”, it provides basic knowledge, skills and competences which then are developed in the study course “Sources of Heat Power Supply” and further professional specialization courses “Design of Heat Power Supply Systems” or “Heating Systems Operation”.

During the studies the student develops and defends 9 study papers (works).

All the study courses in the curriculum are arranged according to their relation to other study courses following a logical sequence. The requirements for previously completed study courses are indicated in the description of each study course.

The final stage of the study programme is the development and defense of a bachelor thesis.

The study course "Programmable Logic Controllers" at the time of writing report is an optional course, but 2021/2022. in the study year we plan to include it in the compulsory part. It has a procedure that includes coordination in the Methodological Commission and approval by the Faculty Board. Therefore, it is included in the description of study courses and in Mapping of study courses but it is not yet in the study plan.

The content of all the study courses corresponds to the aim of the study programme and contributes to the achievement of the learning outcomes of the study programme “Applied Energy Engineering” (see annex “The mapping of the study courses”).

2.3. Assessment of the study implementation methods (including the evaluation methods) by providing the analysis of how the study implementation methods (including the evaluation methods) used in the study courses/ modules are selected, what they are, and how they contribute to the achievement of the learning outcomes of the study courses and the aims of the study programme. Provide an explanation of how the student-centred principles are taken into account in the implementation of the study process.

Student-centred learning approach in the study programme “Applied Energy Engineering” takes into account and respects students’ different needs by creating relevant learning pathways, for example, developing an individual approach for each student based on the offer by selecting options of programme implementation, including full-time and part-time studies. Various pedagogical methods are used according to the circumstances; students’ willingness to study independently is facilitated, at the same time the guidance and support of the teaching staff are ensured, for example, out of every 40 working hours, which correspond to 1 CP (1.5 ETC), 24 hours are provided for students’ individual work; students work on course projects and do homework independently, they receive consultations from the academic staff.

Assessment criteria and methods as well as grading criteria are publicly available, they are determined in the Regulation of Studies: in English: www.llu.lv/sites/default/files/2021-05/Study_regulation_2021_EN.pdf, the assessment evaluates the achieved results of the learning outcomes. The requirements for acquiring credit points in the study courses and the assessment of learning outcomes are described in the programme of each study course.

The studies are implemented in a full-time or part-time mode. As regards part-time studies, sessions take place twice a year, during which students perform laboratory works, participate in practical classes, listen to lectures. Homework assignments are completed in the period between sessions.

The study methods include lectures, practical classes and laboratory works.

Lectures as a method of study implementation have been chosen in almost all study courses (except internships), because they provide a theoretical basis, generate knowledge and are used by the student during practical and laboratory work. It allows them to understand their actions and justify what they have done during those jobs.

In practical classes the student uses the lecture material as well as independently acquired in order to acquire skills in performing technical and other types of calculations related to the field. Practical works are selected in study courses where it is necessary to master engineering calculations (for example, Fundamentals of Electrical Engineering, Physics, Fundamentals of Heat Studies Mathematics, Power Plants and Networks, etc.), to perform graphic work (eg Computer Graphics in Energy, etc.). In general education study courses (eg, English, Philosophy, Engineering Psychology, etc.), they contribute to the strengthening of knowledge acquisition and understanding.

Acquired in practical work is also used in the development of course works.

Laboratory works are necessary and are used in study courses, where students perform experiments (eg, Chemistry, Physics) or connecting electrical circuits, learn to assemble electrical equipment, etc. (eg Applied Electrical Engineering, Fundamentals of Automation, Electrical Machines and Electric Drives, etc.).

The used study methods allow to achieve the study results and aims as follows:

- Lectures provide knowledge and understanding;
- Practical and laboratory works develop skills for practical application of knowledge;
- All the mentioned methods allow to achieve the knowledge, skills and competencies existing in the results of the study program

The e-learning environment is used, where the teaching staff members upload learning materials, communicate with students, assign homework, tests, deliver lectures remotely.

The assessments methods are described below:

An examination is written, oral or mixed (written and oral) assessment to check students' knowledge and skills by a lecturer or a commission of academic staff members in a particular study course or part of it. Examinations are assigned to study courses that are intended as the basis for further courses or that are dominant in the framework of the study direction.

A formal test is a summary of successfully completed assignments in the study course (traineeship, module) (without additional assessment of the acquired knowledge at the end of the study course (traineeship or module)). The formal test as the method of assessment has been chosen for study courses which do not envisage an examination as well as for a part of the course which extends for

more than one semester if this part does not end with an examination. Besides the assessment “pass/fail” in the formal test, a grade is given in some courses to improve the quality of learning.

Grades are taken into account in the allocation of state-funded study places and scholarship competitions, thus stimulating the quality of learning.

2.4. If the study programme entails a traineeship, provide the analysis and assessment of the relation between the tasks of the traineeship included in the study programme and the learning outcomes of the study programme. Specify how the higher education institution/ college supports the students within the study programme regarding the fulfilment of the tasks set for students during the traineeship.

The traineeship (practice) is included in the study programme in the amount of 26 KP (39 ECTS). The traineeship programme is divided into 4 parts. Students do traineeships in various companies. The programme of the traineeship is arranged sequentially according to the content of the study plan. The first year comprises 6 weeks’ traineeship “Introduction in the Profession of Energetic”; in which students get acquainted with the profession in real life conditions, the structure of a company’s energy systems, they learn to perform simple tasks related to electrical installations and systems. The second year comprises 6 weeks’ traineeship “Technologies In Energetic” in which students master the specifics of energy equipment, energy systems assembly technologies and work related to them. The third year comprises 6 weeks’ traineeship “Use of Energy Equipment”; its task is to learn issues related to the operation, maintenance, setup, organization and registration of energy installations. The fourth year includes 8 weeks’ traineeship “Organization of Engineering in Energetic” when students get acquainted with the responsibilities performed by a company’s engineering services, participate in their implementation, study the administration system, production process, organization and management of energy services.

All the tasks are fully in line with the aims and tasks of the study programme: to provide energy supply and electrical equipment service entities in rural areas, cities and small towns with specialists of electrical power engineering and heat power engineering, educate competent engineers in accordance with the needs of the national economy, so that they are able to solve topical problems of rational use of energy and implementation of modern energy supply technologies, and that they are able to work effectively in engineering, management, public administration and municipal positions related to energy engineering.

The traineeship is regulated by the LLU traineeship regulation (see annex: "Traineeship regulation").

LULST appoints an traineeship supervisor for each traineeship from LULST, as well as an internship supervisor is appointed in the traineeship company, which is agreed in the internship agreement.

At the end of the traineeship period students are required to write a traineeship report to ensure the completion of the learning outcomes of the traineeship and its control. The report is checked and evaluated by a supervisor of the traineeship. The learning elements to be acquired during the traineeship and the content of the report are determined by the respective traineeship programme.

The total duration of the traineeship is 26 weeks.

The traineeship place is basically chosen by a student according to his/her interests and approved by an academic staff member responsible for the traineeship, who evaluates the suitability of the

placement for the traineeship programme.

If someone has difficulty finding a traineeship place on their own, academic staff members recommend one, as well as companies offer places for trainees.

A tripartite agreement is concluded between a trainee, LLU and a company providing a traineeship place (see the obligatory annex "Agreement on traineeship" to the second part of the report "Assessment of the study direction"). Students of the programme have done traineeships in more than 90 companies. The largest number of trainees have done traineeships in the company "Sadales tīkls AS". (The list of traineeship companies is included in annex "Provision of Practice")

LLU supports trainees by allowing them to choose an traineeship company according to their interests, but the supervisor of the respective traineeship evaluates the possibilities of the traineeship place to complete traineeship tasks and accepts it or recommends another place.

2.5. 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 evaluations of the final theses.

The themes of the students' final theses could be divided into three fields:

- Electrical power engineering
- Heat power engineering;
- Renewable resources engineering.

However, very often one thesis linked several fields, for example, heat power supply combined traditional primary energy resources with alternative energy supply from renewable energy sources, electrical power supply relied on renewable energy resources, electronic control elements were developed and used to manage electricity or heat supply systems.

Topics were suggested by students, academic staff members and companies (it should be mentioned that companies "Latvenergo AS", "Sadales tīkls AS" and other companies offered topics for final theses each year). The majority of theses focused on real existing companies and objects, some research works examined new innovative methods, devices, solutions etc.

For example, some topics chosen by students were as follows: reconstruction of a specific transformer substation, reconstruction or building of a specific street lighting system, building of a heat supply system in the object, design of a building's electrical installation, increasing the efficiency of the boiler house, application of renewable energy resources, development of biogas production system, etc.

There were unconventional and interesting topics that suggested innovative solutions, such as fuel production from packaging waste, energy supply for small greenhouses, use of aluminum cells for hydrogen production, use of surplus heat from electricity generation in hydroelectric power stations, use of heat from beehives for water preparation, etc.

Evaluation	Number of evaluations of Final thesis						
	2013/ 2014	2014/ 2015	2015/ 2016	2016/ 2017	2017/ 2018	2018/ 2019	2019/ 2020

„10” (outstanding)	2	1	3	-	1	2	1
„9” (excellent)	2	4	3	3	5	4	5
„8” (very good)	4	7	5	5	4	7	6
„7” (good)	4	14	7	8	4	7	11
„6” (almost good)	7	3	3	1	3	8	2
„5” (satisfactory)	3	3	3	1	2	-	2
„4” (almost satisfactory)	1	-	-	1	-	1	-
„3” (poor)	-	-	-	-	-	-	-
Total:	23	32	24	19	19	29	27

Students of the programme participated in annual competitions of students' final theses at the national level organized by companies "Latvenergo AS", "ABB", Ltd., "Schneider Electric Latvia", Ltd., "Draka Keila", Ltd, "The Development Foundation" of Riga Technical University, the Latvian Association of Electric Power Engineers and Energy Installation Builders", where every year without exception several students' final theses won prizes and often got the first places, which proved the high quality of final theses and also the study programme, on the whole.

For example: in 2019, out of 12 winners of the bachelor's thesis competition, 6 represented the program "Applied Energetics". Also in the competition for master's theses out of 4 laureates, 3 graduates had previously completed the LLU "Applied Energetics" bachelor's study program.

2.6. Analysis and assessment of the outcomes of the surveys conducted among the students, graduates, and employers, and the use of these outcomes for the improvement of the content and quality of studies by providing the respective examples.

In addition to the internal surveys of the university, in which students evaluate individual study courses and their teaching staff every semester, regular surveys of students, graduates and employers were conducted with the aim to improve the quality of studies.

The analysis of the results of the latest surveys of students.

One third of the respondents chose LULST because they had heard a positive feedback, also because of the location of the university, 22% were attracted by the opportunity to study with a "dual-purpose", because the programme "Applied Energy Engineering" includes both electrical

power engineering and heat power engineering. It emphasizes the relevance of this programme!

56% answered that their opinion about university now corresponded to the previous information and it was positive, 33% answered that they had not have any expectations, but now they had good impressions, 22% expressed the view that the reality was better than they imagined.

When it comes about to choosing a program 44% of respondents answered that energy engineering is an important industry in the future and there are career opportunities, 11% continued their previous education, 22% of respondents indicated that they worked in energy engineering on a daily basis, while several respondents answered that they wanted to acquire a new field.

In terms of the university's available infrastructure 78% of the respondents noted that everything necessary was available, but it was recommended to create recreation / study rooms for students to spend time while waiting for lectures, as well as refurbishment was necessary in some areas to make the interior of the faculty more visually attractive and cozy.

44% of respondents held the view that there were opportunities to participate in the Erasmus+ mobility programme, 67% indicated that information was available, but they had not used the opportunity. The responses lead to the conclusion that it is necessary to inform students more actively about international mobility programmes and motivate them to participate in such programmes in the future.

68% of respondents noted that there were opportunities to work in the student self-governments of the faculty and the university, one fifth of respondents did not have an opinion. The answers in questionnaires also noted that there had been various surveys where opinions could be expressed.

It is worth mentioning that students are very different: there are active people who are interested in what is happening and are actively involved in everything, and there are students who do not find it relevant or interesting.

Approximately two thirds of respondents had plans to start / continue working in the energy sector, several people already worked in the energy sector, while 44% had plans to continue studies in master's degree programmes, including combining studies with work.

Some important suggestions for improving the programme from the questionnaires are as follows:

- The name of the qualification (Engineer of Agriculture Energetics) is not attractive for potential students despite the fact that the job later is available in the energy sector. The name of the programme should be changed as well.

Recommendation implemented: the content of the programme "Applied Energy Engineering" corresponds to the recently developed professional standard "Engineer of Energy Systems" therefore the previous qualification was changed to the qualification "Engineer of Energy Systems.

- Industry-specific modelling softwares should be included in the programme to become a demanded engineer in the labour market.
- More video / visual material should be used because not always theory / text is what stays in mind.

These proposals were examined and taken into account for the improvement of the content of the corresponding study courses and improvement of the study programme. Study courses use different softwares: Dialux, Matlab, Autocad, Visio, PLC programming softwares etc.

The analysis of the results of the latest surveys of employers.

One representative of employers represented the company which employed the largest number of

the programme's graduates working in one company, they were more than 100, and the second employer represented a company with 44 graduates working in it. The percentage assessment of graduates 'readiness can be seen in Table 1 of the annex "Employers' Surveys".

According to this table, it can be seen that the focus in the development of the program should be on practical training. However, it should be emphasized here that graduates' jobs and positions, spheres of activity are different, therefore it is practically impossible to give practical skills in all possible fields in the study process. It is therefore clear, as indicated by the answers, that additional training is needed when starting work, which includes the specifics of the particular company.

The compliance of graduates' achieved learning outcomes with the learning outcomes defined in the European Qualifications Framework (EQF) in opinion of employers is given in Table 2 of the annex "Employers' Surveys"..

Employers' evaluation of graduates' achieved learning outcomes compliance with the learning outcomes defined by the EQF is equally divided between "fully achieved" and "rather achieved". The answer "rather not achieved" could be explained by the respondent's interpretation of the question. It should be noted that the evaluations "rather was" or "rather was not achieved" can be treated differently.

The analysis of the results of the surveys of graduates.

The activities of respondents are summarized in the following table:

I work in the field of electrical power engineering	79
I work in the field of heat power engineering	5
I work in the field not related to energy engineering (mention the field)	11
Other	5

The following key answers were received to the question why you chose to study in the Applied Energy Engineering study program:

- I worked or I plan to work in the field of energy engineering;
- I considered energy engineering to be an interesting and important industry in the future;
- This degree provides career growth opportunities; "Applied Energy Engineering" programme provides knowledge and skills for electrical power engineering and heat power engineering;
- I continued my previous education in the field.

The answers prove students' motivation to study in the programme, as well as usefulness of including both areas of energy engineering, i.e., heat power and electricity power engineering.

The answers to the question of how you evaluate the material and technical provision of the university ranged from "fully adequate" to "equipment might want more modern".

It should be noted here that material and technical provision has been enriched and improved constantly and the situation has significantly changed since the time of the respondents' presence at the university (see Section 3.1.).

The infrastructure of the university was basically assessed as "Very good, good, sufficient, normal, fully satisfied, compliant", several answers were "Excellent, very comfortable" some answers were "satisfactory".

The answers to the questions about the possibilities to participate in the improvement of the quality of studies were as follows:

54% of the respondents noted the opportunities to express an opinion on improving the quality of studies during their studies and have expressed it, 40% did not consider it necessary to do so.

The most important answers, which contain an assessment and proposals for studies in the Applied Energy program in general:

- Very well-planned and well-structured study programme;
- I do not see a significant need to improve anything at the moment. I think it would be important to attract and motivate those who want to study at a highest education;
- In my opinion, the programme on the whole is sufficient so that one does not have to worry about competitiveness in the labor market after obtaining a diploma. One thing that could be improved: more practical skills should be provided;
- Focus more on such courses as programmable logic controllers, microcontrollers, basics of automation;
- I evaluate it very well, There was no problem finding a well-paid job and even get a promotion;
- Should teach students IDA ICE and EA PSM programmes, and the labour market will demand graduates right after the end of the course;
- The program is good overall. More practical classes and a link with companies in the field would be required to apply theory in practice;
- Following global trends, I suggest improvements that would facilitate students' ability to perceive information flow.

Most of the evaluations were very positive. The proposed improvements mainly concerned the strengthening of practical skills. Therefore, traineeships in companies were planned for the time period of 26 weeks. Unfortunately, traineeship companies sometimes give the same tasks to trainees during the whole traineeship period, such as dismantling old overhead power lines or replacing old gauges, instead of involving trainees in diverse tasks or work responsibilities. It happened sometimes that students completed the traineeship programme on their own initiative when a company did not provide support.

There is always a suggestion for more practical and less theoretical approach in any survey, because the theory is more difficult to learn. But students must learn theory in order to be able to learn practical skills so a balance is necessary in study process therefore the programme attempts to keep the balance between theory and practice.

2.7. Provide the assessment of the options of the incoming and outgoing mobility of the students, the dynamics of the number of the used opportunities, and the recognition of the study courses acquired during the mobility.

LULST has concluded agreements with 161 universities abroad within the framework of Erasmus+ mobility programme. The information on the international mobility in English is available here : <https://www.llu.lv/en/exchange-studies>.

LULST offers a wide range of mobility opportunities.

In the time period from 2013 to 2020, students of the programme “Applied Energy Engineering”

used outgoing mobility opportunities 10 times (see more detailed description in Section 5.2. "Attracting foreign students and lecturers in the study direction" and its annexes of the 2nd part of the evaluation report of the study direction).

A procedure has been established for the implementation of students' international mobility. Before the mobility, a student together with the director of the study programme draws up a letter of intent, in which the student indicates which study courses he/she will study at a hosting university and which study courses correspond to them in the curriculum of "Applied Energy Engineering" programme. The student also prepares an individual plan, which schedules the acquisition of study courses of the "Applied Energy Engineering" programme which will not be possible to acquire during the studies abroad and therefore will not be possible to recognize; the individual plan is approved by the respective teaching staff and the director of the programme.

The recognition of the respective study courses of the programme "Applied Energy Engineering" is performed after the successful acquisition of the study courses abroad.

10-point scale is used to convert the grades obtained at a university abroad according to the assessment system of the Academic Information Centre of Latvia: <http://www.aic.lv/portal/en/izglitiba-latvija/izglitibas-sistema>.

The procedure of recognition is determined by the Rector's regulation "On academic recognition procedure at LLU" (see annex "Academic Recognition at LLU.pdf").

During the mobility, the student keeps the pre-mobility status in terms of the funding source of studies.

III - DESCRIPTION OF THE STUDY PROGRAMME (3. Resources and Provision of the Study Programme)

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. Whilst carrying out the assessment, it is possible to refer to the information provided for in the criteria set forth in Part II, Chapter 3, sub-paragraphs 3.1 to 3.3.

The number of state-funded study places are approved in a tripartite agreement among the Ministry of Education and Science, Ministry of Agriculture and Latvia University of Life Sciences and Technologies (LULST). The tripartite agreement on funding determines that costs of one basic study place for 2020 is EUR 1,518.98, the study level coefficient for bachelor's degree programme is 1 and the social provision of the study place for bachelor's degree programmes is 164.34 EUR, the study cost coefficient for the thematic field of education for the professional bachelor's degree programme "Applied Energy Engineering" (**since there is one programme in the direction, the above information on the direction refers also to the programme and vice versa**) is 1.7 (the coefficients are different for each thematic field of education; they are determined in the regulations "Procedures for financing higher education institutions and colleges from the state

budget” of the Cabinet of Ministers), the costs per student in the professional bachelor’s degree programme “Applied Energy Engineering” account for 2,746.16 EUR.

The expenditures for the bachelor’s degree programme “Applied Energy Engineering” in 2020 consisted of:

- Salaries – 77%
- Scholarships – 6%
- Goods and services – 16%, including utilities – 6%
- Equity capital formation – 1%

The LLU Fundamental Library is available for students. The opening hours of the library are adjusted to the needs of the main users of the library - students and academic staff. On weekdays the library is open from 8.30 to 19.00, on Fridays from 8.30 to 17.00. The library is open also on the 1st Saturday of each month from 9.00 to 14.00. The Reading Room and Inquiry and Information Centre during the examination session are open until the midnight. The catalogue and online data bases are available without restrictions 24/7.

The users of the library are entitled to search information available in 10 subscribed international and Latvian online databases, including CAB Abstracts, EBSCO host, Scopus, Web of Science, Wiley Online Journals etc. A more detailed information on financial resources, information resources and the library is available in Section 1.3. of the 2nd part of the evaluation report of the study direction “Resources and provision of the study direction”

The implementation of professional specialization courses of the field mostly takes place in the premises of the Institute of Energetics of the Faculty of Engineering. The premises are equipped with everything necessary for students, staff and guests. There are parking facilities for cars and bicycles at the building of the Faculty of Engineering. There is a lift inside the building for people with special needs.

There are classrooms and laboratories in the Institute of Energetics with the necessary equipment and technical provision. Lecture take place in the classrooms which are equipped with multimedia equipment.

The infrastructure of Faculty of Engineering, research facilities, material and technical provision of the Institute of Energetics are used for the implementation of the study programme. Facilities and equipment of the laboratories of Institute of Power Engineering are used for the implementation of the programme and achievement of its learning outcomes: Laboratory of Digital Electronics, Laboratory of Renewable Energy, Laboratory of Electric Drive and Heat Power Processes, Laboratory of Electric Installation and Maintenance, Laboratory of Computer Modelling, Laboratory of Electrical Engineering, Laboratory of Artificial Intelligence, Laboratory of General Electrical Engineering, Laboratory of Electrical Measurements, Automation Laboratory, Laboratory of Alternative Energy and Laboratory of Heat Engineering.

To improve the quality of the study process, the following laboratories were improved and modernized as well as provided with new modern equipment during the reference period:

1. In 2018 the Laboratory of General Electrical Engineering was completely renovated. The infrastructure, i.e. furniture and the network electrical switchgears were replaced. Work desks were replaced (in 2015 stands with adjusted dashboards FE-1-LLU-1 were purchased), a display of Samsung 65in UHD 16:9 QM65H edge-LED 500 mounted on the support was installed for demonstrating lectures. A new board was installed, different measurement devices were purchased for the laboratory works.
2. In 2020 the reconstruction was finished in Classroom No314. The classroom was equipped

with a new infrastructure: furniture, a board, an overhead projector 1410053 P, a white magnetic board.

3. A new display of Samsung 65in UHD 16:9 QM65H edge-LED 500 mounted on the support was installed for demonstrating lectures in the Laboratory of Computer Modelling, new tables and chairs were purchased. 21 computers DELL OptiPlex 5050 SFF with Win10Proun Monitori Samsung SyncMaster 204B (20"CRT), TB2016 and 5gg and microcontrollers with peripherals were purchased in 2017 to ensure the better quality of the study process.
4. Old stands displaying laboratory works were completely replaced by new and modern stands thanks to graduates of 2020 as well as the company ABB, Ltd.
5. Direct current power supplies AX-3020L were installed in the Laboratory of Digital Electronics; in 2015 the prototyping equipment of experimental research models of printed circuits, the microcontroller research equipment PIC-AVR, a model of automatic control system ACS-1000 were purchased, in 2018 in the framework of the project a robot manipulator UR 10, Universal Robot, was obtained.
6. Stands with adjusted dashboard FE-1-LLU-1 were installed in the Laboratory of Renewable Energy in 2015, an interactive screen set ME65B with Samsung MD65C" and Samsung 65"Touch Overlay was installed in 2014, a microchip development board set was bought in 2018 due to activities of the researchers.
7. Several pieces of equipment were purchased and installed for the Laboratory of Digital Electronics in 2015: 5 digital desktop oscilloscopes TBS1052B-EDU, 5 function generators AFG-2005, a set of passive and active component analyzers LCR40 un DCA55, a linear motion model with limit switches DCNS BellDrive Module, a positioning model DCNC BeltDrive Module 30, a soldering station TENMA-21-10130.
8. Laboratory of Renewable Energy received a multifunctional screen Samsung display ME65B with Samsung 65"Touch Overlay, Optical mounted on the support.
9. Laboratory of Artificial Intelligence in addition to the existing equipment purchased data loggers set for physical measurements cDAG-9174, National.

Overall, resources and material and tehcnical provision are sufficinet to ensure the achievement of learning outcomes of the programme.

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

III - DESCRIPTION OF THE STUDY PROGRAMME (4. Teaching Staff)

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

Table presents the positions of the academic staff involved in the implementation of the programme in 2020.

Positions of academic staff in 2020

Position	Number
Professors	5
Associate professors	8
Assistant professors (docents)	7
Visiting assistant professors	3
Lecturers	7
Visiting lecturers	14

There are not included 3 lecturers in the table, who were involved in the implementation of the study course Sports, which at the time of writing the report students are free to choose outside the courses in the program, and one guest lecturer delivered the study course “Practical Farm”, which from 2021 will no longer be implemented within the study program.

The academic staff in different study courses, especially in general education courses, varies both by study year and by semester of the year. This is especially noticeable in structural units outside the Institute of Energetics. This is related to the recruitment of new academic staff members, retirement of some others, as well as, for example, taking one’s parental leave, etc. Thus, the number and distribution of teaching staff and academic positions varies from year to year. On the whole, the distribution of positions over the years remains approximately the same. Consequently, changes in the composition of the academic staff during the reference period did not significantly affect the quality of studies.

Changes in the composition of the teaching staff during the reporting period are shown in the table below (it does not include teaching staff in the courses Sport and Practical Farming, as they do not directly affect the results of the program).

Position	2013./ 2014.	2014. /2015.	2015./ 2016.	2015./ 2016.	2016./ 2017.	2017./ 2018.	2018./ 2019.	2019./ 2020.
Profesors	4	4	4	4	4	6	7	5
Assoc. profesors	6	6	6	6	6	5	5	8
Docents	9	10	10	10	10	9	8	10
Lektors	16	18	18	18	18	17	18	21
Asistents	-	-	1	1	1	1	-	-
Total:	35	38	39	39	39	39	40	44

As can be seen, the number of teachers in general has increased. The number of lecturers has increased the most, it is mainly related to the involvement of new lecturers, to whom part of the implementation of old lecturers' courses is transferred, e.g. laboratory or practical work

management, as well as attracting several external lecturers who working in the branch. Changes in the number of other positions are not particularly significant.

On the one hand, it is good that young people with a fresh perspective and new methods become part of academic staff, on the other hand, teaching staff working for a long time have a lot of experience and knowledge and effective teaching methods. Therefore, it is difficult to say if the changes in the composition of academic staff had a positive or negative impact. Candidates, who have abilities to become good teachers are invited to apply for a position. They often are former students who have been noticed by their professors.

But change is the driving force of progress and it is objective because life goes on.

4.2. 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.

Paragraphs 26-32 of the Law on Institutions of Higher Education regulate the composition of academic staff, Paragraph 39 "Academic Staff of Professional Programmes" determines it for professional programmes, and Paragraph 40 of the law determines the status of visiting academic staff: visiting professors, visiting assistant professors and visiting lecturers. The recruitment and employment procedure of the members of academic staff at LLU (announcement of vacancies, hiring process, election procedure to academic position, etc.) is regulated by "LLU Regulation on Academic Positions" approved by the Senate of LLU. The regulation is available on the annex "LLU_Regulations_on_Academic_positions_EN".

(See Section 3.4. of the Part 2 of the self-assessment of the direction). Thus all the requirements of the relevant regulatory enactments regarding the compliance of the qualification of the teaching staff with the positions are observed.

According to the Law on Institutions of Higher Education and the above mentioned LLU regulation, candidates may be elected to the positions of Professors, Associate Professors and Assistant Professors if they have a doctoral degree or candidates may be elected to the position of Associate Professors in a professional programme also if they have at least 10 years of work experience in the field. The compliance of candidates for the position proves their relevant qualification, which undoubtedly serves to ensure high quality of studies and achieve learning outcomes. Academic staff members in these positions have certain requirements for research activities, therefore their results are used in the study process, providing students with the latest developments and research findings in the field. Professors and associate professors mainly deliver lectures, assistant professors deliver lectures and supervise practical and laboratory works, while lecturers both give lectures and supervise most of the laboratory and practical works. Assistants mainly supervise laboratory works and run practical classes.

The distribution of the positions of academic staff members involved in the implementation of the programme is given in Section 4.1. "The analysis and evaluation of the changes in the composition of teaching staff".

4.3. Information on the number of the scientific publications of the academic staff members, involved in the implementation of the 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 may be additionally specified (if applicable).

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).

4.5. Provide examples of the involvement of the academic staff in the scientific research and/or artistic creation activities both at national and at international level (in the fields related to the content of the study programme), as well as the use of the obtained information in the study process.

During the reference period the academic staff of the study programme was involved in research activities in the fields corresponding to the content of the study programme: in total, 22 projects and contract research activities were implemented (due to the regulations on the protection of personal data, the information on academic staff members is not provided here). Research projects and contract research projects as well as more detailed description of research activities are given in the annex "Research and projects" and in the Section 4.1. of Part 2 "Description of the Study Direction".

In addition to the above mentioned, the academic staff of the study programme participated in international cooperation to conduct research activities, Section 4.3. "International cooperation in scientific research and / or artistic performance" of Part 2 "Description of the Study Direction".

The obtained information and knowledge were used in the following study courses: "Bioenergy" and "Alternative Energy and Energy Economics" (the research results on the use of biomass for energy production), "Heat Supply Sources" (research on microclimate, emission reduction), "Transition Processes and Relay Protection" and "Power Plants and Networks" (contract research activities with "Latvenergo AS" SC), "Applied Electronics and Communication Equipment" (research in robotics), etc. The application of the obtained information is reflected in the content of study courses (in the annex "Study courses").

4.6. 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 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 among academic staff members takes place by coordinating the content of study courses and adapting it to the specific features of the corresponding study programme. For example, the content of the Mathematics and Physics study courses for the study programme “Applied Energy Engineering” was adjusted to the requirements of the energy sector, including topics that the programme director and other teaching staff members of the Institute of Energetics considered relevant to this programme. Also, it was agreed that contact hours of these courses should be increased in order to be able to work with students individually thus helping students to acquire the material of the courses.

The study courses of Professional English /German were adapted to the requirements of the energy engineering with the focus on the professional terminology and topics related to the industry.

Professional specialization courses have been designed in coordination with other courses thus the basic theories of the subject are acquired prior to the more specialized knowledge which is acquired in the following study courses. For example, the study course “Applied Electrical Engineering” includes a topic describing operation principles, parameters and general structure of electric machines, which is then further developed in the study course “Electric Machines and Electric Drive” dealing with the selection of a vehicle, its application, analysis of parameters, operating modes, etc. The same refers to other study courses.

The sequence of topics and their compatibility were discussed between the respective teaching staff members in order to avoid overlapping with content of other study courses. It should be noted that each topic can be viewed from a different perspective depending on the application of the objects, conditions, environment, etc. Therefore, if appropriate, the topic can be studied in different study courses.

For example, the selection of protection methods for electrical installation is first taught in the study course “Applied Electrical Engineering” to understand the operation and reasons for the selection; then the selection and calculations for a specific application are analyzed in the respective study course in the next semester. The academic staff members coordinated the topics in mutual communication.

This cooperation process is basically coordinated and supervised by the director of the study program, who is best acquainted with the content of the respective study program, the sequence of courses and the needs of the program.

It is possible to visit lectures of other academic staff members thus it is possible to provide opportunities to exchange experience and to adopt best practices and methods. There are methodological commissions in faculties, in which academic staff members discuss programmes of the study courses and recommend improvements if necessary.

The student-teacher ratio in the study programme “Applied Energy Engineering” in October, 2020 was 13.4, which was similar to the student-teacher ratio at LLU on the whole which accounted for 13.2.

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Annexes

III. Description of the Study Programme - 1. Indicators Describing the Study Programme		
Compliance of the joint study programme with the provisions of the Law on Institutions of Higher Education (table)		
Statistics on the students over the reporting period	3_1_annex_Student_statistics.docx	3_dala_1_pielikums_Studejoso_statistika.docx
III. Description of the Study Programme - 2. The Content of Studies and Implementation Thereof		
Compliance of the study programme with the State Education Standard	3_2_annex_Compliance with the national education standard.docx	3_dala_2_pielikums_Atbilstiba_valsts_izglitiba_standartam.docx
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard (if applicable)	3_3_annex_Compliance with the professional standard.docx	3_dala_3_pielikums_Atbilstiba_profesijas_standartam.docx
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	3_4_annex_Mapping of study courses.xlsx	3_dala_4_pielikums_Studiju_kursu_kartejums.xlsx
Curriculum of the study programme (for each type and form of the implementation of the study programme)	3_5_annex_Study_plan_full_and_part_time.docx	3_dala_5_pielikums_Plans_PunNePL_studijam.doc
Descriptions of the study courses/ modules	Studiju_kursi.zip	Studiju_kursi.zip
Description of the Study Direction - Other mandatory attachments		
Sample of the diploma to be issued for the acquisition of the study programme.	Diploma and supplement.zip	Diploms un pielikums.zip
Description of the Study Programme - Other mandatory attachments		
Document confirming that the higher education institution/ college will provide the students with the options to continue the acquisition of education in another study programme or at another higher education institution/ college (a contract with another accredited higher education institution/ college), in case the implementation of the study programme is discontinued	Agreement_LLUI and RTU_Energy_Engineering_EN.docx	Vienosanas_LLUI un RTU_Energetika.edoc
Document confirming that the higher education institution/ college guarantees to the students a compensation for losses if the study programme is not accredited or the licence of the study programme is revoked due to the actions of the higher education institution/ college (actions or failure to act) and the student does not wish to continue the studies in another study programme	LLU_apliecinajumi_Energetika_EN.docx	LLU_apliecinajumi_Energetikas_virzienam.edoc
Confirmation of the higher education institution/ college that the teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of a related foreign language according to European language levels (see the levels under www.europass.lv), if the study programme or any part thereof is to be implemented in a foreign language.		
If the study programmes in the study direction subject to the assessment are doctoral study programmes, a confirmation that at least five teaching staff members with doctoral degree are among the academic staff of a doctoral study programme, at least three of which are experts approved by the Latvian Science Council in the respective field or sub-field of science, in which the study programme has intended to award a scientific degree.		
If academic study programmes are implemented within the study direction, a document confirming that the academic staff of the academic study programme complies with the provisions set out in Section 55, Paragraph one, Clause three of the Law on Institutions of Higher Education		
Sample (or samples) of the study agreement	Study_Agreement_LV_EN_2021.pdf	Studiju_ligums_2021.pdf
If academic study programmes for less than 250 full-time students are implemented within the study direction, the opinion of the Council for Higher Education shall be attached in compliance with Section 55, Paragraph two of the Law on Institutions of Higher Education.		