

APPLICATION

Study field "Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science" for assessment

Study field	<i>Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science</i>
Title of the higher education institution	<i>Latvijas Biozinātņu un tehnoloģiju universitāte</i>
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Self-evaluation report

Study field "Information Technology, Computer Hardware,
Electronics, Telecommunications, Computer Management,
and Computer Science"

Latvia University of Life Sciences and Technologies

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1. Information on the Higher Education Institution/College

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

Latvia University of Life Sciences and Technologies (LBTU) is one of the four universities of sciences 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 and civil engineering.

On 18 May 2022, the Latvia University of Life Sciences and Technologies Council adopted a decision to change the name of the university, and starting from 1 September 2022, its name in Latvian will be “**Latvijas Biozinātņu un tehnoloģiju universitāte**” (LBTU). The 2022/2023 study year is set as a transition period for the new name of the university. All regulatory documents approved by the university's previous name “Latvijas Lauksaimniecības universitāte” are valid at LBTU.

LBTU:

Vision - Latvia University of Life Sciences and Technologies is a modern, nationally and internationally recognized science university - a leader in the innovations of bioeconomy and related industries and the sustainability of natural resources.

Mission - to build an internationally competitive, innovative, creative and sustainable future for the development of society.

LBTU 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.

LBTU 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 LBTU 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.

LBTU 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 LBTU implement 58 study programmes within **15** study directions (as of October 1, 2022).

Number of students and programmes in LBTU study directions

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

No	Study direction	Number of programmes				Number of students (01/10/2022)	Faculties
		Total	B	M	D		
1	Agriculture, Forestry, Fishery, and Food Hygiene	9	5	2	2	799	LF, MF
2	Veterinary Medicine	2	1		1	429	VMF
3	Architecture and civil engineering	10	5	3	2	442	VBF
4	Production and processing	8	4	2	2	412	PTF, MF, TF
5	Information technology, computer engineering, electronics, telecommunications, computer management and computer science	4	2	1	1	375	ITF
6	Environmental protection	3	1	1	1	87	VBF
7	Health care - a joint programme with LU and RSU	1		1		21	PTF
8	Mechanics and metal working, heat power engineering, heat engineering and mechanical engineering	5	3	1	1	196	TF

No	Study direction	Number of programmes				Number of students (01/10/2022)	Faculties
		Total	B	M	D		
9	Power industry, electrical engineering and electrical technologies	1	1			86	TF
10	Sociology, Political Science, and Anthropology	2	1	1		75	ESAF
11	Economics	3	1	1	1		ESAF
12	Management, administration and real estate management	5	2	3		265	ESAF
13	Hotel and restaurant service, tourism and recreation organisation	1	1			119	PTF
14	Internal security and civil defence	1		1		46	MF
15	Education, pedagogy and sports - the direction to be closed in 2024	3	1	2		58	TF
	Total	58	28	19	11	3 756	

LBTU personnel, job positions and age group statistics (as of October 1, 2022) information are in the table.

	Total	incl. women
University personnel	982	667
incl. academic staff members who have been elected at LBTU	292	190
professors	54	34
associate professors	54	35
assistant professors	64	48
lecturers	41	31

assistants	0	0
leading researchers and researchers	79	42
Academic staff members – professors, associate professors, assistant professors, lecturers or assistants – who are also elected as leading researchers and researchers	147	101
Other personnel	690	477
Academic staff who have not been elected at LBTU (visiting professors, visiting assistant professors, visiting lecturers)	281	166
of which foreign visiting professors, visiting assistant professors, visiting lecturers	10	3
Distribution of <i>academic staff members</i> by age:		
under 25 years	0	0
25-29 years	3	2
30-34 years	22	14
35-39 years	35	19
40-44 years	46	29
45-49 years	43	33
50-54 years	33	27
55-59 years	25	17
60-64 years	36	27

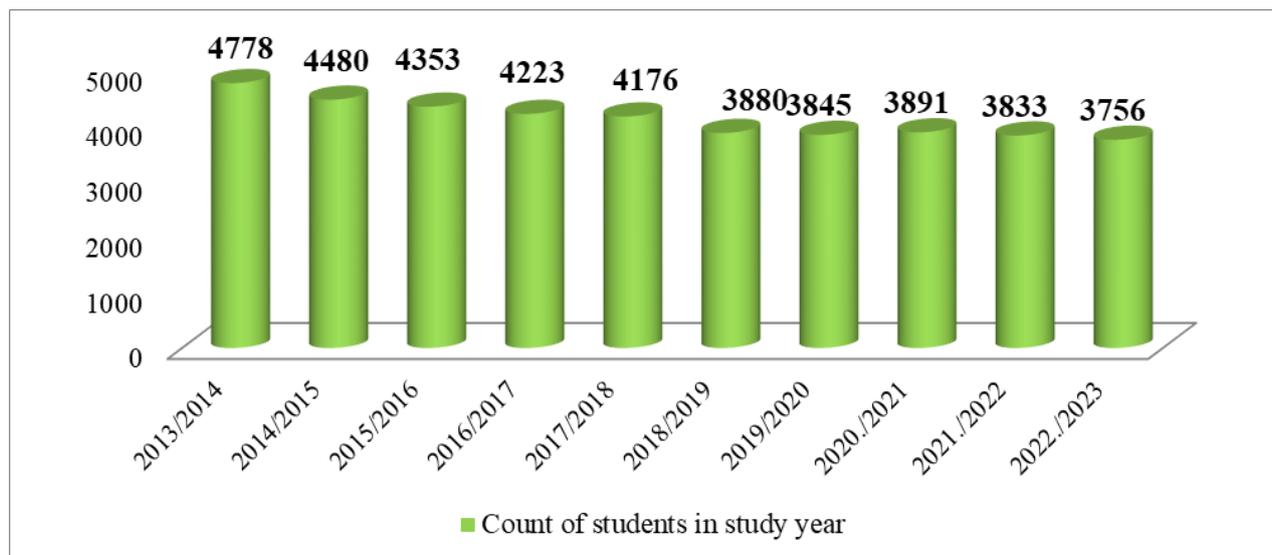
65 years and over	49	22
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217 members of the total academic staff have a scientific degree (74.32%).

LBTU promotes and supports the engagement of young teaching staff in academic work. Of the current academic staff, 51% are less than 50 years old, 32% are from 50 to 65 years old and only 17% are over 65 years old.

Changes in the number of students at LBTU in the period 2013-2022 (October 1 of each year)

In the period from the academic year 2013/2014 to the academic year 2022/2023, the total number of students accounted for average 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 LBTU decreased by 23% 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 2022), the number of students has levelled off, and there has even been a slight increase or very minimal decrease in the total number of students studying at LBTU 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.

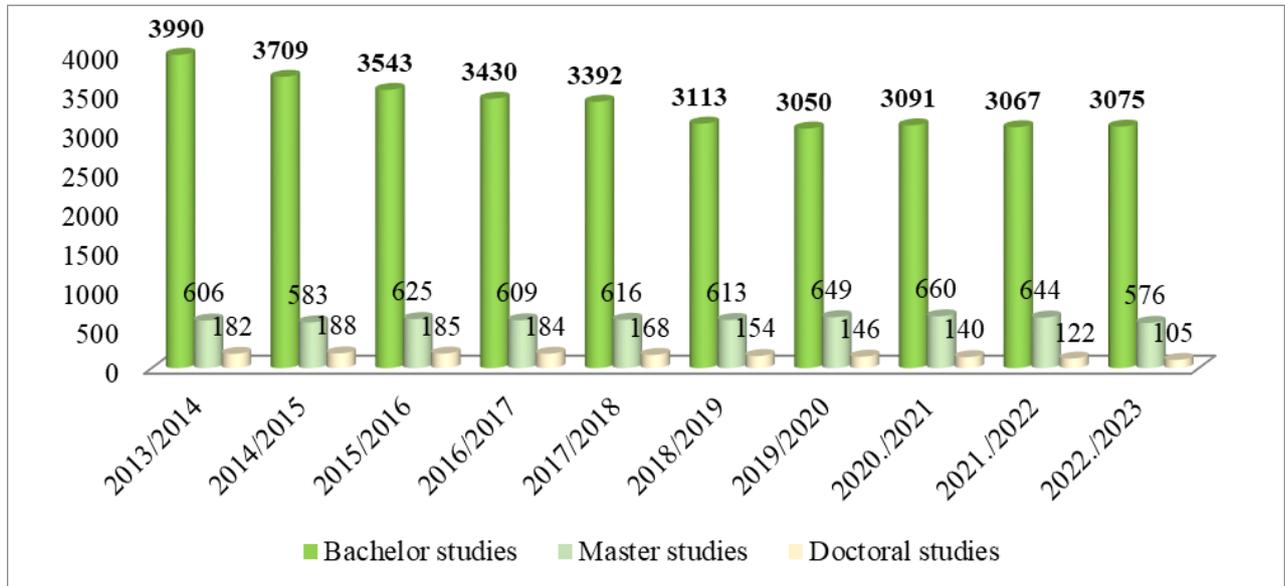
The major reasons are as follows:

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, due to the limitations of COVID-19 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;

- 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, since January, 2022 - EUR 140), and the availability of funding for research was limited.

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

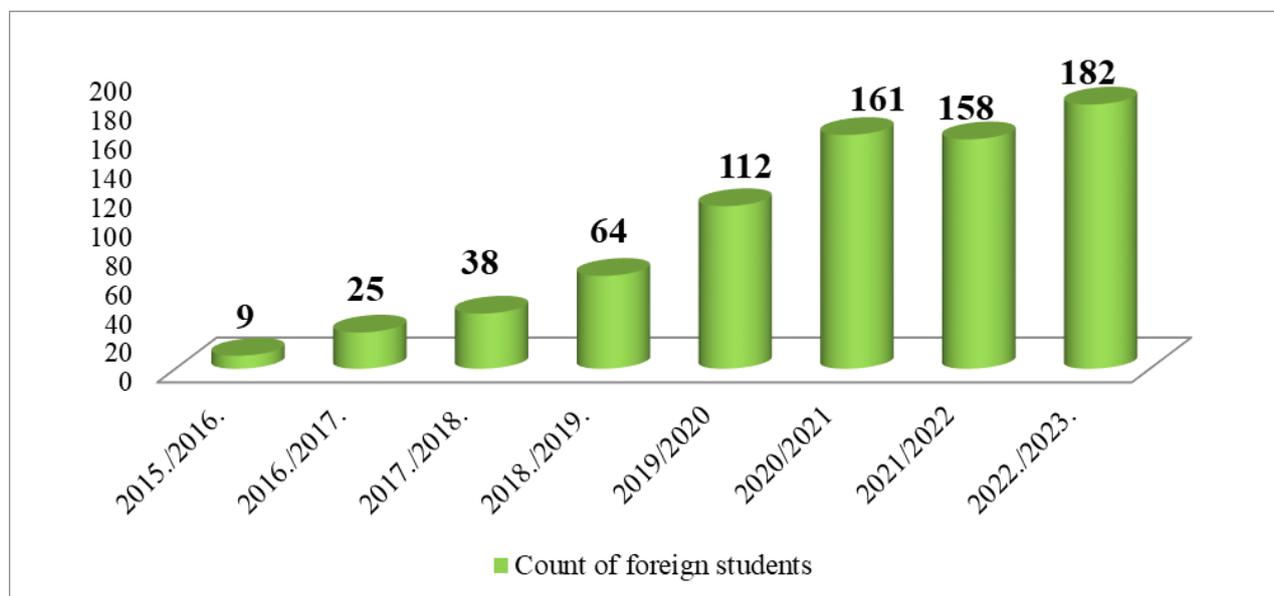
- Bachelor's degree studies: 79-84%;
- Master's degree studies: 13-17%;
- Doctoral studies: 3-4%.



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 LBTU 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 LBTU to increase its number of students:

- In the academic year 2015/2016, LBTU began admitting international students for studying in English. Thus 182 international students studied at LBTU in 13 study programmes (bachelor and master level studies) in the academic year 2022/2023.
- Students are given an opportunity to acquire a bachelor's and master's degree of social sciences in sociology in the form of e-studies.
- 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.);
- Infrastructure for studies and research has been improved and modernised.
- Opportunities to receive scholarships funded by patrons tend to increase.
- LBTU provides doctoral students with internal research grants.



Research activities and motivation measures for the academic staff are defined in the LBTU Development Strategy, the relevant targets set have to be achieved by the Faculties, administrative centres and scientific institutes and laboratories. Each organisational unit of LBTU 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 LBTU Rectorate.

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

The following key (collegial) institutions are involved in making **strategic decisions** at LBTU:

The **Council** is a supreme collegial representation, management and decision-making body authorised by the personnel of LBTU.

The **Council**:

- approves and amends the Constitution of LBTU;
- elects and dismisses the members of the Senate of LBTU;
- elects the rector of LBTU;
- may encourage the removal of the Rector;
- elects the Academic Arbitration Court of LBTU and dismisses its members;
- listens to the annual report on the activities of LBTU prepared by the Rector.

The Council is composed of 200 members who are elected by the organisational units of LBTU by secret ballot for three-year terms in the following composition:

- academic staff - 140;
- students - 40;
- other personnel – 20.

The Council functions in accordance with its Statute <https://www.llu.lv/lv/konvents> (only in Latvian).

LBTU Supervisory Board is a collegial highest decision-making institution of LBTU (<https://www.llu.lv/lv/llu-padome> only in Latvian). The LBTU Supervisory Board is responsible for the sustainable development, strategic and financial supervision of LBTU, as well as ensures the operation of LBTU in accordance with the goals set in the LBTU strategy, protects the autonomy of LBTU, as well as respects the academic freedom of academic staff and students and promotes its implementation.

The LBTU Supervisory Board consists of 11 members (<https://www.llu.lv/lv/llu-padome>), of whom:

- five are nominated by the Senate;
- one is an outstanding representative of the academic environment not related to the activities of LBTU and is nominated by the President;
- five are representatives of the public in accordance with the procedures specified by the Cabinet, and shall be appointed by the Ministry of Agriculture and nominated by the Cabinet.

The main responsibilities of the LBTU Supervisory Board are:

- approves the Constitution of LBTU and its amendments;
- approves the development strategy of LBTU and monitors the progress of its implementation;
- approves the budget and financial plan of LBTU;
- monitors the operation of the internal control and risk management systems, reviews their adequacy and effectiveness;
- upon the proposal of the Rector, decides on:
 - LBTU structure,
 - LBTU staff remuneration policy,
 - Adoption of LBTU real estate development plan.
- nominates candidates for the post of Rector for the election of the Rector to the Council;
- determines the duties and remuneration of the Rector, evaluates the work of the Rector.

LBTU Supervisory Board functions in accordance with its Statute (<https://www.llu.lv/lv/llu-pamatdokumenti> only in Latvian).

The Senate is a collegial higher academic decision-making institution of LBTU, which is responsible for the excellence, development and compliance of the education and research of LBTU with internationally recognised quality standards. The Senate determines the areas of academic and scientific activity of LBTU.

The Senate is approved by the Council for a period of three years. The Senate consists of 50 senators, of which:

- 38 are representatives of academic staff who represent all the Faculties (75%);
- 10 representatives of students who have been nominated by the Student Self-government (20%);
- the Rector of LBTU;
- 1 other personnel.

The Senate functions in accordance with its Statute <https://www.llu.lv/lv/senats> (only in Latvian)

Regulations, decisions and procedures in relation to the matters pertaining to the basic activity of LBTU 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 LBTU.

Annex 2 – LBTU 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. Description of 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 LBTU. Since 2016, the quality management system of LBTU has been based on the international standards for excellence (see Investors in Excellence Standard, www.investorsinexcellence.com).

The quality management system of LBTU 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 LBTU both in 2016 (the first audit) and in 2018., 2020 (the repeated audit). The audit takes place every 2 years.

The quality management system of LBTU is part of the overall LBTU Development Strategy and covers a broad spectrum of matters. A short general description of the LBTU Quality Management System and the Quality Assurance Plan is available at <https://www.llu.lv/index.php/en/mission-and-vision>

Quality management system in the context of studies

LBTU 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 LBTU are restricted access documents and are intended for internal use at LBTU as well as are part of the management and strategic documents of LBTU. 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 LBTU covers all the spheres of LBTU activity. The academic staff and other personnel of LBTU are involved in the quality management system. The coordinating body of the quality management system is the Administrative Centre of LBTU, 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 2(1) of the Law on Higher Education Institutions by providing a justification for the given statement. In addition, it is also possible to refer to the respective chapter of the Self-Assessment Report, where the provided information serves as justification.

1.	The higher education institution/ college has established a policy and procedures for assuring the quality of higher education.	Investor 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>New study programmes are developed in accordance with the Regulation on Study programme Development, Approval and Amendment at LBTU (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 LBTU 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 LBTU website https://www.llu.lv/lv/studiju-virzienu-parskati-un-pasnovertejuma-zinojumi (only in Latvian)</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>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). • Regulation of Doctoral Studies. <p>Both regulations are available in the section of the report "Other annexes" in the "LLU Documents in English"</p> <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 LBTU IS course register at https://lais.llu.lv/pls/pub/kursi.startup?l=1 (language change is possible using a flag at text "Main Menu").</p>

4.	Internal procedures and mechanisms for assuring the qualifications of the academic staff and the work quality have been developed.	<p>LBTU 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 LBTU Regulations on Academic Positions (File available in the attachments section in the folder "LBTU Documents in English"). 2. The Regulation regarding the Calculation of Academic Workload (File in the attachments section in the folder "LBTU Documents in English"). 3. The Motivation System for LBTU Academic Staff (File available in the attachments section in the folder "LBTU Documents in English"). 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) - https://www.llu.lv/lv/nodarbibu-grafiki (only in Latvian)
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>LBTU 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, LBTU employs the accounting system Horizont that is a single system connected with the Ministry of Agriculture.</p> <p>The achievement of the goals and targets set by the LBTU 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 LBTU Director - during the Rectorate meetings; The Rector - during the Council meetings. <p>Annex - screenshots from LBTU IS and LBTU intranet MansLLU.</p>

6	The higher education institution/ college shall ensure continuous improvement, development, and efficient performance of the study field whilst implementing their quality assurance systems.	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 LBTU website https://www.llu.lv/lv/studiju-virzienu-parskati-un-pasnovertejuma-zinojumi (Only in Latvian)
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2.1. Management of the Study Field

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

The previous accreditation of the LBTU ITF higher education study direction "Information technology, computer hardware, electronics, telecommunications, computer management and computer science" (hereinafter referred to as - the "Study Direction") was approved by decision No. 1 of the meeting of the Study Accreditation Commission on 14 May 2013. The direction provides information technology full-cycle studies at LBTU (Professional Bachelor in Information Technologies and Programming Engineer, Bachelor of Life Sciences in Computer Control and Computer Science, Master of Life Sciences in Information Technologies, Doctor of Engineering in Information Technologies).

The direction includes four study programs: Professional bachelor's study program Information technologies for sustainable development (42484); Academic bachelor study program Computer management and computer science (43483); Academic master's study program Information technologies (45483) and Academic doctoral study program Information technologies (51483).

The goal of the Study Direction is to prepare highly qualified specialists at all levels of information technology realises the long-term goal of the LBTU "to implement high-quality studies that ensure the preparation of internationally competitive specialists" (LBTU development strategy for 2015-2022 (https://www.llu.lv/sites/default/files/2020-12/StrategijaENG_8_12_2020.pdf)).

Since 2013, the aim of bachelor's and master's programmes has been determined according to the European accreditation criteria and recommendations for Information Technology study programmes (Euro-Inf Framework Standards and Accreditation Criteria for Informatics Programmes, 2011). Taking into account the current trend towards creating a single European educational space, this compliance is maintained using the latest version of the recommendations (Version: 23.10.2017 <https://eqanie.eu/documents/>), the general parts of the EQUANI framework standards and by aligning it with the best practices for quality assurance in higher education (ESG 2015, Brussels, Belgium).

The results required for Bachelor (First Cycle Degree) and Master (Second Cycle Degree) level studies are divided into 6 categories:

- Information Technology Conceptual Framework - identifies capabilities essential to meet other programme outcomes regardless of specific specialisation and context of application
- Analysis - includes the application of information technology concepts and tools for the analysis of both problems and their solutions.
- Design and Implementation - involves the creation and development of an economically

viable product, process or system to meet defined needs

- Economic, legal, social, ethical and environmental context – determines the skills that graduates need to manage their activities and be aware of various legal and ethical constraints, promotes awareness of the need for a high level of professional and ethical behaviour in relation to information technology activities and knowledge of professional codes of conduct
- Information technology practice – determines the practical abilities that graduates should demonstrate by applying information technology skills in different situations, understanding the contexts in which information technology knowledge can be used
- Other Professional Competencies – lists social or collaborative skills that are critical to communicating information, ideas, problems, and solutions. In addition to common skills, this category also includes personal organisational skills, teamwork and lifelong learning

The division of study results into the mentioned categories is valid for both bachelor's and master's study programmes, however, there are significant differences in requirements between these two levels. For example, if bachelor's level graduates shall be able to formalise and specify real-world problems, the solution of which involves the use of information technology, then master's level graduates shall be able to additionally specify and solve information technology tasks that are complex, incompletely defined or unfamiliar.

In both academic and professional bachelor's study programmes, the necessary basic knowledge of information technology is acquired first, but the overall orientation of the programmes is significantly different. The study plan of the professional programme is prepared in accordance with the Cabinet Regulations regarding the State Standard for Second Level Professional Higher Education and the requirements of the LR standard “Programming engineer”. The programme is oriented towards the development of professional information systems emphasising interdisciplinary application and interacting with the unique fields of study realised by LBTU in Latvia. Accordingly, the study programme has a greater emphasis on practice, and the final work has mandatory requirements to be related to the development of a software product, therefore the amount of the theoretical part in the thesis description may be smaller.

The main goal of the academic bachelor's study programme, in accordance with the Cabinet Regulations regarding the State Standard of Academic Education, is to provide students with the acquisition of theoretical knowledge and research skills, which lay the foundations for further scientific activity. The simultaneously acquired conceptual foundations of information technology are sufficient to allow graduates of both bachelor's programmes to continue their studies in the master's programme.

Both bachelor's level study programmes are aimed at the inclusion of interdisciplinary aspects in the study courses of the study programme, with special emphasis on connection LBTU's unique study areas with ICT, such as precision forestry, precision agriculture, etc. This connection can also be clearly seen in the lists of topics of final theses. The “Computer control and computer science” study programme includes a wider spectrum of fundamental courses in the field of ICT, as well as an orientation to the acquisition of an in-depth theoretical basis for hardware and software work and further research in the field, while “Information Technologies for Sustainable Development” provides students with more practical knowledge of full software development in an interdisciplinary context. ITSD includes unique study courses focused on application and understanding aspects of interdisciplinary software development, such as “Sustainability of Computing”, “Design and Programming of Virtual Environments”, “Automation of GIS Tasks” and others. ITSD students consolidate both fundamental and specific knowledge during a 26-week long professional internship in software development companies, while CCCS students undergo a 12-week internship in relation to Information Systems, choosing ICT hardware services, computer

network companies, software development companies, educational institutions, etc. as places of internship.

CCCS students have more pronounced competences in the operation of the Internet of Things, and students' final theses are more related to topics about the interaction of hardware components, including such topics as embedded systems, smart homes, precision beekeeping, and others.

According to the statistical data, it can be seen that CCCS graduates prefer to study in a master's level study programme and continue their studies in doctoral programme, while ITSD graduates focus on careers and less often choose to study in higher level programmes. For example, in 2022, 5 of the master's students were CCCS graduates, and 1 ITSD, in 2020 a similar trend is observed, 8 CCCS graduates and 1 ITSD.

Master's and doctoral studies are essential to ensure full-cycle study of information technology at LBTU. They are an integral part of the path to scientific activity, because during studies, in addition to industry-specific courses, scientific research skills and the skills of preparing scientific publications are also acquired. The master's degree and doctoral degree also promotes opportunities to occupy leading positions in industry companies, as well as with a doctor's scientific degree, there is an opportunity to occupy leading positions in academic and/or scientific research projects. Many companies are establishing research and development (R&D) departments where PhD students can make a significant contribution. Employees with a doctorate degree are also valued by the state administration. For example, Toms Leikums, who currently works in the Department of Information Technology of the Ministry of Agriculture as the deputy head of the department, defended his work in 2015 on the topic "Basic principles on development of unified document management systems for state institutions" with application in state administration.

The European Commission has named specialisation in high-tech and knowledge-intensive areas as one of the main competitive advantages of the EU in global markets. By 2027, 85% of all jobs in the EU are expected to require at least basic digital skills. According to DESI data, ICT specialists in Latvia make up a smaller proportion of the workforce (2.3%) than in the rest of the EU (3.7% in the EU as a whole). This means that information technology study programmes have a direct relation to the development of the country.

In the Cabinet Order No. 436 (22.06.2021) "On the Education Development Guidelines for the period _____ of _____ 2021-2027 (<https://likumi.lv/ta/id/324332-par-izglitiba-attistiba-pamatnostadnem-2021-2027-gadam>) (only in Latvian), it is stated that the lack of ICT specialists in the labour market is significant. The MoE report of 2020 on the development of Latvia's national economy (<https://www.em.gov.lv/lv/informatie-zinojumi>) predicts that by 2027 there will be a shortage of ICT and engineering specialists (up to ~14 thousand employees in STEM industries). According to CSB data on 2020, there are 7,056 ICT industry companies in Latvia (in 2012, there were 6,326 companies), and their number continues to grow every year (<https://data.stat.gov.lv/>). According to data from the Information Technology Education Foundation, on average, 700 young specialists complete their studies in the field of ICT annually in Latvia, but approximately 3,000 graduates are needed per year (<https://www.lsm.lv/raksts/zinas/ekonomika/it-joma-absolventu-skaitlos-ir-around-700-years-necessary-3000.a347538/>) (only in Latvian).

According to the data of the Bank of Latvia in 2017 compared to 2015, the export of computer services increased by 30.8% and information services (ICT) by 22.5% (<https://www.makroekonomika.lv/pakalpojumu-eksporta-nozime-latvijas-ekonomika>). The ICT industry generates 6% of Latvia's GDP (<https://likta.lv/nozare-skaitlos/>) and is the TOP3 Latvian exporter among all industries.

One of the reasons for such an increase is the wide range of services offered (data centres, system administration services, electronic payment systems, etc.) and the tendency of foreign companies to develop IT infrastructure and production of products for the international market in Latvia. This is facilitated by employee education, knowledge of different languages, the country's development in digital matters, as well as the price competitiveness of the offered services. Factors such as mentality and reliability are also advantages. These aspects prove the need to pay attention to the knowledge included in the category "Economic, legal, social, ethical and environmental context" in the study direction programmes.

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

Summarising and analysing the development of the study direction from 2013 to 2021, an analysis of the state of the study direction was carried out using the SWOT method. The Faculty of Information Technology of LBTU has all the possibilities to successfully realise the analysed Study Direction and to prepare information technology specialists for all regions of Latvia, as well as for work in international companies both in Latvia and abroad.

During the analysis of the situation, the strengths and weaknesses of the study direction have been determined, opportunities have been defined and possible threats have been determined

Strengths

- A strong teaching staff core with PhDs in industry.
- Study programmes with unique in Latvia ICT study courses in the interdisciplinary field.
- The popularity of information technology and computer science among potential students in Latvia and the world.
- Growing demand from students and employees of other industries to learn information technologies as additional skills.
- Growing demand from employers for specialists in this industry, as well as competitive salary.
- The renewed educational and technical support that is suitable for studies.
- Close cooperation with employers in the implementation of internships and study courses.
- A strong network of international partners (participation in consortia) in the field of ICT science and teaching staff experience in large-scale international scientific projects.
- The recognition of the faculty's study programmes in the industry in Latvia, which is promoted by the successful work of the graduates prepared in companies and organisations for more than 20 years, as well as the recognition received by the students in competitions of various levels.
- Realised all three levels of ICT field studies with Doctoral and Promotion Council in the industry.
- Cooperation at the inter-faculty level in the realisation of theses, scientific projects and study courses.

Weaknesses

- It is difficult to attract new qualified teaching staff, mainly due to the disproportion between the salaries of the companies in the industry and the educational institution.
- Restrictions on the maximum workload of teaching staff, which encourages teaching staff to seek additional work opportunities in other educational institutions or companies.
- Lack of non-study jobs in Jelgava for foreign and Latvian students during their studies.
- The disproportion of the job requirements with the remuneration of assistant professors, assoc. prof. and professors.
- Low motivation for ICT students to continue their studies in master's and doctoral studies.
- It is difficult to attract qualified technical personnel due to extremely low remuneration.

Opportunities

- Increase the number of successful students in the study direction.
- Encourage professionally motivated and industry-interested students to continue their studies in higher level programmes.
- Develop new interdisciplinary study courses in cooperation with LBTU's unique study field experts.
- Increase the number of foreign students with the help of cooperation agreements and position the offer in the existing market, expanding advertising and attraction in countries identified as new markets by the LBTU Council and the Centre for International Cooperation.
- Strengthen scientific activity in the field of interdisciplinary applications of information technology.
- Involve senior students and master's students more in scientific work.
- Further promote the international exchange of students of all levels within the framework of various programmes, especially by developing the ERASMUS partner network.
- Promote the recognition of study programmes in the international environment as development and application-oriented ICT programmes with unique interdisciplinary components.
- Participate in various industry organisations to identify new trends in ICT education in a timely manner
- Within the framework of various collaborations, attract more teaching staff from abroad for basic work or for reading lectures.

Threats

- Decrease or invariance of the number of students due to the demographic situation of Latvia.
- Restrictions on attracting students, introducing changes to the co-financing requirement of state-funded study places from students' personal funds in Latvia.
- An even greater diversity of Latvian students' preparation, taking into account the implementation of the curriculum based on the competence approach of the school education system
- The flow of teaching staff to ICT companies and other educational institutions as the gap between higher education salaries and salaries in the industry, schools and other educational institutions is getting wider
- The growing administrative and formal requirements for higher education teaching staff make it difficult to attract qualified teaching staff
- The geopolitical situation in Latvia's neighbouring countries may reduce the desire of foreign students and opportunities for the university to attract students to study, as well as foreign teaching staff to work, at LBTU
- Due to the potential economic stagnation of the European Union and rising daily costs, the

number of fee-paying students may decrease

- By reducing the importance of academic study programmes and emphasising professional higher education, the number of people interested in studies at higher study levels may decrease in Latvia, as well as there may be difficulties in preparing and attracting Latvian scientists to work at LBTU.

Analysing the development of the study direction during the reporting period and evaluating its perspectives, it can be concluded that the STRENGTHS have been significantly consolidated. The existence of full-cycle studies of information technology and the activities of the Promotion Council at ITF have made a significant contribution to raising the qualifications of academic staff. The growing demand for specialists in the field of information technology in Latvia and the world also increases the interest of those who wish to study in this specialty. In recent years, the interest of employees of other industries in master's studies in information technology has also been observed, which is also promoted by the current demand of the labour market. Throughout the faculty's existence, ITF graduates have won awards in national bachelor's and master's theses competitions many times, and as highly valued employees in many IT industry companies, they indirectly contribute to the spread of positive information about information technology studies at LBTU. Since the information technology studies at LBTU are oriented towards applied knowledge direction, the direction has unique opportunities to directly cooperate with specialists in various industries in other LBTU faculties, which allows to include real interdisciplinary problem solving in final thesis and research.

Unfortunately, the previous WEAKNESSES have also remained, where one of the main reasons is the existing lack of study funding, which limits the attraction of highly qualified industry specialists to the learning process. Formal restrictions on the workload of teaching staff and disproportionate formal requirements for certification of work quality force teaching staff to engage in additional job searches and reduce interest in academic positions. Since the reality of life also forces students to look for opportunities to earn money, there is a lack of adequate job offers in the immediate vicinity. Financial restrictions do not allow for providing sufficient technical personnel for the study process, therefore higher category teaching staff such as associate professors, professors and assistant professors are forced to devote time to simple tasks necessary for the organisation of studies.

Work on the implementation of all the measures mentioned in the OPPORTUNITIES section, detailed in the relevant sections of this report, is ongoing.

Unfortunately, it is actually impossible to influence one of the biggest THREATS – the decrease in the number of students in Latvia – within the scope of the study direction. First of all, it is the real demographic situation in Latvia. Secondly, the planned co-financing requirements from students' personal funds, which in the current economic situation undoubtedly threaten to reduce the number of students and encourage their outflow to foreign countries, are a cause for concern. A serious threat to future students can be posed by the current reform of secondary education, which actually intends to transform secondary education, leading to the preparation of multifaceted, fragmented groups of students of different levels and knowledge, who may have limited opportunities for further higher education.

The further development of the study direction is described in the improvement plan of the Study Direction, which includes improvement plan of each study programme. These plans were developed within the framework of the LBTU project SAM 8.2.3 (itf_pilnveides_plans_en).

2.1.3. The structure of the management of the study field and the relevant study

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

The study direction is implemented at the Faculty of Information Technologies. 4 departments of the faculty are involved in the implementation of the study direction: Department of Computer Systems, Department of Management Systems, Department of Mathematics and Department of Physics. Teaching staff from other LBTU structural units are also involved in the implementation of the study direction: The Faculty of Engineering, Faculty of Economics and Social Development, Language Centre, Faculty of Environment and Civil Engineering, and Faculty of Forestry. The study direction includes 4 study programmes.

The academic staff of the ITF faculty are involved in ensuring the operation of the study direction: dean, vice-dean, directors of study programmes, heads of departments, lecturers and the LBTU Student Self-Government (also the Student Self-Government of the faculties). The dean's office of the faculty supervises student affairs, manages record-keeping, prepares diploma supplements, etc., binding record-keeping documents.

The programme director is responsible for the implementation of the study programme in accordance with the Senate Decision No. 9 – 81 of 12 April 2017 “Regulations on Study Programme Directors”, which defines the duties and rights of the director. The director of the study programme is approved by the LBTU Senate based on the decision of the LBTU Study Council. The responsibilities of the Director of the Study Programme:

1. organise study programme development;
2. prepare information for the annual review of the self-assessment of the study programme and direction, and the accreditation report;
3. cooperate with the dean of the faculty, heads of departments/institutes, teaching staff and students to improve the study programme;
4. follow up on the assessment of teaching staff involved in the study programme in the LBTU Information System (LBTU IS) and evaluate them;
5. analyse the results of the conducted surveys and propose the elimination of the detected deficiencies;
6. perform academic recognition of study courses or their parts;
7. inform students about current processes, activities and requirements in studies, cooperate with the LBTU Study Centre and Communication and Marketing Centre.

The director of the study programme prepares information about the study programme for the annual self-assessment report of the study direction, which is developed together with the head of the study direction.

The internal documents of LBTU regulate the preparation of reports regarding the study direction. The prepared annual report is approved by the ITF Council.

The study programme directors, vice-dean and dean are involved in the work of the ITF Methodological Commission (LBTU Senate Decision No. 6 – 17 of 9 April 2008 “Regulations of the Methodological Commission”), participating in the evaluation and coordination of the content and quality of the study programmes implemented in the faculty.

The organisation of the study programme is created taking into account the needs of the students in the study process, regularly evaluating and analysing the performance. Study work is organised by the responsible departments, but supervised by the Faculty Council, Study Centre, LBTU Council and Senate.

The effectiveness of management at LBTU is facilitated by a uniform order in the study organisation in all study directions and programmes, uniform document samples and availability of information on ongoing processes and current events, regular meetings attended by management, deans, and supporting administrative units. See the management structure scheme in the appendix (itf_studiju_virziena_parvaldiba_en).

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

Admission regulations for all LBTU study programmes are approved by the Senate every year in October and published on the LBTU website. For those interested, Regulations in Latvian are available at <https://www.llu.lv/lv/uznemsana>, for studies in English - <https://www.llu.lv/en/degree-programmes>.

New students, master's students and doctoral students are admitted on a competitive basis, in accordance with the competition criteria defined in the Admission Regulations.

In both bachelor's programmes realised at LBTU ITF, admission requirements are previous **secondary education**. New students are admitted on a competitive basis, based on the results of their centralised exams in Latvian, foreign languages, and mathematics. Students receive additional points for the centralised exam in physics. From the next study year (2023/2024) also for the newly introduced Programming and Design and Technology centralised exams in Latvia. Applicants for the study programme can apply using the e-service (at the portal latvija.lv) and the unified admission system, in which applications are simultaneously processed for 12 Latvian universities (Latvia University of Life Sciences and Technologies, University of Latvia, Riga Technical University, Daugavpils University, Liepaja University, Vidzeme University of Applied Sciences, Rezekne 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 system offers several advantages:

- for higher education institutions - to forecast the number of potential students who will enter into a study agreement;
- for applicants - to approve the application for studies closer to their place of residence, to follow their opportunities to study in the chosen study programme, to promptly receive the results of the competition.

Applicants are ranked by the uniform system corresponding to latvija.lv, and applicants receive information on the obtained study place, its financing, as well as information on the conclusion of a study agreement with LBTU to their e-mails and the specified telephone numbers.

Foreign students use the application system <https://apply.llu.lv/>, which is based on the purchased

Dream apply system (<https://dreamapply.com/>). Foreign students are tested for secondary education, language knowledge, which is confirmed by an internationally recognised certificate, and when enrolling in LBTU's ITF bachelor's and master's programmes, students take the entrance examination remotely, using a special course of the LBTU e-study system. Foreign students are admitted twice a year – in September and February. Starting from 2023, admission will be continued only once a year – in September, which is the decision of the LBTU Study Council. The detailed admission procedure for foreign students is presented on the LBTU portal: <https://www.lbtu.lv/en/how-to-apply> (14_Admission_regulation_2023_2024).

The admission requirements for the master's programme “Information Technology” firstly include the general LBTU admission requirements. New master's students are admitted on a competitive basis on the basis of a weighted average mark obtained in bachelor's studies (or higher professional education studies). LBTU graduates can apply for master's studies electronically, using the LBTU Information System; graduates of other universities – in person at LBTU.

Taking into account the demand observed in recent years and in consultation with employers in order to expand the possible range of master's students, studies in this programme are also offered to graduates in other fields (not related to ICT studies). Consequently, the admission rules have been slightly supplemented:

For the master's program:

- a. Implementation language Latvian - bachelor's degree or first-cycle (second-level) professional higher education in engineering, computer science, mathematics or physics. If the education was obtained in another field of study, an entrance exam must be taken.
- b. Language of implementation English - bachelor's degree or first-cycle (second-level) professional higher education in engineering, computer science, mathematics or physics. If the education was obtained in another field of study, an entrance exam must be taken. English language skills at least B2 level

Admission requirements for the doctoral programme “Information Technology”

- Implementation language Latvian - Master's degree or equivalent higher education in information technology. If the education was obtained in another branch of engineering, an entrance exam must be taken.
- Language of implementation English - Master's degree or equivalent higher education in information technology. If the education was obtained in another branch of engineering, an entrance exam must be taken. English language skills at least B2 level

In the study programmes of the study direction, prospective students can also start studies in later study stages, if they have previously acquired knowledge, skills and competencies in formal education or in non-formal education. LBTU has approved regulations and procedures for starting studies at later study stages and recognising knowledge, skills and competences acquired outside formal education or in professional experience (information available at Procedure for Starting Studies in Later Stages of Study)

During the current activity of the study direction, there has been no equalisation of non-formal or other types of education.

In undergraduate level studies, there are practical examples where students join a group as listeners while acquiring individual study courses. This process is managed by the Lifelong Learning Centre of LBTU.

In 2019, an agreement was also concluded with the Samarkand branch of Tashkent State University

of Economics on the realisation of the study plan and contents of the 1st and 2nd year of the study programme “Information Technology for Sustainable Development” in Samarkand, Uzbekistan with opportunities for successful students of Uzbekistan, after completing the 2nd year, to be admitted to the 3rd year of the LBTU ITSD study programme. In order to be admitted to the 3rd year, the procedure “Transfer from another higher education institution” is applied, which is provided at <https://www.llu.lv/lv/pariesana-no-citas-augstskolas>. This process is led by the International Cooperation Centre of LBTU, the ITF foreign student coordinator and the director of the study programme together with the ITF Methodological Commission.

In recent years, students relatively often transfer from other Latvian higher education institutions to study at later stages, for example, a 2nd-year bachelor's student in the field of ICT from Riga Technical University can start studies in the 2nd year of the LBTU ITF corresponding programme, following the “Transfer from another higher education institution” procedure (<https://www.llu.lv/lv/pariesana-no-citas-augstskolas> - only in Latvian). The Methodological Commission is actively involved in these issues, which, upon the initiative of the study programme director and the student's application, evaluates the student's suitability and the compliance of the courses studied with the content of the relevant study programme of LBTU ITF, providing approval for the transfer, clarifications or rejection. Foreign students from other Latvian universities have also transferred to LBTU ITF.

In general, the processes of the admission system are clear, improved over the years, tested and practically applicable, providing both Latvian and foreign students with a clear mechanism for starting studies in the first or later courses in the study programmes implemented in the study direction.

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

The evaluation criteria, conditions and binding procedures for LBTU students are described in the Study Regulations, that are available in Latvian <https://www.llu.lv/lv/studijas> and in English <https://www.llu.lv/en/study-guide-documents>

The basic principles and procedures for evaluating student knowledge are determined by Cabinet Regulations No. 512. “Regulations regarding the State Standard for Second Level Professional Higher Education”; Cabinet Regulations No. 240 “Regulations regarding the Standard for National Academic Education”; Cabinet Regulations No. 1001 “Procedure and Criteria for Awarding a Doctoral Degree” and the internal regulatory doctorate of LBTU developed on their basis: Study Regulations, Regulations regarding Final Examinations, Procedures for submitting electronic copies of final works and their verification in the plagiarism control system, On the individual examination of the final thesis in the plagiarism control system, On violations of academic integrity in final works/doctoral theses, Academic Integrity Regulation and Diploma with distinction.

In evaluating the study results of LBTU students, the basic principles defined in the Cabinet Regulations are observed:

- The principle of openness of assessment – in accordance with the set objectives and tasks of the study programmes, as well as the goals and tasks of the study courses, the higher education

institution has determined a set of requirements for the assessment of study results. The LBTU Study Regulations stipulate that the study results are evaluated according to two indicators: qualitative (examinations are evaluated on a 10-point scale or pass/fail) and quantitative (amount of the study course in credit points (CP), including both the attendance and the amount of independent work – the amount of credit points is presented in the study plan).

- The principle of obligatory assessment – it is necessary to obtain a successful assessment of the acquisition of the entire content of the study programme.

- The principle of assessment revision possibilities – the LBTU Study Regulations specify the appeal procedure.

- The principle of diversity of the types of tests used in the assessment – different types of tests are used in the assessment of the study programme acquisition, which are determined in the study plan.

According to the Study Regulations, the control of the knowledge and skills acquired in lectures and independent studies shall be regular throughout the semester. During the semester, the teaching staff in their study course regularly check the knowledge and skills of the students using the types of tests specified in the study course programme (tests, homework, calculations, graphic works, reports, colloquiums, laboratory works, etc.).

Regular control tests and other interim tests provided for in the study course programme are scheduled during contact hours. Control tests and other interim tests can also be organised in the LBTU e-study system, regardless of the type and form of studies.

The programme of each study course defines the knowledge, skills and competence to be acquired as a result of studying the course, as well as describes the evaluation criteria and methods (itia_kursu_programmas_en, dvdz_kursu_programmas_en, IT_kursu_programmas_ENG, phd_kursu_programmas_en)). The programmes are placed in the LBTU IS Study Course Register, as well as in the e-study environment. At the beginning of the course, each member of the teaching staff explains the content and requirements of their course to the students. The evaluation is based on the principle of aggregation of positive achievements, which gives students the opportunity to show to what extent they have achieved the expected results.

Every study year, the calendar schedule for development of Bachelor's theses and the calendar schedule for development of Master's theses are clarified and approved (<https://www.itf.llu.lv/lv/studiju-un-reglamentejosie-dokumenti>). The principles of evaluation of final theses are determined by the “Regulations regarding Final Examinations” and subordinate regulatory documents. The ITF methodological regulations describe the development and defence of theses in detail: Methodological regulations for developing and defending a bachelor's thesis; Development and defence of the Engineering Master's thesis in the “Information Technology” study programme (methodological regulations); Completion of coursework, bachelor's and master's theses (methodological regulations) (<https://www.itf.llu.lv/lv/studiju-un-reglamentejosie-dokumenti>) (In Latvian). These regulations have been translated and are also applicable to foreign students (<https://www.itf.llu.lv/en/writing-bachelor-and-master-thesis>). For foreign students, the calendar schedule is approved twice a year, as theses are currently defended in summer (June) and winter (January) (<https://www.itf.llu.lv/en/writing-bachelor-and-master-thesis>).

LBTU has joined the Unified Computerised Plagiarism Control System, which checks all final theses developed during studies at LBTU. The evaluation of the final thesis on a 10-point scale is determined by the final thesis defence commission based on the thesis description, thesis review/reviews and the defence process. A special software module is integrated into the e-study system, which allows identification of plagiarised works submitted using the e-study system in

various study courses.

Internship evaluation is based on the LBTU Regulation on Internship and guided by the internship study programme. The entire progress of the internship is documented and monitored with the help of the internship organisation web system (<http://prakses.itf.llu.lv/>) developed by the ITF. This system is also available to foreign students in English. In the internship system, all internship regulatory documents are stored, all interns and their corresponding internship places, as well as promptly filled internship diaries, are registered. At the end of the internship, students prepare and present an internship report. The internship is evaluated with a pass/fail. The internship results are evaluated by the internship supervisor, the director of the study programme and an invited commission.

The procedure and criteria for the evaluation of doctoral theses and the granting of the scientific doctoral degree are determined by the Cabinet Regulations No. 1001 “On the Procedure and Criteria for Granting (Promotion) of the Scientific Doctoral Degree”, LBTU Regulations “On the Promotion Councils and the Promotion.” According to these regulatory documents, the evaluation of doctoral theses and the granting of a scientific degree are carried out by the ITF Information Technology Industry Promotion Council. The requirements for the format of the doctoral thesis are determined by the Regulations “On the technical formatting of the scientific work to be submitted to the Promotion Council.” The procedure for conducting doctoral studies and the procedure for appeals are regulated by the Regulations for Doctoral Study.

The procedure, criteria and principles for evaluating students' achievements at different levels contribute to the achievement of study programme goals and ensure the evaluation of student-centred learning.

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

Academic integrity - the exercise of academic work with the highest standards of professionalism and accuracy, objectivity and truthfulness, moral and ethical principles, integrity, including the prevention of plagiarism, truthful reporting and accuracy in academic publications, and in communication and publicity activities (6_Regulations for Academic Integrity).

The **task** of academic integrity of the University is:

- to observe a high academic and scientific culture;
- to promote public confidence in the quality of education and the results of scientific research;
- to prevent and eliminate violations of the principles of operation of academic integrity;
- to determine liability for dishonest and unauthorised actions.

Students and LBTU academic, general, scientific, and administrative staff are equally responsible for the observance of the principles of academic integrity and for the consequences of violation. The LBTU Code of Ethics (<https://www.llu.lv/lv/llu-pamatdokumenti>, in English - <https://www.llu.lv/index.php/en/study-guide-documents>) and the Regulations on Academic Integrity are available on the LBTU website. (<https://www.llu.lv/lv/llu-pamatdokumenti>, in English, <https://www.llu.lv/en/study-guide-documents> or file (6_Regulations for Academic Integrity)

LBTU has developed and follows certain procedures for the control of plagiarism in the final works and actions, if plagiarism is confirmed:

- the Rector's Order "Procedures for submitting electronic copies of final works and their verification in the plagiarism control system";
- the Rector's Order "Violations of academic integrity in final works/doctoral theses".

In 2014, LBTU concluded an agreement on the use of the inter-university unified computerised plagiarism control system (hereinafter referred to as – the System) and started the examination of all final works for plagiarism in undergraduate studies and master's studies. Starting with 2017/2018 study year, LBTU determined that the mandatory examination for plagiarism shall also be carried out for doctoral theses.

The procedure provides that if in the final thesis the System detects a 10% coincidence of the text with another thesis, then the final thesis will be reviewed by the Faculty's Methodological Commission/Industry Promotion Council, and a decision will be made on the presence or absence of plagiarism, before receiving explanations from the author and supervisor of the final thesis in person. Since the implementation of the unified computerised plagiarism control system, only one thesis has been discovered among ITF final year students in a bachelor's study programme, where the author of the thesis was invited to the ITF Methodological Commission to discuss the result identified by the system. As a result, the author admitted that a large part of the thesis was plagiarised and decided to interrupt their studies. The author resumed their studies the following year and developed a new final thesis, which they successfully defended.

In the period from 2014 to 2022, a total number of 399 works have been submitted to the plagiarism control system, of which:

Computer control and computer science, a - 190

Information technologies for sustainable development, p/b - 115

Information technologies, a/m - 92

Information technologies, PhD - 2

In 2018, one bachelor thesis from the IT study program did not pass plagiarism control.

Starting with the principle of academic integrity of 2021/2022 – plagiarism in study papers – LBTU examines the works developed and submitted by all students during their studies (reports, term papers, course work, etc.). The LBTU e-learning system uses the plagiarism control tool "Ouriginal HE". On the basis of these results, each member of the teaching staff can follow the performance of practical works and, according to the requirements of their course, take this information into account in the assessment of work. Initially, the greatest attention is paid to developing students' understanding of plagiarism and eliminating its use in course works.

Undergraduate students are introduced to the principles of academic integrity in the early courses, during the preparation of course projects and term papers. ITSD students are introduced to the preparation of scientific articles and the principles of science in the "Computing Sustainability" module of the course. Master's level students learn these topics in courses related to research methodology and preparation of scientific articles. Doctoral students learn these topics in "Research Methodology" courses, as well as in organised ITF doctoral student seminars.

In general, the observance of academic integrity during the reporting period can be evaluated as very good. Conflict situations arise very rarely, and claims of students or teaching staff regarding the observance of academic integrity are usually resolved in the relationship between the student and the teaching staff, in rare cases involving the course curator or the Vice-Dean of Studies.

2.2. Efficiency of the Internal Quality Assurance System

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

LBTU's quality management system is based on LBTU's strategy and organisational values defined in it, as well as on the basic principles and requirements of the international standard "Investors in Excellence". LBTU's operational planning, organisational management and work performance management system is based on organisational hierarchy and document hierarchy. The basis of the operational planning system is the LBTU development strategy (https://www.llu.lv/sites/default/files/2021-03/StrategijaLV_0.pdf) and the developed action plans.

One of the four highest-level goals defined in the University's mission is "To provide high-quality study and lifelong learning services", according to which the Education Programme defined in the basic document "LBTU Quality Management System Description and Assurance Plan" (<https://www.llu.lv/en/mission-and-vision> ([Mission and vision | LBTU \(llu.lv\)](#))) includes the Education Offer Development Plan and the Education Human Resources Development Plan, which are the highest level guidelines in maintaining the study direction.

The next level of detail in the regulatory documents of the study direction is related to one of LBTU's core principal activity processes "Ensuring the basic process of studies", and consists of process descriptions, internal orders and external regulatory enactments. Documents describing the Support process and supporting elements (methodology, manuals, databases, forms, register of internal regulatory documents and register of external regulatory documents) have been developed for the full implementation of the activity.

The requirements of the quality assurance system are implemented at three levels

Quality assurance at the management level of LBTU:

Quality assurance activities	Compliance Criteria	Responsible person
Development of normative study documents and forms of LBTU	Legislation of the Republic of Latvia, Cabinet Regulations, MoEs laws and regulations	LBTU Study Centre, Office of the Vice-Rector of Studies
Study programme implementation planning and control	LBTU study documents	LBTU Study Centre
Increasing the qualification of academic staff (MMK, Innovations in didactics of universities)	LBTU study documents	LBTU Study Centre, Office of the Vice-Rector of Studies

Quality assurance activities	Compliance Criteria	Responsible person
Approval of study work documents and reports (Self-assessment reports, strategic plans and reports, etc.)	Regulatory enactments related to studies, LBTU study documents	LBTU Senate, Study Council, Scientific Council, Study Centre, Vice-Rector of Studies
Student surveys on the quality of work of teaching staff and the quality of study courses	Criteria developed by the Sociological Research Group of LBTU	LBTU Sociological Research Group, LBTU ITSEC Department of Information Systems

The LBTU Study Centre coordinates, analyses and controls the study process, its compliance with the regulatory enactments of the Republic of Latvia and manages the development of related regulatory documents, as well as develops proposals and prepares LBTU internal regulatory documents related to the study process. In order to systematise the use of regulatory documents at all levels and to centrally help follow their changes, the LBTU e-study system has created a support course SPDLBTU “Support for directors of study programmes at LBTU”. It contains current information and regulatory documents necessary for the work of study programme directors, providing access to materials. Guidelines and examples for implementing the various requirements are also given. Such materials significantly improve the efficiency and quality of work of programme directors, which is especially important in a situation when the importance of the role of study programme directors in ensuring the study process is increased.

In the second support course of similar importance, LBTUGD_2020 “Preparation of study direction self-assessment report”, all current information about the preparation of the report is included in the e-study system, as well as guidelines for the use of these resources are added. Since the previous accreditation process, the information in these sections is regularly supplemented and updated, ensuring a significant contribution to the quality of LBTU processes.

Quality assurance at the level of the Faculty of Information Technology:

Quality assurance activities	Compliance Criteria	Responsible person
Preparation of annual self-assessment reports regarding the study programmes	Cabinet Regulations, LBTU study documents	Dean, head of study direction, directors of study programmes
Development of the faculty's strategic plan	Regulatory documents of LBTU	Dean, department heads
Implementation report of the Faculty's strategic plan	Regulatory documents of LBTU	Dean, department heads
Evaluation of study programmes, plans and courses	LBTU study documents	ITF Methodological Commission, departments, study programme directors
Study programme implementation planning and control	LBTU study documents	ITF vice-dean, study programme directors

Quality assurance activities	Compliance Criteria	Responsible person
Technical support	Requirements for provision of study programmes	Dean, department heads, vice dean in economic affairs.

Quality assurance at the level of ITF departments:

Quality assurance activities	Compliance Criterion	Responsible person
Preparation of annual and accreditation self-assessment reports regarding bachelor's, master's and doctoral study programmes	Cabinet Regulations, LBTU study documents	Study programme directors
Preparation of annual and accreditation self-assessment reports regarding the study direction "Information technology, Computer Equipment, Electronics, Telecommunications, Computer Control, Computer Science"	Cabinet Regulations, LBTU study documents	Head of the study direction
Improvement of study programmes	Study programme quality assurance process	Study programme directors
Improvement of study courses	Study programme quality assurance process	Study programme directors
Evaluation of the quality of study programmes, plans and courses (<i>peer review</i>) before re-approval of each study document	Study course programme review procedure	Study programme director
Evaluation of the external quality of study courses and programmes (at the end of each study semester)	Student survey	Study programme director
Analysis of student success and attendance of lectures	Study plan	Head of department, study programme director, course curator, Vice Dean of Studies

Quality assurance activities	Compliance Criterion	Responsible person
Study programme graduate surveys	ITF graduate survey questionnaire	Study programme director

The main educational programme results and indicators related to the study process provided in the LBTU Development Strategy:

1. Number of students at LBTU as of 1 October of the respective year
2. The number of graduates, which is determined after the defence of the final theses
3. Characteristics of student mobility, determined once a year on 1 September
4. Quality of studies (average arithmetic indicator of student evaluations on a 5-point scale)

In the assessment of internal quality, much attention is paid to the qualifications and work of teaching staff, which is characterised by the following indicators:

1. Participation of teaching staff in qualification improvement courses, seminars, etc.
2. Participation of teaching staff in mobility programmes
3. Study materials prepared by the teaching staff
4. Evaluation of teaching staff
5. Improved study course programmes
6. Number of foreign guest lecturers who have lecturing contracts with LBTU
7. The number of leading specialists of the industries involved in the study process

The faculty is also a member of LIKTA (<https://likta.lv/>) and Informatics Europe (<https://www.informatics-europe.org/>), which allows for obtaining information from industry organisations and employers about possible improvements in the content of the programmes. The Dean of the Faculty or study programme directors also regularly participate in the European Computer Science Summit 2022 workshops and conference, within the framework of which programme directors and deans acquire new management skills and gain skills and knowledge about new trends in European ICT education. The faculty is also involved in the Digital Humanism (DIGHUM) initiative led by TU Wien. Within the framework of this initiative, workshops are created and knowledge is collected about ethical considerations and, as automation and machine learning develop, the challenges of human-computer interaction in the near future.

The analysis of the results of student, graduate and employer surveys carried out during the reporting period is included in the appendix *itf_studejoso_darba_deveju_absolventu_aptaujas_lv* (In Latvian) and *itf_studejoso_darba_deveju_absolventu_aptaujas_en*.

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

The development of new study programmes at LBTU takes place in accordance with the regulations approved by the Senate *“Regulations for development, approval and modification of study*

programmes at LBTU” (<https://www.ltu.lv/lv/ar-studijam-saistitie-dokumenti>) (only in Latvian) or (Procedure for Study Course_Traineeship Programme Development Process). The regulations provide that before the study programme is approved by the Senate, it is discussed and analysed in the faculty's Methodological Commission, the Council and the LBTU Study Council.

The existing study programmes are regularly reviewed every study year, resulting in the annual report of the study direction. The reports are available on the LBTU website <https://www.ltu.lv/lv/studiju-virzienu-parskati-un-pasnovertejuma-zinojumi> (only in Latvian). The reports are analysed in the Faculty Council, the Study Centre, the Study Council and approved by the Senate.

The content of study programmes is updated based on the recommendations of employers and industry associations and the established priorities. Study programme directors regularly get acquainted with LIKTA reports, Informatics Europe reports and conference content, as well as ACM and IEEE curriculum recommendations (<https://www.acm.org/education/curricula-recommendations>). Practically every year, ITF organises an internship seminar for students, in which lecturers also participate, in order to familiarise themselves with the specifics of companies, the technologies used, and the expected preparation of students for the implementation of internships. The seminar usually takes place in November and 7-10 industry companies participate in it.

As a result of such cooperation between employers and ITF, several courses have been created, the co-authors or readers of individual lectures are representatives of the industry, for example, the authors of the Master's level study course “Automated Testing”, besides the ITF professor, are also representatives of *SIA TestDevLab* and *AS Emergn*, the co-authors of the “IT project management” course are the leading developers of *SIA Accenture*.

In the period from 2018 to 2021, all study programmes were evaluated in detail within the framework of the LBTU project SAM 8.2.3 “Improving the management of the Latvia University of Life Sciences and Technologies”. Foreign experts and representatives of the relevant industry (employers) participated in the evaluation of the programmes. Based on the recommendations of experts, study programme improvement plans were developed and implemented.

Students also have the opportunity to make proposals about the content of the study programme when meeting with the director of the study programme. For example, ITSD final year students in 2018, after evaluating the content of the ITSD study programme, made a proposal to replace the “Computer Networks II” study course with a software development course. This proposal was discussed with the head of the study direction, as well as in the Methodological Commission. A decision was made to exclude the “Computer Networks II” study course from the programme, developing a new study course instead.

At the end of each study year, the bachelor's and master's final theses commissions also prepare conclusions about the quality of the final theses and the students' knowledge, providing proposals for further improvements. These recommendations identify skills that students still need to acquire and potential improvements. By inviting the programme director, discussions are held about the inclusion of new courses in the study programme or the inclusion of topics in existing study courses. The commission consists of high-level managers of the leading industry companies in Latvia.

Recommendations about the content of the study programme can also be received with the help of the internship supervisor's feedback. In bachelor's study programmes, internship supervisors from companies provide an evaluation of the intern's skills and other characteristics. At the end of the internship, the students prepare an internship report and present the internship results to the ITF

commission. Both in the feedback from the internship supervisor and during student presentations, recommendations for further improvements of the study programme content can be identified, which are recorded by the study programme director.

Possible improvements in the content of the study programme can also be identified by analysing the feedback of students who have decided to interrupt their studies (ex-matriculate). Students indicate the reasons for interrupting their studies in the application, but usually a conversation is also conducted with the student about broader reasons for such a decision. For example, one of the improvements of the study programme in the bachelor's level programmes was made after analysing the reasons for exmatriculation of students in the 1st semester, where the students mentioned the fact that, in the 1st semester, they did not see the industry courses (more emphasis was placed on the general study courses) and decided to interrupt their studies. After analysing these reasons and evaluating the appropriate succession of study courses, a decision was made to adjust the study plan and to include several study courses that were not previously planned in the 1st semester, such as "Database Technologies" and "Operating Systems". After these changes, deficiencies in the study plan or the absence of industry courses are practically not mentioned as the reason for exmatriculation.

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

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

- in writing or orally at the faculty level - to the curator, study programme director, vice dean or dean;
- in writing or orally at the management level of LBTU - at the Study Centre, to the Vice Rector of Studies, the Study Council and the Senate, reviewing and approving various internal normative documents.
- anonymously, using the possibility of whistleblowing at LBTU <https://www.llu.lv/lv/trauksmes-celsana> (only in Latvian).

The LBTU Study Regulations, which are available to all students in *Mans LBTU*, specify the procedure for submitting and considering complaints (appeals).

If the student has submitted a written complaint, then, after its examination, he/she receives a written answer, provided that the examination of the complaint took place without the presence of the student.

The student can also submit a complaint to the LBTU Arbitration Court, which operates in accordance with its regulations.

Students can also submit complaints and proposals to the ITF student self-government, as well as to the LBTU student self-government, which further examines the complaint, helps solve it, or forwards it to the appropriate LBTU structural unit or person.

Several times a year, the dean's meetings are organised with representatives of the ITF student self-government, as well as course leaders. A correspondence group has also been established, involving the dean, leaders of all courses, as well as representatives of the ITF student self-government.

There were no written complaints about the study process during the reporting period. Conflict situations that could be perceived as complaints are usually resolved through negotiations at the level of course leaders or course curators. In rare cases, the director of the study programme or the vice-dean of studies are involved in the negotiations.

There have been student conflicts with the university regarding tuition fee delays, but these conflicts are resolved in other LBTU commissions by involving lawyers, specialists from financial structural units, as well as in certain situations by engaging external services for the collection of tuition fees from students, in cases of non-payment.

2.2.4. Provide information on the mechanism for collecting the statistical data, as developed by the higher education institution/ college. Specify the type of data to be collected, the regularity of collection, and the way the information is used to improve the study field. Describe the mechanism for obtaining and providing feedback, including with regard to the work with the students, graduates, and employers.

LBTU collects statistical data centrally in various dimensions and with different regularity.

Once a month:

1. The number of students by study programmes, study types and forms, study directions and faculties – the collected statistical data is sent to LBTU management and faculty deans. Statistical data is used to follow the dynamics of the number of students at LBTU.
2. Use of state-funded study places – data is collected by study programme in order to monitor the use of state-funded study places. This statistical data is used to predict the number of newly admitted state-funded students and the number of places for student rotation in each semester (competition for state-funded study places) – the collected statistical data is sent to the management of LBTU and the deans of the faculties, as well as to the vice-deans of the faculties, if needed.

Once during the study year

1. Number of graduates by study programmes, study directions and faculties, types of funding – the data is used to prepare various reports (for example, LBTU annual report <https://www.llu.lv/lv/llu-pamatdokumenti>)
2. Admission results – admission results in various dimensions. Admission results are used to plan admission limits and projections for each subsequent year.
3. LBTU Statistical data compilation *Augstskola-1* for Central Statistical Bureau (CSB). The data compilation is created on the basis of the forms specified by the CSB. The collected data is also sent to the Ministry of Education and Science, and is available to all interested parties (<https://izm.gov.lv/lv/publikacijas-un-statistika/statistika-par-izglitibu/statistika-par-augstako-izglitibu>). The data is also used for the preparation of various reports (for example, the LBTU annual reports <https://www.llu.lv/lv/llu-pamatdokumenti>).

Once a year:

1. Statistical data compilation by study directions (the summary is made for the previous study year) – the number of students by study programmes, study types and forms, graduates, those who have interrupted their studies and the reasons why their studies are interrupted, statistics regarding foreign students. These summaries are received by all directors of study programmes and this data is used to prepare the annual reports of the study programmes for evaluation (available at <https://www.llu.lv/lv/studiju-virzienu-parskati-un-pasnovertejuma-zinojumi> (in Latvian only)).
2. Use of state-funded study places during a year – the data is used for the preparation of reports on the performance of the LBTU, MoA and MoES contract.
3. Compilation of performance indicators of LBTU Development Strategy for 2015-2022 Education programmes and Research programmes – the data is used for annual reports on the implementation of the Development Strategy and for cascading performance indicator goals for the next year. Strategy implementation reports by faculties take place in face-to-face meetings.
4. Data on the performance indicators of the LBTU Development Strategy for 2015-2022 is collected at the faculty level. The IS system of LBTU is used for compilation, in which employees enter data on annual activities, while the programme director and dean retrieve the data in the form of a report. The compilation is contained in the annual document “Faculty work plan”, which is prepared by the dean together with the vice-deans and heads of departments and presented to the ITF Council, as well as at the end of the year, when it is presented at the General Meeting of Employees, in which all LBTU ITF employees participate. Annex itf_darba_plans_2020_en includes a sample of the Annual Work Plan of the Faculty for 2020, which is approved by the ITF Council and submitted to the Rector of LBTU.
5. During the internship seminars, information about internship offers is obtained and the number of internship offers in the prakses.itf.llu.lv system is increased.
6. The performance of each academic staff member in science is summarised at the end of the calendar year in accordance with the decision of the LBTU Scientific Council of 26 October 2022 “On evaluating the effectiveness of the scientific activity of LBTU academic staff, leading researchers and researchers”. Academic staff enter data using LBTU IS throughout the calendar year.

2.2.5. Specify the websites (e.g., the homepage) on which the information on the study field and the relevant study programmes is published (in all languages in which the study programmes are implemented) by indicating the persons responsible for the compliance of the information available on the website with the information published in the official registers (State Education Information System (VIIS), E-platform).

Information about study directions and study programmes is published on the LBTU website www.llu.lv or www.lbtu.lv, i.e. see news about what is happening in the corresponding study programmes, as well as basic information about each study programme. Detailed information (descriptions of study programmes) is available in the section: *Studijas / Studiju programmas* -> <https://www.llu.lv/lv/studiju-programmas> and in the section *Nāc studēt / Ko studēt?* (in Latvian) *Assistance in choosing study programmes* - <https://www.llu.lv/lv/studiju-programmas>

Information about study programmes in **English** is available on the LBTU English page: *Studies / Degree Studies / Degree Programmes* -> <https://www.llu.lv/en/degree-programmes> and application

<https://apply.llu.lv/>

All study programme descriptions can also be accessed through the LBTU ITF faculty website <http://www.itf.llu.lv/>: *Studies / Study opportunities* -> <https://www.itf.llu.lv/lv/studiju-iespejas>

Information about study programmes is also available in **electronic informational materials** (booklets), incl. information about the study programme and alumni feedback that has been collected.

- Basic studies booklet: <https://www.llu.lv/buklets/llu-pamatstudiju-buklets-2020> - renewed every study year
- Master's study booklet: <https://www.llu.lv/buklets/llu-magistra-studijas-buklets-2020> - renewed every study year
- Booklet in English: <https://www.itf.llu.lv/en>

Up-to-date information on all study programmes of the study direction are also available on the electronic platform of the Academic Information Centre <https://eplatforma.aika.lv/>

The structural units responsible for the compliance of the information available on the LBTU website with the information available in the official registers:

- Study Centre regarding first- and second-level professional programmes, bachelor's and master's study programmes,
- Study Centre regarding doctoral study programmes,
- International Cooperation Centre regarding study programmes that are implemented in English.

The information on the LBTU website has been prepared in cooperation with the director of each study programme.

Information about LBTU study programmes is also available on the portal **www.prakse.lv**: <https://www.prakse.lv/edu/profile/84/latvijas-lauksaimniecibas-universitate> (In Latvian)

Person responsible for posting information: Project Manager of the Lifelong Learning Centre.

Information about LBTU study programmes is also available in the **National Educational Opportunities Database** [www.niid.lv](http://niid.lv/niid_search?qy=Latvijas%20Lauksaimniec%C4%ABbas%20universit%C4%81te&level_1=7): http://niid.lv/niid_search?qy=Latvijas%20Lauksaimniec%C4%ABbas%20universit%C4%81te&level_1=7

The LBTU website provides information on the conditions and procedures of academic mobility in accordance with the ERASMUS + University Charter and programme guidelines:

- <https://www.llu.lv/lv/starptautiska-mobilitate> - in Latvian;
- <https://www.llu.lv/en/exchange-studies> - in English.

LBTU subscribes to study e-marketing websites:

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

For foreign students

- The LBTU website provides comprehensive and detailed information for potential and current full-time students from abroad:
- about LBTU's offer to acquire study programmes in English, see <http://www.llu.lv/en/degree-programmes>, where the information of each programme is detailed up to the study plan;

- about the step-by-step admission process, see <http://www.llu.lv/en/how-to-apply>
- about immigration procedures, see <http://www.llu.lv/index.php/en/immigration>
- about study and living conditions, see <http://www.llu.lv/sites/default/files/2018-11/LBTU-Celvedis-EN-2018-17.10.pdf> ;
<https://www.llu.lv/en/before-arrival>
- about foreign students' testimonials, – <http://www.llu.lv/en/student-testimonials-7>

The director of the study programme or the external relations coordinator of the faculty is responsible for the compliance of the content of the information posted on the websites or its changes with the official information, while the external relations coordinators of the LBTU International Cooperation Centre (ICC) are responsible for posting it on these websites.

The LBTU International Cooperation Centre has prepared and published informative booklets “Erasmus+ Mobility Information Handbook”, “Degree Studies”, information sheets, and materials that are used to promote study programmes and exchange studies in marketing activities.

2.3. Resources and Provision of the Study Field

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

The overall financial provision of the Study Direction and its approval procedure is as follows:

The amount of state-funded study places is coordinated in a tripartite agreement between the Ministry of Education and Science (MoES), the Ministry of Agriculture (MoA) and Latvia University of Life Sciences and Technologies (Latvia University of Agriculture). In the tripartite agreement on financing, the base cost of one study place, study level coefficients, social security of the study place, study cost coefficients of the thematic field of education are determined (the coefficients for each thematic field of education are different, they are stipulated in Cabinet Regulations, Procedures for Financing Institutions of Higher Education and Colleges from the Funds of the State Budget)

(<https://likumi.lv/ta/en/en/id/149900-procedures-for-financing-institutions-of-higher-education-and-colleges-from-the-funds-of-the-state-budget>).

Every year, the LBTU Senate approves the distribution of revenues and expenses of the LBTU general budget structure which is prepared in accordance with the law On the State Budget taken by the *Saeima* every year and the annual LBTU Rector's order On LBTU General Budget Planning. Control and audit of the general budget is performed by an independent sworn auditor, whose opinion and report are reviewed and approved by the Senate.

Before approving the distribution of the LBTU general budget revenue and expenses in the Senate, it is reviewed, discussed, and approved by the Working group on resource use and development issues, which consists of the Rector, vice-rectors, chancellor, the LBTU director, all deans of faculties, head of the resource accounting centre/key accountant, head of the financial planning centre, key economists, and key specialists in real estate and legal issues.

The main components of the LBTU general budget revenue and expenditure in 2022 are as follows:

State budget transfer for ensuring the study process: EUR 10 754 571

Revenue from the LBTU fee: EUR 2 273 695

Science revenue/expenditure: EUR 10 382 932

ERASMUS revenues/expenditures EUR 394 982

Donations received: EUR 15 000

The distribution of revenue and expenses approved by the LBTU Senate determines that 80% of the funding allocated from the state consists of compensation costs, and 20% other costs. 60% of the paid study funding consists of reimbursement costs, and 40% other costs, of which 20% is directly at the disposal of the faculty that implements the respective study programme. The amount of funding for the Science Base is calculated and allocated annually from active research activities. The Science Base funding in the amount of 50% is at the direct disposal of the faculty, and 50% is to cover centralised costs. The science funding consists of funding attracted for the implementation of projects.

The total funding is further specified broken down according to study programmes and is available in the study programme descriptions of this report.

Study fees for study direction programmes in the study year 2021/2022 in EUR (yearly study fee)

- Computer Control and Computer Science, basic studies: EUR 1720 (Latvian language flow)
- +) EUR 2000 (flow of foreigners/English language)
- Information Technologies for Sustainable Development, basic studies: EUR 1720 (Latvian language flow) EUR 2000 (flow of foreigners/English language)
- Information Technology, master's studies: EUR 2240 (Latvian language flow) EUR 2500 (flow of foreigners/English language)
- Information Technology, doctoral studies: EUR 2580 (flow of Latvian citizens) EUR 4100 (flow of foreigners/English language)

Science funding is formed from the funding attracted in the projects. Science funding also includes science base funding, which is calculated based on the performance of scientific activity at the university and faculty. The part of the science base funding received at the university is distributed among the faculties based on the performance indicators of the faculty's scientific activity of the previous year, for example, the number of publications, researchers' remuneration, scientific workloads.

The science base funding obtained at the faculty (allocated from 2016) and performance funding are as follows:

in 2016 EUR 30 330.72 base | EUR 17 517.70 performance

in 2017 EUR 30 800.64 base | EUR 28 331.39 performance

in 2018 EUR 28 021.36 base | EUR 25 837.29 performance

in 2019 EUR 25 619.00 base | EUR 23 937.30 performance

in 2020 EUR 37 970.00 base | EUR 25 277.30 performance

in 2021 EUR 40 588.03 base | EUR 28 262.79 performance

in 2022 EUR 46 673.19 base | EUR 29 093.37 performance

The obtained science funding can be used for scientific purposes by supporting the scientific activity of doctoral students, publication of researchers, the purchase of the necessary research infrastructure and researchers' remuneration. Performance funding is calculated for the elected staff (researchers and leading researchers), and is also used for researchers' remuneration. In general, the majority of science funding is spent on researchers' remuneration, funding of researchers' publications and participation in scientific conferences, and also on the purchase of the infrastructure necessary for science (sensors, servers, data storage devices, etc.), and business trips to participate in consortia meetings where international project applications are prepared.

The funding allocated to the faculty is also used for the development of study infrastructure and provision. The main sources of this funding are a certain part of study fees for fee-paying students and income from retaking various student examinations. For example, the fees for retaking the exam, etc., determined by, for example, the Rector's Order No. 4.3.-8/156 of 2022, On the Procedure for the Collection of Study Fees and Study Academic Debt Settlement Fees.

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

For the implementation of the study direction, all necessary resources are available, both adequate funding to ensure learning and teaching activities, and sufficient and easily accessible material and technical support.

In recent years, LBTU has implemented several large-scale infrastructure improvement projects, as a result of which the study implementation building itself (Jelgava Castle) was improved by building ventilation, changing windows and carrying out interior repairs. Renovation and building insulation works were also carried out in several student hotels. Improvements can also be seen in the infrastructure of STEM studies (modernisation of the LLU STEM study programmes as part of the project)

(<https://www.llu.lv/lv/projekti/apstiprinatie-projekti/2017/llu-stem-studiju-programmu-modernizacija>) (In Latvian)- all 12 laboratories of the faculty available to ITF students have been renovated, equipped with modern computer equipment (more than 200 computers) and appropriate equipment (printers, 3D printers, screens, projectors, etc.). The rational use of science-based funding has also allowed the development of the infrastructure necessary for science, which is also available for students to carry out research work by writing publications, final theses. For example, thermal camera, servers, high-performance computers, virtual reality and eye tracking equipment, etc.

Also, the income of the faculty is used mainly for the renovation of the infrastructure by taking into account the rapid development of the industry and the priority of the faculty to create a comfortable and pleasant study environment for students.

The programs of study direction have basically been implemented in the Faculty of Information Technology, which is located in Jelgava, 2 Lielā Street, in the premises of Jelgava Palace. Studies take place in four departments: The total space area of the Department of Computer Systems is 410 m², the total space area of the Department of Management Systems is 210 m², the total space area of the Department of Mathematics is 350 m², and the total space area of the Department of Physics is 985 m².

In order to ensure a successful higher education environment, students are provided with a wide range of resources: both physical resources, such as libraries, study equipment and IT infrastructure, and human resources – academic staff, study consultants and other advisors. Each study programme has its own study programme director and each stream of students has its own curator who help solve current problems. There is also an International Student Coordinator who helps navigate the possible mobility of students.

The material and technical base of both the LBTU and other faculties is used in the implementation of the Study Direction: In the Faculty of Forestry, Faculty of Environment and Civil Engineering, Technical Faculty, Faculty of Economics and Social Development, Language Centre, etc.

Students and the faculty may collaborate with the Department of Technology and Knowledge Transfer (TEPEK) and use the infrastructure available thereby. Also, the library infrastructure with computer equipment, subscribed science databases, etc. are available for the implementation of the Study Direction.

Dormitories are available for students. LBTU has six functioning dormitories where in recent years large-scale investments have been attracted for repair works and energy efficiency improvement works by providing students with increasingly high-quality living conditions at dormitories. The Sports House is also available which implements several sports activities that are available to LBTU students free of charge or with a fee discount.

ITF continues to work with Microsoft and the use of the “Azure Dev Tools for Teaching” programme in the ITF study process is extended every year, which opens the possibility for all ITF students and teachers to download the latest Microsoft computer programmes and use them for academic purposes, as well as a USD 100 credit on the cloud computing platform Azure Cloud Computing is available for those studying in the programme and for the academic staff for resources during the period of 12 months, and it is renewable as long as the student is studying in the Faculty. Currently, the programme has been extended until 27 February 2023. As part of cooperation between ITF and software manufacturers, resources are also available to students as part of cooperation between Oracle University, Apple iOS Developer, and CISCO Academy.

During Covid-19, the material and technical base for remote work was improved. Laptops, internet cameras, headsets with microphones and microphones were purchased by using MoES Science base financing and ITF's own financial resources to ensure working remotely and for the preparation of study materials for remote studies. Also, several rooms are equipped with card readers and automatic doors, which allow students and teaching staff to access the rooms with the issued identification cards (LLU employee and student cards).

All the LBTU facilities have access to the wireless web, which is free of charge for LBTU students and employees, and also guests. Students also have access to several information systems – e-study system, the LBTU information system, ITF practice information system, and an LBTU e-mail address has also been created for students and employees.

The material and technical provision of individual study programmes, and also the available laboratories, are included in the description of each study programme within this report.

2.3.3. Provide information on the system and procedures for the improvement and purchase of the methodological and informative provision. Description and assessment of the availability of the library and the databases to the students (including in digital environment) and their compliance with the needs of the study field by specifying whether the opening times of the library are appropriate for the students, as well as the number/

area of the premises, their suitability for individual studies and research work, the services provided by the library, the available literature for the implementation of the study field, the databases available for the students in the respective field, the statistical data on their use, the procedures for the replenishment of the library stock, as well as the procedures and possibilities for the subscription to the databases.

LBTU has a large, accredited Fundamental Library available, which provides library users with literature necessary for teaching, research, scientific and consultative activities or literature thereon. The collection of the library by branches of science consists of: agriculture - 38%, social sciences - 24%, technology - 19%, natural sciences - 10%, and other branches of science - 9%. Collections are continuously replenished to meet the needs of the study directions.

The library offers to order information sources that are not in the collection of the library by using an interlibrary subscription. It is possible to order books and other documents located in other Latvian libraries, and also documents from foreign libraries or document delivery centres.

Branch publications for studies and research work are available in Subscription, Educational literature subscription, Reading room. Factographic and bibliographic inquiries on issues on various sectors are available at the Bibliographic Information Department.

Subscribed databases in the LBTU network or outside the LBTU network may be used to search for information sources that are not available in the library collection, by using user accounts of the LBTU IS, the Reference and Information Centre of the LBTU Fundamental Library, and interlibrary loan services can also be used.

The working hours of the library are adapted to the needs of the main users of the library - students and academic staff. On working days, the library is open for users from 8.30-19.00, on Fridays from 8:30 to 17:00. The library is also open to users on the first Saturday of every month from 9:00 to 14:00. The working hours of the library's reading rooms and the Reference and Information Centre are extended to 24.00 during a period of individual studies and examinations. The catalogue and online databases are available without a time limit. Access to the library's electronic resources is organised through the library's homepage (<https://llufb.llu.lv/en>). In special situations, such as during the COVID-19 pandemic, the library also works remotely, and also in person with extended working hours, for example, until 22:00. By expanding the possibilities of the LLU student and faculty card, it is planned to create access to individual library rooms at any time of the day.

In order to ensure access to education for every student, the LBTU FB has built elements of environmental accessibility for persons with special needs: signs are placed near the building with a schematic location of the rooms and the location of the lift, the building has a lift, facilities specially equipped for persons with mobility impairments, room directions, marked stairs, it is possible to enter the building with a guide dog.

In order to ensure suitability for permanent study and research work, the total area of the LBTU FB's reader service premises is 787 m². The reading room has comfortable workplaces both in the hall and on the balcony. Internet and WI-FI are available. There is also a seating area with sofas in the reading room. There is also a quiet reading room. The inquiry and information centre has stationary computers and the services of a qualified consultant.

FB provides access to extensive internet resources, for example, in addition to general reference publications, about informatics and computer technology, magazines and links are available in English at the IMCL - International Conference on Interactive Mobile Communication, Technologies

and Learning, and also open access seminars in English at the Wolfram Education Group (Mathematica). About technology and technical sciences, the IMCL - Interactive Mobile and Computer Aided Learning.

The library has purchased the search engine PRIMO DISCOVERY, which gives the possibility to simultaneously search in the subscribed and free access online databases, in the electronic general directory "Kopkatalogs" of the libraries of national importance, in the databases created by the LBTU FB (publications of LBTU teaching staff and researchers, master's theses of LBTU, etc.). By registering with the LBTU IS user account, it is possible to view your user account and extend the deadlines for issues, order publications in the catalogue, access full texts in subscribed online databases and save your search results.

Currently, FB provides access to 51 databases, including: CAB Abstracts, CRC Press e-books, EBSCO databases, EBSCO eBook Academic Collection, ScienceDirect, Scopus, Scival, Web of Science, Wiley Online. Every year, opportunities to expand the range of subscribed databases are considered by rationally using the resources, and also by subscribing to the database for a short period of time in order to evaluate the added value it provides for students, scientists and teaching staff of all levels.

The specificity of information technology is that without specialized own field information, it is often necessary to solve interdisciplinary tasks, therefore the availability of multidisciplinary information in the library is particularly important

There is a possibility to connect to subscribed databases of e-journals and e-books outside the LBTU network by using the LBTU IS user account and EZproxy.

Readers are also offered databases created by employees of the LBTU Fundamental Library: Electronic catalogue of the LBTU Fundamental Library, Articles of LBTU journals and conferences, Publications of LBTU lecturers and researchers, Doctoral theses defended in LBTU, Master's theses in LBTU.

Analysing the databases available to students, academic and scientific staff, the LBTU FB observes usage statistics and periodically summarises the intensity of use of subscribed foreign databases. For example, in 2021, the total number of connection sessions to Scopus, Web of Science and EBSCO databases which are most relevant to the industry, were 18 499, 4 368 and 37 022, respectively, and the number of searches was 23 963, 15 088 and 107 694.

The services of the LBTU Fundamental Library include: consultations on searching for printed works in the electronic directory, handing out of literature, interlibrary subscription (SBA) services, international interlibrary subscription (SSBA) services, provision of references and consultations, copying, scanning, spiral binding, printing, access to the wireless network, access computers for preparing documents and searching for information, and also to use specialised software, such as Autodesk EDU Master suite CorelDRAW, SPSS Statistics, VISIO and others.

FB offers the following tools for working with scientific publications: bibliographic references, the Mendeley tool, ORCID, books on writing publications, the Publons tool.

The collection of the library is mainly compiled in accordance with the recommendation of the teaching staff. The "Book request form" is available on the library's website, link (in Latvian): <https://lufb.ltu.lv/lv/pakalpojumi/gramatu-iegade-llu-fb-krajumam>. By taking into account the requests of teaching staff and other users of the library, the LBTU FB purchases publications.

The LBTU Fundamental Library has developed a "Collection Assembling Policy" which determines that the main priority in assembling the collection is for LBTU study programmes and research directions. According to the Mandatory Copies Law, LBTU FB, as a library of national importance, receives one copy of each printed work and electronic publication in the fields of the LBTU profile.

In cooperation with the Cultural Information Systems Centre, LBTU FB offers its users to try out many databases available in the world. The employees of LBTU FB carefully evaluate the usage statistics of both the subscribed and trial databases. As a result, a decision is made regarding which database the library subscribes to, by taking into account the trial statistics and based on faculty recommendations.

In addition to the resources of the LBTU Fundamental Library, special literature in the field of information technology is also available to students in the library of the ITF faculty. This literature is maintained in all ITF departments and is the responsibility of assigned staff from each department:

- In the Department of Computer Systems (Room 35) – laboratory manager Kristīne Notruma;
- In the Department of Mathematics (Room 215) – head of the department Svetlana Atslēga;
- In the Department of Physics (Room 314) – guest lecturer Ergi Bufasi;
- In the Department of Management Systems (Room 23-1) – record keeping specialist Valentīna Balss.

In recent years, due to the rapid development of the ICT industry, the specific literature necessary for teaching and science is purchased and available directly in the faculty library.

In 2021 and 2022, the following book purchases were made from the Science base financing of the MoES in the faculty: 2021 DSK – 46; FC 1; MK – 5 (52 books in total) in 2022, 9 books were purchased by DSK.

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

The Study Direction takes place on-site by taking into account the specified number of contact classes in each study course according to the amount of work (CP). The LBTU e-learning platform Moodle (<https://estudijas.llu.lv/>) is widely used as a support system in the study process. In this platform, it is possible to create a website for each study course where it is possible to place study materials, assign independent work, receive such for evaluation, create tests of various complexity and other examinations, send e-mails (Procedure for Using E-studies System at LLU).

The BBB (BigBlueButtonBN) tool is integrated in the LBTU e-learning system, which allows the provision of online lectures, practical classes, seminars, conferences, and, if necessary, the defence of final theses. LBTU offers to use the online platform ZOOM for the organisation of various conferences and work (lectures, practical work, consultations) with students, although BBB is recommended as the primary tool for video lectures.

E-learning support has been set up to maintain the system and provide assistance in the case of problems which provides consultations and promptly helps to eliminate the problems that have arisen.

The e-learning system of LBTU includes instructions, video instructions which are available to teaching staff and students in the use of various tools; plagiarism testing of study papers submitted in e-studies is possible.

The Moodle platform is widely used in studies, and practically every study course has its own website, so that the study process is not interrupted during the study restrictions (for example,

pandemics).

In response to the needs of the internships implemented by the ITF, the internship management system prakses.itf.llu.lv has been created within which students can familiarise themselves with the binding documentation, fill in log-books and carry out other activities to support professional internships.

The LBTU information system (<https://lais.llu.lv/>) is available for students to manage their data at the university, keep track of the courses they have taken and their evaluations, see the lesson schedule, study plan, submit surveys about study courses and perform other activities. Within this system, the directory of all courses is publicly available (<https://lais.llu.lv/pls/pub/kursi.startup?l=1>) with course programmes.

When starting their studies, students are also offered an LBTU e-mail with a unique e-mail address. The student can use this e-mail for communication during studies, and also LBTU sends all official notifications to the student directly to this e-mail. LBTU e-mail has a web interface <https://roundcube.llu.lv>

Jira (<https://www.atlassian.com/software/jira>) is used as a support tool for managing different courses and in software engineering courses. Various software solutions are used in the realisation of the study courses themselves, which are often reflected in the course descriptions.

The LBTU portal operates in 2 languages (<https://www.lbtu.lv/lv>) and the faculty website in 3 languages (<https://www.itf.llu.lv/lv>) for information transfer. These solutions are based on Drupal, which allows you to add them modularly with various components and ensure adaptation to the features of different devices.

Apart from industry-specific software such as PostgreSQL, Oracle Database, Visual Studio, R Studio, etc., various types of content transfer software are used in the course implementation, including presentation apps such as Microsoft PowerPoint, Prezi, Keynote, Google Slides, online interactions tools with students during lectures, such as Mentimeter, Slido, Miro.

As a part of professional development courses, teaching staff learn to work with a new type of software for the implementation of studies, for example, at the 2021 LBTU Academic Conference, teaching staff got acquainted with the Miro software for the implementation of study courses and projects in Nikolas Hall's presentation "Innovating with Digital to Succeed with Remote Learning" and the importance of digitisation in education and for new trends in Georg Muir's presentation "The future of education". In 2021, within the framework of the project "Development of LBTU academic staff" at ZRKAC courses were organized for teaching staff on the topic Video lecture - distance learning method.

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

The recruitment and employment process of LBTU teaching staff (including the announcement of vacancies, recruitment, election procedure, etc.) is regulated by the regulations approved by the LBTU Senate, *Regulations of the Latvian Agricultural University Regarding Academic Positions* (LLU_Regulations_on_Academic_positions_EN).

Recruitment

The number of positions of professors, associate professors and assistant professors in the relevant sub-sectors of science is determined by the Senate of LBTU in conformity with the decision of the faculty council in conformity with financing possibilities and the need for the implementation of appropriate study programmes. Academic positions at LBTU are held through an open competition, which is stipulated *in the By-laws of the Latvian Agricultural University Regarding Academic Positions (7_LLU_Regulations_on_Academic_positions_EN)*.

Requirements

Applicants for an academic position need the scientific or academic degree specified for the particular position. The requirements for applicants for the academic positions are determined by the Law on Higher Education Institutions.

Common requirements for all applicants for academic positions are:

- knowledge of the official language in accordance with the requirements of regulatory enactments;
- knowledge of foreign languages at the level necessary for fulfilling the duties of an academic position (including leading classes in these languages);
- continuous improvement of one's academic and scientific qualifications.

Election

Based on the proposals received from academic structural units regarding vacant academic positions, the LBTU Personnel Department prepares a draft advertisement and submits it to the LBTU Academic Personnel and Structural Policy Commission for consideration (hereinafter - the Commission). Following the decision of the Commission meeting, the Personnel Department prepares a project on vacant academic positions and submits it to the LBTU Senate for approval. After the adoption of the Senate's decision, the Personnel Department announces an open competition for vacant academic positions by publishing an advertisement in the newspaper *Latvijas Vēstnesis* and on the homepage of LBTU.

Elections are held by open voting: for the position of professor and associate professor - at the respective councils of professors of branches no later than within four months from the day of announcement of the competition; for the position of assistant professor, leading researcher, researcher, lecturer, assistant and research assistant - at the faculty councils no later than within three months from the date of announcement of the competition; for the position of leading researcher, researcher and scientific assistant - at the scientific councils of scientific institutes no later than within two months from the day of announcement of the competition.

The rector enters into an employment contract with the person elected for the academic position for the entire term of the election.

If there is a vacant academic position at LBTU, the LBTU Senate may decide not to announce a competition by the suggestion of the faculty council. In this case, the rector can hire a visiting professor, associate visiting professor, visiting associate professor, visiting lecturer or visiting assistant for a period of up to two years.

The **individual academic work** of the academic staff is planned in each study year in accordance with the *Regulation of the LBTU Academic Work Calculation (8_Regulation_on_Calculation_of_Academic_Workload)* and the rector's order *On the Planning, Accounting and Control of the Individual Workload of the Teaching Staff in the Study Year*, which determines the components of the work of the academic staff, standards, accounting and control procedures (available in the *8_Regulation_on_Calculation_of_Academic_Workload*).

The remuneration for an academic position is determined on the basis of the Cabinet Regulation *Regulations Regarding Remuneration of Teachers*: – <https://likumi.lv/ta/id/283667> and rector's order *On Teachers' Remuneration*.

The professional development of the academic staff includes both the acquisition of appropriate professional development programmes and the exchange of experience and participation in conferences and seminars, which is confirmed by the documents issued upon their completion.

Academic staff shall be entitled to paid academic holiday of six calendar months every six years for scientific research or the performance of scientific work outside his or her workplace.

The procedures for professional development shall be determined by the Cabinet Regulation *"Regulations Regarding the Necessary Education and Professional Qualifications for Pedagogues and the Procedure for Improving the Professional Competence of Pedagogues"* (<https://likumi.lv/ta/id/301572>). This Regulation determines that the academic staff of a higher education institution must complete 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) by the end of the term of election. Professional development may include appropriate international mobility, as well as participation in conferences and seminars, which is certified by the documents submitted by the academic staff. LBTU has established a professional development programme for higher education pedagogues *Innovations in university didactics*. The aim of the programme is to improve the knowledge of higher education pedagogues in didactics of higher education institution and the possibilities of their use in pedagogical activities. After completing this programme, a certificate is issued.

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

In order to ensure continuous opportunities for improving the qualifications of teaching staff, LBTU has implemented various opportunities.

Training at LBTU:

In order to stimulate continuous professional development in didactics of a higher education institution, the professional development programme for higher education pedagogues *Innovations in Didactics of a Higher Education Institution* has been established. Enters into force on: 14.09.2018 Volume: 4 CP (160 academic hours, including 60 contact hours). The programme complies with Section 5 "Tasks of Higher Education Institutions", Paragraph 2¹ of the Law on Higher Education Institutions: Higher education institutions shall implement their internal quality assurance systems within the scope of which (Clause 4): internal procedures and mechanisms for assuring the qualifications of academic staff and the work quality shall be developed; Section 26 "Staff of a

Higher Education Institution, the Rights and Duties Thereof”, Paragraph 5 of the Law on Higher Education Institutions: The duty of the management of a higher education institution shall be to attend to the working conditions of the staff, to provide the possibility for in-service training and retraining. Cabinet Regulation No. 569, “Regulations Regarding the Education and Professional Qualifications of Teachers and Procedures for the Professional Development of Teachers”, are also applicable: Pedagogues of higher education institutions and colleges shall acquire professional development programmes on innovations in the higher education system, didactics of higher education or educational work management in the amount of 160 academic hours (including at least 60 contact hours).

Experienced teaching staff from the direction of pedagogy, and also other directions, are involved when acquiring the course “Innovations in Didactics of Higher Education Institution”. Within the framework of the course, teaching staff is evaluated and they receive a certificate for completing the course at the end thereof. Heads of departments ensure that these requirements are implemented for academic staff, for example, at the beginning of each academic year, department clerks send all academic staff information about the annual start of classes in this course

Professional development may also include appropriate international mobility, as well as participation in conferences and seminars, which is certified by the documents submitted by the academic staff. Teaching staff involved in the field of study shall actively participate in different conferences, publish research results, and also attend various professional development seminars and courses, for example at the Zemgale Region Competence Development Centre or the Baltic Computer Academy. In 2020, IT training “Modern and Effective Communication and Cooperation Tools in the IT Environment” was organised within project No. 8.2.2.0/18/A/014 on the following topics: (1) Dynamic and Active Presentation; (2) MS Cloud Services for Data Storage and Sharing; (3) Online Tools for Creating and Communicating Interactive Presentations and Creating Surveys Online. These courses were attended and passed by several teaching staff involved in the direction.

In 2020, a training service was also organised for the directors of the LBTU study programme within the framework of project No. 8.2.3.0/18/A/009 2020-09-30 “Improving the Management of Latvia University of Life Sciences and Technologies”: Module 1. Training for Improving the Content of Studies and Learning Quality Management Skills (32 h); Module 2. Training for the Promotion of Innovations in Study Content and Learning Forms (48 h). Program directors were trained in these courses, which was very useful, as no special training had been organized for program directors before.

The activity of the LBTU project of the European Social Fund No. 8.2.2.0/18/A/014 “LBTU academic staff improvement” (ES29) – academic staff competence improvement in 2022, the opportunity to attend 7 different training courses was provided: (1) Effective work organisation, time management, priorities, work for results, hybrid work; (2) Psychological portrait and cooperation skills of the new generation of students; (3) Conflict resolution methods; (4) Change mindset; (5) Professional burnout and stress resilience; (6) Public speaking; (7) Managerial authority and leadership. Within the framework of this activity, some part of the teaching staff also improved their skills.

Since one of the priorities of this direction is the attraction of foreign students and the realisation of high-quality studies, the learning of foreign languages (especially English) is also financially supported. Within the framework of such training, during the reporting period, several teaching staff have improved their English language skills by receiving internationally recognised Pearson language certificates. English language training is also organised by the Language Centre of the LBTU which provides study groups with different preliminary knowledge: without preliminary knowledge; with preliminary knowledge – basic level (A1) (continuator); with preliminary

knowledge – basic level (A2 – B1); with intermediate knowledge (B1+; B2).

By improving the infrastructure of the learning environment, teaching staff is also assisted with learning new tools. For example, in 2020, the LBTU I TZAC organised SENSUSlab training in relation to purchased interactive glass boards. Various informative events are also regularly organised by the LBTU Fundamental Library. For example, in 2020 it invited, via announcements in a webinar organised by Cambridge University Press, access to and the possibility for the publication of Cambridge Open Access resources. Webinar target audience: teachers, researchers, students, library staff, etc.

The opportunities offered by the LBTU to increase the qualification for teaching staff are also provided by various other measures: 1) ERASMUS+ mobility programme within the framework of which exchange of experience is possible; 2) participation in international scientific conferences, seminars is financed as far as possible; 3) since 1981, the LBTU Academic Conference has been organised every year, the purpose of which is to encourage teaching staff to systematically improve their didactic competence and share their successes with colleagues.

Using the possibilities of hosting lessons at LBTU, following the procedure for hosting lessons developed by LBTU, teaching staff have the opportunity to attend lectures of other teaching staff and improve their knowledge under the guidance of colleagues. Open lectures of teaching staff, seminars for doctoral students, etc. shall be organised periodically, within the framework of which teaching staff can acquire new skills. The lecturers of the direction are also involved in the organisation of the European Digital Week events, where they organise open lectures for their colleagues and all interested parties, for example, in 2016 the lecture “Use and Importance of E-signature”, in 2017 the lecture “Cybersecurity Online: Trojan Horses, Worms, Zombie Army – Everyday Life or Characters from Movies?” and “Build a Web Communication App with Video Calling Functionality Using JavaScript and Twilio” in cooperation with SIA TestDevLab, and other lectures.

Various workshops are regularly organised for our students and teachers in cooperation with ICT companies, for example with Accenture Latvia the workshop “Security Testing and Attacks on Systems” or Like a Coffee workshop “Introduction to IoT and Physical Computing Using Raspberry Pi” in 2020 and 2021.

The evaluation of the professional development of the academic staff typically takes place in conversations with the head of department and programme director about the usefulness of the development measures for the realisation of the direction and the justification of the costs, especially if the professional development imposes obligations for the realisation of the direction, for example financial costs or the absence of the teaching staff. Academic staff can also take various courses in their free time and submit their certificates as professional development enhancements.

Full information about each academic staff member's qualification raising activities is available and stored in his/her LBTU IS account and CV.

Teaching staff shall add the list of professional development activities to the LBTU IS accounts by uploading certificates and specifying the information on professional development. In the academic staff motivation system, these data are gathered and the Study Centre shall, together with the vice-rector of studies, evaluate whether the specific professional development is an activity that relates to the study process.

Before the mobility of the teaching staff to another educational institution (usually within the framework of ERASMUS), a justification for mobility is prepared, and, after the mobility, a mobility report is provided. The justification shall be evaluated by a special commission established by the ITF, which takes the decision to recommend mobility for an employee if the purpose and activities

of the mobility can provide added value to the realisation of studies. After the mobility, the report shall be evaluated by SSC specialists who take the decision on the successful use of funding.

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

The list of teaching staff involved in the implementation of the study programmes involved in the Study Direction is included in Annex (itf_macibspeku_saraksts_lv_en). The qualifications of the teaching staff, the implemented courses, and other parameters shall also be indicated. Biographies (CVs) of the teaching staff are specified in (itf_cv_lv) and (itf_cv_en).

56 teaching staff shall be generally involved in the implementation of the direction programmes, of which 36 has a doctorate degree and 20 has a master's degree. 36 teaching staff members have been elected to academic positions. A large number of teaching staff also carry out research work at the same time and are elected as researchers or leading researchers. When evaluating the workload of academic staff in study work, it should be taken into account that teaching staff also participate in the implementation of other study programmes, carry out research work, operate in the field of lifelong learning, as well as, in some cases, also perform administrative work, for example, acting as dean, vice-dean, head of the doctoral school and other responsibilities.

The list of faculty publications, as well as the study courses in which theses of publications are used, can be found in Annex: itf_scopus_publicacijas_ar_arvalstniekiem_en, itf_publications_study_courses_lv_en , itf_publication_list_lv_en Teaching staff distribution is included in the table below:

Position	Number	% of total number
Professors, incl. Emeritus	8	25%
Associate professors, incl. Emeritus	12	37.5%
Docents	8	25%
Lecturers	4	12.5%
Assistants	0	0%
Total	32	
incl. teaching staff who are scientific staff, total		
Leading researchers	23	
Researchers	4	
Scientific assistants	0	

The table below shows that the teaching staff of the Study Direction were also active in the commissions, committees and councils related to education, research and industry issues. As a result, lecturers know the current issues in the industry and follow the policy of the industry.

No.	Name of the council, commission	Number of teaching staff
1	LZP experts (Engineering and Technology - Electrical Engineering, Electronics, Information and Communication Technologies and other sectors)	11
2	Members of professorial councils	1
3	Members of promotion councils	12
4	Members of the Latvian Academy of Sciences	2
5	Members of state institutions, ministries, local government commissions	8
6	Members of the scientific committees, editorial boards and conference organising committees	6
7	Members of boards, councils, commissions of professional industry organisations	2
8	Members of international organisations	6
9	Members of the State Examination Commissions for the final thesis	8

The qualification and contribution of teaching staff is also assessed by the industry, the state and local governments by granting the teaching staff awards and certificates of appreciation. Awards and appreciations received during the reporting period:

Medals of the Ministry of Agriculture of the Republic of Latvia "For diligence" and certificates of appreciation;

Jelgava state city municipality awards and certificates of appreciation

State Emeritus Scientist status

During the reporting period, the teaching staff of the study direction has implemented mobility within the framework of several activities:

- within the framework of ERASMUS+, NordPlus or other mobility programme for lectures or exchange of experience; Within the framework of the ERASMUS+ program, during the reporting period, 19 teaching staff have participated in the mobility of teaching staff to give lectures (STA) to 8 different countries, and 14 staff have participated in the exchange of experience (STT) to 10 countries.
- within the framework of the intensive courses of BOVA (the Baltic Association of Forestry, Veterinary and Agricultural Higher Education Institutions);
- for the participation in international conferences, exhibitions and workshops;
- within the framework of international project activities (seminars, workshops, thematic

excursions, etc.);

It should be noted that in recent years the mobility of teaching staff and students was severely limited by the Covid-19 situation, currently the situation is becoming more active.

More detailed information about mobility of teaching staff can be found in Curriculum Vitae (CV) of each lecturer involved in the study direction, which are attached in appendix (itf_cv_lv) (In Latvian) and (itf_cv_en).

The departments also carry out activities to establish long-term cooperation with foreign higher education institutions. It provides an opportunity to also attract foreign guest lecturers within the framework of other activities ("ERASMUS+", international projects). During the reporting period, 15 foreign guest lecturers have taught classes for students of the Study Direction.

For more detailed information on attracting foreign guest lecturers, see Section 5.2 Attracting Foreign Students and Lecturers to the Study Direction. Statistics on incoming and outgoing mobility of lecturers during the reporting period are attached to this report in (itf_macibspeku_mobilitate_lv un itf_studentu_mobilitate_lv). Assessing the activity of lecturers for the implementation of mobility to foreign universities and other institutions, it shall be concluded that the possible financial tools and programmes are sufficient. The biggest challenge is the planning of mobility activities, as most lecturers (including foreign ones) are very busy with their daily academic and research work.

2.3.8. Assessment of the support available for the students, including the support provided during the study process, as well as career and psychological support by specifying the support to be provided to specific student groups (for instance, students from abroad, part-time students, distance-learning students, students with special needs, etc.).

In the implementation of the Study Direction, various programmes have been created to support students and people have been involved, for example, a student mentoring programme, a course curator, seniors of groups and courses, students of older years in the ITF Student Self-Government who help to solve different student problems. During the pandemic, students had access to a psychologist attached to the university who provided support to students during this challenging period.

There are also several student associations and corporations, in which current students and graduates of the course also operate, such as Fraternitas Imantica, Ventonia, in which students can get involved and get various forms of help for successful studies and understanding of student opportunities and the role of the university. Other interest groups are also active and accessible.

Financial Support

Financial support for students during their studies is scholarships (<https://www.llu.lv/stipendijas>). Students can apply for the following in accordance with the competition procedures:

1. State scholarships - in master's and basic studies, the monthly scholarship until 31.12.2021 was EUR 200, starting from 01.01.2022 - EUR 140 per month, in doctoral studies EUR 140.00 per month;
2. One-time scholarship - during the semester, the student can apply for a one-time scholarship in the amount of 2 minimum scholarships;
3. Scholarships for obtaining a scientific degree - it is a scholarship equivalent to a loan in the

amount of EUR 85.37 (the granting of new scholarships has been discontinued as of 1 March 2020);

4. Social scholarship "Studēt gods" for students from large families – EUR 160 per month;
5. LBTU Development Fund (LBTU AF) scholarship – the fund offers students a total of 18 scholarship programmes (from EUR 40 to 1500). Scholarships are both monthly and one-time.

Discounts on Tuition Fees

The LBTU offers relief for the tuition fee (50-100%) to the following successful students:

1. LBTU employees who study in doctoral study programmes.
2. Children of LBTU employees.
3. For disabled people of the first and second groups.
4. Orphans or persons left without parental support.
5. For student athletes.

Scholarships

Students in the "Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science" study programmes can participate in the following scholarship contests administered by the Development Fund:

- Basic studies – 7 scholarship programmes (Ulmanis, Senate, Čakste, Jānis and Millija Kāvuši, Mirdza Oškāne, LLU Student Self-Government, Jānis Rūvalds)
- Master studies – 5 scholarship programmes (Ulmanis, Senate, Čakste, Jānis and Millija Kāvuši, Mirdza Oškāne, LLU Student Self-Government, Jānis Rūvalds)
- Doctoral studies – 1 in scholarship programmes (Jānis and Millijas Kāvuši).

Those who are still studying can apply for: the state scholarship, the social scholarship "Studēt gods" and the verbal scholarship of the faculties – the Alberts Krastiņš scholarship. Scholarship opportunities are also offered by the RTU Development Fund, LU Fund and Vītoli Fund, etc., for which students of this direction can also apply, for example, in 2017 an ITIA student received the prestigious University of Latvia Foundation scholarship and award named after Ada Lovelace.

During the reporting period, five students of the direction have received such scholarships: the Ruvalda scholarship, the Mirdza Oškāne scholarship and 3 times the Senate scholarship

Companies also offer their own scholarships. During the reporting period, for example, JSC Emergn offered one scholarship each year to the best student in this direction. The Faculty has also established an Excellence Scholarship, which is awarded to one of the best students for which foreign students can also apply.

LBTU provides support for foreign students in various issues:

1. application for studies is carried out by using the e-admission system "Dream Apply" which provides partially formalised admission procedures and thus significantly facilitates the applicant's communication with LBTU; SSC coordinators individually answer specific questions of interest to applicants;
2. all foreign students are provided with places in well-equipped dormitories for students;
3. in order to familiarise foreign full-time and exchange students with the study and living environment of LBTU and the cultural environment of Latvia, a "Welcome Week" is organised for them in the first week of each semester, during which corporate bonding events are also held;
4. LBTU SSC provides technical support in matters of visas, obtaining/extending residence

permits, and also insurance;

5. LBTU SSC and faculty external relations coordinators, and also study programme directors, shall inform students from abroad about LBTU's internal regulations and their application practices, provide consultations on study and household issues, help draw up documents, help solve problem situations, etc.;
6. The "Erasmus Student Network" group operates at LBTU, and also the LBTU Student Self-Government, which organises students' free time and cultural events;
7. The coordinators of external relations of LBTU shall inform foreign students about available health care at family doctors and Jelgava polyclinic, and, where necessary, perform accompanying functions;
8. starting from 2019/2020 study year, a survey of foreign students about taught courses was introduced every semester. The survey shows students' satisfaction with the quality of these courses.
9. the planning of classes for foreign master's students is carried out by the director of the study program, ensuring operative communication between students, teaching staff and faculty management.

Career support

In all study programs there is a close cooperation with companies and organizations in the field. Study trips to companies, guest lectures with the participation of industry professionals and other activities are organized, that help to find the most suitable specialization and direction, where to work after graduation of the study programme. Also, in cooperation with companies, students are provided with traineeships, where they often continue to work even after graduation. A practice seminar is also organized where students are introduced to career opportunities in IT companies.

2.4. Scientific Research and Artistic Creation

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

In the Study Direction, research is carried out in the following sectors of natural science (group 1) and engineering science and technology (group 2) defined the LBTU Strategy (<https://www.llu.lv/en/mission-and-vision>). The sub-field of natural science is computer science and information technology sciences, and the sub-field of engineering science is energy, electronics and telecommunication engineering sciences.

The priority research directions of the Study Direction (<https://www.llu.lv/en/science-innovations>) are included under the engineering block in which the main research activities are related to food technologies, energy, smart machines and technologies (especially in agriculture, forestry), information technology, construction, woodworking, geodesy, environment and water management issues (including greenhouse gases (GHG) and agricultural runoff). The research of the direction related to 1) system-biology, modelling and optimisation of metabolic networks; 2) application of

information technology solutions, mathematical modelling and statistics in agriculture, environment and forestry; 3) development and evaluation of cross-cultural information systems have been distinguished separately. These scientific directions have been chosen based on the scientific competence of the Study Direction, the interests of individual researchers, leading researchers and also doctoral students, and they meet the needs of the prospective economic areas defined in the Smart Specialisation Strategy of Latvia in which the innovation capacity of Latvia can be built.

The strategic and long-term research goals for the field of study are defined in the Research Programme of Latvia University of Life Sciences and Technologies for 2015-2020 (<https://www.llu.lv/sites/default/files/2021-03/StrategijaLV.pdf> - p. 6, hereinafter - the Research Programme), which determines that excellence in research that promotes technologies and innovation must be ensured, and shall be integrated into the study process. The LBTU Research Programme defines specific, measurable results to be achieved, such as the number of publications in SCOPUS and WoS indexed editions, the number of publications in journals, the supported Horizon 2020 projects, the number of publications co-authored by private sector participants, (private) funding of research by companies. Several action plans have been developed at the LBTU level to achieve these results: 1) a target cooperation improvement plan; 2) the plan for the participation in EU research and innovation framework programmes Horizon 2020 and other research and innovation support programmes and technology initiatives; 3) the plan for increasing the number of international publications; 4) knowledge and technology improvement plan; 5) the plan for the development of research human resources that contributes to the overall activity of the LBTU, incl. the research activity of the study direction, the creation, dissemination and transfer of new knowledge in the national economy.

At LBTU, the programme Performance of the Fundamental Research at LBTU is being implemented by creating new knowledge and technological insights in the research directions determined in the development strategy of LBTU. An application for a project can be submitted by the researchers elected by LBTU or leading researchers who have completed, are currently implementing or have received approval for the commencement of an industrial (applied) research or experimental development project at the time of the project application. The total funding of one research project - up to EUR 10 000, implementation period - up to two years.

In 2020, an international evaluation was carried out in Latvian scientific institutions by summarising the results of scientific activity for the period from 2013 to 2018. International experts assessed the activity of the LBTU in three thematic areas: Agricultural, Forestry and Veterinary Sciences, Engineering and Technology and Social Sciences. In general, it was concluded that LBTU is a strong national university with the potential to become a serious international player in the scientific environment in the next 5-10 years.

In the five years from 2013 to 2018, the university has significantly increased the quality and volume of scientific work, as well as been involved in the implementation of both national and international research projects. At the same time, serious investments have been made in the development of scientific infrastructure, and the university management has obtained the quality management system certificate "Investors in Excellence". The significant progress has been recognised by international experts in all branches of science.

As the results of the international evaluation show, in the field of engineering and technology, the "social impact of research" is rated as very good, while criteria such as "economic impact", "science infrastructure" and "development potential" are at a good level.

The rapid development of LBTU's scientific activity is reflected not only by the results of the international assessment, but also by the data compiled by various institutions published in previous years.

Doctoral students studying in the scientific direction play an important role in the development of the scientific direction of the faculty. A large part of doctoral students already start active research and involvement in scientific projects during their studies. After graduation, some doctoral students continue to work in the implementation of this direction. The example of 2022 is doctoral student Jurij Holms, who defended his doctoral thesis and was involved in both academic and scientific work of the faculty. Several such successful examples can be named. Also, 3 out of 4 programme directors are doctoral graduates of LBTU in this direction. In addition to conducting study programmes, such as Assoc. prof. Aleksejs Zacepins and Prof. Gatis Vītols leads and participates in the implementation of international projects, and also actively publishes articles in high-level peer-reviewed international scientific publications. A large number of doctoral students solve interdisciplinary problems and get involved in one of the primary scientific directions defined by the faculty: IT Solutions, Application of Mathematical Modelling and Statistics in Agriculture, Environment and Forestry.

Every year, the faculty develops a development plan, within the framework of which the numerical indicators to be achieved in both studies and science, and also measures that will allow these indicators to be achieved, are indicated. Annex itf_darba_plans_2020_en contains the report and plan for 2020 approved by the ITF Council and reviewed at the general staff meeting. The dean shall report on the performance of the rectorate in January of each year and submit a report and a plan to the rector.

2.4.2. The relation between scientific research and/or artistic creation and the study process, including the description and assessment of the use of the outcomes in the study process.

Most of the academic staff employed in the field of study shall be elected as researchers or leading researchers at LBTU, which means that teaching staff shall perform the functions and activities of both the teaching staff and research staff. This allows one to successfully integrate the results of the latest and current research into the study process. It ensures compliance with the basic principle of the Latvian Education Development Guidelines for 2014-2020 - education promoting a knowledge-based society - (<https://likumi.lv/ta/id/266406-par-izglitiba-attistiba-pamatnostadnu-20142020> gadam-apstiprinasa nu) (only in Latvian).

During the reporting period, the teaching staff of the study direction have prepared teaching materials and scientific monographs which include the results of scientific projects and are used in the study process.

Teaching staff of the Study Direction shall actively participate in both the international scientific projects on the topics of the field and research financed by the state. Often, students studying in a master programme and doctoral students are also involved in scientific projects.

The results and materials of different projects are used in individual study courses of the study process. For example, the results of the Horizon 2020 project SAMS (International partnership for innovation-based management services in smart beekeeping) are used in the course Realisation of the Smart System Development Platform and in the course Computer Technology in Biosystems Management. The results of the ERA-NET project RETRACT (Creating a Flexible Urban Transport System in Smart Cities) are used in both the course Basics of Machine Learning and Smart System Development Platforms.

For example, during the reporting period, 3 works were developed on the topics of precision beekeeping in the professional bachelor's program: • Development of beekeeping farm management system prototype

- Development of Web system for remote bee colony monitoring
- Development of beekeeping farm management system prototype

7 works have been developed in the academic bachelor's program:

- Development of the bee colony remote monitoring system
- Bee colony video observation development
- The apiary interactive map development
- Usage of artificial neural networks in bee colony state detection
- Automated monitoring of bee colony Weight dynamic
- Evaluation of alternative energy usage in Precision Beekeeping
- A deep machine learning model for estimating bee activity in video materials

23 theses were defended in the master's program related to research in the field of agriculture during the reporting period. The following topics were developed in the last three years:

- Image recognition-estimation for wood cargo weight in truck
- Determining plant health using neural networks
- Development of a solution for wood fault detection
- Correcting wood defects with the help of machine learning
- Localization and identification of oak wood faults with a convolutional neural network
- Development of the precision beekeeping system for analyzing the sound of the bee colony
- Development of the R library for determining GHG emissions in the agricultural sector
- Development of a machine learning model for weed recognition using synthetically generated data

In order to motivate the teaching staff to prepare teaching materials and integrate the experience obtained in projects and practical research in the study process, LBTU has created a motivation system where the preparation of teaching materials and the scientific dimension are the elements to be evaluated, for which the staff receive financial support.

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

LBTU's location and interaction with universities and research institutions of the Baltic Sea region, Europe and the world have contributed to the recognition of researchers and leading researchers of the Study Direction and research carried out thereby on a European scale. It is largely determined by the niche studies of the Study Direction, which are related to precision agriculture, especially precision beekeeping and precision forestry, smart cities, GHG emission calculations and modelling, ecosystem assessment, etc. for the specific directions implemented by LBTU.

Project table in the Annex itf_projekti_en.pdf.

During the reporting period, 56 publications have been prepared together with foreign authors,

indexed in the SCOPUS database (itf_scopus_publicijas_ar_arvalstniekiem_en).

Cooperation with foreign universities has promoted student exchange between higher education institutions; through such exchanges, students of all study programmes are the beneficiaries. The ITF has signed agreements with 26 foreign universities. Several guest lecturers from these universities have given lectures to the students of the course, and several teaching staff of the course have given lectures in the mentioned partner universities within the framework of the ERASMUS programme (see section 2.3.7.).

In total, during the reporting period, 53 students used student mobility, and 5 students used mobility for practice. Students had travelled to countries such as Lithuania, Slovenia, Cyprus, Spain, Malta, the Czech Republic, Hungary, Portugal and more.

16 times the teaching staff went on mobility for the purpose of giving lectures and 15 times for exchange of experience. Change of students and teaching staff within the framework of the ERASMUS programme is summarised in Annex (itf_foreign_students_staff_en and itf_macibspeku_mobilitate_en).

The academic staff of the department actively participates and is involved in various international organisations: Nordic Association of Agricultural Science (NJF), Cross-Border Cooperation Network for the Incorporation of Mathematical Competences in Regional Socio-Economic Development (MATNET), Mathematics and Statistics in Higher Agricultural Education and Research (Baltic Nordic Agricultural Universities Cooperation Network AGROMETRICS), International Society for Engineering Pedagogy (IGIP) etc.

The teaching staff also worked in scientific editorial boards of journals, e.g., BJMC (Baltic Journal of Modern Computing), etc.

The teaching staff is also invited to participate in the peer review of scientific articles in many scientific journals, for example, Professor Rudīte Chevere is registered as a reviewer in Publons (<https://publons.com/wos-op/>) (Web of Science ResearcherID AAK-2908-2021).

The academic staff reviews foreign master's and doctoral theses.

Future international cooperation for the development of science is based on the closer integration of science and research in the study process; promotion of science and research both in the international environment and in the national environment (using www.sciencelatvia.lv); the use of internal LBTU grants and financing to support young scientists and attract young scientists from abroad; to promote the publication of research results of master's and doctoral students in international publications; to promote the preparation of international project applications by developing a more targeted motivation system and performance financing for science.

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

LBTU is the LBTU Academic staff motivation system approved by the Study Council Decision No. 2.4.-13/8 on 29 November 2017 (9_LLJ Academic Staff Motivation System), where you can receive up to 5 points in each section of the motivation system for scientific publications and reports at

scientific conferences. The information about both sections is stored in the LLU Information System and is taken from the system's user account for evaluation.

From the faculty's science base financing, the financing is awarded to researchers and leading researchers for scientific publications in Q1 or Q2 journals. Also, using base financing, you can attend international scientific conferences with reports on conducted research.

According to the By-laws of Academic Work Calculation approved by the LBTU Senate on 11 March 2020 (8_Regulation_on_Calculation_of_Academic_Workload), managing and reviewing master's theses shall also be included in the calculation of the amount of the academic work (respectively 2 h and 0.4 h for one KP per one student), as well as managing doctoral theses (60 h per year for a full-time doctoral student and 45 h per year for a part-time doctoral student).

Order of LTBU No. 4.3.- 8/17 of 10 March 2017 provides that one of the four sections of the work amount of the teaching staff shall be scientific work. A different amount of lecture-room work is provided for different categories of teaching staff positions with the aim of more scientifically qualified teaching staff devoting a larger proportion of their time to research by reducing the proportion of mandatory lecture-room work in the total workload accordingly. For an assistant, the minimum amount of lecture-room work per year shall be 512-640 h, for a professor 192-256 h for full-time work.

LBTU functions in accordance with the procedures for the assessing the efficiency of scientific activity of the LLU academic staff approved by the LBTU Science Council on 29 April 2020 (Procedure for measuring the efficiency of the scientific performance). The effectiveness of scientific activity is evaluated in 7 sections: scientific and contractual projects (5 criteria); scientific and popular scientific publications (5); patents (3); management of master's and doctoral theses (3); participation in conferences and exhibitions (4); peer review of scientific works and work in editorial boards (4); organisational work to ensure scientific activity (2). The academic staff of LLU shall submit a scientific activity report (electronically) for the previous year by 11 January of each year. By summing up the individual evaluations of the academic staff, the evaluation of the effectiveness of the scientific activity of the structural units is also formed.

The list of the most important publications of the teaching staff, related to the delivered study courses, can be found in the appendix [itf_publications_study_courses_lv_en](#)

LBTU operates a system that regulates the use of base financing, redistributing a certain part of it to structural units depending on the results achieved. Each researcher receives performance financing, the amount of which directly depends on the results of the scientific work. In order to increase the scientific capacity of LBTU and to promote the involvement of master's students, doctoral students and young scientists in scientific activities, a programme for the implementation of LBTU's research programme has been established, where scientific projects are financed in accordance with tender procedures. Within the framework of the programme, the research projects are supported in the priority research directions laid down in the science development strategy of LBTU. The project application of the programme may be submitted by the researchers or leading researchers elected by LBTU. Each person may submit no more than one project to the tender in one application round. The tender for the acceptance of applications shall be announced in the spring - information shall be posted in the LBTU portal and on the LBTU news page.

The programme Conducting Fundamental Research at LBTU shall also function in LTBU. The purpose of the programme is to ensure the conducting of fundamental research at LBTU, thus creating new knowledge and technological insights in the research directions laid down in the development strategy of LBTU. Basic research is experimental or theoretical research carried out mainly to acquire new knowledge about things and phenomena without any direct commercial

application or use. Within the framework of the programme, the research projects shall be supported in the priority research directions laid down in the science development strategy of LBTU. An application for a programme project can be submitted by the researchers elected by LBTU or leading researchers who have completed, are implementing or have received approval for the commencement of an industrial (applied) research or experimental development project at the time of the project application. Each person may submit no more than one project to the tender in one application round. The total funding of one research project – up to EUR 10 000, implementation period – up to two years.

A compilation of quantitative data on scientific activities is included in the Appendix itf_kvantitativie_zinatnes_en.

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

The programme Scientific Capacity Strengthening at LBTU is functioning at LBTU, the purpose of which is to promote the development of the priority research directions laid down in the science development strategy of LBTU and the development of appropriate doctoral theses. Within the framework of the programme, the research projects are supported in the priority research directions laid down in the science development strategy of LBTU. The expected result is a concrete, recordable result obtained during the execution of the project, which can be used in the international scientific environment and innovation activity – partially prepared section of the results of the doctoral thesis, submitted and approved at least one publication in Scopus or Web of Science indexed journal, including the LBTU journal Rural Sustainability Studies or in any of the collection of articles.

LBTU also holds an international student scientific conference Students on Their Way to Science (<https://www.sws.llu.lv/>) every year in April, which encourages students to participate and in which students from all fields of study regularly participate. Abstracts of conference papers are published every year. In 2022, 4 students of the direction participated with reports in this conference. Some of the student topics: Augmented and mixed reality in cultural learning; The impact of artificial intelligence in daily life; Hiveopolis – enhancing migratory beekeeping practice using the digital flowering calendar; Digital matchmaking platform for international cooperation in the biogas sector: practical assessment.

LBTU has also established an international scientific conference for doctoral students Research for Rural Development (https://www2.llu.lv/research_conf/). In 2022, it already happened for the 28th time. Doctoral students of the study direction also have the opportunity to participate in this conference and, for example, Nikolajs Būmanis, the doctoral student of 2020, gave presentations on the following topics: *Data fusion challenges in precision beekeeping: a review* and *Deep learning solution for children long-term identification*, or for example Gints Rudusāns, the doctoral student, with the publication and report *Machine learning methods for classification of sensitive data*.

Masters and doctoral students are also involved in the implementation of scientific projects. Usually, the topic of their final papers is related to the problems to be solved in the project For example, doctoral student Daniels Kotov participates in several projects (Hiveopolis,

HydroG(re)EnergyY-Env), doctoral student Nikolajs Būmanis participates in the MyFairShare project. During the reporting period, master's student Kristina Grausa participated in the Horizon project "Digital Global Biogas Cooperation (DiBiCoo)"

The main activities for the involvement of students in scientific research are the following:

Bachelor's level: study courses introduce the steps of science, know how to search for information in scientific databases, publish annotations, for example, the conference "Students on their Way to Science". Individual students, in cooperation with the teaching staff, publish articles indexed at an international level, for example Yun Chan, Micky "Automated sentiment analysis and emotion recognition for appropriate audio recommendation in online interaction environments" (indexed in Web of Science) or Amanda Kļaviņa "Eye tracking solution for undergraduate curriculum of landscape architecture" (indexed in Scopus). It must be recognised that undergraduate students focus more on learning the content of the programme and only in the last year show interest and are ready to engage in scientific activity. Since a large part of the teaching staff are also researchers with international experience, the involvement of students in science takes place with the help of lecture examples and presentations of certain topics.

Master's level - at the master's level there are special courses dedicated to the preparation of scientific articles and learning research methods. Within the framework of these courses, the first annotations or publications to be published are also created. Individual students are involved in the implementation of scientific projects. Doctoral seminars organised by the ITF at least 2-3 times a year serve as a platform for scientists to connect with masters and doctoral students.

Doctoral level - at this level, a doctoral student, in close cooperation with the supervisor, usually starts actively publishing in various publications, reporting at conferences, attending seminars, etc. The scientific activity of the graduating doctoral students of this study direction at LBTU is highly valued. Practically all of them have more than 5 published scientific articles, at least 3-5 participations in international conferences and other commendable achievements, for example, patents created as part of the doctoral work and published worldwide (Mikus Vanags, the doctoral graduate of 2017, *Abstract data processing technologies*).

Students of all levels are financially supported in starting scientific activities, for example, students of all levels are paid to participate in conferences where students report on research results and have developed a publication.

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

University and study work is closely inseparable from innovation, because innovation is a process in which new scientific, technical, social, cultural or other field ideas, developments and technologies are implemented in a market-demanded and competitive product or service. Students are the part of society that will be the main drivers of innovation in their professional activities. In order for this process to be as successful as possible, it is very important for future specialists, especially in the field of information technology, to understand the opportunities given by the investment of information technology in various fields and the connection of information technology with aspects of sustainable development.

Today, in various industries, the urgent need for lifelong learning in the field of information technology has been one of the basic rules since its very beginning, because this field is characterised by particularly continuous and rapid development. One of the main skills expected from young specialists by the representatives of ICT companies is the ability to learn. For this purpose, the study process itself is made as innovative as possible and its content includes the main current affairs of the industry as much as possible. Product and process innovations are of primary importance, but of course marketing and organisational innovations are also considered at the same time. During the reporting period, without significant changes in study programmes, the contents of study courses are updated practically every year or individual study courses are changed to more relevant ones.

Students get familiar with innovations both during the study process at all levels and during training and professional internships. Most likely, students themselves are involved in the creation of innovations in the process of the development of their final theses. As examples, we can mention the topics of the final theses of the last years, the names of which already indicate the direction of the content towards innovation:

- Research of RPA tools and their application in business process automation
- Air quality monitoring in common spaces
- Privacy and data protection analysis in smartphone applications
- Support software for energy efficiency improvement in households
- Machine learning in forecasting payment delay
- Application of convolutional neural networks in pedestrian flow analysis
- Development of a prototype of a facial recognition system
- Possibilities for applying open data in Latvia
- The reduction of image retention of OLED screens
- Statistical Comparison of Multiple Nucleotide or Protein String Algorithms
- Research of phylogenetic tree algorithms and software
- Evaluation of resource planning and e-commerce systems integration methods in the implementation of automatic data exchange.

The Department of Technology and Knowledge Transfer (<https://www.ilu.lv/lv/tehnologiju-un-zinasanu-parneses-nodala>) operated at LBTU, the purpose of which is to actively promote cooperation between LBTU scientists and commercial companies, protection of intellectual property and commercialisation of research results. Every year, the students of the direction are invited to a series of lectures, where the representatives of TEPEK talk about the nature of innovations, patents and other current nuances related to innovations in the multidisciplinary field.

The Department of Technology and Knowledge Transfer of LBTU offers several services: offering research and scientific competence services of LBTU scientists to entrepreneurs, protection of the intellectual property at LBTU, cooperation with Zemgale, Kurzeme, Vidzeme and Šiauliai incubators, cooperation with merchants/entrepreneurs, technology transfer units of other universities, municipalities, Zemgale and other planning regions, EEN Latvia, LTC and the Patent Board of the Republic of Lithuania, planning and organising of seminars, conferences, contact exchanges and exhibitions, commercialisation of the LBTU research results and technology transfer, as well as consulting scientists and manufacturers.

Each faculty of LBTU offers possible areas and topics of cooperation. ITF offers the opportunity for merchants to develop IT solutions in precision beekeeping, to develop embedded system solutions for agriculture and monitoring of environmental parameters, to assess the cross-cultural usability of information systems, and other topics.

At the end of 2021, the student business incubator named “HatchUp” has started its operation at LBTU. This will give all those studying at the university the opportunity to take the first steps in business and already develop their ideas during their studies; in addition, by using the infrastructure available at the LBTU as a starting point for research purposes (In Latvian: <https://www.llu.lv/lv/raksts/2021-12-23/izveido-llu-studio-business-incubator-hatchup>).

Both the existence and opportunities of the student business incubator, the availability of TEPEK, as well as the opportunities for students of this direction to create innovative solutions in cooperation with LBTU’s unique study and science directions have a positive effect on the implementation of the study direction by providing the opportunities for students to learn skills about innovation, which is an important part of the ICT sector.

2.5. Cooperation and Internationalisation

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

Explicit cooperation with Latvian institutions in study directions is formed in the following directions:

1. Cooperation with other Latvian universities. Within the framework of the direction, the strongest cooperation has been established with the University of Latvia and Riga Technical University; however, a certain level of cooperation is also maintained with other Latvian universities that implement studies of the ICT direction. Cooperation is formed within the framework of state examination commissions and master’s examination commissions, where the chairman of the state examination commission of the programme of the Computer Management and Computer Science is a professor at Riga Technical University. The master’s examination committee includes professors from both Riga Technical University and the University of Latvia. The doctoral council of this direction which consists of two professors from the University of Latvia and, practically for the entire reporting period, a professor from Riga Technical University has also been established at LBTU and it has been functioning for several years. Cooperation also takes place in managing and reviewing doctoral theses. Professors and associate professors from the ITF are often reviewers of doctoral theses for the LU and RTU papers, while the RTU and LU professors are reviewers for works to be defended in the doctoral council of LBTU ITF. Together with colleagues from the University of Latvia, Liepāja University and Vidzeme University, as well as foreign partners, the scientific journal “Baltic Journal of Modern Computing” (<https://www.bjmc.lu.lv/>) has been published for several years. Also, together with colleagues from the LU, RTU and the Institute of Transport and Communications, the interests of Latvian ICT higher education are represented in the association Informatics Europe. Joint scientific publications are often created within the framework of various cooperation projects, for example, in recent years, the teaching staff of the direction have written several scientific publications together with the teaching staff of

the University of Latvia.

2. Cooperation with employers. The faculty is a long-term member of the Latvian ICT Association (LIKTA), which brings together several Latvian ICT educational institutions, as well as the largest entrepreneurs and organisations in the sector. Every year, general meetings of members are convened; the LIKTA conference and intensive work takes place annually in the LIKTA Education group in which the representatives of ITF are also involved. Membership in this association provides support and a closer connection with employers by identifying the development of ICT education in the Latvian context, finding new business contacts, etc. Cooperation with employers is also formed through the implementation of the annual ITF student internship seminar in which several entrepreneurs participate and present internship opportunities, requirements and the career model in the company. Similar cooperation takes place during the ITF days organised by students, when several companies visit the university with thematic lectures, stands, technical demonstrations and other activities, thus providing students with closer contact with potential employers. Historically, comprehensive cooperation agreements are concluded with individual companies, although formalised cooperation agreements have not been practised in recent years, as fruitful cooperation takes place without formal commitments. The connection with the entrepreneur also takes place through the implementation of internship programmes in the courses of bachelor's level, guest lectures with the representatives of the sector, joint workshops, for example, the annual security hackathon in cooperation with Accenture Latvia or testing workshops in cooperation with SIA TestDevLab, IT project management course in cooperation with SIA Accenture. Individual course programmes are also created jointly with entrepreneurs, for example, the Automated Testing course was developed in cooperation with A/S Emergn and SIA TestDevLab. The teaching staff of ITF has the opportunity to participate in summer schools organised by companies and acquire new skills. Several members of the teaching staff have used this form of cooperation. Also, several members of the teaching staff have done internships for several months in companies of the sector. Employers also participate in surveys on improvement of study programs and employment of graduates created by programme directors.
3. Cooperation with local governments. Taking into account the geographical location of LBTU – the city of Jelgava, close cooperation has been established with the Operational Planning Centre (POIC) of the city of Jelgava, as well as the local government of the republic city of Jelgava. Since 2019, the ITF has participated in various studies commissioned by the local government of the republic city of Jelgava, such as Study on Maintaining and Developing the Information System of the Digital Economy Platform of the City of Jelgava, 2022. The local government of the city of Jelgava has been involved as a partner of the LBTU in the preparation of several international project applications of the ICT, as well as in the implementation of approved projects. For example, Individual Mobility Budgets as a Foundation for Social and Ethical Carbon Reduction (MyFairShare) with partners from Austria, Germany, Great Britain, Norway and Switzerland, as well as other projects. Students of the academic bachelor's level programme also choose ICT departments of local government as places of internship, for example in Bauska, Jelgava and other Latvian cities. Certain final papers of studies have been written in cooperation with local governments; for example:
 - Development of the interactive eco-guide for the city of Rēzekne
 - Wireless network management system development and implementation of Jelgava local municipal authorities
 - Development of home page of Jelgava 1th secondary school
 - Concept design of unified website of local authorities of Jelgava City
 - Geographical information system development in municipality of Jelgava

- Research of virtual private networks and implementation in computer network of Jelgava local municipality
- Digital visualization of Jelgava Pasta island
- Jelgava cultural life website creating
- Development of virtual tour of Jelgavas Technical school
- Development of Jelgava city traffic light algorithm in virtual space

4. Cooperation with scientific institutes takes place in the implementation of various interdisciplinary works. The most obvious cooperation in recent years has been with the institute "Latvijas meža un koksnes produktu pētniecības un attīstības institūts" (MEKA), where several theses of master's level were written within the framework of the cooperation which were successfully defended and received recognition from the master's examination commission. This cooperation also continues in 2022 and the student solves the topic proposed by the MEKA in his master's thesis, which is related to determining the quality of plywood adhesives using machine learning methods. Similar cooperation takes place with the Institute of Horticulture, as well as other institutes of the branch. The researchers of LBTU ITF together with various institutes have prepared project applications, for example together with the Institute of Horticulture, and are implementing projects, for example the project "Evaluation and determination of the most effective methods of limiting current pests of legumes and the factors affecting the viability of the most important pollinators for agriculture identification" is implemented together with the Scientific Institute of Plant Protection (Agrihorts), the project "New technology to produce hydrogen from Renewable Energy Sources based on AI with optimised costs for environmental applications (HydroG(re)Energy-Env) is implemented together with the Institute of Electronic and Computer Sciences, as well as cooperation with other Latvian scientific institutes. Examples of these:

- Development of plant leaf recognition system for smartphone using image recognition methods
- Development of livestock data monitoring system
- Analysis and prototype development of automatic lighting control system for hen house
- Application of capacitive sensors in fruit and vegetable recognition
- Digital elevation model development for surface water hydrological researches
- Measurement data tool for geodetic works
- Geographic data management system for forest administration
- Interactive map development of wind turbines displaying in Latvian territory
- Forest machinery dynamic draft measurements solutions

The basic criteria for searching for cooperation partners are, mainly related to the partner's type of activity, experience and set of skills, as well as the partner's interest in cooperating. Sometimes cooperation is initiated by graduates who are working in a company or organisation. Cooperation is often initiated in informal conversations by meeting with employers at various events, such as the ZIBIT awarding of the best bachelor's and master's theses competition, LIKTA conferences, industry workshops, such as Oracle Day, Riga COMM exhibition where ITF scientists participate with innovation stands, etc.

Employers are involved in various implementation processes of the direction, which also strengthen existing or create new collaborations: guest lectures of study courses, work in state examination commissions, development of study courses, organisation of workshops for students, provision of internships, participation in internship seminars, organisation of study tours, etc.

In general, all the mentioned collaborations within Latvia contribute to the achievement of the goals and results of the direction by creating competitive, versatile and high-quality study content and study environment for the students and teaching staff of the direction, creating one of the important components of the university - the platform where the student not only acquires

theoretical and practical knowledge, but is also brought closer to industry experts from all over the world, develops his or her communication skills and personal growth, and actively engages in his or her training process. Annex itf_sadarbibas_ligumi_en include a list of signed cooperation agreements.

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

In 2022, the LBTU Internationalisation Plan was developed, which sets out the goals, priorities and performance indicators of the university's international cooperation in the fields of exchange studies, full-time studies of foreigners and living conditions of foreigners. The plan is developed by the LBTU International Cooperation Centre together with representatives from the faculties.

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 direction of study corresponds to those implemented by LBTU.

2) The plan envisages priority co-operation with international university associations whose active members are LBTU – Association for European Life Science Universities (ICA), Baltic University Programme (BUP), Baltic and Nordic Agricultural University Network (BOVA – NOVA), Nordic Association of Agricultural Science (NJF), etc., and pursuing their academic activities in similar study and research directions.

3) As the offer of international cooperation from foreign universities is wide, LBTU focuses its activities on those partners with whom such cooperation is long-lasting and productive. Also, at the level of the LBTU study directions there are foreign partner universities or their faculties with which there is a regular exchange of students and lecturers (Erasmus+ programme, etc.), participation in joint projects both in the field of studies (for example, SAM 8.2.3) and research, mutual participation in scientific and methodological conferences, etc.

4) the lecturers of LBTU ITF, during their Erasmus+ exchange study outing visits, familiarise themselves with the specifics of the relevant study programmes of partner universities, assess the quality of implementation and create academic contacts, which create preconditions for both the effective student exchange visits and academic cooperation in the field of research projects. Exchange of experience during mobilities has helped to improve the quality of implementation of the study programme, as well as to accumulate the experience of international cooperation.

5) LBTU ITF has started to implement dual diploma studies with the Samarkand branch of Tashkent State University of Economics in the study programme “Information Technologies for Sustainable Development”. During the visits of the LBTU management to foreign universities, such studies are offered for joint implementation, which has created a response in several Georgian, Azerbaijani and Uzbekistan universities in cooperation with which such studies could be started in the near future.

The institutions of higher education with which the LBTU has concluded Erasmus+ inter-institutional

agreements are summarised in (itf_sadarbibas_ligumi_lv) (In Latvian) and (itf_sadarbibas_ligumi_en) (https://www.llu.lv/sites/default/files/2018-10/LLU%20ligumi%20_Erasmus%2B%20partneraugstskolas_HEIs%2027.03.18.xls)

The ITF has been a member of the international association Informatics Europe for several years. This association brings together the implementers of the European ICT study programmes, as well as groups of scientists (<https://www.informatics-europe.org/join-us/current-members.html>). Conferences “Informatics Europe” are also well attended by large companies from the industry, such as Google, Accenture, Microsoft and others. Membership in this association and the events implemented by this association allows strengthening and expanding of the circle of contacts in the European Union. Several examples can be mentioned when the foundations for new Erasmus cooperation agreements are laid in the activities of this association (for example, cooperation with the University of Debrecen in Hungary), new potential lecturers are approached (for example, Cristina Romero Gonzales), collaborations for the preparation of science project applications are formed.

Such activities make it possible to ensure new mobility for students and teaching staff, professional development of teaching staff by teaching in other EU higher education institutions, etc. critical components of the internationalisation of the study direction. As ICT services are one of Latvia's main export units, ICT education, including the export of programme content and knowledge of this study direction, is prospective and can be developed in the future, which is also determined in the priorities of LBTU.

The study process also benefits from the cooperation of teaching staff and scientists involved in the direction with international partners in various consortia, especially in the implementation of the projects of the Horizon programme. Within the framework of the cooperation of such scientific projects, students also have the opportunity to listen to a guest lecture by a foreign scientist on typically interdisciplinary ICT issues, for example, within the framework of the international RETRACT scientific project, in which researchers from this study direction were partners, in 2019 students had the opportunity to listen to lectures from Chile, Romanian and Mexican researchers on the issue of smart cities on-site at Jelgava Palace. Other examples can also be mentioned, within the framework of which researchers give guest lectures to our students, as well as researchers of this direction give lectures to students of other sectors.

Foreign cooperation partners are selected based on the similarity of their activity direction with the activity directions of the LBTU, type of universities and organisations, mutual interest in developing joint research directions, involvement in similar organisations, interest of both parties and prospective added value that partners can provide for each other's growth in study or scientific development.

The current cooperation with international partners is considered to be good; however, growth in this direction must be continued by including cooperation with EU employers, as well as expanding the network of cooperation partner universities which has also been successfully done in recent years, for example, by establishing new cooperation in 2022, including ERASMUS contracts with partners in Croatia and Bulgaria.

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

In order to attract foreign students, LBTU first provides information about its offer which can be found on the websites (see the section Availability of Information on the Study Direction). LBTU implements various marketing activities to attract foreign students: agreements are concluded with recruitment agents, providing for the evaluation of their work efficiency, e-marketing, participation in international education fairs and agent forums, webinars, etc. LBTU is a member of the Higher Education Export Association of Latvia (AIEA) and participates in its organised activities. For example, in the autumn of 2022, Vietnam is introduced (by participating in educational exhibitions in Hanoi and Ho Chi Minh City) as a potential market for the export of LBTU ICT programmes.

The Dream Apply system (apply.llu.lv) is used to manage student applications and make the application process more convenient.

Promotional materials are created within the faculty, such as promotional videos, articles on social networks (Facebook, Instagram); the faculty website is maintained in English (www.itf.llu.lv/en). For the implementation of the study direction, three teaching staff have been hired for permanent work during the reporting period: In the Department of Computer Systems, guest professor Cristina Romero Gonzales (Spain, Machine Learning direction), guest professor Eric Schneider (Sweden, Internet Search Technologies direction), as well as guest lecturer Ergi Bufasi (Albania, Physics direction).

Recruitment of teaching staff is organised in various ways by announcing competitions on international portals or by personally addressing potential candidates. The recruitment of teaching staff has not always resulted in results, mainly due to the relatively low salaries of Latvian higher education compared to the salaries of several other EU universities. In the near future, the attraction of teaching staff may be affected by the geopolitical situation of Latvia, which is beginning to have a negative impact, for example, on the attraction of students in certain study directions at the LBTU. However, at the same time, the recognition of the university's activity in world university rankings such as THE World University Rankings, QS World University EECA Rankings, Multirank, etc. allows onto increase the visibility of the LBTU and its related programmes in the international environment.

Outbound mobility

It is possible to apply for mobility for teaching staff involved in the study direction, especially through ERASMUS+. During the last eight years, 19 teaching staff have gone to give lectures on the mobility of teaching staff, but 15 persons have participated in the exchange of experience (STT) in staff mobility.

Students have also used ERASMUS+ exchange opportunities. During the reporting period, 47 students have participated in student mobility studies (SMS), in internship (SMP) - 9 students. Detailed information on student affiliation to study programs and student and faculty exchange countries is given in the appendices ([itf_studentu_mobilitate_en.pdf](#), [itf_macibspeku_mobilitate_en.pdf](#)).

Teaching staff mobility within programmes such as ERASMUS does not cause any difficulties, as both the LBTU ITF lecturers and guests at LBTU are professionals in their field and only provide added value to the implementation of studies. Before the mobility of lecturers from the LBTU ITF, a selection process shall be carried out by identifying the relevant skills for the mobility process, for example, whether the lecturer has an appropriate level of language knowledge, whether the lecturer works with foreign students, etc., as well as whether the Order of the Rector is issued every year on Procedures for the Implementation of Teaching Staff and Staff Mobility. The selection shall

be organised by the SSC together with a special committee established in the faculty, which is usually headed by the ITF dean or vice-dean of studies. Student applications shall also be analysed and students' suitability for mobility shall be evaluated, for example, the student must not have any academic debts.

In general, the outbound mobility of teaching staff and students may be assessed as good; at the beginning of the reporting period, student mobility was critically low, however, by bringing this issue to the fore and taking appropriate measures (by motivating the International Student Coordinator of the faculty, developing an advertising campaign, recording a podcast and creating interview articles with foreign students and Latvian students who participated in mobility), improvements have been achieved over the years. Also, new mobility cooperation agreements were concluded, within the framework of which productive mobility takes place. During the pandemic, mobility was hampered; however, in 2022 it has resumed actively and in the coming years it can be predicted that with the active work of the faculty, mobility will continue to develop and will bring added value to the qualitative implementation of the study direction.

Inbound mobility

The faculty accepts teaching staff from foreign countries for lecturing. During the pandemic (2020-2021), this activity decreased, but in 2022 it resumed by hosting a faculty member from the University of Bari in Italy to lecture undergraduate students on Semantic Web technologies. In total, within the framework of the ERASMUS program, during the reporting period, there have been 11 mobility of teaching staff to give lectures for the students of the realized programs from Italy, Croatia, Poland, Lithuania and other countries.

Inbound mobility can also be described as good, but not great. During the reporting period, 22 students came to study at the bachelor's level for study mobility, mainly from Malta, Lithuania and Kazakhstan. Incoming mobility students joined the flow of full-time foreign students.

Statistical data on foreign students and teaching staff during the reporting period is included in the Appendix (itf_foreign_students_staff_en.pdf).

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

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

The international evaluation of the study direction and the programmes comprised therein was carried out within the framework of agreement No. 2011/0012/1DP/1.1.2.2.1/11/IPIA/VIAA/001 of the European Social Fund project "Evaluation of Higher Education Study Programmes and Proposals for Quality Improvement" (9 May 2011 – 13 April 2013). In conformity with the provisions of this project, reports and other information were prepared for all study programmes, which were evaluated by the Evaluation Commission in the composition of 13 people (Chairman of the Commission Prof. Raimondas Čiegis). During the on-site meeting (23 March 2012), commission

members Prof. Henrikas Pranevičius, Prof. Jūri Kiho, Dr Modris Greitāns, Pēteris Krastiņš (LDDK), Aivars Šāblis (the representative of LSA).

All four study programmes of the Direction were submitted for evaluation by the Commission. The joint conclusion of the expert commission was: all the study programmes of the direction of LBTU (LLU) Faculty of Information Technology "Information technology, computer engineering, electronics, telecommunications, computer management and computer science" are recognised as sustainable (by citing "Programmes considered to be sustainable").

The evaluation commission's expert report contained general recommendations for the further improvement of study programmes: (1) to provide doctoral students with better and focused specialised access to international databases of scientific literature, (2) to actively publish scientific articles in internationally peer-reviewed journals, (3) to plan and implement a regular academic staff development policy. The implementation of these recommendations is fully described in Section 2.3.3, in the description of each study programme and in Annex (itf_iepriekseja_akred_rekomend_en). During the reporting period, a lot of attention has been paid to the publications of the academic staff, which resulted in a significant increase in the number and quality of publications (detailed information is given in the publications list of teaching staff (itf_publication_list_lv_en). Improvement of the qualification of the teaching staff of the faculty has been significantly improved (see Sections 2.3.5, 2.3.6). During the reporting period, the successful work of the Direction Doctoral study programme has been of great importance, as a result of which the staff of the faculty has been replenished with new teaching staff with a doctorate degree, as well as the existing teaching staff have obtained a doctorate degree.

Another important contribution to the improvement of the study direction was the project "Implementation of management of Latvian Agricultural University, No. 8.2.3.0/18/A/009", within the framework of which activities were also carried out with the aim of improving the quality of the content of the LBTU study programmes. As a result of this project, the programmes of the Study Direction obtained evaluations and recommendations from the experts of the sector, on the basis of which a plan for the improvement of a study programme was developed for each programme.

Comparing the quantitative indicators

23 databases were available to doctoral students in the previous reporting period, and 51 database in this reporting period.

In the previous reporting period, the teaching staff and researchers of the faculty had published 49 of the most important articles in scientific journals, but in this reporting period the number of the most important articles (Scopus, Web of Science) is approaching 200. The total number of publications exceeds 500.

Growth can also be seen in professional development - in the previous reporting period, 28 teaching staff improved their skills in various events, but during this period, measures to improve the qualifications of teaching staff have become so versatile and their number is so large that obtaining a total number would require extensive accounting work. Full details of each faculty member are described in their CV.

However, this is only a quantitative measurement. It is important to add that the emphasis in recent years has been on the quality of activities, for example, publications in journals that fall into the Q1 and Q2 quartiles. Professional development emphasises gaining international experience, as well as internships in companies.

In general, the recommendations provided by the experts were valuable and activities for their implementation were implemented during the entire reporting period, for example, the rational use

of the available financing in order to achieve significant improvements in all the comments indicated by the experts.

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

On 12 February 2014, the LLU Senate considered the proposal of the director of the study programme “Programming” to change the name of the programme to “Information Technologies for Sustainable Development”. The proposal was previously discussed in the ITF Council and supported. The main reasons for such a name change are that “Programming” no longer characterises the content and essence of the programme. Also, the LR standard “Programming engineer” of the programme provides for a wide range of skills acquired by specialists. In the implementation of this programme, it was decided to update the application of software in various industries, so a new name was proposed (“Information Technologies for Sustainable Development”) which is related to the development of technologies and cross-industry software to ensure the sustainability of other sectors. On 2 April 2014, the Study Accreditation Commission of the Ministry of Education and Science of the Republic of Latvia approved the name change. No recommendations were made in this process.

Annexes

I - Information on the Higher Education Institution/ College		
Information on the implementation of the study field in the branches of the higher education institution/ college (if applicable)		
List of the governing regulatory enactments and regulations of the higher education institution/ college	1_dala_1_pielikums_EN_Main internal legal acts and regulations.docx	1_dala_1_pielikums_Galveno_normativo_dokumentu_saraksts.docx
The management structure of the higher education institution/ college	1_dala_2_Pielikums_LBTU_management_structure_EN.docx	1_dala_2_Pielikums_LBTU_parvaldibas_sHEMA_LV.docx
II - Description of the Study Field - 2.1. Management of the Study Field		
Plan for the development of the study field (if applicable)	itf_pilnveides_plans_en.pdf	itf_pilnveides_plans_lv.pdf
The management structure of the study field	itf_studiju_virziena_parvaldiba_en.png	itf_studiju_virziena_parvaldiba_lv.png
A document certifying that the higher education institution or college will provide students with opportunities to continue their education in another study programme or another higher education institution/ college (agreement with another accredited higher education institution or college) if the implementation of the study programme is terminated.	Vienosanas_LLU and RTU_ITF_EN.docx	Vienosanas_LLU un RTU_Informacijas_tehnologijas_LV.edoc
A document certifying that the higher education institution or college guarantees compensation for losses to students if the study programme is not accredited or the study programme license is revoked due to actions (actions or omissions) of the higher education institution or college and the student does not wish to continue studies in another study programme.	LBTU_aplicinajums_studiju_virzienam_Informacijas_tehnologijas_EN.docx	LBTU_aplicinajums_studiju_virzienam_Informacijas_tehnologijas.edoc
Standard sample of study agreement	2_dala_05_Study_Agreement_2021_LV_ENG.pdf	2_dala_05_Studiju_ligums_2021_LV.pdf
II - Description of the Study Field - 2.2. Efficiency of the Internal Quality Assurance System		
Analysis of the results of surveys of students, graduates and employers	itf_studejoso_darba_deveju_absolventu_aptaujas_en.pdf	itf_studejoso_darba_deveju_absolventu_aptaujas_lv.pdf
II - Description of the Study Field - 2.3. Resources and Provision of the Study Field		
Basic information on the teaching staff involved in the implementation of the study field	itf_macibspeku_saraksts_lv_en.xlsx	itf_macibspeku_saraksts_lv_en.xlsx
Biographies of the teaching staff members (Curriculum Vitae in Europass format)	itf_cv_en.zip	itf_cv_lv.zip
A statement signed by the rector, director, head of the study programme or field that the knowledge of the state language of the teaching staff involved in the implementation of the study programmes within the study field complies with the regulations on the state language knowledge and state language proficiency test for professional and official duties.	LBTU_aplicinajums_studiju_virzienam_Informacijas_tehnologijas_EN.docx	LBTU_aplicinajums_studiju_virzienam_Informacijas_tehnologijas.edoc
A statement of the higher education institution/ college on the respective foreign language skills of the teaching staff involved in the implementation of the study programme at least at B2 level according to the European Language Proficiency Assessment levels (level distribution is available on the website www.europass.lv, if the study programme or part thereof is implemented)	LBTU_aplicinajums_studiju_virzienam_Informacijas_tehnologijas_EN.docx	LBTU_aplicinajums_studiju_virzienam_Informacijas_tehnologijas.edoc
II - Description of the Study Field - 2.4. Scientific Research and Artistic Creation		
Summary of quantitative data on scientific and/ or applied research and / or artistic creation activities corresponding to the study field in the reporting period.	itf_kvantitativie_zinatnes_en.pdf	itf_kvantitativie_zinatnes_lv.pdf
List of the publications, patents, and artistic creations of the teaching staff over the reporting period.	itf_publication_list_lv_en.xlsx	itf_publication_list_lv_en.xlsx
II - Description of the Study Field - 2.5. Cooperation and Internationalisation		
List of cooperation agreements, including the agreements for providing internship	itf_sadarbibas_ligumi_en.pdf	itf_sadarbibas_ligumi_lv.pdf
Statistical data on the teaching staff and the students from abroad	itf_foreign_students_staff_en.pdf	itf_foreign_students_staff_lv.pdf
Statistical data on the incoming and outgoing mobility of students (by specifying the study programmes)	itf_studentu_mobilitate_en.pdf	itf_studentu_mobilitate_lv.pdf
Statistical data on the incoming and outgoing mobility of the teaching staff	itf_macibspeku_mobilitate_en.pdf	itf_macibspeku_mobilitate_lv.pdf
II - Description of the Study Field - 2.6. Implementation of the Recommendations Received During the Previous Assessment Procedures		
Report on the implementation of the recommendations received both in the previous accreditation and in the licensing and/ or change assessment procedures and/ or the procedures for the inclusion of the study programme on the accreditation form of the study field.	itf_iepriekseja_akred_rekomend_en.pdf	itf_iepriekseja_akred_rekomend_lv.pdf
An application for the evaluation of the study field signed with a secure electronic signature	IESNIEGUMS_Studiju_virziena_novertesana_Informacijas_tehnologijas_EN_precizets.docx	Iesniegums_studiju_virziena_Informacijas_tehnologijas_novertesana_precizets.edoc
III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme		
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)		
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period		
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard		
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)		
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme		
The curriculum of the study programme (for each type and form of the implementation of the study programme)		
Descriptions of the study courses/ modules		
Description of the organisation of the internship of the students (if applicable)		
III - Description of the Study Programme - 3.4. Teaching Staff		

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

Other annexes

Name of document	Document
LBTU_mansLLU_ekransavini_LV.pdf	LBTU_mansLLU_ekransavini_LV.pdf
LBTU_mansLLU_screenshots_EN.pdf	LBTU_mansLLU_screenshots_EN.pdf
LBTU Documents in English	Documents in English-20221122.zip
LBTU Galvenie dokumenti latviešu valodā	Dokumenti latvisu valoda-20221122.zip
itf_projekti_lv.pdf	itf_projekti_lv.pdf
itf_projekti_en.pdf	itf_projekti_en.pdf
itf_darba_plans_2020_lv.pdf	itf_darba_plans_2020_lv.pdf
itf_darba_plans_2020_en.pdf	itf_darba_plans_2020_en.pdf
itf_scopus_publicācijas_ar_arvalstniekiem_lv.pdf	itf_scopus_publicācijas_ar_arvalstniekiem_lv.pdf
itf_scopus_publicācijas_ar_arvalstniekiem_en.pdf	itf_scopus_publicācijas_ar_arvalstniekiem_en.pdf
itf_publications_study_courses_lv_en.xlsx	itf_publications_study_courses_lv_en.xlsx
LBTU_IKT_skaidrojums_par_noraditajiem_precizejumiem_zinojuma.docx	LBTU_IKT_skaidrojums_par_noraditajiem_precizejumiem_zinojuma.docx
itf_pieteikšanas_bisk_2023_2024.pdf	itf_pieteikšanas_bisk_2023_2024.pdf

Information Technologies for Sustainable Development (42484)

Study field	<i>Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science</i>
ProcedureStudyProgram.Name	<i>Information Technologies for Sustainable Development</i>
Education classification code	<i>42484</i>
Type of the study programme	<i>Professional bachelor study programme</i>
Name of the study programme director	<i>Gatis</i>
Surname of the study programme director	<i>Vītols</i>
E-mail of the study programme director	<i>gatis.vitols@llu.lv</i>
Title of the study programme director	<i>Dr.sc.ing.</i>
Phone of the study programme director	<i>20230842</i>
Goal of the study programme	<i>Provide students with knowledge, skills and competences in order to become high-level software engineers with the ability to implement interdisciplinary software solutions, as well as a deeper understanding of all stages of development in the implementation of full-cycle software methodologies.</i>
Tasks of the study programme	<ol style="list-style-type: none"> <i>1. Provide theoretical knowledge and practical skills to prepare specialists who engage in real software development processes, knowing the necessary theoretical basis as well as the interdisciplinary aspects of the ICT field</i> <i>2. Prepare specialists who are able to participate in team work, knowing technologies, using professional communication and arguing their point of view in several languages</i> <i>3. Provide students with knowledge on sustainability issues, emphasizing the contribution of the ICT field in ensuring the sustainability of various sectors, especially agriculture and forestry</i> <i>4. Promote the acquisition of research and practical skills by developing analytical abilities to systematically solve tasks in practice and in the work environment</i>

Results of the study programme	<p>1. Knows about the basic issues of information technologies, methods of understanding real-world problems, systematic thinking and analysis, as well as approaches to identifying interdisciplinary problems and creating technological solutions, especially in precision agriculture.</p> <p>2. Knows about the design and implementation of information and communication technology systems, stages of software engineering methodologies and their impact on development processes.</p> <p>3. Is able to specify requirements, design, program, test, implement software and prepare user documentation.</p> <p>4. Knows and understands the contribution and impact of technology on public safety, environmental, economic and social processes.</p> <p>5. Knows how to apply the theoretical and practical knowledge acquired during the study process in real life, by getting involved in local or international software development or scientific projects, as well as creating own companies.</p> <p>6. Is able to work effectively individually or in collaboration in developer groups of field or cross-discipline technological solutions, using terminology and an appropriate communication, as well as the fundamental theoretical base of the industry.</p> <p>7. Knows foreign languages and how to discuss with people, understands the components of business processes and proposes current technologies to solve interdisciplinary tasks.</p>
Final examination upon the completion of the study programme	Bachelor Thesis

Study programme forms

Full time studies - 4 years - latvian

Study type and form	Full time studies
Duration in full years	4
Duration in month	0
Language	latvian
Amount (CP)	160
Admission requirements (in English)	Secondary education
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	Professional Bachelor Degree in Information Technologies
Qualification to be obtained (in english)	Programming Engineer

Places of implementation

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

Full time studies - 4 years - english

Study type and form	Full time studies
Duration in full years	4
Duration in month	0

Language	<i>english</i>
Amount (CP)	<i>160</i>
Admission requirements (in English)	<i>Secondary education. At least B2 level of English language skills.</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Professional Bachelor Degree in Information Technologies</i>
Qualification to be obtained (in english)	<i>Programming Engineer</i>

Places of implementation

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

3.1. Indicators Describing the Study Programme

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

On 12 February 2014, the LLU (LBTU) Senate considered the proposal of the director of the study programme "Programming" to change the name of the programme to "Information Technologies for Sustainable Development". The proposal was previously discussed in the ITF Council and was supported. The main reasons for such a name change are that "Programming" no longer characterises the content and essence of the programme. Also the LR standard "Programming Engineer" of the programme provides for a wide range of skills acquired by specialists. In the implementation of this programme, it was decided to emphasize the application of software in various disciplines, so a new name was proposed ("Information Technologies for Sustainable Development") which is related to the development of technologies and interdisciplinary software to ensure the sustainability of other industries. On 2 April 2014, the Study Accreditation Commission of the Ministry of Education and Science of the Republic of Latvia approved the name change with protocol No. 4. These and technological development changes also initiated corrections in the study plan and the development of new courses for the implementation of this programme.

In 2014/2015, the director of the study programme was changed (until then, Prof. Rudīte Čevere, Dr.sc.ing., was the director of the programme). From this year, Prof. Gatis Vītols, Ph.D., has been performing the duties of the director of the study programme.

Due to the growing interest from students from other countries, as well as the priority set by the university to develop the admission of international students, in 2016 a decision was made to offer the study programme in English to foreign students. In the autumn semester of 2016, the first student was admitted - a foreigner from Hong Kong. Since 2016, the study programme has also been implemented in English and foreign students study in it. In 2020, the first foreign student graduated from the programme. Since 2020, foreign students have also graduated from the faculty every year.

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

This professional bachelor's study programme is implemented in the study direction "Information Technology, Computer Technology, Electronics, Telecommunications, Computer Management and

Computer Science". The duration of the studies is four years, and students are given the opportunity to continue their studies at higher levels within this or other study direction – in the master's degree, for example "Information Technologies" and then the doctoral level programme "Information Technologies". Students obtain the qualification "Programming Engineer", and this study programme is implemented according to the professional standard "Programming Engineer" (<https://registri.visc.gov.lv/profizglitiba/dokumenti/standarti/ps0227.pdf>) (In Latvian). The duration of the study programme implementation is determined by Cabinet Regulation No. 512 and it is at least 4 years (160 credit points) (<https://likumi.lv/doc.php?id=268761>) (In Latvian). This programme duration is 4 years.

The goals of the programme correspond to the goal of the direction and the general goal of the university "High-quality studies that ensure the preparation of internationally competitive specialists", as well as the university's vision "the university is one of the leading science and technology universities in the Baltic Sea region specialising in the sustainable use of natural resources to improve the quality of life of society", within which sustainability is emphasised. (https://www.lbtu.lv/sites/default/files/2020-12/StrategijaENG_8_12_2020.pdf). In November 2022, LBTU Senate was discussing version of new strategy document which is developed for further years. During application of this report, strategy version is still discussed in LBTU board. This report is prepared using strategy documents for period 2015-2022.

The aim of the study programme is to provide students with knowledge, skills and competences in order to become high-level software engineers with the ability to implement interdisciplinary software solutions, as well as a deeper understanding of all stages of development in the implementation of full-cycle software methodologies.

To achieve the aim, following tasks are executed:

1. Provide theoretical knowledge and practical skills to prepare specialists who engage in real software development processes, knowing the necessary theoretical basis as well as the interdisciplinary aspects of the ICT field
2. Prepare specialists who are able to participate in team work, knowing technologies, using professional communication and arguing their point of view in several languages
3. Provide students with knowledge on sustainability issues, emphasizing the contribution of the ICT field in ensuring the sustainability of various sectors, especially agriculture and forestry
4. Promote the acquisition of research and practical skills by developing analytical abilities to systematically solve tasks in practice and in the work environment

Study programme will prepare graduates who (defined results):

1. Knows about the basic issues of information technologies, methods of understanding real-world problems, systematic thinking and analysis, as well as approaches to identifying interdisciplinary problems and creating technological solutions, especially in precision agriculture.
2. Knows about the design and implementation of information and communication technology systems, stages of software engineering methodologies and their impact on development processes.
3. Is able to specify requirements, design, program, test, implement software and prepare user documentation.
4. Knows and understands the contribution and impact of technology on public safety, environmental, economic and social processes.
5. Knows how to apply the theoretical and practical knowledge acquired during the study process in real life, by getting involved in local or international software development or scientific projects, as well as creating own companies.

6. Is able to work effectively individually or in collaboration in developer groups of field or cross-discipline technological solutions, using terminology and an appropriate communication, as well as the fundamental theoretical base of the industry.
7. Knows foreign languages and how to discuss with people, understands the components of business processes and proposes current technologies to solve interdisciplinary tasks.

The aim, the task with the set student skills, as well as the programme results are closely related to the responsibilities and expected skills of specialists in this field named in the software engineer standard. At the time of writing the report, the standard prepared in 2009 has been published (<https://registri.visc.gov.lv/profizglitiba/dokumenti/standarti/ps0227.pdf>) (In Latvian). Since ITF is a member of LIKTA's Education Working Group, the draft of the new standard, which will be created in 2022 and at the time of writing the report, has been submitted to the Ministry of Education and Science (MoES) for evaluation, is currently being discussed. Also, the skills and responsibilities of the programming engineer named in the draft of this standard draft are realised in this study programme.

The qualification awarded as a result of the graduation of the programme is included in the professional classifier of the Republic of Latvia, renewed in 2022 in the subgroup "2512 02 Programming ENGINEER" of the second basic group "25 senior specialists in the field of information and communication technologies" (<https://www.lm.gov.lv/lv/klasifikacija/profesiju-klasifikators/profesiju-klasifikators-aktualizets-2022g-ada-8aprili>) (In Latvian).

Analysing the Cabinet Regulation No. 322 "Regulation on Classification of Education in Latvia", current study programme code 42526 do not correspond to an existing programme in the subgroup "Other engineering sciences" of the thematic group "Engineering and technologies" (<https://likumi.lv/doc.php?id=291524>) (In Latvian), awarding a professional bachelor's degree in information technologies.

Since 2017, the regulations of the Cabinet of Ministers have included the educational thematic group "Life Sciences, Mathematics and Information Technologies" with the thematic group "Computer Science" and the subgroup "Programming". Although subgroup can be judged as too narrow by its name, at the same time it includes the direction of program implementation - training of software engineers, so it has been decided to change the program code to 42484.

LBTU is under the management of the Ministry of Agriculture, and also in communication with the representatives of the ministry, the number of state-funded study places for this program is increased, emphasizing the uniqueness of the program, directly related to the challenges of precision agriculture, precision forestry and woodworking.

In addition to the Programming Engineer Standard of the Republic of Latvia, the creation, development and implementation of the programme is guided by ACM and IEEE guidelines for preparation of software engineers (<https://www.acm.org/binaries/content/assets/education/se2014.pdf>).

The implementation of the programme takes into account the main qualities of a software engineering graduate:

Professional knowledge. Show mastery of software engineering knowledge and skills and of the professional standards necessary to begin practice as a software engineer .

Technical knowledge. Demonstrate an understanding and apply appropriate theories, models, and techniques that provide a basis for problem identification and analysis, software design, development, implementation, verification, and documentation.

Teamwork

End-User Awareness

Design Solutions in Context

Perform Trade-Offs

Continuing Professional Development

The study programme is implemented in Latvian and English. Students are divided into separate streams, except for certain situations (for example, guest lectures in English, teaching staff members from abroad). In both streams, the study content is implemented identically, with one exception – the stream of Latvian students learns a foreign language (Professional English), while the stream of English students learns a foreign language (Latvian I and II).

The study programme courses are divided into several parts: General education courses (20 CP), Theoretical courses of the field (36 CP), Professional specialisation courses of the field (60 CP) and Optional part (6 CP), within which the student can freely choose study courses from the offer catalogues of LBTU or other universities. The implementation of the study programme also includes a 26-week long professional practice (26 CP), within which students go on practice (internship) in software development companies in Latvia or other countries of the world, as well as the development of a bachelor's thesis (12 CP).

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

As this study programme belongs to the field of STEM (Science, Technology, Engineering and Mathematics), its development has been one of the priorities in Latvia for the last few years, which is also shown by several investment projects, for example, the project of developing the infrastructure of STEM study fields which was implemented throughout Latvia from 2017–2020, for example [LBTU project \(https://www.llu.lv/lv/projekti/apstiprinatie-projekti/2017/llu-stem-studiju-programmu-modernizacija\)](https://www.llu.lv/lv/projekti/apstiprinatie-projekti/2017/llu-stem-studiju-programmu-modernizacija) (In Latvian), as well as the constantly allocated state-funded study places for STEM field programmes.

In the field of ICT, referring to the data of the Central Statistical Bureau, LIKTA collected data (<https://likta.lv/nozare-skaitlos/>) (note: English slides at the second half of presentation) and concluded that in 2020 more than 7,000 ICT companies were registered in Latvia (https://data.stat.gov.lv/pxweb/en/OSP_PUB/START_ENT_UZ_UZS/?tablelist=true) and the number of people employed in the ICT industry in Latvia is more than 38 thousand. The ICT industry in Latvia is growing rapidly and many companies operate in an international environment. In general, ICT produces 6% of Latvia's gross domestic product and ranks among the top 3 Latvian export industries (<https://likta.lv/nozare-skaitlos/>), and for several years in a row, companies in the ICT industry have emphasised the lack of qualified labour. In recent years, software developer has been the most demanded profession in Latvia. The Ministry of Economics report of 2022 on the labour demand prediction in Latvia's by 2040 (<https://www.em.gov.lv/lv/media/15413/download?attachment>) (In Latvian) predicts that by 2040 there will be a shortage of ICT and engineering specialists (by 2040 in Latvia there will be shortage of 6400 ICT industry specialists). Compared to other mentioned industries, shortage of ICT

specialists are the largest.

In general, higher education institutions in Latvia prepare around 700 new specialists per year, however, representatives of the industry believe that this is not a good performance and it is necessary to increase the number of graduates. In 2017, a study by the CERTUS think tank concluded that Latvia needs to prepare 3,000 graduates in the ICT industry every year (http://certusdomnica.lv/wp-content/uploads/2017/10/web_CertusZinojums_2017_1dala_Latvija2022-2.pdf) (In Latvian).

Since 2021, the Ministry of Agriculture, under which the university is subordinate, has allowed the increase of the state-funded place in this programme, which allowed 40 students to be admitted to state-funded places in 2020, 45 students in 2021, and 55 students in 2022. The Ministry of Agriculture defines ICT field programmes with application and interdisciplinarity components as an important component in the development of LBTU and the development of industries supervised by the Ministry of Agriculture. With a slight percentage decrease in the number of students dropping out of the programme, the overall increase in the number of students in the programme can be seen, and an increase in the number of graduates can be predicted. However in year 2021./2022. Student dropout has increased. This increase can be related to implemented restrictions on studies during pandemic, so students quit studies. Now restrictions are removed and if such restrictions will not be implemented, student dropout could be reducing in next years.

The majority of students implement their practice in software development companies in Latvia, where after completing the practice, the majority of students sign an employment contract with the company and get involved in real projects. This allows us to make the assumption that the majority of graduates work in ICT companies in Latvia, geographically mainly in Jelgava, Bauska and Riga area, although remote work has developed in recent years.

These factors result in the fact that graduates of the programme do not have any difficulties in finding jobs in ICT companies, working in state institutions, as well as founding their own companies. The demand for programme specialists can be seen in the implementation of practice, when students find practice themselves relatively quickly and only in rare cases ask the practice supervisor for help in finding a practice.

In March 2022, as part of the study direction, companies in the ICT industry were surveyed to see whether and how many graduates of ITF programmes work in their companies. Out of the 54 surveyed companies, 22 companies answered, confirming that a total of 64 graduates are working for them. The largest employers of ITF graduates are industry companies such as "Accenture Latvia", AS "Emergn", LLC "TestDevLab", "If P&C Insurance Latvia", etc.

According to the data collection of the State education information system, it can be seen that the income of graduates in the group Natural Science, Mathematics and IT is the highest in Latvia, with a weighted median of EUR 15,323 per year. The average income of graduates in the country in all industries is EUR 12,048 per year (<https://www.viis.gov.lv/dati/absolventu-monitorings-2020-un-2021gada-publikacijas>) (In Latvian).

According to the portal [algas.lv](https://www.algas.lv) (<https://www.algas.lv/algu-informacija/informacijas-tehnologijas/programmaturas-inzenieris?search=1>) (In Latvian), the salary of a programming engineer ranges from EUR 1,257-3,252 per month. According to CSB data, the average monthly salary in Latvia in 2021 was EUR 1,277, which means that programming engineers receive salaries that are above the average salary in the country.

On this portal, it can be clearly seen that out of the top 5 best-paid positions in Latvia, three are positions in the field of ICT. Since there is a critical shortage of ICT employees in Latvia, there is a battle for existing industry professionals and future professionals. In the implementation of the

study programme, this is felt both in the transition of teaching staff members to the industry due to the attractive salary, and also in the beginning of the students' careers in ICT companies already in early study courses. According to prakse.lv and LDDK data, the most in-demand profession in the industry in recent years is programmer (<https://jauns.lv/raksts/bizness/287908-darba-deveji-nosauc-sogad-pieprasitakas-profesijas-un-vinup-rat-labakas-augstskolas>) (In Latvian). According to cv.lv data, 731 job offers in the ICT industry have been published in October 2022 (https://cv.lv/en/search?limit=20&offset=0&categories%5B0%5D=INFORMATION_TECHNOLOGY).

The ICT industry group has the most published job offers on this portal, the job group with the second-most offers is sales with 566 job offers, however, looking at the sales offers as well, several are related to the sale of ICT products, having a requirement for prior knowledge in using systems and assembling equipment. In 2019, when conducting an unofficial search for graduates on the LBTU LinkedIn portal (<https://www.linkedin.com/school/2171108>), using the LBTU alumni section on this portal, it was concluded that practically all graduates of the programme registered on this portal indicated that they work in ICT companies.

Considering the above, it can be concluded that the study programme implements an important function in Latvia - to reduce the shortage of qualified employees of companies, as well as to continue to support one of Latvia's primary export industries with qualified highly trained graduates.

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

Stream implemented in the Latvian language

In the study programme in the period 2012./2013.-2022./2023., there is an increase in the number of matriculated students from 26 (in 2012./2013.) to 65 (in 2022./2023). Unchanged dynamic is also observed in the number of graduates on average 15 students graduate each year. Increase of graduates are predicted with increase of matriculated students for past 3 years. The data are summarised in the appendix (itia_studentu_statistika_en). In the fall semester of 2022, 143 students are studying in the Latvian stream of the programme, while in the English stream 26 students.

Such numbers can be explained by the increase in state-funded study places for the profession, as well as, for example, LIKTA promotional campaigns, programme promotional campaigns in schools, social networks, as well as programme visibility on the prakse.lv portal (<https://www.prakse.lv/study/433/latvijas-lauksaimniecibas-universitate/informacijas-tehnologijas-ilg-spejigai-attistibai-profesionalas-augstakas-izglitibas-bakalaura-studiju-programma>) (In Latvian) and Study ICT in Latvia (BITS) promotional materials (<https://www.facebook.com/bits.education.lv>).

It can be seen that during the implementation of the study programme, students are also being ex-matriculated. The majority of ex-matriculated students do it of their own free will in the first weeks of study, often citing a discrepancy between expectations and reality regarding the studies as the reason for ex-matriculation, as well as in the final course, not being able to combine studies with work, which students continue after qualification practice during the 4th year of study. There are some students who have difficulty learning content of specific study courses, such as programming

and mathematics. This is often explained by the low level of preparation of the applicants in the STEM courses, which is a problem observed throughout Latvia, as the grades in the centralised exams in mathematics decreases every year.

In general, bachelor's level programmes have seen a higher demand for professional study programmes at the university in recent years. Young people appreciate the qualification of this study programme, as well as a 26-week long practice, where the university cooperates with an entrepreneur, students are integrated into the working environment and find jobs. It shall be recognised that the practice, during which a large number of students find their first jobs, also affects the inability of some students to prepare a bachelor's thesis and leave or postpone their studies in the 8th semester. This is also the main reason for the ex-matriculation of students in the 7th or 8th study semester. In order to solve this problem, negotiations have been started with employers and this issue has also been brought up in the Latvian ICT Association (LIKTA). Various mechanisms have been introduced, for example, several entrepreneurs offer paid leave for writing a bachelor's thesis, practice supervisors introduce additional steps to ensure high-quality supervision of practice and timely introduction of students to the bachelor's thesis development schedule and main development steps. For example, in order to receive a positive grade in the study course "Professional Qualification Practice I", a student needs to receive a positive evaluation from the reviewer of the first draft of the bachelor's thesis.

Foreign students

In 2016, the first foreign full-time students were admitted. Since 2016, foreign students have been admitted every year. Since 2018, due to various delays in issuing visas, a decision was made to admit students to this programme twice a year - in September and February. In 2020, the first foreign students graduated from the study programme, and in January 2022, foreign students graduated from the study programme for the first time in the winter period - in January. All studies (with exceptions during the Covid-19 pandemic) are organised in-person. In general, the number of foreign students in the programme is slowly increasing and the biggest increase can be seen in the 2022/2023 study year, when there is 26 active students in the study programme. This year, within the framework of the memorandum of the LBTU and Samarkand branch of Tashkent State University of Economics, which provides that the ITSD study programme is implemented in Samarkand under the supervision of our teachers according to the 1st and 2nd course plan, 11 students from Uzbekistan also came to study in the programme. After completing 2 courses in Samarkand, students have the opportunity to continue their studies in Latvia in the 3rd year of this study programme. Currently, 11 students from Uzbekistan have taken advantage of this opportunity. This and similar (initiated) collaborations, as well as the faculty's active involvement in foreign promotional campaigns and the university's international recognition, obtaining good ratings in world university rankings (for example, World University Rankings (<https://www.timeshighereducation.com/world-university-rankings>)), allows us to predict that the number of foreign students and graduates in this programme will continue to grow. At the same time, analysing the demographic situation of Latvia, the number of students in the Latvian stream may not continue to rapidly grow and will stabilise. The programme was also chosen as one of the few included in the Latvian-wide campaign Study ICT in Latvia (BITS) (<https://www.facebook.com/bits.education.lv>)

The total number of students in the programme ranges from 78 to 169 students. The increase mainly occurs in the flow of foreign students, as well as in years when more state-funded study places are awarded. In recent years, the number of state-funded study places in this programme has been increased, correspondingly with the admission of more students. The number of admitted fee-paying students is relatively small, and there is no reason to predict a large increase in the number of fee-paying students, as the cost of living continues to rise, but the salary level in Latvia

is not experiencing rapid growth. This means that the ability to pay will decrease, which can potentially reduce the number of fee-paying students as well. The proportion of fee-paying students does not exceed 10% of the total number of students and, in the 2022./2023. study year, there were 14 students in the programme who paid for their own studies.

The number of graduates by study year in the reporting period is on average about 13-15 students. In recent years, the number of graduates has not significantly increase and is stable, however, the forecasts for the number of graduates in 2023 show an increase – 28 students, which can be explained by the increase in the number of admitted students starting from 2017 and the faculty's work to reduce student dropout with the active involvement of student mentoring, the course curator and the study programme director in certain aspects of the study programme implementation.

During the reporting period from 2013/2014–2021/2022, 116 students have graduated from this study programme.

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

3.2. The Content of Studies and Implementation Thereof

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

The total amount of the professional bachelor's study programme “Information Technologies for Sustainable Development” is 160 CP (240 ECTS), study duration is 4 years (8 semesters). Implementation takes place in the form of full-time studies. The study courses of the study programme are divided into four parts (General study courses (20 CP); Field theoretical basic courses (36 CP); Field professional specialization courses (60 CP) and Elective courses (6 CP)). The study programme also includes professional practice (26 CP) in the 7th and 8th semesters. The aim of the practice is to practically strengthen the theoretical knowledge, skills and abilities acquired during the study courses in a real work environment in companies or organisations that are engaged in software development. In the 7th semester of studies, students start work on the development of a bachelor's thesis, which is defended at the end of the 8th semester. 12 CP are intended for the development of a bachelor's thesis. Study plan is included in Appendix

(itia_studiju_plans_en).

All study course descriptions are given in Appendix (itia_kursu_programmas_en).

Elective courses are offered every year to all university students, including students of this program. Students are free to choose the courses they want to study. The course offer is approved by the methodological committee of the faculty. These courses could be from different disciplines such as foreign languages, for example, for several years, students choose Spanish language courses or Stress Management courses. In 2023, students will also be offered courses related to machine learning implemented by the University of Latvia. The order in which free elective courses are offered is determined by the order of the vice-rector in studies of LBTU, which is issued every year. Year 2023/2024 order sample is included in the appendix (itf_pieteikšanas_bisk_2023_2024) (In Latvian).

The basic content and structure of the study programme was created in connection with the Latvian professional standard “Programming Engineer” and also guided by the guidelines developed by IEEE and ACM SE2014: Curriculum Guidelines for Undergraduate Degree Programmes in Software Engineering (available in English) (<https://www.acm.org/binaries/content/assets/education/se2014.pdf>). Changes in the content of the programme are also determined by the decisions of the State Examination Commission, which, after the defence of students' theses, the members of the commission express and incorporate into the protocol every year.

The content of the programme can also be influenced by the insights and potential improvements gained as a result of participation in “Informatics Europe” (<https://www.informatics-europe.org/>), as well as participation in the Education Working Group of the Latvian ICT Association (LIKTA). The faculty has been a member of the “Informatics Europe” organisation for several years, receiving updates on content and trends, as well as participating in the European Computer Science Summit (<https://www.informatics-europe.org/ecss/home.html>) conference of deans and heads of institutions, in which participation takes place for several years in order to gain knowledge, acquire new ERASMUS partners and exchange current content. Compliance with national education standard and professional standard are included in Appendixes (itia_atbilstiba_valsts_standartam_en) (itia_atbilstiba_profesijas_standartam_en).

The creation of separate courses is stimulated by cooperation with entrepreneurs, for example, after discussions with “Accenture Latvia”, the course “Security Testing” (2 CP) is offered, and a workshop on the topic of security testing is held every year as well.

Every year, lecturers participate in various professional development events, do practices in companies, participate in international scientific projects, conferences. This contributes to the improvement of study course content or teaching methods. Non-essential changes to the course are made regularly, which are also reflected in the change of programme descriptions. During this reporting period, several changes have been made to the study programme plan, mainly replacing, excluding and including study courses, as well as changing the amount of credit points for individual study courses, for example, the amount of credit points for the study course “Computer Hardware” has been increased from 1.5 to 3 CP. Emphasising experience in companies and in order to promote the connection of final theses with the industry, the amount of the study course “Professional Practice” has been increased to 26 CP.

New study courses have been created: “Fundamentals of Sustainable Development” in the amount of 2 CP, in which the concepts of sustainability are explained to students and an introduction to computing tasks is provided. The following new courses have also been created: “Computational Sustainability” (2 CP), “Security Testing” (2 CP), “Virtual Environment Design and Programming” (2

CP), etc. Certain study courses were excluded from the programme, for example “Computer Networks II”.

The arrangement of courses in the study plan was also changed. In order to increase students' motivation to study bachelor's study programmes, it has been decided to increase the amount of special courses in the field already from the first semester of studies. For this purpose, the order of undergraduate study programme courses has been changed. In the 1st semester, courses such as “Database Technologies”, “Operating Systems” and “Graphic Application Software” are additionally planned. Such a decision was made after analysing the reasons for the ex-matriculation of several students, where the students mentioned the fact that they did not see the industry courses, more emphasis was placed on the general study courses.

The mapping of study courses to achieve learning outcomes of the study programme is included in Appendix (itia_kursu_kartejums_rezultatiem_en). The mapping demonstrates that all the results of the study programme are achieved, which is the result of long-term and continuous work with all stakeholders of ICT studies.

Feedback on the compliance of the study programme with the requirements of the labour market and scientific trends is also obtained through the analysis of the results of professional practice, discussions with practice supervisors from companies. During the practice, students get to know the real work environment and technologies that are used in real projects. Since students are also working on their bachelor's theses in parallel with practice, during this time students are also getting familiar with scientific findings in literature. Since ITF teaching staff members have experience in scientific projects at the local and international level, these insights also appear in the implementation of study courses.

In 2018, the implementation of the LLU management improvement project (<https://www.llu.lv/lv/projekti/apstiprinatie-projekti/2018/latvijas-lauksaimniecibas-universitates-par-valdibas-pilnveide>) (In Latvian) was started at LBTU. Within the framework of this project, an evaluation of the content of this programme was carried out by 3 parties - the company “Dynamic University”, an academic environment expert from an EU accredited higher education institution, Prof. Jaroslav Pokorny (Charles University, Prague), as well as experts from “PricewaterhouseCoopers” (PwC). As a result of the evaluation, it was identified that the programme achieves its goal and meets the requirements of the industry and the labour market and can be positioned as an application-oriented business informatics programme that focuses on the development of software and solutions with an emphasis on interdisciplinary companies and organisations.

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

3.2.3. Assessment of the study programme including the study course/ module implementation methods by indicating what the methods are, and how they contribute to the achievement of the learning outcomes of the study courses and the aims of the study

programme. In the case of a joint study programme, or in case the study programme is implemented in a foreign language or in the form of distance learning, describe in detail the methods used to deliver such a study programme. Provide an explanation of how the student-centred principles are taken into account in the implementation of the study process.

At the university and also at the faculty, the emphasis is placed on the development of the student, who not only obtains a bachelor's degree and qualification, but also improves his/her personality during his/her studies, becoming a critical-thinking and creative person and who would recommend the study programme to other future students.

The basic principles of study implementation, the organisation and study process in general are described in the University's Study Regulations (https://www.llu.lv/sites/default/files/2021-05/Study_regulation_2021_EN.pdf), which is available to all students and employees.

The study process is organised in Latvian and English. Studies in English are provided as a separate stream, with the exception of cases when a study course module or topic is taught in English, for example in the case of lectures given by a foreign guest lecturer or in the case of classes taking place within the framework of the ERASMUS programme, as well as in certain situations when practical work classes are planned together for both streams. The programme is implemented as face-to-face studies for 8 semesters. Study courses are designed for face-to-face contact classes and individual studies. Each study course has a course plan that is publicly available in Latvian and English (<https://lais.llu.lv/pls/pub/kursi.startup?l=1>). At the beginning of the course implementation, students are introduced to the course plan, requirements and the results to be achieved. Students and teaching staff members have access to the LBTU Academic Integrity Regulations (6_Regulations for Academic Integrity), which regulate the principles of academic integrity, and to the Study Regulations (https://www.llu.lv/sites/default/files/2021-05/Study_regulation_2021_EN.pdf), which describe the procedure by which students can resolve conflicts, as well as contest the course evaluation.

Since 2016, LBTU has received the Investors in Excellence certificate and carries out ongoing activities regarding quality assurance and improvement of university processes.

Several support tools are available to the students for the course of studies, mainly the university information systems (lesson plans, progress reports, registered courses, Elective courses) and the e-study system (lecture materials, assignments, tests, etc.). The e-study system is an integral study tool, which during the pandemic has often been the only form of studying with the help of video lectures, audio recordings, chat and other tools. In any course, at the beginning of learning, the teaching staff members introduce the student to the course requirements. These requirements, as well as an outline of course curriculum, is available in the programme description which is available on the university information system. For practice support, the faculty's practice management system has been created (prakses.itf.llu.lv). It is a tool that allows the student to fill in practice diaries, choose an practice location, apply for a new location, and perform other functions. Any study course is concluded with a student's voluntary survey about the progress of the course. This survey has been created in cooperation with the Student Self-Government of the university and allows us to identify the students' opinions about the implementation of the course, and allows the student to give comments about the implementation of the course. Students can express proposals and objections regarding the organisation of the course also during the implementation of the course, by freely expressing their opinion to the leader of the course, the curator, representatives

of the ITF Student Self-Government, the director of the study programme, the vice-dean or the dean.

Similar to other study programmes of this direction, which are implemented by LBTU, the principles of student-oriented education are one of the priorities which is also related to the ACM international guidelines emphasised in the implementation of the programme (<https://www.acm.org/binaries/content/assets/education/se2014.pdf>), as well as to the professional standard (<https://registri.visc.gov.lv/profizglitiba/dokumenti/standarti/ps0227.pdf>) (In Latvian). In the Standards and guidelines for quality assurance in the European higher education area adopted by the ministers responsible for higher education in the European higher education area in 2015, paragraph 1.3 is devoted to student-oriented education. In the implementation of this direction, both the recommendation expressed in these standards and guidelines, as well as other aspects that dominate in student-oriented education, are taken into account.

As the ICT industry basically works with a project implementation approach, students, in the study environment, are offered conditions that include a project implementation approach, for example, by working in groups in software engineering courses, using methods in course implementation. When students evaluate each other's work and participate in discussions, for example, during defence of database projects in Database Technologies, defence of course papers in Database Access Applications, they can openly express their opinion and engage in discussions with teaching staff members or fellow students, etc.

In general, the usual methods are used for the implementation of the courses – lectures, practical and laboratory work, seminars, as well as methods that develop analytical and systemic thinking, creativity and communication skills – group work, discussions, situation modelling, study tours, etc.

The student's interests are also identified in the relationship between the teaching staff member and the student, and within the limits of possibilities, students can learn them in depth by receiving additional tasks and materials from the teaching staff members. For example, at the beginning of 2022, a small group of students showed an in-depth interest in learning virtual reality skills – these students were given the opportunity to work in the laboratory outside of class time and implement the planned projects. Guest lecturer Inga Viļumsone also devoted extra time to preparing materials and working with students.

Students receive extensive comments on their submitted work, and students can reach teaching staff members during office hours and online on the e-learning platform to receive more detailed evaluations of their work. With a large number of students, it requires additional time investment from the teaching staff members, so it is not always possible to receive such detailed evaluations in all courses.

Student-oriented education also emphasises flexibility and adaptability of content and teaching methods. This could be clearly seen during the pandemic, when it was necessary to adapt the content for online and face-to-face learning according to specific rules in a short time. A hybrid approach was implemented at the faculty, when a teaching staff member read the lecture in person and streamed it online in the e-study system. Several other process improvements were also introduced to prevent students from having to interrupt their studies during the pandemic.

Study courses also emphasise student creativity. Examples are the study courses “System Analysis and Modeling”, “Database Technologies”, “Computational Sustainability”, which include components in which students express themselves creatively, by choosing their own project topics, developing their own interpretations of the system model or preparing the analysis of an unusual interdisciplinary problem for students in the reaction paper related to the “Computing Sustainability” course.

Since foreign students, students of other races, students with special needs and students of different religions also study at the faculty, the emphasis is placed on making all students feel safe and integrated in the study environment. This is mainly addressed by identifying suitable course leaders who define the overall culture in the course and identify problem situations in a timely manner. For this purpose, the leaders of courses and groups are selected after voluntary interviews with applicants conducted by ITF Student Self-Government representatives and programme directors shortly after signing contracts with students. For the integration of foreign students, for example, separate practical works are planned together with students of the Latvian stream, within the permissible limits of regulatory enactments. Student stories are also created and published on the LBTU portal, where, for example, the story and reflections of a foreign student are published, as the story of Gowtham Satti (<https://www.llu.lv/lv/studentu-un-absolventu-stasti/sagerbties-silti-un-studet-it-7450-km-no-majam>) (In Latvian). The university also adapted the canteen menu to include food labels on ingredients, which is important not only for foreign students, but also for students of the Latvian stream. LBTU and the faculty analysed whether the environment, as well as the content of study courses, is accessible to people with special needs. For example, LBTU has a compilation on environmental accessibility (<https://www.llu.lv/lv/vides-pieejamiba-personam-ar-invaliditati>) (In Latvian). For example, such an analysis identified several necessary improvements in the study materials – the use of colour codes instead of colour names, the availability of the material on different platforms and screens, etc. Students are invited to use ERASMUS exchange opportunities (<https://www.llu.lv/en/go-abroad>), which promote the intercultural communication in student-oriented education, as well as contribute to getting to know another university's study organisation culture.

Aspects of the choice of student-oriented educational content are offered as much as possible. All students are offered Elective study courses in the amount of 6 CP. Students can additionally learn the content by using LBTU lifelong learning courses. The content is delivered to students in various forms – video recording, live lecture, presentation slides, descriptions of practical work and demo video recordings for practical work. Students are divided into practical work groups, however, students can choose to switch to another group by informing the dean's staff thereof.

Students are also not restricted in the use of technological solutions and teaching staff members, within the limits of possibilities, offer alternative tools for the implementation of tasks, if the student has expressed such a wish.

Likewise, in the internal culture of the faculty and in the implementation of the study programme, discrimination based on gender, race, religious affiliation, sexual orientation, material status, etc. limiting human rights factors is not allowed or supported. During the emergency situation declared in the country (during the Covid-19 pandemic), students who could not attend lectures in person due to family and financial reasons were supported with the help of hybrid lectures.

Students have the opportunity to freely choose the topics of various tasks, the practice location for the implementation of professional practice, the topic of the final thesis. In certain situations (health problems, expectant mothers), a student can form an individual study plan following procedure defined in LBTU for taking courses. In the implementation of several study courses, the accumulative assessment is used, which allows students to predict the final assessment and choose appropriate strategies for passing the study course.

In general, it can be concluded that continuous work is being done so that the implementation of the programme takes place as an essential component, taking into account the principles defined in student-oriented education and allowing students to be actively involved in the implementation of the learning process.

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

The study programme includes a 26-week long practice in the amount of 26 CP (39 ECTS) in software development companies that have experience in the development of software products. At the university, practices are implemented in accordance with Cabinet Regulations No. 512 of 2014 "Regulations regarding the State Standard for Second Level Professional Higher Education" (<https://likumi.lv/doc.php?id=268761>) (In Latvian) and the university's internal normative documents - Practice Regulations (itf_lbtu_praksu_nolikums_lv_en). A programme is created for the implementation of the practice, which is available in the practice management system of the faculty (<http://prakses.itf.llu.lv/>). Students are introduced to the practice programme.

The faculty has long-term cooperation experience with several industry companies, and although formal agreements on commitment to cooperation, including practice locations, have historically been concluded with individual companies, students do not have any particular difficulties in finding a practice suitable for their interests, and the conclusion of such formal agreements on the provision of practices is not required. On the contrary, since the number of ICT companies in Latvia that can be considered as potential practice locations is rapidly increasing, as is students' interest in practices outside of Latvia, signing commitment agreements with certain companies can impose additional obligations on both the company and the faculty.

When the student has chosen the practice location, if necessary, gone through the selection process and agreed with the employer on the practice conditions, a tripartite agreement is concluded between the university, the employer and the student (itf_lbtu_praksu_nolikums_lv_en). For the practice, a practice supervisor in the company and a practice supervisor from the university are appointed. List of the most popular practice locations since the previous accreditation can be found on practice management system (<http://prakses.itf.llu.lv/?pid=42>).

The aim of the professional practice of this programme is to practically strengthen the theoretical knowledge and practical skills and abilities acquired during the study courses in a real work environment in companies or organisations that are engaged in software development. Professional practice is a critically important component in the implementation of this professional programme, which is confirmed by both the binding professional standard of the Republic of Latvia and the international training guidelines for specialists in this field (ACM Curriculum Guidelines for Undergraduate Degree Programmes in Software Engineering) (<https://www.acm.org/education/curricula-recommendations>).

Every year in November, ITF organises an on-site practice seminar, within the framework of which 7-10 companies are invited to introduce students to potential practice locations, the reality of practice implementation and to participate in discussions with students. During the pandemic (2020-2021), the organisation of seminars was interrupted. However, it is currently planned to conduct them in the usual format. These seminars usually gather close to 100 visitors and companies themselves show initiative to participate in such seminars. Companies are often invited

outside of the practice seminar to present their knowledge and talk about potential job opportunities, for example in the direction of databases, etc. For several years in a row, business representatives also participate in the matriculation event for new students, within the framework of which they give a motivating and explanatory presentation about the industry and potential growth in various positions in the industry. In 2022, such a presentation was given by SIA "TestDevLab", in other years by "Accenture Latvia", "C.T.Co." and other companies.

The faculty has also developed a support tool (information system) for the implementation of the professional practice programme <http://prakses.itf.llu.lv>. This tool has been operating for several years and includes functionality related to finding a practice, filling in practice diaries, related documents as offered by company practices, etc. A practice course has also been created in the e-study system.

A large number of students find practices themselves, however, students have the opportunity to contact the practice supervisor to find a suitable practice from among the faculty's cooperation partners. Some students also tend to change practice location during the 26-week long practice, mainly when receiving an offer from another company or wanting to expand the range of skills to be acquired.

Students from foreign countries follow the practice programme in the same way as students from Latvia. A large number of ICT companies in Latvia use the English language as a means of communication in the company, including when writing accompanying documentation. ICT companies are happy to offer practices to foreign students as well. Foreign students also have the opportunity to do a practice in another country, which some students have also taken advantage of. In this case, a tripartite agreement is concluded with the company, student and university, before which the student provides information to the director of studies about the practice location, specifying its website and physical address. After the director of the study programme has familiarised himself/herself with the company (if necessary, contacted the company by asking the necessary questions about the field of activity) and confirmed its suitability, the agreement is concluded. Currently, foreign students have completed practices in companies located in Latvia, China, India and Portugal.

However, some foreign students also choose practices in Latvia, for example "Chili SIA", "Wonderland Media SIA", etc.

Also, students can use the opportunities offered by the ERASMUS programme to implement practices in the member states of the ERASMUS+ programme (<https://www.llu.lv/en/erasmus-internship>).

Practice tasks are closely related to the results of the program, especially students acquire the skills to participate in real software development projects, work in a team and understand all phases of software development, while solving problems that arise in real business processes.

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

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

theses.

During the reporting period since 2013./2014., 115 bachelor's theses related to various software development process tasks, typically, information systems programming, creation of artificial intelligence solutions, testing, preparation of specifications, precision technologies applications have been successfully defended in this programme. Since this programme includes professional practice in the 4th year of study, the topics of the final theses often result from practice tasks and problems that students have solved independently during the practice within the framework of projects. As part of the development of such final theses, sometimes consultants from the company where the student undergoes professional practice are engaged.

Some of the thesis topics are also offered by the entrepreneurs themselves, which are typically submitted in September of each year, because this is the month when students who are admitted in the fall choose or propose their final thesis topics. The teaching staff members of the faculty also offer topics for final theses. The compiled list of potential topics is published on the faculty's website in the section for foreign students (<https://www.itf.llu.lv/en>) "Writing bachelor's and master's thesis". Students can also initiate their own topic and freely choose a suitable supervisor from the academic staff or employers. When choosing from employers, the director of the study programme checks the suitability of the employer's representative as a supervisor (in the field of scientific degrees).

Theses topics are also offered by other faculties and departments of the university, for example landscape architecture direction, veterinary science direction, construction direction, agriculture direction, which are the unique study directions of this university in Latvia. These topics are unique in the Latvian context, as they allow ICT students to access the equipment and data of this university's laboratory, for example, landscape architecture issues with eye tracking technologies, precision beekeeping solutions, etc.

The list of topics of defended final theses is available in Appendix (itia_aizstavetie_darbi_en)

The specificity of the final theses topics of this programme is related to the creation of software for the development of various industries, with an emphasis on life science industries such as agriculture, forestry, environmental sciences, and others.

The relevance of topics and the quality of development are controlled by several control points, such as topic approval, draft submission, pre-defence, preparation of main theses, etc. The student's formal assistants in the development of theses are the methodological instructions for the development of final theses (<https://www.itf.llu.lv/en/writing-bachelor-and-master-thesis>), as well as instructions for the design of the work. Webinars are also organised for students at the faculty, within the framework of which the work development processes are explained.

In November, the Department of Computer Systems organises a meeting of the department, where the relevance of topics to the industry, their topicality, formulation of the topic, goals and tasks are evaluated. The potential supervisor also participates in the meeting of the department. All topics are also sent to and comments received from the chairman of the Commission for the final thesis, who is a representative of the industry company. The chairman of the Commission usually assesses the potential relevance of the topic, consulting with the other members of the Commission, if necessary. In case of a positive decision of the department, the student can start work on the final thesis. Approximately 3 months after the approval of the topic (following the approved calendar schedule for the final thesis) (<https://www.itf.llu.lv/en/writing-bachelor-and-master-thesis>), students submit the first drafts of their work, which are evaluated by an expert in the relevant field from the

faculty. Only after the expert's positive conclusion, can the student continue working on the bachelor's thesis. About 6 months after the topic has been approved, a pre-defence of final theses is organised, where students present their works. In another month, the final theses is defended. The State Examination Commission includes mostly representatives of employers, who are also reviewers of works. After the defence results, the Commission provides a conclusion on the relevance of the topics, recommendations for potential future topic directions, as well as recommendations for improving the development of theses.

The thesis development procedure, as well as cooperation at the interdisciplinary level with experts and entrepreneurs, allows students to develop a thesis that addresses current and industry-identified problems and challenges. The final theses of the students of these programmes are mainly application-oriented and practical, in contrast to the final theses of the academic study programme, where great emphasis is placed on theoretical research and modelling.

For several years, ITSD students have been winning awards for the best or top 3 bachelor's theses in Latvia at the ZIBIT event, which is sponsored and evaluated by the largest ICT companies in Latvia and implemented in cooperation with the RTU Development Fund. All Latvian universities and higher education institutions which implement study programmes in the field of ICT participate in the competition. Some examples of awards received by students of this programme: "Development of mobile application "Jelgava Students"" (1st place, 2015.). „ Eye Tracking and Facial Feature Recognition in Landscape Evaluation" (2nd place, 2019.), „Microsoft Kinect Solution for Rehabilitation" (1st place, 2019.)

The average evaluations of the final thesis (10 point scale) are as follows (indicated by the years of defence): 2014 – 7.8; 2015 – 7.5; 2016 – 8.1; 2017 – 7.3; 2018 – 7.8; 2019 – 7.8; 2020 – 7.4; 2021 – 7.3, the overall average evaluation is 7.62 points, which is considered as very good performance.

3.3. Resources and Provision of the Study Programme

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

In terms of resources and provision, thanks to several large investment projects, the university has everything necessary for the implementation of the study programme and the achievement of results.

Both a developed study base and, thanks to the university's progress towards science development, a science provision base are available, which can also be accessed by students of the programme.

The study programme is basically implemented at the Faculty of Information Technologies, which is located in Jelgava, Lielā iela 2, in the premises of the Jelgava Palace. Studies take place in four departments: The total area of the Department of Computer Systems is 410 m², the total area of the Department of Management Systems is 210 m², the total area of the Department of

Mathematics is 350 m², and the total area of the Department of Physics is 985 m².

Study course lectures are held in Jelgava Palace lecture auditoriums. Lectures, which are given to students of both bachelor's programmes (the number of students may exceed 100 and, for example, in 2022, approach 150), take place in one of the large lecture rooms with, if necessary, special equipment for microphones, 2 projectors, etc. Such rooms in Jelgava Palace are Room No. 317, Room No. 278 or, if the number of students exceeds 150, lectures can be held in Jelgava Palace Hall.

The following laboratories are available for laboratory work in industry courses:

Room No. 25 Software Quality Assurance Laboratory (17 workplaces)

Room No. 27 Computer Networks Laboratory (15 workplaces)

Room No. 28 Database and Data Security Laboratory (21 workplaces)

Room No. 32 Software Development Laboratory (16 workplaces)

Room No. 47 Computer Architecture Laboratory (15 workplaces)

Room No. 115 Machine Learning Laboratory (12 workplaces)

Room No. 301 Virtual and Augmented Reality Laboratory (7 workplaces)

Room No. 217 (16 workplaces)

Room No. 220 (21 workplaces)

Room No. 31 Multimedia and GIS Laboratory (27 workplaces)

Room No. 221 Statistical and Mathematical Modelling Laboratory (21 workplaces)

Room No. 287 (12 workplaces)

In addition to those mentioned, students take courses in the laboratories of the Department of Physics, in the laboratories of the Faculty of Engineering, and in the laboratories of other structural units.

Over the years, all laboratories have been improved and renovated with the necessary equipment. The STEM infrastructure improvement projects implemented by LBTU, as well as the funding of the Ministry of Agriculture, made a big contribution to the creation of individual laboratories. For example, the financing of improvement projects of the STEM study direction made it possible to equip the Software Quality Laboratory with iMac computers from the Apple company, which are used in software testing, multimedia courses, and operating systems courses. The server room of the faculty and the necessary equipment for the implementation of computer network courses have also been improved. There are situations when companies also donate computer equipment for study purposes, for example, server equipment donated by SIA "Netix" helps to implement computer network administration courses.

Students also have access to an accredited library located in the Jelgava Palace (<https://lufb.ltu.lv/en>). Each department also has libraries with specific literature sources for specific courses. It shall be admitted that due to the rapid changes in the ICT industry, literature tends to become rapidly outdated and in the courses, part of the literature sources are indicated as online sources – online books, software documentation, standards, lecture recordings. Both faculty science base funding and fee revenue funding are available for the purchase of literature, and it is also possible to use the library's option to order literature sources. During the reporting period, all

demonstrated initiatives of teachers and students in relation to industry literature have been supported. All LBTU students are provided with free access to scientific and educational literature subscriptions, of which the most relevant for ICT students are, for example, “Scopus”, “Web of Science” and “ScienceDirect Journals”. For the implementation of interdisciplinary works and course modules, other publications and indexes are available, for example “CABI Crop Protection Compendium”, “CABI Forestry Compendium”, etc. Access outside LBTU premises is managed using a proxy service, with the help of which students can connect to library resources from anywhere in the world with their student identifier and password specified in the study agreement.

Although one of the priorities of ITF is to move towards free software solutions as much as possible, paid software for certain study courses is provided as part of cooperation agreements and students do not need to invest personal funds to purchase software in order to successfully study in this programme. ITF software and course materials in this study programme are also provided within the framework of cooperation with Microsoft (Azure Dev Tools for Teaching), Oracle (Oracle University), Apple (iOS Developer University). ESRI licenses are also available for students to learn the GIS automation course. In courses where it is not possible to transfer software to students, such as MATLAB, it is possible to access it in the laboratory, as well as to arrange remote access to the resource using a VPN. In 2021, automatic doors were installed in several laboratories, which can be opened with employee and student ID cards. Students can also enter individual rooms and access resources using their student cards (the LBTU student card is issued after the agreement is signed) during faculty working hours.

As part of the cooperation with Microsoft, students have access to a USD 100 credit in the cloud computing platform “Azure Cloud Computing”, which students often use.

In 2022, the work on the creation of the new Virtual and Augmented Reality Laboratory (sets of virtual reality glasses, mixed virtual reality glasses, a powerful 3D handheld scanner, 3D printing equipment, high-performance computers), which will be used both in the study process (for example, for the implementation of the course “Virtual Environment Design and Programming”) and research, has been completed. This classroom was created using the funding of the project S390 “For the improvement of the material base of LLU for scientific research and for ensuring laboratory analyses in 2021”.

The infrastructure of the faculty's study direction and the skills of the teaching staff members also made it possible to quickly adapt to the restrictions imposed by the Covid-19 pandemic, and to implement studies in a remote form or in a hybrid mode, when the teacher gave lectures to students in person and simultaneously streamed lectures in the Moodle BBB environment, which allowed students, for example, who were in a longer quarantine, to continue learning the content of the lectures.

The provision of resources for the study programme could currently be considered as one of the strong components in the implementation of the study programme, although, taking into account the rapid technological development of the ICT industry, investment in resources is continuous.

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

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

The amount of state-funded study places is coordinated in a tripartite agreement between the Ministry of Education and Science (MoES), the Ministry of Agriculture (MoA) and Latvia University of Life Sciences and Technologies (LBTU). In the tripartite agreement on financing, the basic cost of one study place, study level coefficients, social security of the study place, study cost coefficients of the thematic area of education are determined. The coefficients for each thematic area of education are different. They are stipulated in the Cabinet Regulations "Procedure in which universities and colleges are financed from the state budget" (<https://likumi.lv/ta/en/en/id/149900-procedures-for-financing-institutions-of-higher-education-and-colleges-from-the-funds-of-the-state-budget>).

Every year, the LBTU Senate, but since 2022, the LBTU Council (Board), approves the distribution of revenues and expenses of the LBTU general budget structure, prepared in accordance with the *Saeima* annual Law on the State Budget and the annual LBTU Rector's Order "On LBTU General Budget Planning". Control and audit of the general budget is performed by an independent sworn auditor, whose opinion and report are reviewed and approved by the Senate of LBTU.

Before approving the distribution of LBTU general budget revenue and expenses in the Senate, it is reviewed, discussed, and approved by the working group called "Working group on resource use and development issues" created by order of the rector, which consists of the rector, vice-rectors, chancellor, LBTU director, all deans of faculties, head of the resource accounting centre/chief accountant, head of the financial planning centre, key economists, and key specialists in real estate and legal issues.

The distribution of income and expenses approved by the LBTU Senate (since 2022, the LBTU Council) determines that 80% of the funding allocated from the state consists of compensation costs, and 20% other costs. 60% of the paid study funding consists of reimbursement costs, and 40% other costs, of which 20% is directly at the disposal of the faculty that implements the respective study programme. The amount of funding for the science base is calculated and allocated annually from active research activities. The science base funding in the amount of 50% is at the direct disposal of the faculty, and 50% is to cover centralised costs. The science funding consists of funding attracted for the implementation of projects.

The tripartite agreement on state funding of study programmes for 2022 stipulates that the basic cost of one study place is EUR 1630.11, the study level coefficient for the professional bachelor's programmes is 1 and the social security of a study place for professional bachelor's programmes is EUR 265.50; the study cost coefficient of the education thematic area for the professional bachelor's programme "Information Technologies for Sustainable Development" is 1.74, the costs per student in the professional bachelor's programme "Information Technologies for Sustainable Development" are EUR 3097.57. In previous years, the costs per student were as follows: 2021 – EUR 2935.52, 2020 – EUR 2746.15, 2019 – EUR 2745.96, 2018 – EUR 2642.76, 2017 – EUR 2532.81, 2016 – EUR 2078.34, 2015 – EUR 2078.45 and 2014 – EUR 2061.89.

According to the data, it can be concluded that the costs per student continue to grow steadily. Sharp jumps in costs have not been observed, however, since 2016 costs have increased by almost 30%. LBTU's Study Council has determined that if 5 or fewer students are enrolled in the programme in the current study year, the programme will not be implemented for this year's students. The profitability of the programmes is affected by various factors and the closure/opening of the programmes is decided by the Study Council and the LBTU Senate. The profitability of the programme is affected by the priorities of LBTU, as well as state guidelines and orders for the implementation of programmes, for example, certain STEM programmes may not be profitable from an income point of view, but they are maintained to prepare specialists in the particular field. A similar situation can be observed with the implementation of study programmes for foreign students. When starting the offer and implementation of the ICT field study programme for foreign students, LBTU does not set the minimum number of students in the programme, accordingly the programme can be implemented with a small number of students. In principle, LBTU decides to initially subsidise the implementation of the programme. The International Cooperation Centre and the Study Council decide on offering and implementing the programme for foreign students. Not all LBTU programmes are offered to foreign students, however, all programmes of this direction (ICT) at LBTU are offered to foreign students and there is a trend and perspective for an increasing number of students in this programme as well.

3.4. Teaching Staff

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

Thanks to the faculty's personnel development plans and activities, a strong team of professors, associate professors, assistant professors and lecturers/guest lecturers is being formed for the implementation of master's and doctoral study courses. For the implementation of certain courses, specialists from the industry or with experience in the industry are also recruited as guest lecturers. The ITF staff development plan is purposefully improved and submitted annually to the LBTU Personnel Department. Programme directors, heads of departments, deans, as well as teaching staff members can individually express their desire for a potential new position announcement. Every year, the dean prepares an application to the vice-rector of studies regarding the announcement of new positions or the extension of existing positions. The wishes and proposals mentioned in the dean's application are decided by a special Personnel Development Commission headed by the rector of LBTU. As a result of targeted work of ITF, a successful renewal of the staff has been formed, creating a strong team of teaching staff members, which is involved in pedagogical work, as well as scientific and organisational work. In the implementation of the ITSD programme during this reporting period, the recruitment of several highly qualified specialists, the professional development of teaching staff members, as well as the scientific activity can be evaluated as very good.

38 teaching staff members participate in the implementation of the study programme, composed of 6 professors, 8 associate professors, 7 assistant professors, 4 lecturers and assistants. Of the involved teaching staff, 26 have been elected to LBTU and 21 of those elected have a doctoral degree. Proportion of women to men: 21 female and 17 male (itf_macibspeku_saraksts_lv_en).

During the reporting period, several teaching staff members have enrolled in doctoral studies, for example Mg.sc.ing. Jekaterina Smirnova, Mg.sc.ing. Nikolajs Būmanis, Mg.sc.ing. Daniēls Kotovs, etc., as well as doctoral graduates are involved in study work, for example, Dr.sc.ing. Armands Kviesis.

Actively developing ERASMUS mobility, foreign teaching staff members have given more guest lectures as part of the programme, and ITF teaching staff members have given lectures or developed professionally in partner universities abroad. Within the framework of cooperation and projects, teaching staff members have completed practices in industry companies. All teaching staff members involved in the implementation of the programme for foreign students speak English at the B2 or C1/C2 level. Some of the teaching staff members have also obtained internationally recognised language proficiency certificates, mainly in Pearson English programmes. LBTU teaching staff members are regularly offered to improve their language skills, and the faculty also financially supports the desire of employees for professional development, if it corresponds to the improvement of the implementation of the study programmes of the faculty.

Since a large part of the teaching staff is also involved in scientific work, presenting their research results at conferences, publishing articles in scientific journals and collections of articles, the teaching staff members increase their scientific experience, which gives the opportunity to include this experience in the implementation of study courses. From the point of view of the programme management, this growth is commendable, and the priorities set by the university, as well as the type of LBTU higher education institution determined in Latvia – the university of science, show that the scientific experience of teaching staff members will continue to grow in the future, which allows us to predict the future growth of international and scientific experience of teaching staff members.

Both the pedagogical and scientific experience of the teaching staff members, as well as professional development, practices in industry companies, allow achievement of the tasks defined by the study programme and the expected results, which are determined by the professional standard and international guidelines, as well as other requirements that LBTU has set as priorities, for example, “Investors in Excellence” certification requirements (<https://www.investorsinexcellence.com/iie-standard/assessment/>). Challenges arise in the programme management processes, because the high qualifications of teaching staff members create challenges to maintain their presence in the implementation of the programme, as teaching staff members often receive job offers in industry companies, as well as in other competing educational institutions. Although, in general, there have been no drastic changes in the composition of employees, with the increasing salary diversity in the ICT industry and the education sector, it is necessary to continuously look for solutions for the retention of teaching staff and the attraction of new teaching staff.

In general, the qualifications of the teaching staff fully meet the requirements and nature of the programme implementation. Information about the teaching staff members involved in the study programme can be found in the Description of the Study Direction and in the Appendix (itf_macibspeku_saraksts_lv_en).

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

At the beginning of the reporting period, 45 teaching staff members participated in the implementation of the programme. 36% had a doctoral degree and 37% were professors or associate professors.

In the 2022/2023 study year, the programme is implemented by 38 teaching staff members. 55% had a doctoral degree and 37% were professors or associate professors.

In general, the age structure of teaching staff has been renewed, and the number of teaching staff with a doctoral degree has increased as well reaching more than a half of teaching staff with doctoral degree. The current age and experience structure is commendable and is one of the youngest structures compared to other university faculties, maintaining or increasing the quality of programme implementation in several aspects.

A large part of the teaching staff involved in the implementation of the programme also participates in the implementation of scientific projects, as well as actively publishes and reports scientific findings in the international environment. Scientific experience has a positive effect on the quality of studies, allowing students to acquire study courses that are renewed according to the latest scientific findings. Joint scientific publications of a teaching staff member and a student, which are published in international scientific journals, are also often created, for example, the article "Development of classroom microclimate monitoring system" by ITSD student Amanda Kļaviņa and the teaching staff members (indexed in the SCOPUS database) (<https://www.tf.llu.lv/conference/proceedings2017/Papers/N145.pdf>) or the article "Automated sentiment analysis and emotion recognition for appropriate audio recommendation in online interaction environments" by ITSD student Micky Yun Chan and the teaching staff members (<https://library.iated.org/view/VITOLS2021AUT>). At the annotation level, students and teaching staff also publish their work in the collection of articles of the LBTU conference "Students on their Way to Science" (<https://www.sws.llu.lv/>). Such cooperation has not been clearly observed in the previous reporting period and is considered a positive development.

The teaching staff also actively participates in the professional development activities organised by the university. For example, in 2021, 68 times teaching staff members involved in the implementation of the programme have improved their pedagogical, technological and language skills. The faculty provides financial support for the professional development of teaching staff members, which allows, in principle, any teaching staff member to express a desire for professional development and realise it if it corresponds to the development of study programmes.

9 teaching staff are graduates of the faculty who have completed at least 2 study levels and have become new teaching staff. This fact is also to be evaluated positively, as it shows that graduates of the faculty's programmes are prepared at a high level, are motivated and able to fit into the pedagogical environment while training new students.

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

has the status of an expert and expiration date of the Latvian Council of Science expert) (if applicable).

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

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

As one of the faculty's priorities is the creation of a strong team of teaching staff and support staff members, this is also reflected in the mutual cooperation between teaching staff members and the internal organisational culture. The faculty has not established a formalised mechanism for promoting cooperation between teaching staff members. This is mainly achieved by creating a pleasant working environment for employees and ease of internal communication, using the seminar room for teaching staff members, quick communication via chat tools (Skype, Slack, etc.) or video meeting tools Big Blue Button, Zoom, etc. Likewise, employee initiatives are supported both in decisions and financially, to the extent possible.

The main forms of cooperation in the implementation of the study programme are:

- In the implementation of courses and the implementation of mutual interaction between courses, for example, in the course “Database Technologies”, students develop a database project, which is later used as a basis in the course “Database Access Applications”. The defence of both projects is evaluated by the lecturers of both courses. Also, for example, the course “Computational Sustainability” is implemented by 4 teaching staff members, where each is responsible for certain course modules, and the course evaluation takes place by jointly drawing up the tests, as well as participating in the evaluation of final course papers. Several similar collaborations can be named within the study programme, taking into account the rapid change of the ICT industry, the succession of study courses and mutual interaction in building skills for understanding the entire software development cycle.
- In the implementation of scientific projects. Several teaching staff members are involved in the implementation of scientific projects, in which they form a team to represent LBTU in international project implementation consortia or an implementation team in national projects. For example, Assoc. Prof. Vitālijs Komašilovs, Assoc. Prof. Aleksejs Zacepins and Assistant Professor Armands Kviessis participate in the implementation of the Horizon programme project “824069-HIVEOPOLIS. Futuristic beehives for the smart metropolis”

(<https://www.hiveopolis.eu/consortium/>) or Prof. Irina Arhipova, Prof. Gatis Vītols, Prof. Līga Paura and guest lecturer Nikolajs Būmanis participate in the project of the Horizon programme “MyFairShare Individual mobility budgets as a social and ethical basis for reducing carbon emissions” (<https://jpi-urbaneurope.eu/project/myfairshare/>).

- In the development of new courses, the courses “Computational Sustainability”, “Machine Learning Basics”, “Operating Systems” and others can be named as examples, the creation of which has involved several teaching staff members.
- In the supervision of students' final theses. In addition to the supervisor, in connection with the development of the final thesis, the student is also assisted by a work consultant and an internal faculty reviewer of the thesis draft. Typically, both the supervisor and the consultant communicate about the progress of the work and the draft reviewer expresses his/her thoughts about the progress of the work. Often there are also informal consultants from the interdisciplinary field, for example, an agricultural expert tells the student about the problem to be solved, a landscape architect defines the problems of practical work, etc. examples that can clearly be seen in the list of topics of final theses. In general, there is active communication during the development of final theses, as well as during the processes of topic approval and review of drafts.

Teaching staff members meet and discuss new collaborations and resolve issues formally at department meetings, dean's office meetings, faculty council meetings, methodological commission, general staff meeting, doctoral student seminars, as well as informally, by holding discussions, for example, in the Faculty's Teaching Staff Seminar Room (Room No. 35) or during joint recreational activities outside working hours. Events organised by students also promote the cooperation and communication of teaching staff members, for example erudition competitions, chess tournament, ITF student day events. LBTU Sports Days are organised every year, where the ITF teaching staff sports team is almost always formed and the majority of faculty members participate.

Likewise, the teaching staff also participates in the course “Innovations in university didactics”, where the cooperation of all LBTU teaching staff members is promoted in separate modules. This course offers an opportunity for all teaching staff to participate in professional development, by acquiring new skills every year.

The ratio of teaching staff FTE to students for the fall semester of 2022/2023 in September is: 18.9 students to 1 FTE. Programme is executed with 8.93 FTE (total 169 students).

Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	itia_diploms_pielikums_en.zip	itia_diploms_pielikums_lv.zip
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)		
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period	itia_studentu_statistika_en.pdf	itia_studentu_statistika_lv.pdf
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard	itia_atbilstiba_valsts_standartam_en.pdf	itia_atbilstiba_valsts_standartam_lv.pdf
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)	itia_atbilstiba_profesijas_standartam_en.pdf	itia_atbilstiba_profesijas_standartam_lv.pdf
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	itia_kursu_kartejums_rezultatiem_en.pdf	itia_kursu_kartejums_rezultatiem_lv.pdf
The curriculum of the study programme (for each type and form of the implementation of the study programme)	itia_studiju_plans_en.pdf	itia_studiju_plans_lv.pdf
Descriptions of the study courses/ modules	itia_kursu_programmas_en.zip	itia_kursu_programmas_lv.zip
Description of the organisation of the internship of the students (if applicable)	itf_lbtu_praksu_nolikums_lv_en.pdf	itf_lbtu_praksu_nolikums_lv_en.pdf
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)		

Information Technologies (45483)

Study field	<i>Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science</i>
ProcedureStudyProgram.Name	<i>Information Technologies</i>
Education classification code	<i>45483</i>
Type of the study programme	<i>Academic master study programme</i>
Name of the study programme director	<i>Rudīte</i>
Surname of the study programme director	<i>Čevere</i>
E-mail of the study programme director	<i>rudite.cevere@llu.lv</i>
Title of the study programme director	<i>Dr.sc.comp.</i>
Phone of the study programme director	<i>63005701</i>
Goal of the study programme	<i>Provide in-depth theoretical preparation, software engineering knowledge and practical skills in solving problems in universal issues related to the development, maintenance and use of software systems in order to be ready to perform leading functions in the field of information technology (IT) in scientific research, software and hardware design and development, as also in the performance of works using these technologies</i>
Tasks of the study programme	<ul style="list-style-type: none"> • <i>to provide in-depth knowledge in the organization and implementation of the full life cycle of software and hardware development,</i> • <i>to provide knowledge about modern trends in the development of theories of information technology,</i> • <i>to learn modern development methods,</i> • <i>to acquire skills for adapting theoretical knowledge to the requirements of the development of a specific software and/or hardware product and the sphere of software use,</i> • <i>to prepare employees who can fulfill the roles of leading specialists in all stages of the life cycle of software systems,</i> • <i>to give scientific-research work skills and develop the ability to conduct research in the chosen topic.</i>

Results of the study programme	<ul style="list-style-type: none"> • <i>In underlying conceptual basis for information technologies be able to explain in depth relevant concepts and scientific principles mathematical methods and precise technologies</i> • <i>In analysis be able to apply appropriate analysis methods and tools to the solution of complex problems in information technology and to assess their limitations</i> • <i>In design and implementation be able to describe and explain design processes and methodologies relevant to their subject area and be able to apply and adapt them in unfamiliar situations</i> • <i>In economic, legal, social, ethical and environmental context be able to demonstrate awareness of the need for a high level of professional and ethical conduct in information technology</i> • <i>In practice of information technologies be able to apply information technologies to new application areas, taking account of relevant commercial, industrial, social and environmental constraints</i> • <i>In other Professional Competences be able to organise their own work independently, demonstrating initiative and exercising personal responsibility</i>
Final examination upon the completion of the study programme	<i>Master Thesis</i>

Study programme forms

Full time studies - 2 years - latvian

Study type and form	<i>Full time studies</i>
Duration in full years	<i>2</i>
Duration in month	<i>0</i>
Language	<i>latvian</i>
Amount (CP)	<i>80</i>
Admission requirements (in English)	<i>Bachelor's degree or first cycle (second level) higher professional education in engineering, computer science, mathematics or physics. If the education was obtained in another field of study, an entrance exam must be taken</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Master Degree of Life Sciences in Information Technologies</i>
Qualification to be obtained (in english)	<i>-</i>

Places of implementation

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

Full time studies - 2 years - english

Study type and form	<i>Full time studies</i>
Duration in full years	<i>2</i>
Duration in month	<i>0</i>
Language	<i>english</i>
Amount (CP)	<i>80</i>

Admission requirements (in English)	<i>Bachelor's degree or first cycle (second level) higher professional education in engineering, computer science, mathematics or physics. If the education was obtained in another field of study, an entrance exam must be taken. At least B2 level of English language skills</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Master Degree of Life Sciences in Information Technologies</i>
Qualification to be obtained (in english)	-

Places of implementation

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

3.1. Indicators Describing the Study Programme

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

The parameters of the master's study programme such as the programme name, the type of studies and the amount of CP have not changed during the reporting period.

The current study program code 45526 according to the educational classification presented in the Regulations of the MK "Regulations on Latvian Education Classification" (No. 322 2017.06.13) was created as belonging to the educational thematic group Engineering, manufacturing and construction -> Engineering and technologies -> Other engineering sciences.

In the future, the classification code needs to be clarified by changing it to 45483, which corresponds to the thematic group Natural sciences, mathematics and information technologies -> Computing -> Computer systems, databases and computer networks

The awarded degree will henceforth be "Master of Science in Information Technology".

In the previous accreditation the language of implementation was not required to be presented, and it was not recorded. Since there has been a demand from those who want to study from abroad in recent years, the possibility to acquire the study programme in English was added. The first foreign students started from the 2017/2018 academic year. Therefore, in the future, it is necessary to determine Latvian and English as implementation languages.

Due to the growing interest from bachelors of other specialties to continue their studies for the IT master's degree, the admission rules have been supplemented, providing for an entrance exam. Now the admission rules for master's studies are defined in the following version:

- a. Implementation language Latvian - bachelor's degree or first-cycle (second-level) professional higher education in engineering, computer science, mathematics or physics. If the education was obtained in another field of study, an entrance exam must be taken.
- b. Language of implementation English - bachelor's degree or first-cycle (second-level) professional higher education in engineering, computer science, mathematics or physics. If the education was obtained in another field of study, an entrance exam must be taken. English language skills at least B2 level.

During the previous accreditation, full-time and part-time studies, intramural and extramural, were specified as the type and form for the implementation of the master's study programme. During the existence of the study programme so far, with some exceptions, only full-time intramural studies have been implemented due to the fact that there has been no demand for other forms from those who want to study. We believe that in the future it is useful to maintain only full-time intramural studies.

3.1.2. Analysis and assessment of the study programme compliance with the study field.

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

Since the beginning of its approval, the master's study programme, Information Technologies, has been created as a logical component of the full-cycle higher education in information technologies, which includes bachelor's, master's and doctoral degrees.

The goal of the program is to provide in-depth theoretical preparation, software engineering knowledge and practical skills in solving problems in universal issues related to the development, maintenance and use of software systems in order to be ready to perform leading functions in the field of information technology (IT) in scientific research, software and hardware design and development, as also in the performance of works using these technologies

According to the purpose, the tasks of the program are:

- to provide in-depth knowledge in the organization and implementation of the full life cycle of software and hardware development,
- to provide knowledge about modern trends in the development of theories of information technology,
- to learn modern development methods,
- to acquire skills for adapting theoretical knowledge to the requirements of the development of a specific software and/or hardware product and the sphere of software use,
- to prepare employees who can fulfill the roles of leading specialists in all stages of the life cycle of software systems,
- to give scientific-research work skills and develop the ability to conduct research in the chosen topic.

Master's program study results according to section 2.1.1 of this report for the given categories of EQUANIE study program outcomes are as follows:

- In underlying conceptual basis for information technology be able to explain in depth relevant concepts and scientific principles mathematical methods and precise technologies
- In analysis be able to apply appropriate analysis methods and tools to the solution of complex problems in information technology and to assess their limitations
- In design and implementation be able to describe and explain design processes and methodologies relevant to their subject area and be able to apply and adapt them in unfamiliar situations
- In economic, legal, social, ethical and environmental context be able to demonstrate awareness of the need for a high level of professional and ethical conduct in information technology
- In practice of information technologies be able to apply information technologies to new application areas, taking account of relevant commercial, industrial, social and environmental constraints

- In other Professional Competences be able to organise their own work independently, demonstrating initiative and exercising personal responsibility

It is noted in the study programme improvement plan developed within the framework of the LBTU project SAM 8.2.3 that "the name of the study programme corresponds to its content, which is not narrowly specified but is oriented towards broad basic issues of information technology", therefore this name can be maintained during the further implementation of the study programme (annex itf_virziena_pilnveides_plans_en and itf_virziena_pilnveides_plans_lv).

The study program codes used during the reporting period were based on the assumption that the study field belongs to the thematic group of engineering sciences with an orientation to interdisciplinary applications. Analyzing the education classification codes presented in the Rules of the Ministry of Education "Regulations on the Classification of Latvian Education" (No. 322 2017.06.13) it was recognized that in the thematic group "Engineering, manufacturing and construction" none of the transferred program groups is related to information technology, therefore the only possible program code "Other engineering", which together make up the code - 45526. Accordingly, the degree to be awarded was "Master of Engineering in Information Technology".

Evaluating the existing study program code at the present moment, it was found useful to clarify this classification so that the selected educational thematic groups reflect more the content of the study direction programs. From now on, the master's program will use the classification code 45483, which corresponds to the thematic group "Natural sciences, mathematics and information technologies -> Computing -> Computer systems, databases and computer networks"

Accordingly, the degree to be awarded will henceforth be "Master of Science in Information Technology"

During the reporting period, the programme was mainly implemented in Latvian. Since the organisation of guest lectures was practiced in individual courses of master's studies by involving employees of leading IT companies, including foreign specialists, these lessons were held in English. Individual courses were also taught in English, led by a professor from a foreign country. In such a situation, upon emergence of demand for training foreign students as well, all other courses were prepared in English, ensuring the option for delivering the entire study programme in English. Its implementation is confirmed by the first successfully defended master's theses (2019 - 1; 2021 - 2; 2022 - 1).

In recent years, there has been interest in enrolling in a master's studies also among applicants whose previous education is not exactly information technology. This is partly explained by the development of lifelong learning, which especially promotes the acquisition of smart technologies, as well as by the demand in the labour market. As the use of information technology in all industries is expanding, the need for employees of various industries who can professionally manage the acquisition and maintenance of information technology tools and methods necessary for their industry is increasing. Simultaneously with the expansion of the spheres of application of information technology, the general computer skills of the population also increase, and information technology issues are also included in bachelor's study programs of various branches. In such a situation, a logical decision is to expand the range of possible master's students, and the admission rules have been supplemented with an entrance exam, as described in section 3.1.1.

During the previous accreditation, full-time and part-time studies, intramural and extramural, were specified as the type and form for the implementation of the master's study programme. During the existence of the study programme so far, with some exceptions, only full-time intramural studies have been implemented due to the fact that there has been no demand for other forms from those

who want to study. We believe that in the future it is useful to maintain only full-time intramural studies.

The duration (2 years) and volume (80 CP) of the study programme correspond to the duration (volume) of the master's study programme mentioned in the Regulations on the State Academic Education Standard (Cabinet Regulation No. 240 of 13.05.2014). Together with the three-year information technology bachelor's study programmes in other universities, it allows the total duration of bachelor's and master's studies to be no less than five years as provided by the Law on Institution of Higher Education (14.11.2021-31.12.2025), therefore it is not useful or necessary to change this.

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

Information technology specialists are currently in short supply in all countries and in all sectors, this is also mentioned in the sections of this self-assessment report (see 2.1.1), so this information is not repeated here.

In addition to meeting the direct requirements of the industry, information technology education also plays an important role in the formation of the information society, which is described in the document "Information society development guidelines for the period of 2014-2020" (Cabinet Order No. 486 of 2013).

The methods and tools of information technology development and the areas of their use are so diverse that it is not useful to focus on the creation of a single comprehensive master's programme of information technology studies on a national scale. Different study programmes in several universities are able to provide a wider range of knowledge among information technology specialists.

With regard to the analysis of the employment of graduates, the current situation excludes the possibility of carrying it out in high quality in certain study programmes, specifically within the framework of the master's study programme Information Technologies. First, there is not enough reliable data on the employment of graduates and their salary levels to draw any serious conclusions. Due to the protection of personal data, it is not permissible to collect such data from the graduates themselves, but impartial sources of data on these issues do not exist or are not available.

This type of data analysis has been started in CSB, but the first version covers only data for graduates of 2017-2018. The number of 2017 graduates of the ITF master's study programme presented in it matches the data available to the faculty, but the data for 2018 differ significantly (27 and 17). In any case, the employment rate is close to 100%. Without questioning the fact that the collection and analysis of such data at the global level can be necessary and useful, it practically does not give anything at the level of study direction and programme development. Most of the master's students who enrol to study in this programme have already started active careers and try to combine studies in the master's degree with work duties in companies.

Maintaining the topicality and quality of the programmes included in the course of study is based on close cooperation with industry companies (according to the CSB data for 2020, there are 7096 of them in the sector). ITF's current cooperation list includes about 60 companies with which information is exchanged on current study and industry news issues.

In October 2021, companies were surveyed about the attitude of information technology companies towards a master's degree as desirable education for employees. The question was asked to 30 companies, of which 10 responded. It is known that companies in the ICT industry greatly promote the improvement of the qualifications of their employees, including studies, but the general opinion about a master's degree confirmed the already known "not bad, but not required". Experience demonstrates that the formal education master's degree of employees is mostly used and provides value when companies prepare international project proposals or participate in price surveys and procurement.

In the area of information technology, international certification of employees is very popular (for example, it is possible to obtain 23 different levels of Certified Tester category from ISTQB; (<https://www.istqb.org/#certifications-diagram>); certification of different levels of project managers in Project Management Professional (<https://www.pmi.org/certifications/project-management-pmp>); 5 different levels of Agile development certifications (PMI Agile Certifications <https://www.pmi.org/certifications/agile-certifications>); Top 7 Security Certifications of 2022 (<https://resources.infosecinstitute.com/topic/7-top-security-certifications-you-should-have/>) and many more. Extensive and professional training materials to prepare for the certification are freely available from many certification websites. In relevant study courses, they are included in the list of literature or mentioned as additional sources of information during lectures, for example in the course InfT6027 Automated Testing. It should be noted that obtaining all these certificates requires some prior knowledge, and they are not cheap.

In March 2022, companies were surveyed about whether and how many graduates of LBTU ITF bachelor's and master's studies are among company employees. The question was asked to 54 companies, of which 22 answered confirming that 64 graduates of bachelor's and master's studies are working for them.

When evaluating the employment of graduates of the master's study programme, it is necessary to take into account the fact that, upon entering the master's programme, practically all of the master's students are already working, so it cannot be concluded that finding a job is directly related to the master's studies.

The second possible field of activity for graduates is academic and scientific work, in which a master's education is mandatory minimum education or a prerequisite for doctoral studies. In this field of employment, **15** graduates of the ITF master's study programme are currently part of the LBTU ITF staff as teaching staff of various levels or have been elected to the position of researcher or leading researcher. Another **6** graduates of master's studies work in the provision of information systems at LBTU.

Data from the website Algas.lv (<https://www.algas.lv/algu-informacija/informacijas-tehnologijas>) were used when evaluating the remuneration of ITF industry specialists. As of 22 September 2022, the salary range for related positions in the Information Technologies category is currently as follows: EUR 934.00 (minimum salary) to EUR 3,021.00 (about 10% of employees may earn less than the specified minimum, 10% more than the specified maximum).

More than 60 job offers have been posted on this same website since 22.09.2022, where the salary range is from EUR 1,100 to EUR 8,000.

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

languages.

In the previous reporting period, studies were carried out only in the form of full-time studies. Due to the lack of demand for part-time studies, they were not implemented in this reporting period. According to the wishes of the students, contact classes are held two days a week, on Fridays and Saturdays full days are planned with classes. This study schedule, which was initially created at the suggestion of students due to the fact that practically all students work, is still welcomed by students. For foreign students, classes are also planned on other days throughout the week.

Since 2013, there have been no significant changes in the number of students in the information technology master's study programme (see attachment mgr_studentu_dati_lv un mgr_studentu_dati_en). In the 2021/2022 academic year, there is a slightly more notable decrease in the number of students, where the impact of the pandemic could be partly the reason. In recent years, a trend has been observed that the number of ITF bachelor's degree graduates is decreasing among master's students and interest from students of other fields is increasing. If at the beginning of the reporting period all the applicants for master's studies had completed their ITF bachelor's studies, then in the 2021/2022 academic year, out of 14 applicants, there were only 3 of such. The main reason is that students of ITF bachelor's study programmes start working already during their studies. It is known that there is a significant shortage of employees in the sector, and the salary level in the information technology sector is above average. Companies in the ICT sector are usually very supportive of an employee's master's studies, however there is no special demand for such education in the companies of the sector. The lifelong education of employees is very common in the industry, including in the way of various internationally certified forms.

Until 2017, studies in the information technology master's programme were held only in Latvian. As the first requests from foreign students came, starting from the 2017/2018 academic year, the programme has been also provided in English. So far, the number of foreign students is low, which is largely due to difficulties in obtaining visas from interested countries in many cases, and advertising and enrolment rates have been reduced by the restrictions of the COVID-19 pandemic.

The results of students' studies and dropout are significantly related to the opportunities to fully combine work with studies, and for many, with the responsibilities of family life as well.

The following have been indicated as the main reasons for discontinuing studies for graduate students: difficulties in combining study work and work in companies of the sector as well as difficulties in completing the assigned study work and work at home. The decrease in the number of students is also closely related to the overall demographic situation of the country, which is characterised by a large decrease in the population in the 20–24 age group (decrease by 9% in 2016). The most important reason for stopping studies is "at one's own will" and "for failure to perform the obligations of the study contract by not fulfilling the requirements of the study programme". The trend is more visible in the first year, where students conclude that they will not be able to combine studies and work duties already in the first semester. One of the reasons is also the requirements of the study programme, which, despite general knowledge of the information technology industry, require a certain level of knowledge in the exact subjects. The number of students who stopped their studies did not change much during the reporting period. It was a little higher in the 2017/2018 and 2018/2019 academic years (11 and 12 respectively). The highest number of dropouts was in the 2021/2022 academic year, but due to the pandemic situation it should be evaluated differently.

Complete statistical data on those studying in the master's study programme during the reporting

period is provided in the appendix mgr_studentu_dati_en.

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

3.2. The Content of Studies and Implementation Thereof

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

Study results of the study programme are defined as an aggregate of knowledge, skills and competences to be acquired, and according to the wording corresponding to level 7 of EKI they include:

- **Knowledge** (knowledge and understanding): Able to demonstrate in-depth or extended knowledge in software, system analysis and hardware design and development, which provides a basis for independent scientific research activity in the area of information technology (IT)
- **Skills** (the ability to apply knowledge, communication, general skills): Able to independently use theory, methods and problem-solving skills to perform complex business process research and modelling work, solve system analysis tasks, as well as develop non-traditional IT applications.
- **Competency** (analysis, synthesis and evaluation): Able to independently formulate and critically analyse complex production process optimisation problems, justify decisions and, if necessary, perform additional analysis. Able to integrate knowledge from various fields, contribute to the creation of new knowledge and techniques in issues related to the development of software systems.

The required knowledge, skills and competences are acquired as a result of the interaction of all study courses included in the programme, by learning a certain part of the set of planned study results described in point 3.1.2. with each course. The results of each individual course are given in the course descriptions of the study programme (Appendix IT_kursu_progarmmas_LV and IT_kursu_progarmmas_ENG), but their relationship with the results of the study programme is shown in the mapping of study courses (Appendix mgr_rezultatu_kartejums_lv and mgr_rezultatu_kartejums_en).

At the beginning of the reporting period, the master's study programme included a total of 48 study courses. The study courses of the compulsory part were thematically combined into several subgroups: Specialty General Courses and Compulsory Optional Study Courses, as well as three groups of specialised courses: Production Computer Management Systems, System Analysis and Information Technologies in Biosystems. The full amount of mastering these courses was 128 CP, therefore students had to choose courses every year and keep track of the total number of acquired credit points. The basic principle in the organisation of choice was the orientation of students to one of the three subgroups of courses mentioned above. During several years of study, it was proven that such a choice is not feasible in practice. The master's students were all working and their interests were related to the tasks to be performed in the workplace. As a result, wide choice options led to the fact that each course was chosen by 3-4 students, which prevented organising the entire learning process in high quality.

The grouping of study courses and the total volume of courses were gradually reduced, reaching the full programme volume of 80 CP (including the master's thesis). However, during the improvement of the master's study programme carried out within the project No. 8.2.3.0/18/A/009 "Improvement of the management of Latvia University of Life Sciences and Technologies" the recommendation from industry experts was to keep the possibility to choose courses in the programme. In accordance with this, a currently valid study programme plan has been prepared, in which the division of study courses is in accordance with the Cabinet Regulation No. 240 "Regulations on the State Academic Education Standard (Appendix mgr_atbilstiba_standartam_lv and mgr_atbilstiba_standartam_en)", combining them into three groups: "Compulsory courses - A", "Restricted elective courses - B" and "Elective Courses - C". The total number of possible courses has been increased to 30. Accordingly, the study implementation procedure provides that the choice is made during the first semester of studies by the director of the study programme in coordination with the master's students of the relevant year. The study programme plan for the academic year 2022/2023 is provided (Appendix mgr_studiju_plans_lv and mgr_studiju_plans_en). A study programme plan in English has also been prepared, which is used to organise studies of foreign students, if the studies are started in the spring: according to the regulations of the Latvian educational year - in the second (spring) semester. Since individual courses are taught to students of Latvian and foreign groups together, and it is possible to teach individual courses only in a certain semester, study programmes in Latvian and English contain identical courses, but their arrangement in the time schedule can be very different (Appendix mgr_studiju_plans_lv and mgr_studiju_plans_en). The only difference in the study courses is that the students of the Latvian group have a foreign language special course, and there is Latvian language for foreign students. Several years of experience in working with foreign master's students have strengthened the belief that it is not useful to keep enrolment twice a year, some foreign master's students arrive with a significant delay in the beginning of the semester anyway. In the 2022/2023 academic year, a decision has been made to further keep the admission of students only once a year.

Taking into account the fact that in recent years there has been an increase in the demand from bachelors of other specialties among applicants for master's studies, and foreign master's students are studying, in order to meet the requirement of Cabinet Regulation No. 240 "if the student has not mastered the requirements specified in the Law on Environmental Protection and the Law on Civil Protection in a lower level study programme, he/she shall learn such in addition to the master's study programme", the elective courses of the study programme additionally includes appropriate courses. In general, the master's study programme plan has been supplemented with the following courses"

No.	Course code	Course title
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1.	InfT5052	Internet Search Technologies
2.	InfT5053	System Theory and Management
3.	InfT6031	Artificial Neural Networks
4.	InfT6014	Artificial Intelligence in Agriculture
5.	InfT5033	Technical Writing
6.	InfT5035	IT Industry Law
7.	VidZ3006	Ecology and Environmental Protection
8.	Citi4016	Labour and Civil Protection

In the free choice part, master's students can also choose any course from the current published list of free choice courses for the study year. In order to ensure the availability of free choice courses and to organize the application for them, before each academic year, the order of the vice-rector of studies is issued "On organizing the application for free choice courses of basic studies during the study year 2023./2024. " (in Latvian only).

If a master's student wants to learn a course from another study program of an appropriate level, then, in coordination with the instructors of this course, it is a paid course, the learning of which can be organized through the Center for Lifelong Education

If the master's student wants to take a course not included in the study plan in the optional part, or if it is not possible for the study group to agree on a sufficient number of students in one study course due to justified reasons, the ITF has developed the procedure for individual studies.

After completing the academic master's study programme Information Technology, masters have the opportunity to continue their education in the ITF doctoral study programme Information Technology or in a doctoral study programme at another higher education institution according to its admission conditions.

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

As a result of the study programme improvement process carried out within the framework of the LBTU project SAM 8.2.3, it was concluded that the study content of the study programme is fully relevant to the needs of the information technology industry and the labour market. The content of the study programme is reviewed before the beginning of each study year, including those elective courses that reflect the current affairs of the industry or for which it is possible to attract foreign teaching staff in the planned academic year. Each teaching staff updates the content of the study courses according to the development and relevance of the topics included in the course at least once every 2-3 years. Every academic year, guest lectures and practical work are organised within the framework of various study courses, during which leading specialists of ICT companies present current issues for the industry and latest development tools and methods.

The awarding of the academic degree of Master of Engineering in Information Technology is based on the knowledge, skills and competence the master's student acquired during the studies and is confirmed by the ability to develop a master's thesis, reflecting in it the scientific research skills as well. Master's students are motivated to prepare presentations for the LBTU annual international student conference Students on Their Way to Science, for example:

- Augmented and Mixed Reality in Culture Learning. Paula Kalniņa, Irina Arhipova
- HIVEOPOLIS - Enhancing Migratory Beekeeping Practice using the Digital Flowering Calendar. Daniēls Kotovs, Aleksejs Zacepins, Oļvija Komašilova
- How CAPTCHA can be solved by Human Expression. Saurabh Sharma, Rudite Cevere

For master's students it is possible to get the first important publications in the annual International Scientific Conference Research for Rural Development based on the topic of their master's thesis and in cooperation with the supervisors of the master's thesis. This preparation of publications is usually linked to the study course InfT6010 Writing Scientific Publications.

The decision on awarding a master's degree is made by the Master's Examination Commission, which consists of professors from RTU and LU, leading employees of ICT companies and ITF professors and leading researchers, all members of the commission are doctors of science. During the defence of the thesis, the correspondence of the thesis to the latest information technology trends and the possibilities of practical use and implementation of the works are analysed during discussions. Every time, after the work of the master's examination commission, the overall results are discussed and recommendations are formulated on how to further improve the development of the final thesis and the defending process, which helps to implement continuous improvement of this process. The relevance of the final theses to the information technology industry is confirmed by the topics of the developed master's theses, for example:

- Image recognition-estimation for wood cargo weight in truck
- Determining plant health using neural networks
- Correcting wood defects with the help of machine learning
- Development of the precision beekeeping system for analyzing the sound of the bee colony
- Development of the R library for determining GHG emissions in the agricultural sector
- Development of a machine learning model for weed recognition using synthetically generated data
- Analysis of privacy and data protection in smartphone apps
- Energy efficiency improvement support system for households
- Use of artificial intelligence in e-commerce websites
- Development of Eset antivirus automation tools in the municipality of Bauska region
- Air quality monitoring in common areas

Study plans and study course programmes are regularly reviewed at the meetings of the Methodical Commission of the Faculty of Information Technology and, if necessary, changes are

approved by the ITF Council. The last editing of all study courses was done in the 2021/2022 academic year by updating and clarifying the knowledge, skills, competences and assessment methods of the study courses, as well as the lists of literature recommended for the study of the course.

The improvement of the content of study courses is based on the experience of teaching staff in projects of various levels, participation in various exchange programmes, such as ERASMUS, active participation of teaching staff in various associations, professional organisations and expert councils, qualification improvement seminars, as well as regular cooperation with industry companies.

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

The study methods implemented in the master's study programme are described in the programme of each study course. Contact hours and independent studies are planned for learning each course. Depending on the goals of the study course, a division is made between classroom lessons and independent work. The total volume of hours for 1 CP is 40 h.

The type of implementation of studies includes:

- contact hours, which include classroom or online hours in lectures, practical work, laboratory work, seminars, tests; traditionally, in the master's study programme, it is 12 or 16 classroom hours per 1 CP;
- independent study work, during which students perform in-depth learning of theoretical material, preparation for seminars, tests and exams, as well as preparation of homework and credit tests;
- in addition to direct study work, master's students can participate in the development of scientific projects, prepare publications and presentations at conferences, participate in lecturing study courses in bachelor's study programmes;

Modern computer technologies, multimedia projectors, video materials, lecture handouts are used for lectures. In recent years, it has also been possible to conduct lectures and other contact classes remotely, using various tools for organising video conferences and online meetings such as BigBlueButon, MS Teams, Zoom. These forms of organising classes are mainly used in classes or guest lectures led by foreign teachers and employees of IT companies, as well as in emergency situations when there are government restrictions on holding classes in person. The basic environment in which remote learning of study courses is organised is the LBTU E-study system implemented in the Moodle environment.

Practical classes and seminars use active forms of learning that promote analytical and creative thinking and develop communication skills. In the practical work, works of different levels and complexity are carried out, which correspond to the goals of the specific study course.

In laboratory work, students work in modern laboratories, as well as carry out experimental development and testing of various models and prototypes. During experiments, data is collected by means of various digital devices, after the experiment, the data is processed, analysed and conclusions are drawn.

Methodical materials, additional literature sources and other handouts are offered for students' independent work. The environment of the E-study system is mainly used for issuing these materials and assignments, as well as for posting the results of the work. The E-study system also provides an opportunity for additional information exchange with the teaching staff of the relevant study course.

The main and most extensive task of the independent work is the development of the master's thesis, which is also organised and monitored using the E-study system. Master's students can obtain methodological materials for the development and design of master's theses on the LBTU ITF website and in the E-study system in the InfT6004 Master's Thesis section.

The use of a combination of these methods contributes to the achievement of study course results and study programme goals.

At the same time, the overall organisation of the study programme is oriented towards the implementation of student-centred educational principles in accordance with the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) adopted in 2015. The basic principles of the implementation of student-centred teaching and learning recommend taking into account and respecting the diversity of the student contingent and their needs, creating suitable learning processes, using different ways of implementing programmes, as well as diverse pedagogical methods. This is implemented during the development of lesson plans, coordinating the times and forms of individual lessons with students. If necessary, an online connection is used in parallel with face-to-face lectures, which allows participation in the lessons both in person and remotely. At the same time, this option provides an opportunity to record the course of the lecture, which allows students to listen to the material presented in the lecture again, at a time convenient for them.

The principle of student-centred education to promote the student's desire for independence, while at the same time ensuring the guidance and support of the teaching staff, is implemented in the form of various conferences, seminars, practical work and laboratory work, when students can demonstrate their acquired knowledge, skills and competences and discuss with each other and with teachers. Students also have the opportunity to participate in conferences of various levels organised by the University and to discuss current problems and their solutions, as well as present reports.

During the implementation of the programme, students are provided with an individual approach and feedback. During the study process, students receive the support of the teaching staff of the study course during the organisation of lectures, during practical and laboratory work, as well as in matters of independent work. Students have the opportunity to consult individually with the teaching staff of the study courses, both in person and using the individual e-mail of each teaching staff member (all teaching staff have an individual e-mail address name.surname@lbtu.lv created according to uniform principles). Academic staff consultations, depending on the study load, are organised for each teaching staff member for 1 or 2 hours per week.

The following principles are used in the evaluation of studies:

- principle of mandatory assessment: the student needs to obtain a positive assessment in each study course;
- principle of accumulation: regular work during the semester affects the final assessment in

the study course;

- principle of openness and clarity of requirements: requirements according to a specific study course programme, its goals and tasks are defined in introductory lessons, as well as in the IS system;
- principle of variety of examination types: various forms of examination papers are used, including evaluations for papers submitted in the e-study environment;
- assessment compliance principle: the content included in the tests must correspond to the content included in the programmes of specific study courses.
- principle of assessment review options: The LBTU Study By-Laws determine the procedure for reviewing the obtained assessment (described in paragraph 2.2.3)

In accordance with the Law on Institution of Higher Education of the Republic of Latvia and the LBTU Study Regulations , all works of students are evaluated in a 10-point system or with "passed" or "failed", if such a rating corresponds to the content contained in the specific study course programme and is approved.

Feedback is provided by regular tests provided in study course programmes, laboratory work development protocols and practical work that must be defended.

Study work is submitted in printed or electronic format (depending on the specifics of a specific study course), and the student can receive an assessment of his work in accordance with the procedure established by the specific study course. In recent years, the submission and approval of final theses in electronic format has also been developed and ensured.

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

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

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

The research topics of the master's thesis to be developed are relevant for the area of science, a

wide range of users, and correspond to the general study profile of LBTU. Many works are developed in relation to specific companies. For example, out of 109 master's theses developed during the reporting period, the topics of 53 theses (49%) were related to agriculture, the development of information systems of various industries and production management systems, while 26 (24%) works are theory-oriented, performing the research, development and application of algorithms and methods for the needs of various industries. For example:

- Statistical Comparison of Multiple Nucleotide or Protein String Algorithms
- Research of phylogenetic tree algorithms and software
- Precision agriculture technology application opportunities in field cropping
- Analysis of wireless sensor network technologies for monitoring of agricultural processes
- Real-time mobile agricultural robot management through the mobile network
- Information system for the analysis of forecasts of weather natural observations
- Development of the prototype of the tariffication planning system of teachers
- Use of online data for comparing traffic intensity
- Automated management system for archival document climate
- Possibilities for applying open data in Latvia
- The reduction of image retention of OLED screens
- Usage of cross border electronical identification solutions in Latvia

The average evaluations of the final thesis by the years of defence are as follows: 2013 – 8.3; 2014 – 8.6; 2015 – 7.4; 2016 – 7.8; 2017 – 8.7; 2018 – 7.2; 2019 – 7.3; 2020 – 7.87; 2021 – 7,17; 2022 – 9. The overall average rating is 7.93 points.

The quality of master's final theses is also confirmed by the fact that, in the reporting period, three works won two second and one third place in the state competitions for the best student graduation work in computer science in the group of master's theses, for example, in the ZIBIT 2017 competition for the best Latvian master's theses, Lauris Liepiņš, a master's graduate of LBTU, won 2nd place with the work Development of a Geographically Adaptable Driving Simulator, supervisor Mg.sc.ing. Ingus Smits (*Ingus Šmits*).

3.3. Resources and Provision of the Study Programme

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

All the necessary infrastructure resources are available for the implementation of the study programme.

During this reporting period, several infrastructure development and improvement projects took place in the faculty. Various laboratories and specialised computer classes have been created or improved at the faculty during the reporting period, their total number is 12 computer classrooms with a total of 200 computers.

The ITF continues to work with Microsoft and the use of the “Azure Dev Tools for Teaching” programme in the ITF study process is extended every year, which opens the possibility for all ITF students and teachers to download the latest Microsoft computer programmes and use them for academic goals, and a \$100 credit on the cloud computing platform Azure Cloud Computing is available for those studying in the programme and for the academic staff for resources during the period of 12 months, and it is renewable as long as the student is studying in the faculty. Currently, the programme has been extended until 27 February 2023.

Computer equipment is constantly being updated at the faculty in order to give both students and teaching staff the opportunity to work with current and efficient equipment. The equipment has been purchased using both MoES Science Base funding and ITF's own financial resources, and STEM project funding.

The ITF is a partner of Oracle and Cisco, which enables the implementation of database and computer network courses based on the software of the aforementioned companies.

For study courses related to computer control and electronic platforms, the technical base was supplemented with several sets of Arduino and Raspberry Pi platforms, and robotic platforms and various sensors were purchased for practical work of students. Using the funding of the STEM project, a set of equipment for robot programming was purchased, which includes robot chassis, manipulators, equipment controllers, sensors for various applications and tool sets.

Using the funding of the STEM project, refurbishment of premises managed by ITF was carried out and stationary air conditioners were installed, improving the study environment.

Using ERAF project funding, a set of equipment for radiation analysis was purchased, which includes a thermal camera with accessories for radiation registration in the spectral range 7.5–14 μm and a spectrometer with accessories for radiation registration in the spectral range of absolute intensity 220–110 nm. These devices are usable in physics courses and student research.

Using ERAF project funding, the faculty purchased a “Human eye activity scanning hardware set with specialised software” in 2020, which includes eye pupil tracking glasses and a stationary eye tracking camera.

In 2022, the work on the creation of the new virtual reality room (sets of virtual reality glasses, mixed virtual reality glasses, 3D handheld scanner, 3D printing machine, high-performance computers), which will be used both in the teaching process and research, has been completed. This classroom was created using the funding of the project S390 “For the improvement of the material base of LBTU for scientific research and for ensuring laboratory analyses in 2021”.

During Covid-19, the material and technical base for remote work was improved. Using the MoES Science base funding and ITF's own financial resources, laptops, internet cameras, headsets with microphones and microphones were purchased to ensure remote work and for the preparation of study materials for remote studies.

Students have access to all the necessary study literature. All the resources and services of the LBTU Fundamental Library described in sections 2.3.1–2.3.3 of this report are available to students of all study programmes, including the master's students. Special literature is also available in the ITF libraries, which are located in all departments of the Faculty, and assigned employees of each department are responsible for them:

- Department of computer systems (room 35) - head of laboratory Kristīne Notruma;
- In the Department of Mathematics (room 215) - head of the department Svetlana Atslaga;
- In the Department of Physics (room 314) - guest lecturer Ergi Bufasi;
- Management systems department (room 23-1) - record keeping specialist Valentina Balss.

Special literature is also available individually at teaching staff of separate study courses (see section 2.3.3). The material base is supplemented every year, including use of the annual offers of publishing houses. Given the extremely rapid development of the information technology industry, printed publications in many cases do not manage to follow it quickly enough, however, the availability of information on the internet is widely developed in the industry. For example, training materials for the certification of different levels of employees, such as the International Software Testing Qualifications Board <http://www.istqb.org/>; IEEE Computer Society <https://www.computer.org/education/bodies-of-knowledge/software-engineering>

Within the study course InfT5048 Research methodology, master's students prepare research on a certain topic, learning practical skills for searching literature sources in international databases.

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

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

The overall financial provision of the Study Direction and its approval procedure are described in section 2.3.1 of this report.

State funding for the master's study programme Information Technologies has been as follows:

	2022	2021	2020	2019	2018
The basic cost of one study place (in EUR) determined in the tripartite agreement on state funding of study programmes	1,630.11	1,630.11	1,518.98	1,518.98	1,458.51
Study level coefficient for master's programmes	1.5	1.5	1.5	1.5	1.5
Social security for a study place	265.50	164.34	164.34	164.34	164.34

Study cost ratio of the thematic area of education	1.74	1.7	1.7	1.7	1.7
Costs per student (EUR)	4,513.61	4,321.10	4,037.06	4,036.77	3,881.97

At the same numbers in 2020 and 2019, the cost per student differs by a few cents because every year the provision of the study coefficient in % varies slightly by small hundredths after the decimal point. Upon rounding, this provision is 100%, but in figures in the contract it is 99.98242% in 2020 and 99.97517% in 2019.

	2017	2016	2015	2014	2013
The basic cost of one study place (in EUR) determined in the tripartite agreement on state funding of study programmes	1,393.33	1,333.11	1,333.11	1,333.11	1,333.36
Study level coefficient for master's programmes	1.5	1.5	1.5	1.5	1.5
Social security for a study place	164.34	164.34	164.34	164.34	164.34
Study cost ratio of the thematic area of education	1.7	1.7	1.7	1.7	1.7
Costs per student (EUR)	3,717.06	3,035.35	3,035.52	3,010.68	3,032.26

Also in 2016 and 2015, the costs per student differ due to provision for the study coefficient: 84.45564% in 2016 and 84.46058% in 2015

In 2016, 2015 and 2014, the costs per student differ due to provision for the study coefficient: 84.45564% in 2016, 84.46058% in 2015, 83.7295803% in 2014

3.4. Teaching Staff

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

Qualification of teaching staff involved in the implementation of the master's study programme meet the conditions of study programme implementation and the requirements of laws and regulations. 26 teaching staff members participate in the implementation of the study programme, composed of 7 professors (6 elected from LBTU, one visiting professor), 6 associate professors (6

elected from LBTU), 5 assistant professors (4 elected from LBTU, one visiting assistant professor), 7 lecturers (1 elected from LBTU, 6 visiting lecturers). Of the entire teaching staff involved in the implementation of the study programme, 17 have been elected by LBTU and 19 have a doctoral degree. Two teaching staff members have been recruited and have signed a contract with LBTU from abroad (Spain and Sweden), and they have experience working in foreign higher education institutions.

Teaching staff involved in the study programme also carry out scientific activities, including preparing scientific publications, participating in conferences and seminars, participating in research projects.

The qualifications of teaching staff involved in the implementation of the study programme are regularly renewed and supplemented by attending various seminars, courses and participating in the development of various projects.

In recent years, in order to supplement and renew the composition of academic personnel, ITF has paid great attention to the involvement of doctoral students in academic work. In general, the following activities have been carried out to improve the qualifications of teaching staff: 1) admission of teaching staff holding a master's degree to LBTU ITF doctoral programme; 2) inviting guest lecturers from Latvian and foreign universities; 3) using the ERASMUS experience exchange programme; 4) internship in ICT companies with the aim of acquiring knowledge and practical skills, which can be used afterwards in individual study courses.

The master's study programme is also implemented in English, and therefore all involved teaching staff have a B2 or higher level of English fluency. The level of English fluency is confirmed by a certificate signed by the director of the study programme.

In order to make it possible to include the courses that reflect the latest trends in the field of ICT in the study programme, foreign teaching staff and employees from Latvian ICT companies, which are often subsidiaries of foreign companies and where the working language is English, are recruited to teach the courses. In that case, the ITF teaching staff who are fully proficient in the national language are also recruited for these courses. Such courses include Data Science and Machine Learning Algorithms and Automated Testing.

The qualification of teaching staff, which affects the quality of study results, should be evaluated from two points of view. One of them is the knowledge of the teaching staff in a specific problem area related to the study courses delivered by him/her. Their formal confirmation is the scientific degree of the teaching staff, the position held, publications. Pedagogical skills of the teaching staff, the ability to clearly convey the main ideas of the course to the students and create interest in independent work and research are equally important for the achievement of study results.

Procedures existing in the LBTU for ensuring the qualification and quality of work of the academic staff is detailed in section 2.3.6 of this report.

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

According to the data provided in the previous accreditation report, in 2013, 24 teaching staff members participated in the implementation of the master's study programme, of which 14 held a degree of Doctor of Science (58%). 21 members of the teaching staff were elected by LBTU (LUA at

that time) (87%).

26 teaching staff members participated in the implementation of the master's study programme in 2022, of which 19 hold a degree of Doctor of Science (73%). 17 members of the teaching staff are elected by LBTU (65%). Attracting foreign teachers and employees of Latvian ICT industry companies to the study process has made it possible to include new study courses relevant to the industry in the study plan, for example InfT5050 Data Science and Machine Learning Algorithms; InfT5052 Internet Search Techniques; InfT6027 Automated Testing. In general, the number of teaching staff members holding a doctoral degree has increased. This has been achieved both by the existing teaching staff obtaining a doctoral degree and also by attracting new teaching staff. Out of the current 26 teaching staff members, 14 participated in the implementation of the study programme in 2013 as well. This means that the study courses taught by them still remain in the study programme. The involvement of new lecturers is usually simultaneously connected with the inclusion of new study courses in the study programme.

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

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

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

Within the framework of the study programme, the classroom lessons of many study courses are planned in blocks. Eight calendar weeks are allocated for courses, the volume of which is 2 CP. For

larger courses, the time is correspondingly longer. The time of exams and tests is the same for all courses regardless of this schedule (session), but at the discretion of the teaching staff, the test or exam can also be organised at the end of the block classes.

The simplest form of faculty collaboration is when two teaching staff members are assigned to the course. Usually one of them conducts lectures, the other conducts practical or laboratory work. Such cooperation is mainly used in bachelor's courses, only in some courses in the master's programme at the current stage (for example, Resource Planning Systems). A common form is that within the framework of a course, employees of ICT companies are invited to one or more guest lectures (for example, in the courses Automated Testing, IT Project Management).

During the last improvement of the study programme, several 2 CP courses were combined, transforming the relevant content with an emphasis on interdisciplinary application. For example, the courses Mathematical Modelling of Processes and Methods of Mathematical Physics (amounting to 4 and 2 CP) are combined in the Interdisciplinary Computing course with a total amount of 6 CP. It is delivered by teaching staff from the Department of Mathematics and the Department of Physics, respectively; the former courses Precision Agricultural Computer Systems (2 CP) and Geo-Information Systems (GIS) in Agriculture (2 CP) have now been combined into the Precision Technologies for Interdisciplinary Development (4 CP) course, which is led by the teaching staff of the Department of Computer Systems and the Department of Management Systems. In the case of such combined courses, there is close cooperation between the participating teaching staff and their departments both during the development of the course programmes and during the planning and running of the course.

The professional and pedagogical cooperation of the teaching staff also takes place during the development of master's theses, when the master's student has the opportunity to receive consultations from every lecturer of the faculty. The master's thesis is developed starting from the first months of study, when the master's students have to choose a topic. The progress of the development of the master's thesis is reviewed at the end of each semester. At the end of the first semester, the master's student must submit a thesis draft of a certain amount, which is examined and evaluated by the supervisor and a specially appointed reviewer from the teaching staff of the faculty. In the penultimate month of the second semester, the pre-defence of the works takes place, when the defence is heard by the director of the study programme and at least two teaching staff members. Two reviewers are appointed for each paper for the final version of the thesis. Therefore, it is possible for the master's student to receive multi-faceted recommendations for improving the quality of development and research, and indirectly, by examining works supervised or reviewed by other teaching staff, information is exchanged between teaching staff as well.

Cooperation between teaching staff also takes place regularly using cooperation mechanisms such as the Methodical Commissions of the Faculty of Information Technology and Council meetings, where study course programmes, topics of final theses and other important issues related to the implementation of the study programme and the necessary changes are discussed. The members of the Methodological Commission evaluate and make recommendations on improving study courses. This process includes such elements as the distribution of lectures and practical lessons, the application of assessment methods, the analysis of study course content issues, and others.

Proportion of the number of students and teaching staff within the study programme, at the time of submission of the self-assessment report is 19,3.

Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	mgr_diploms_en.zip	mgr_diploms_lv.zip
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)	mag_stud_progr_Informācijas_tehnoloģijas_AIP_atzinums_EN.docx	mag_stud_progr_Informācijas_tehnoloģijas_AIP_atzinums.edoc
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period	mgr_studentu_dati_en.xlsx	mgr_studentu_dati_lv.xlsx
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard	mgr_atbilstiba_standartam_en.pdf	mgr_atbilstiba_standartam_lv.pdf
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)		
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	mgr_rezultatu_kartejums_en.xlsx	mgr_rezultatu_kartejums_lv.xlsx
The curriculum of the study programme (for each type and form of the implementation of the study programme)	mgr_studiju_plans_en.pdf	mgr_studiju_plans_lv.pdf
Descriptions of the study courses/ modules	IT_kursu_programmas_ENG.zip	IT_kursu_programmas_LV.zip
Description of the organisation of the internship of the students (if applicable)		
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)	LBTU_apliecinajums_studiju_virzienam_Informācijas_tehnoloģijas_EN.docx	LBTU_apliecinajums_studiju_virzienam_Informācijas_tehnoloģijas.edoc

Computer Control and Computer Science (43483)

Study field	<i>Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science</i>
ProcedureStudyProgram.Name	<i>Computer Control and Computer Science</i>
Education classification code	<i>43483</i>
Type of the study programme	<i>Academic bachelor study programme</i>
Name of the study programme director	<i>Aleksejs</i>
Surname of the study programme director	<i>Zacepins</i>
E-mail of the study programme director	<i>aleksejs.zacepins@llu.lv</i>
Title of the study programme director	<i>Asociētais profesors, Dr.sc.ing.</i>
Phone of the study programme director	<i>63005701</i>
Goal of the study programme	<i>To prepare broad-minded specialists with higher education in the field of IT, providing versatile basic academic education in the field of computer control and computer science, as well as the basic skills of professional and research work in information technologies, which will allow them to successfully enter the labour market or continue their studies in a master's programme.</i>
Tasks of the study programme	<p><i>Tasks of the study programme are:</i></p> <ul style="list-style-type: none"> <i>• To provide general knowledge in the field of ICT and computer control and computer science</i> <i>• To get to know the application of computer control in production, agriculture and forestry in depth</i> <i>• To provide an insight into the processes taking place in the industry by attracting experts and representatives of ICT companies</i> <i>• To supplement theoretical knowledge with practical lessons</i> <i>• To provide basic skills for conducting scientific research work</i> <i>• To provide students with practice in ICT companies and municipalities</i>

Results of the study programme	<p><i>Learning outcomes to be achieved are:</i></p> <ul style="list-style-type: none"> • <i>The student acquires knowledge of basic issues, terminology, technologies and concepts of computer science</i> • <i>The student acquires general knowledge and learns the principles of logical thinking</i> • <i>The student orients and is able to effectively learn modern IT tools and apply them to solve tasks</i> • <i>The student is able to explain the theoretical foundations of computer control and computer science, including computer architecture, computer network construction, etc.</i> • <i>The student is able to develop an IT and/or computer control solution to a specific problem</i> • <i>The student is able to perform systems analysis, design and testing</i> • <i>The student acquires basic skills in scientific and research work</i> • <i>The student is able to acquire new knowledge and skills independently</i> • <i>The student is able to learn industry literature in a foreign language</i> • <i>The student is able to choose and apply appropriate IT tools, methods, algorithms for solving problems</i> • <i>The student is able to solve computer control tasks individually and in a team</i> • <i>The student is able to effectively plan his/her time and work tasks</i> • <i>The student is able to present and argue his/her point of view</i> • <i>The student is able to fit into the labour market</i>
Final examination upon the completion of the study programme	<i>Bachelor Thesis</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>Secondary education</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Bachelor Degree of Life Sciences in Computer Control and Computer Science</i>
Qualification to be obtained (in english)	<i>-</i>

Places of implementation

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

Full time studies - 4 years - english

Study type and form	<i>Full time studies</i>
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Duration in full years	4
Duration in month	0
Language	english
Amount (CP)	160
Admission requirements (in English)	Secondary education. At least B2 level of English language skills.
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	Bachelor Degree of Life Sciences in Computer Control and Computer Science
Qualification to be obtained (in english)	-

Places of implementation

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

3.1. Indicators Describing the Study Programme

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

Since the previous study direction accreditation sheet was issued, two parameters of the study programme were changed. First, the possibility to acquire the study programme in English was added. This change was made in 2016. The first two students from India entered the study programme in 2017/2018 and one more student in 2018/2019. But after some time, the students made a decision to change the academic study programme to the professional study programme at ITF (Faculty of Information Technologies).

Second, the director of the CCCS study programme has changed. The change came into effect with the 2014/2015 academic year.

Other parameters of the study programme were not changed since the previous study direction accreditation sheet was issued.

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

The study program code used during the reporting period were based on the assumption that the study field belongs to the thematic group of engineering sciences with an orientation to interdisciplinary applications. Analyzing the education classification codes presented in the Rules of the Ministry of Education "Regulations on the Classification of Latvian Education" (No. 322 2017.06.13) it was recognized that in the thematic group "Engineering, manufacturing and construction" none of the transferred program groups is related to information technology, therefore the only possible program code "Other engineering", which together make up the code - 43526. Accordingly, the degree to be awarded was "Bachelor's Degree of Academic Engineering Science in Computer Control and Computer Science".

Evaluating the existing study program code at the present moment, it was found useful to clarify this classification so that the selected educational thematic groups reflect more the content of the study direction programs. From now on, the bachelor's program will use the classification code 43483, which corresponds to the thematic group "Natural sciences, mathematics and information technologies -> Computing -> Computer systems, databases and computer networks"

The study programme “Computer Control and Computer Science” (hereinafter referred to as – the CCCS) is an academic bachelor's study programme, after successful completion of which the student obtains a *Bachelor's Degree of Life Sciences in Computer Control and Computer Science* which gives the right to continue studies in a master's study programme, professional master's study programme and second-level professional higher education study programme.

The study programme “Computer Control and Computer Science” is the first stage in the full academic cycle, which is implemented at LBTU ITF, followed by master's and doctoral studies.

The aim of the study programme is to provide a set of knowledge, skills and competence in accordance with the 6th level of knowledge, skills and competence of the qualification framework specified in the Classification of Latvian Education, i.e.:

- students are able to demonstrate basic and specialised knowledge specific to the field of ICT science and a critical understanding of this knowledge, moreover, part of the knowledge corresponds to the highest level of achievements in the field of ICT science;
- students are able to demonstrate an understanding of the most important concepts and regularities in the field of ICT science;
- students are able to carry out a research activity using the acquired theoretical basics and skills;
- students are able to formulate and analytically describe information, problems and solutions in the ICT field, explain them and discuss them in an argumentative manner with both specialists and non-specialists;
- students are able to independently structure their learning;
- students are able to direct their own and subordinates' further learning and professional development;
- students are able to demonstrate a scientific approach to solving problems, take responsibility and initiative when working individually, in a team or managing other people's work;
- students are able to make decisions and find creative solutions in changing or uncertain circumstances;
- students are able to independently obtain, select and analyse information and use it;
- students are able to make decisions and solve problems in the ICT field;
- students are able to demonstrate an understanding of professional ethics;
- students are able to evaluate the impact of their professional activity on the environment and society and participate in the development of the ICT field.

The purpose of the CCCS study programme is to prepare highly qualified specialists in the field of IT, providing versatile academic knowledge in the field of computer control and computer science, understanding of the development of scientific research work, as well as the basic skills of professional and research work in information technologies, which will allow them to successfully enter the labour market, as well as continue their studies in a master's programme. The 12-week practice included in the programme, which the students undergo in one of the IT industry companies, gives students the opportunity to apply and expand the acquired knowledge, develop general, communication and professional skills, as well as the competence to perform information analysis, synthesis and evaluation, to be able to independently make decisions and solve problems in real working environment conditions. The aim of the programme fully corresponds to the aim of the direction, which realises the long-term goal of the LBTU activity based on the LBTU development strategy, i.e. “to implement high-quality studies that ensure the preparation of internationally competitive specialists”.

The tasks of the CCCS study programme are aimed at achieving a defined goal in the field of

fundamental and theoretical knowledge, which forms the basis for possible further education, as well as the development of practical skills and competence, which forms the basis for further activity in a sufficiently wide spectrum of fields of activity.

The tasks of CCCS are:

- To provide general knowledge in the field of ICT and computer control and computer science
- To get to know the application of computer control in production, agriculture and forestry in depth
- To provide an insight into the processes taking place in the industry by attracting experts and representatives of ICT companies
- To supplement theoretical knowledge with practical lessons
- To provide basic skills for conducting scientific research work
- To provide students with practice in ICT companies and municipalities

The results of the studies are in turn closely related to the results formulated in the aim of the programme – the preparation of highly qualified, creative and broad-minded IT specialists. The results are aimed at acquiring knowledge about the basic issues of computer science and professional abilities to develop IT and computer control solutions. The results include the general ability to effectively plan time and work tasks and, no less important, the ability to fit into the labour market.

All the results are:

- The student acquires knowledge of basic issues, terminology, technologies and concepts of computer science
- The student acquires general knowledge and learns the principles of logical thinking
- The student orients and is able to effectively learn modern IT tools and apply them to solve tasks
- The student is able to explain the theoretical foundations of computer control and computer science, including computer architecture, computer network construction, etc.
- The student is able to develop an IT and/or computer control solution to a specific problem
- The student is able to perform systems analysis, design and testing
- The student acquires basic skills in scientific and research work
- The student is able to acquire new knowledge and skills independently
- The student is able to learn industry literature in a foreign language
- The student is able to choose and apply appropriate IT tools, methods, algorithms for solving problems
- The student is able to solve computer control tasks individually and in a team
- The student is able to effectively plan his/her time and work tasks
- The student is able to present and argue his/her point of view
- The student is able to fit into the labour market

The persons are admitted in the CCCS study programme if they meet the requirements regarding previous education, i.e. have completed secondary or secondary professional education. The mandatory requirement for admission to the programme for persons who have obtained secondary education since 2004 is the evaluation of the centralised exam in Latvian, a foreign language and mathematics. In addition, the evaluation of the centralised exam in physics is taken into account, since mathematics and physics are the basic disciplines of engineering. On the other hand, for persons who obtained their secondary education before 2004, the mandatory requirement is the annual grade in Latvian, foreign language and mathematics indicated in the certificate/diploma or the evaluation of centralised exam in Latvian, foreign language and mathematics. Additional points are for the annual grade in physics indicated in the certificate/diploma.

The scope of the bachelor's study programme is 160 credit points, of which 12 credit points are allocated for the development of a bachelor's thesis, which complies with Cabinet Regulations No. 240 "Regulations on the State Academic Education Standard". The duration of studies is eight semesters, or 4 years.

The content of the CCCS study programme ensures the achievement of scientifically based wide-profile study results. Study courses and study modules form the compulsory, limited choice and elective parts of the study programme.

In the appendix *DVDZ_diploms_pielikums_en.zip*, the diploma to be issued for completing the study program and its appendix samples are placed.

In the appendix *bak_stud_progr_Datorvadiba_un_datorzinatne_AIP_atzinums_EN.docx*, the conclusion of the Council of Higher Education is added, because less than 250 full-time students are expected to study in the DVDZ program.

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

The Bachelor's Degree of Engineering Science in Computer Control and Computer Science forms the basis for further career development, continuing studies in a master's degree or starting a career in a company in the industry. Graduates have very wide career opportunities in the field of Information and Communication Technologies (hereinafter referred to as – the ICT) and beyond, as IT development methods and tools and their areas of application are very diverse. In addition to meeting the direct requirements of the industry, information technology education also plays an important role in the formation of the information society, which is described in the document "Information society development guidelines for the period of 2014–2020" (Cabinet Order No. 486 of 2013).

The "Computer Control and Computer Science" study programme provides knowledge and skills that allow graduates to work in ICT industry companies or in any industry company by doing work related to information technology support. Work according to the specialty is possible both in Latvia and practically in any country in the world.

There are many ICT companies in Latvia (the total number of companies in the ICT industry in 2020 is 7,056 according to the data of the Central Statistical Bureau, hereinafter referred to as – the CSB) and the number of people employed in the ICT sector is more than 38 thousand (according to CSB data). ICT is a prospective and growing industry in Latvia, which is also proven by the rapid growth of the industry. According to CSB data, the turnover of the ICT industry already exceeds EUR 4 billion and more and more Latvian companies offer services in the international market.

The shortage of computer control and ICT specialists in the Latvian market is very large. This is evidenced by the fact that more than 80% of final-year undergraduate students start working in a specialty by the time they finish their studies and defend their thesis. The Ministry of Economics of Latvia also recognises the lack of ICT specialists. Long-term labour market forecasts prepared by the Ministry envisage wider use of various technologies and innovations on a daily basis, covering the employment needs of industries. The Ministry's report of 2020 on the development of Latvia's national economy predicts that by 2027 there will be a shortage of ICT and engineering specialists (up to ~14 thousand employees in STEM industries).

One of the representatives of the industry, the chairman of the Board of the Latvian technologies and entertainment services company “Lattelecom” Juris Gulbis, also admits that the Latvian companies in the ICT industry are increasingly feeling the lack of specialists and are experiencing a battle for talent.

Articles and data published in mass media and news portals show that the information technologies industry is one of the most demanded in the labour market.

(Only in Latvian: <https://www.delfi.lv/business/versijas/lilita-trupa-it-specialistu-trukums-nozare-un-pieprasijums-turpina-augt.d?id=53308893>)

Every year, around 700 young specialists complete their studies in the field of information technologies in Latvia, however, this number falls well short of what is needed to raise the IT field in Latvia to a quality approaching the world level (Only in Latvian: <https://ir.lv/2021/07/16/it-specialistu-trukums-nozare-un-pieprasijums-turpina-augt/>).

CCCS graduates do not face any difficulties in finding a job after graduating from the university. Some of the students start working immediately after the practice in the 6th semester. Employers appreciate ITF students, their skills and competencies. Most of the graduates choose industry companies like TestDevLab, BBIT, ZZ Dats, Accenture and others as their workplace.

Maintaining the topicality and quality of the programmes included in the course of study is based on close cooperation with industry companies. ITF's current cooperation list includes about 60 companies with which information is exchanged on current study and industry news issues.

In March 2022, companies were surveyed about whether and how many graduates of LBTU ITF bachelor's and master's studies are among their employees. The question was asked to 54 companies, of which 22 answered confirming that 64 graduates of bachelor's and master's studies are working for them.

Data from the website <https://www.algas.lv/> (<https://www.algas.lv/en/salaryinfo/information-technology>) were used when evaluating the remuneration of ITF industry specialists. As of 22 September 2022, the salary range for related positions in the Information Technologies category is currently as follows: EUR 950.00 (minimum salary) to EUR 3,106.00 (about 10% of employees may earn less than the specified minimum, 10% more than the specified maximum).

More than 60 job offers have been posted on this same website since 22.09.2022, where the salary range is from EUR 1100 to EUR 8000.

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

In total, 189 graduates of the academic bachelor's study programme “Computer Control and Computer Science” of LBTU Faculty of Information Technologies have obtained the bachelor's academic degree in engineering from the 2013/2014 to 2022/2023 study year. The number of students in the study programme by study year indicates the known stabilisation of the number of students in recent years. The total number of students in the programme ranges from 126 to 169

students. The reason for the stabilisation is the constant number of state-funded places. It should be noted that in the last study year (2021/2022) the number of state-funded places for the first year was increased to 65 places (in 2020/2021, there were 50 places), but in the 2022/2023 study year it has been increased by another 5 budget places, i.e. to 70 places. Historically, the number of students admitted in the CCCS bachelor's study programme is close to the number of state-funded places, due to the students' limited ability to pay. The proportion of fee-paying students does not exceed 10% of the total number of students and, in the last study year, there were 8 students in the programme who paid for their studies from personal financial resources.

The number of graduates varies slightly by study year and averages around 21 students. In recent years, there has been a tendency for the number of graduates to decrease, for example, in 2017/2018, 31 students graduated from the CCCS programme, and in 2020/2021, there were 21 graduates. This decrease can be partially explained by the fact that a large part of the last 4th year students are already working and lose motivation to finish their studies. The Covid-19 pandemic also had an impact on the decrease in the number of graduates and the progress of the study process. For some students, the remote study process and the development of the final thesis created difficulties.

It is possible that the number of graduates could have been higher had it not been for the decline in the number of students in all courses. The analysis and comparison of the number of students by study year allows us to notice common features and conclude that the largest student dropout can be observed in the first year of study. On average, during 4 years of study, it is around 33 students per year, but in the first year of study there was a maximum dropout of up to 40% of the admitted students. One of the reasons for dropping out is students' understanding and awareness that a non-binding specialty was chosen, thus the study programme is changed to another one. Some students say that studying at the university is still too difficult and they choose to start working. When interrupting the study process and withdrawing from the study programme, students cite "at own initiative" as the reason for exmatriculation. Other reasons that students have mentioned are not returning from an academic leave, not fulfilling the obligations of the study contract, not fulfilling the financial obligations or the requirements of the study programme.

Detailed information on student statistics can be found in the appendix: *dvdz_studentu_statistika_lv_eng.xlsx*

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

3.2. The Content of Studies and Implementation Thereof

3.2.1. Analysis of the content of the study programme. Assessment of the interrelation between the information included in the study courses/ modules, the intended learning outcomes, the set aims and other indicators with the aims of the study course/ module and the aims and intended outcomes of the study programme. Assessment of the

relevance of the content of the study courses/ modules and compliance with the needs of the relevant industry, labour market and with the trends in science on how and whether the content of the study courses/ modules is updated in line with the development trends of the relevant industry, labour market, and science.

The study programme is based on the “Regulations on the State Academic Education Standard” (Only in Latvian: <https://likumi.lv/ta/id/266187-noteikumi-par-valsts-akademiskas-izglitibas-standartu>), which stipulates that the content of the bachelor's programme shall ensure the achievement of scientifically based broad-profile study results. The table on the compliance of the study program with the national education standard is given in the appendix: *dvdz_atbilstiba_valsts_standartam_en.pdf*

The total amount of the academic bachelor's study programme “Computer Control and Computer Science” is 160 credits (240 ECTS), the duration of studies is 4 years (8 semesters) in the form of full-time studies. The study programme consists of three parts (A – Mandatory study courses (130 CP); B – Limited choice study courses (24 CP of 30 CP) and C – Elective study courses (6 CP)). The mandatory part and the limited choice part of the programme include the guidelines, principles, structure and methodology of the ICT science industry or sub-industry, the history and current problems of the development of the science industry or sub-industry, as well as the characteristics and problems of the science industry or sub-industry from an interdisciplinary aspect. The study programme also includes practice (12 CP) in the 6th semester. Its task is to promote the acquisition of practical skills and competencies in the field of development and maintenance of information and communication systems, as well as computer science. Practice takes place in ICT companies or structural units, scientific research companies, municipalities, as well as LBTU structural units. The studies end with the development and defence of a bachelor's thesis (10 CP). The study programme is mainly based on the mandatory knowledge block, which provides the necessary knowledge at the bachelor's level, while the limited choice study courses provide in-depth knowledge regarding individual computer control and computer science technologies. The study program plan is given in the appendix: *DVDZ_studiju_plans_en.pdf*.

All study course descriptions are given in appendix: *dvdz_kursu_programmas_en.zip*

Elective courses are offered every year to all university students, including students of this program. Students are free to choose the courses they want to study. The course offer is approved by the methodological committee of the faculty. These courses could be from different disciplines such as foreign languages, for example, for several years, students choose Spanish language courses or Stress Management courses. In 2023, students will also be offered courses related to machine learning implemented by the University of Latvia. The order in which free elective courses are offered is determined by the order of the vice-rector in studies of LBTU, which is issued every year. Year 2023/2024 order sample is included in the appendix (*itf_pieteiksanas_bisk_2023_2024*) (In Latvian).

Work on updating the content of the programme is ongoing. Courses are updated in accordance with the development of information technologies and market needs by making minor changes or additions to the content of individual study courses, which do not affect the study programme plan. Periodically, new study courses are developed and introduced into the study programme in order to promote compliance with the trends of the science industry and the development of the latest technologies. For example, in the period from 2014 to 2022, several new study courses were developed: Programming technologies in computer control, Intelligent systems development

platforms, Basics of machine learning, Basics of e-commerce technologies, User interface design and others. Representatives from ICT companies also participate in the process of updating the study programme, giving their opinions and recommendations.

In order to assess whether the study programme meets the real market requirements, regular conversations are held with graduates about their work progress, as well as feedback from practice supervisor about the success of interns, their skills and competencies used. The surveyed practice supervisors rate the students' knowledge as very good or good and admit that the students are very well prepared for the demands and needs of the labour market.

In individual study courses, guest lecturers from industry and ICT companies are invited to give lectures on current events, trends and new technologies used in the industry.

Teaching staff involved in the study programme also improve their qualifications and obtain current information about what is happening in the industry, using practice opportunities in ICT companies, attending courses, seminars and conferences. Several teaching staff members of the faculty who are involved in the implementation of the study programme have completed practice in the industry companies during the reporting period, e.g. T. Rubina, A. Zacepins, A. Kviesis, V. Komashilovs, N. Būmanis and others.

The mapping of study courses/modules to achieve learning outcomes of the study programme is given in the appendix: *DVDZ_kursu matrica_lv_eng.xlsx*. The mapping demonstrates that all the results of the study programme are achieved. Each individual study course is linked to several achievable results of the study programme and contributes to the achievement of the overall aim of the study programme.

Within the scope of the ESF project “Improvement of LLU management” (Only in Latvian: <https://www.llu.lv/lv/projekti/apstiprinatie-projekti/2018/latvijas-lauksaimniecibas-universitates-parvaldibas-pilnveide>), the evaluation of the study programme content and the development of the improvement plan have been carried out based on recommendations from foreign industry experts. A detailed evaluation from Dynamic University, which pointed out the programme's potential weaknesses and strengths, also helped to improve the study programme. The emphasis of the programme on IT applications, the quantity and variety of practical lessons, a significant number of guest lectures given by IT professionals and representatives of IT companies, as well as the existence of practice, were positively evaluated. On the other hand, industry experts pointed to the need for a discussion on the possibility of implementing the study programme over a period of three years, which could favourably affect the competitiveness of the study programme on the Latvian scale. This issue was discussed in detail in the faculty. As a result of the discussions, it was concluded that the transition from a 4-year programme to a 3-year programme is currently not possible, as it requires a significant reduction in the scope of the programme and abandoning practice, which is highly valued both by experts and students.

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

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

It is possible to acquire the academic bachelor's study programme "Computer Control and Computer Science" in the form of full-time studies. The duration of the study programme is 4 years (8 semesters). In one study year, there are 32 classroom work weeks and 8 weeks of individual study and examination time. The learning process of the study programme is organised in Latvian and English (for foreign students).

The study process, its organisation and the general principles of evaluation are regulated by the LBTU Study Regulations. It is determined that the study process consists of face-to-face contact classes and independent studies, within the framework of which students shall perform a certain amount of work individually or in groups. The LBTU e-study system is increasingly used in the study process. Study results are evaluated according to the previously defined criteria. Information about the study conditions and assessment criteria for each study course is included in the study course description and is usually communicated to students in the first lesson.

The CCCS study programme is acquired in the form of lectures, practical or laboratory work classes, independent work classes, consultations with teaching staff and workshops. In addition to traditional forms of work, remote methods for implementation of the study process are also used. LBTU uses the Moodle e-study system. During the Covid-19 pandemic, it was actively used, providing a continuous learning process in a remote form. The e-study system provides all the necessary functionality for the remote implementation of the study process: conducting video lectures in online mode, publishing an archive of video lectures, placing various types of electronic materials, assigning tasks, organising tests, posting comments and grades, messaging, etc.

The implementation of the study programme in a foreign language does not differ from its implementation in the Latvian language, because the teaching staff is involved in teaching the lessons to students of both streams.

A separate chapter of the LBTU study regulations (4. Study results) describes the study results and their evaluation procedure. The evaluation system of the study programme "Computer Control and Computer Science" is based on the provisions defined in these Regulations and on the following principles: 1) students need to finish the study course with a positive grade (4 points and more); 2) in many study courses, the student's acquired knowledge is evaluated using the accumulative principle (summing up all grades or points obtained during studies for specific parts of the study course, activities); 3) students are informed about the content of the study course, the requirements for finishing it and the evaluation system. The evaluation methods and principles used by the teaching staff are objective and respected. Each lecturer in its study course regularly checks the students' knowledge and skills during the semester, using the types of tests specified in the course programme description (tests, homework, reports, laboratory work, etc.). The requirements of the study course depend on the specifics of the study course, the degree of complexity and the organisation of the study process.

Students have the right to express claims. For this purpose, a section (5. Appeal) is included in the Study Regulations, which describes the procedure for submitting and considering complaints. LBTU has also developed the Academic Integrity Regulation, which regulates the principles of academic integrity.

In the “Standards and guidelines for quality assurance in the European higher education area” adopted by the ministers responsible for higher education in the European higher education area in 2015, paragraph 1.3 is devoted to student-oriented education, which includes seven basic principles. In the implementation of the study programme, LBTU is guided by the mentioned seven basic principles for student-oriented learning and teaching, and observes the mentioned principles of knowledge evaluation. In the implementation of the study process, the principles of student-oriented teaching are also taken into account: respect towards the diversity of students and their needs, developing appropriate teaching paths according to opportunities; diverse pedagogical methods are used whenever possible and if the conditions allow it. During the learning process, the student's desire for independence is encouraged, while at the same time providing continuous support from the teaching staff. Students are not discriminated based on materials, gender, native language or other parameters.

Regular assessment of applicable teaching methods and pedagogical methods takes place in the form of feedback not only through direct discussions with students, but also through regular surveys both within study courses and within the programme. Elected teaching staff also attend the “Didactics of Higher Education Institutions” course.

Students' desire for independence is especially encouraged in the process of developing coursework and projects, as well as bachelor's thesis, where students have the opportunity to find a solution to a specific task independently. Practice in companies also promote students' independence by receiving the necessary support from the company's staff.

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

The CCCS study programme includes a practice, which is organised in the 6th semester. For students, the amount of practice is 12 CP. One credit point (1 CP) corresponds to one week of practice, which is 40 academic hours. Therefore, the duration of the practice is 12 weeks, or 480 hours. The practice organisation at LBTU is regulated by the Regulation of Practice, which is available in the LBTU information system. Practices are implemented in companies corresponding to the ICT sector, state or local government institutions, as well as at the University. Each practice is led and coordinated by a teaching staff member – the practice supervisor, who is approved by the dean of the faculty. On the other hand, at the place of practice, the intern's work is managed and coordinated by an appointed employee of the company, who is one of the leading specialists of the company. A study course programme has also been developed for practice.

The university helps students find practice. Before starting the practice, the teaching staff – the

practice supervisor and the programme director – informs the students about the practice offers received, which are sent by both long-term cooperation partners and new companies. Such offers are sent to the faculty centrally to the dean's office, to teaching staff – practice supervisors and directors of study programmes. Information about the offered practices is placed in several sources: in the faculty at the notice board, on the faculty's website, in the Job and practice offers section of the LBTU website, as well as on the faculty's social networks.

Students can also use the opportunities offered by the career portal <https://www.prakse.lv/> and participate in competitions for practices. LBTU, in cooperation with Riga Technical University Development Fund, offers students the opportunity to participate in open tenders and find paid practices in various local and foreign companies in Latvia.

Every year, in order to inform students about practice and work opportunities, certain companies organise guest lectures for students both in person and remotely. Study tours or excursions to industry companies are also often organised.

Students can independently find a suitable practice for themselves. The student chooses the practice in Latvia or outside it in such a way as to fulfil the requirements of the practice programme, coordinating it with the practice supervisor. The compliance of the practice with the programme is evaluated by the practice supervisor based on the information submitted by the student about the chosen practice.

Practices are organised during the 6th semester. Lessons are not scheduled during the practice. When assigning a student to a practice, a dean's order is issued and a practice contract is concluded between LBTU, the student and the practice location.

In the previous year of study, such industry companies as TestDevLab, Posti Messaging, BBIT, AS Latvenergo, ZZ Dats and others were chosen as practice locations.

During the practice, students have the opportunity to test their theoretically acquired knowledge and skills, as well as gain an idea and practical experience in solving problems in ICT companies. Interns have the opportunity to solve tasks individually or work in groups.

During the practice, the student performs practice tasks and work duties, prepares a practice report in accordance with the practice programme and regularly fills in a practice diary using the faculty's practice system <http://prakses.itf.ltu.lv/>, in which the practice tasks and their progress are described in detail. The student submits the practice report together with the practice location supervisor's feedback by uploading it to the faculty's practice system.

Practices are graded with pass/fail. The practice defence is accepted and evaluated by the commission organised by the faculty, which consists of a teaching staff member – the practice supervisor and the director of the study programme. The overall assessment of the practice is made up of several stages and results of the practice process: a fully completed practice diary, a fully completed practice, practice report, feedback from the practice location supervisor, presentation of the practice report and answers to the questions of the commission members.

Students value the opportunity to undergo a practice very positively, and some of them choose the practice as their permanent workplace after completing the practice. The knowledge strengthened during the practice and the acquired practical skills also help students to choose the topics of their final theses, connecting them with the activities and tasks performed in practice.

Students from foreign countries follow the practice programme in the same way as students from Latvia. A large number of ICT companies in Latvia use the English language as a means of communication in the company, including when writing accompanying documentation. ICT companies are happy to offer practices to foreign students as well. Foreign students also have the

opportunity to do a practice in another country. In this case, a tripartite agreement is concluded with the company, student and university, before which the student provides information to the director of studies about the practice location, specifying its website and physical address. After the director of the study programme has familiarised himself/herself with the company (if necessary, contacted the company by asking the necessary questions about the field of activity) and confirmed its suitability, the agreement is concluded.

Also, students can use the opportunities offered by the ERASMUS programme to implement practices in the member states of the ERASMUS+ programme (<https://www.llu.lv/en/erasmus-internship>).

LBTU practice regulations are given in the appendix: *itf_lbtu_praksu_nolikums_lv_en.pdf*

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

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

A bachelor's thesis is an independent theoretical study or practical development in which the student systematises, expands and strengthens the acquired theoretical knowledge and proves his/her theoretical maturity, demonstrating the ability to apply theory in practice. The student develops and defends the bachelor's thesis at the end of the theoretical studies.

The process of developing a bachelor's thesis in the "Computer Control and Computer Science" study programme consists of several stages, which the student shall implement in close cooperation and consultation with the selected supervisor and consultant, if one was chosen:

1. Acquaintance with methodological instructions for developing and defending a bachelor's thesis
2. Selection and formulation of the topic of the bachelor's thesis
3. Formulation and justification of the thesis goal and tasks
4. Preparation of the thesis structure (table of contents)
5. Data extraction, processing of obtained information and data, analysis of literature sources
6. Development of the experimental part
7. Preparation of the description of the results
8. Preparation of work summary and conclusions
9. Submission of the thesis
10. Preparation of a presentation to defend the thesis
11. Defence of the thesis

One of the important stages in the development of a bachelor's thesis is the choice of the topic of the thesis, which shall be made on the initiative of the student. The sources and types of choices for the topic of the bachelor's thesis can be different. When choosing a topic, it is recommended to be guided by the following considerations:

1. a student shall choose the field with which the topic of the bachelor's thesis could be related;
2. a student shall define and clarify an existing problem (question) in this field, which for known reasons needs to be solved or is of interest;
3. a student shall determine what he/she could do in his/her thesis to solve the chosen problem or issue.

There are various options for choosing the topic of a bachelor's theses. 1) The student can choose one of the topics for its bachelor thesis offered by the relevant department. For this purpose, seminars are organised at the beginning of the semester, in which the lecturers of the departments inform of the existing scientific and practical topics, within the framework of which it is also possible to develop bachelor's theses; 2) The student itself can initiate the development of the topic of its interest according to the subject programme and conditions, in coordination with the teaching staff; 3) The student itself can initiate the development of the topic of its interest, which is related to the task to be performed at its current workplace; 4) The bachelor's thesis can also be developed on the basis of the course work (project), supplementing and further expanding the topic discussed in it; 5) The source of the topic of bachelor's theses may be related to the tasks performed in professional qualification practice.

The bachelor's thesis shall contain the formulation and analysis of the problem, as well as the justification of the solution. In the development of a bachelor's thesis, only practical work with a specific software tool is not allowed, without emphasising the application to achieve the set goal. The final thesis topics in the “Computer Control and Computer Science” study programme are often interdisciplinary, with an emphasis on technology applications in agriculture, forestry, and other industries. The faculty has developed and approved the rules for the development, design and methodology of bachelor's theses.

If students choose a topic related to a study course, practical lessons are often improved, new practical tasks and methodical materials are developed, which describe the methodology or technique of performing practical work, which are also approved in the study process. When choosing topics related to existing scientific projects, the results of the work are used for project implementation. On the other hand, if the topics are related to the workplace, then the results are used to improve the work process or to perform a specific work task.

During the reporting period, 215 bachelor theses have been defended. All works submitted to VEK have been successfully defended, which indicates a high-quality bachelor thesis development process. Only one graduate defended its bachelor's thesis during the reporting period with a lower positive grade – 4 points. It is worth noting that students have two pre-defences of the final thesis before the final defence, the purpose of which is to control and ensure the quality of the thesis development.

The average evaluations of the final thesis by year are as follows: 2014 – 7.96; 2015 – 8.32; 2016 – 7.71; 2017 – 7.55; 2018 – 8.10; 2019 – 7.68; 2020 – 7.55; 2021 – 8.10 and 2022 – 7.50. The overall average evaluation in the reporting period is 7.83 points. 57% of all graduates obtained a grade equal to or higher than 8, which is considered very good.

Each time, after the work of the state examination commission, a discussion is organised, which defines and summarises recommendations for further improvement of the final thesis development and defence processes. These recommendations are taken into account in the development and implementation of these processes.

“Computer Control and Computer Science” final theses are of high quality, which is also indicated by successful participation in Latvian national final theses competitions, such as Zibit. Some of the winners of this competition are: Raivis Baltmanis with the topic “Use of land laser scanner data to

determine the volume of timber” (2nd place, 2014), Sandra Rakickaite “Implementation of smart rental contracts based on blockchain technology” (1st place, 2018).

3.3. Resources and Provision of the Study Programme

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

For the implementation of the “Computer Control and Computer Science” study programme, all necessary resources are available, both adequate funding to ensure learning and teaching activities, and sufficient and easily accessible material and technical support.

To ensure a successful higher education environment, students are provided with a wide range of resources including:

- premises - auditoriums, laboratories, computer classrooms, library, canteen, etc.;
- material and technical resources - auditoriums with tables, chairs, study equipment, e.g. blackboard, projectors, computers, televisions, specialised equipment and devices, e.g. 3D scanner and 3D printing equipment, IT infrastructure, e.g. wireless internet connection;
- methodical teaching materials - various teaching assets, teaching aids;
- information systems - LBTU information system, e-study system, university's internal information network mans.llu.lv;
- human resources - teaching staff, study curators, study programme directors, mentors and other faculty and university employees who can provide advice within their sphere of responsibility and competence.

Each stream of students has its own curator who helps to solve current problems. An Erasmus coordinator has also been appointed at the faculty, who advises students on the possibility of gaining study experience at one of LBTU's partner universities within the framework of the ERASMUS+ programme.

Students have access to the necessary study literature to ensure learning achievements. It is available in the LBTU Fundamental and ITF department libraries. The material base of the faculty is replenished every year. The textbooks are stored at all departments of faculties in the rooms indicated by the head of the laboratory of the department, as well as kept individually by the teaching staff responsible for individual study courses.

The study programme is basically implemented at the Faculty of Information Technologies, which is located in Jelgava, Lielā iela 2, in the premises of the Jelgava Castle. Four departments of the IT faculty are involved in the implementation of the study process:

- Department of Computer Systems with a total area of 410 m²,
- Department of Control Systems with a total area of 210 m²,
- Department of Mathematics with a total area of 350 m²,
- Department of Physics with a total area of 985 m².

During this reporting period, several infrastructure development and improvement projects were successfully implemented in the faculty, the list of which is given below in this report. Various laboratories and specialised computer classrooms have been created or improved at the faculty during the reporting period, the total number of which is 12 computer classrooms with 200 computers (see table). The faculty has its own server room, which is used in courses related to computer networks. Three new laboratories with computers (115, 287 and 301) were additionally placed during the reporting period.

Table. ITF laboratories and specialised computer classrooms

Computer classroom No.	Number of computers in the computer classroom, including the teacher's computer	Notes
Department of Computer Systems		
No. 25	17	Software Quality Assurance Laboratory that hosts Apple's iOS computers.
No. 27	15	Computer Networks Laboratory (CISCO networking academy programme)
No. 28	21	Database and Data Security Laboratory (Oracle academy LBTU member institution)
No. 32	16	Software Development Laboratory
No. 47	15	Computer Construction Laboratory
No. 115	12	Artificial Intelligence and Machine Learning Laboratory
No. 301	7	Virtual and Mixed Reality Laboratory
Department of Mathematics		
No. 217	16	Laboratory of Numerical Methods
No. 220	21	Mathematical Modelling Laboratory
Department of Management Systems		
No. 31	27	Multimedia and GIS laboratory
No. 221	21	Statistics and Modelling Laboratory
No. 287	12	Interdisciplinary Software Development Laboratory

In 2017, with the help of STEM project funding, an Apple computer classroom was created in the faculty with several iMac computers, which students use in the Operating Systems, Testing and Multimedia study courses. There are 17 workplaces in the classroom.

In 2019, with the help of STEM project funding, a set of optical cable welding, Mikrotik RouterBoard routers, Cisco and HP switches were purchased for the Computer Networks Laboratory.

In 2019, with the help of STEM project funding, two sets of Cisco computer network hardware were purchased, which are used to implement the “Cisco Academy” course. Eight servers were also purchased for the Computer Networks Laboratory and a demonstration server cabinet with servers was created, that are used in the laboratory work of the study courses “Computer networks” and “Computer network administration”.

The ITF continues to work with Microsoft and the use of the “Azure Dev Tools for Teaching” programme in the ITF study process is extended every year, which opens the possibility for all ITF students and teachers to download the latest Microsoft computer programmes and use them for academic purposes. As part of acquiring the study programme, students and teachers have access to a \$100 credit in the cloud computing platform “Azure Cloud Computing” for the use of resources for a period of 12 months, which is renewable while the student studies at the faculty.

Computer equipment is constantly being updated at the faculty in order to give students and teaching staff the opportunity to work with current and efficient equipment. The equipment was purchased using MoES Science Base funding, ITF's own financial resources and project funding, or funds allocated by MoES.

The IT faculty is a partner of Apple, Oracle and Cisco, which enables the implementation of database and computer network courses based on the software of the aforementioned companies.

For study courses related to computer control and electronic platforms, the technical base was supplemented with several sets of Arduino and Raspberry Pi platforms, as well as robotic platforms and various sensors were purchased for students' practical lessons. Using the funding of the STEM project, a set of equipment for robot programming was purchased, which includes robot chassis, manipulators, equipment controllers, sensors for various applications and tool sets.

Using the funding of the STEM project, cosmetic repairs of the managed premises were carried out in the IT faculty and stationary air conditioners were installed, improving the ventilation of the premises.

Using ERAF project funding, a set of equipment for radiation analysis was purchased, which includes a thermal camera with accessories for radiation registration in the spectral range 7.5–14 μm and a spectrometer with accessories for radiation registration in the spectral range of absolute intensity 220–110 nm. These devices are used in physics courses and student research.

In 2020, using ERAF project funding, the faculty purchased a “Human eye activity scanning hardware set with specialised software”, which includes eye pupil tracking glasses and a stationary eye tracking camera.

In 2022, the work on the creation of the new virtual reality room (sets of virtual reality glasses, mixed virtual reality glasses, 3D handheld scanner, 3D printing machine, high-performance computers), which is used in the teaching process and research, is completed. This classroom was created using the funding of the project S390 “For the improvement of the material base of LLU for scientific research and for ensuring laboratory analyses in 2021”.

During Covid-19, the material and technical base for remote work was improved. Using the MoES Science base funding and ITF's own financial resources, laptops, internet cameras, headsets with microphones and microphones were purchased to ensure the progress of the study process in remote mode and the preparation of study materials.

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

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

The amount of state-funded study places is coordinated in a tripartite agreement between the Ministry of Education and Science (MoES), the Ministry of Agriculture (MoA) and Latvia University of Life Sciences and Technologies (LBTU). In the tripartite agreement on financing, the base cost of one study place, study level coefficients, social security of the study place, study cost coefficients of the thematic area of education are determined. The coefficients for each thematic area of education are different. They are stipulated in the Cabinet Regulations "Procedure in which universities and colleges are financed from the state budget".

Every year, the LBTU Senate, but since 2022, the LBTU Council, approves the distribution of revenues and expenses of the LBTU general budget structure, prepared in accordance with the Saeima annual Law on the State Budget and the annual LBTU Rector's Order "On LBTU General Budget Planning". Control and audit of the general budget is performed by an independent sworn auditor, whose opinion and report are reviewed and approved by the Senate of LBTU.

Before approving the distribution of LBTU general budget revenue and expenses in 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, LBTU director, all deans of faculties, head of the resource accounting centre/chief accountant, head of the financial planning centre, key economists, and key specialists in real estate and legal issues.

The distribution of income and expenses approved by the LBTU Senate determines that 80% of the funding allocated from the state consists of compensation costs, and 20% other costs. 60% of the paid study funding consists of reimbursement costs, and 40% other costs, of which 20% is directly at the disposal of the faculty that implements the respective study programme. The amount of funding for the Science Base is calculated and allocated annually from active research activities. The Science Base funding in the amount of 50% is at the direct disposal of the faculty, and 50% is to cover centralised costs. The science funding consists of funding attracted for the implementation of projects.

The tripartite agreement from 2022 on state funding for the study programmes stipulates that the basic cost of one study place for the CCCS study programme is EUR 1630.11 per year, the study level coefficient for bachelor's programmes is 1 and the social security of the study place for bachelor's programmes is EUR 265.50, the education thematic area study cost coefficient for the bachelor's programme "Computer Control and Computer Science" is 1.74. Thus, the cost per

student of the bachelor's programme "Computer Control and Computer Science" amounts to EUR 3097.57, which is EUR 162.05 more than in 2021.

In previous years, the costs per student were as follows:

- in 2021 – EUR 2935.52,
- in 2020 – EUR 2746.15,
- in 2019 – EUR 2745.96,
- in 2018 – EUR 2642.76,
- in 2017 – EUR 2532.81,
- in 2016 – EUR 2078.34.

3.4. Teaching Staff

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

38 teaching staff members participate in the implementation of the "Computer Control and Computer Science" study programme, of which 22 (58%) are men and 16 (42%) are women. Of the teaching staff members, 5 are professors (including one Emeritus), 10 associate professors (including one Emeritus), 7 assistant professors and visiting assistant professors, 15 lecturers and guest lecturers. Of the involved teaching staff, 25 have been elected to LBTU and 22 of those elected have a doctoral degree. The qualifications of the teaching staff involved in the implementation of the study programme meet the conditions of the implementation of the programme and the requirements of regulatory enactments.

Teaching staff involved in the study programme also carry out scientific activities, incl. developing scientific publications, participating in conferences and seminars, participating in research projects.

The qualifications of teaching staff involved in the implementation of the study programme are regularly improved by attending various seminars, courses and participating in the practice process at industry companies. In order to raise the qualifications of the academic staff, the ESF project No. 8.2.2.0/18/A/014 "Perfection of academic staff of LLU" was implemented at the LBTU level in the period from 2019 to 2022, in which representatives of the academic staff were:

- provided with the possibility of practice with merchants, in order to promote a closer connection of the study process with the national economy and to increase the competence of teaching staff;
- able to participate in English language courses, which made it possible to increase the level of English language knowledge of academic staff and provided an opportunity to take the international English language exam for obtaining a certificate, in order to promote the development of new study programmes, attracting foreign students and increasing

professional performance;

- able to participate in courses that provide an opportunity to improve the leadership, communication and interaction skills of the academic staff in order to ensure a more efficient and modern study process, productivity and quality of work performance.

Several teaching staff members of the faculty used the activities offered by the project. In total, 9 members of the teaching staff of the study programme completed a practice, 8 completed the specialised training “Modern and effective communication and collaboration tools in the IT environment” and 8 completed English language courses and successfully passed the international exam in the Pearson programme, which increased their English language skills.

In recent years, in order to increase the composition of highly qualified personnel, ITF has paid great attention to the involvement of doctoral students in academic work. In general, the following activities have been carried out to improve the qualifications of teaching staff: 1) admission of teaching staff to LBTU ITF doctoral programme; 2) inviting guest lecturers from Latvian and foreign universities for the purpose of exchange of experience, including; 3) involvement in the ERASMUS experience exchange programme; 4) practice in ICT companies with the aim of expanding knowledge and practical skills, which can further be used in the improvement of individual study courses or in the development of new courses.

The “Computer Control and Computer Science” study programme is also implemented in English, and therefore all involved teaching staff have a B2 or higher level of English knowledge. The level of knowledge of the English language is indicated in the staff's CV.

The influence of teaching staff qualifications on study results can be evaluated in two directions. First of all, the higher the formal qualification of the teaching staff (position and scientific degree), the greater the pedagogical and research experience of the teaching staff, which enables to provide both theoretically and practically more reasoned justifications to students based on scientific research within the framework of the study course. It helps to acquire broader and/or deeper knowledge and achieve higher study results. Secondly, the qualifications and active scientific activity of teaching staff promote the involvement of bachelor's and master's students in research, as well as international cooperation of teaching staff.

In the appendix: *LBTU_apliecinajums_studiju_virzienam_Informacijas_tehnologijas_EN.docx*, there is a confirmation that the academic staff of the academic study program meets the requirements specified in the third paragraph of the first part of Article 55 of the Law on Higher Education Institutions.

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

38 members of the teaching staff are involved in the implementation of the CCCS programme in the 2022/2023 academic year, of which 22 (58%) are men and 16 (42%) are women. The number of teaching staff members, compared to the beginning of the reporting period, increased by only one. The ratio of men/women changed very little (at the beginning of the period there were 20 men and 17 women), which indicates the stability of the composition of the teaching staff. Analysing the professional development of teaching staff, the number of representatives of academic personnel with a doctorate degree in science has increased in the faculty. At the moment, 24 (63%) teaching staff members of the faculty have a doctorate degree in science, which is 12% more than at the

beginning of the reporting period. 10 faculty members are associate professors (including one Emeritus) and 5 are professors (including one Emeritus), which make up 39% of all faculty members. This is 4% more than at the beginning of the reporting period. 25 teaching staff members have been elected to academic positions at LBTU.

Since the overall qualification of the teaching staff has improved during the reporting period, this has had a positive impact on the quality of studies and its improvement, as the qualification of the teaching staff undeniably affects the quality of the studies.

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

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

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

The cooperation of teaching staff is of great importance for the development of the faculty and also of the University. At LBTU, the cooperation of teaching staff is implemented in three ways: 1) cooperation of teaching staff within the study course; 2) cooperation of teaching staff in methodological work; 3) cooperation of teaching staff in scientific activity.

The most common type of cooperation in the IT faculty is the cooperation between two lecturers in the implementation of joint study courses, where one gives lectures and the other conducts practical work. Examples include such study courses as Programming, Databases and Database Technologies, Algorithms and Data Structures, Basics of Intelligent Systems Development, Basics of

Software Engineering and other study courses. The teaching staff also cooperates in the development of study course programmes and their updating. There are study courses, which are developed by teaching staff of one department, for example Computer Networks (CISCO) I, II and III, Computer Network Administration I and II, Basics of Machine Learning and others. There are also study courses, in the development and implementation of which teaching staff from different departments are involved, for example, Computer Control Tasks in Production. Another important form of cooperation of teaching staff is participation in scientific research projects, as usually several teaching staff members are involved in the projects.

The mutual cooperation of the teaching staff within the study programme is evaluated as very good, because the faculty has a positive and productive working atmosphere.

The faculty uses several methods of promoting the cooperation of teaching staff. Some teaching staff and/or researchers create joint scientific publications or participate in the implementation of scientific projects. Faculty cooperation is promoted by organising joint department and faculty meetings, where topical issues related to the implementation of the study programme and organisation of the study process, programme content, sequence of courses, goals, results, the need to renew courses and other issues are discussed. In some cases, for a more detailed discussion of a specific topic, teaching staff meet individually in small working groups. Two years ago, for face-to-face meetings of groups in the faculty, the seminar room was organised and equipped. It is located in the palace in the faculty's Room 35. The DSK library has also been created in this room, where lecturers and students can read industry books purchased by the faculty. On the other hand, for remote online group meetings, teaching staff use the Moodle system module Big Blue Button, Zoom or some other live video communication tools. Teaching staff also participate in annual academic and scientific conferences organised by LBTU, where colleagues from LBTU and other universities (including foreign ones) share their experiences and current challenges.

In order to promote cooperation between teaching staff and students, a ITF student self-government organises various events and activities. Examples are the ITF days and the Chess tournament. In case of any questions, representatives of the student self-government meet with study programme directors and faculty management. In these meetings, the study process, achievements, difficulties and challenges faced by the students are discussed. The obtained information is used by study programme directors and faculty management to improve individual study courses and study programmes.

At the university level, before the COVID-19 pandemic, an employee sports day was organised, where the teaching staff of the faculty jointly participated in various sports activities, defending the honour of their faculty, which also promoted mutual cooperation and cohesion.

The study programme is constantly reviewed, and in the event that a new study course is developed, the interconnection of the courses is reviewed and which study courses shall be completed prior to the learning of the new study course is defined. Also, the existing study courses in the programme are planned in a certain order to ensure sequential and consistent acquisition of knowledge and its practical application.

The ratio of the number of students and teaching staff within the study programme at the 2022/2023 is 18,4/169.

Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	DVDZ_diploms_pielikums_en.zip	DVDZ_diploms_pielikums_lv.zip
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)	bak_stud_progr_Datorvadiba_un_datorzinatne_AIP_atzinums_EN.docx	bak_stud_progr_Datorvadiba_un_datorzinatne_AIP_atzinums.edoc
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period	dvdz_studentu_statistika_lv_eng.xlsx	dvdz_studentu_statistika_lv_eng.xlsx
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard	dvdz_atbilstiba_valsts_standartam_en.pdf	dvdz_atbilstiba_valsts_standartam_lv.pdf
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)		
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	DVDZ_kursu_matrica_lv_eng.xlsx	DVDZ_kursu_matrica_lv_eng.xlsx
The curriculum of the study programme (for each type and form of the implementation of the study programme)	DVDZ_studiju_plans_en.pdf	DVDZ_studiju_plans_lv.pdf
Descriptions of the study courses/ modules	dvdz_kursu_programmas_en.zip	dvdz_kursu_programmas_lv.zip
Description of the organisation of the internship of the students (if applicable)	itf_lbtu_praksu_nolikums_lv_en.pdf	itf_lbtu_praksu_nolikums_lv_en.pdf
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)	LBTU_apliecinajums_studiju_virzienam_Informacijas_tehnologijas_EN.docx	LBTU_apliecinajums_studiju_virzienam_Informacijas_tehnologijas.edoc

Information Technologies (51483)

Study field	<i>Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science</i>
ProcedureStudyProgram.Name	<i>Information Technologies</i>
Education classification code	<i>51483</i>
Type of the study programme	<i>Doctoral study programme</i>
Name of the study programme director	<i>Ivars</i>
Surname of the study programme director	<i>Mozga</i>
E-mail of the study programme director	<i>ivars.mozga@llu.lv</i>
Title of the study programme director	<i>Dr.sc.ing.</i>
Phone of the study programme director	<i>63005701</i>
Goal of the study programme	<i>Promote the development of information technologies engineering and create an international generation of highly qualified young scientists in the information technologies sector, as well as provide the academic and scientific staff of the Information Technologies Faculty of the Latvia University of Lifesciences and Technologies (LBTU).</i>
Tasks of the study programme	<ul style="list-style-type: none"> <i>• to ensure a high-quality doctoral study process in order to prepare qualified scientists, teachers and engineers who are competitive in the labor market of Latvia and the European Union, who could meet the current and prospective needs of the Latvian and world economy using the latest technologies and solutions in engineering related to information and communication technologies;</i> <i>• promote the development of a creative, responsible and lifelong learning-motivated personality;</i> <i>• develop problem-solving skills, the ability to set strategic and tactical goals and explain actions to achieve these goals;</i> <i>• develop innovation and creativity as important skills necessary for an engineer and manager working in the field of information technologies;</i> <i>• ensure the study process that complies with Latvian state norms and regulations, the LBTU Constitution, as well as LBTU internal norms, which in turn determine the general structure of the study process;</i> <i>• to create a strategic vision and understanding of engineering sciences in matters related to information and communication technologies</i>

Results of the study programme	<ul style="list-style-type: none"> • <i>knows and understands the most current scientific theories and insights, orients himself in the terminology used in foreign languages in the sub-sectors of information technologies, manages the latest research methodology and modern research methods implemented in one of the study programs of computer control of biosystems or technology and management of e-studies, or systems analysis, modeling and design, or in the field of computer management of technical systems and various areas related to information technologies;</i> • <i>is able to independently evaluate and choose appropriate methods for scientific research in the areas of computer control of biosystems or e-study technology and management, or systems analysis, modeling and design, or computer control of technical systems. Is able to conduct theoretical and empirical research, collect, analyze, critically evaluate and systematize the information obtained, knows the methods of data processing and analysis obtained from research</i> • <i>is able to communicate with the scientific community and society, including at scientific conferences and seminars, about his scientific field of activity and the role of information technologies as an application of interdisciplinary science. Able to independently improve their scientific qualifications, implement scientific projects, manage research or development tasks in companies and organizations</i> • <i>has contributed to expanding the boundaries of knowledge in the chosen field of computer control of biosystems or e-study technology and management, or systems analysis, modeling and design, or computer control of technical systems, or has given a new understanding to existing knowledge and its applications in practice by carrying out original research, of which part is at the level of internationally cited publications</i> • <i>is able to provide creative research in solving complex issues related to biosystem computer control or e-study technology and management, or systems analysis, modeling and design, or computer control of technical systems by performing critical analysis and evaluation of results</i> • <i>able to independently put forward research ideas, plan, structure and manage scientific projects, participate in the implementation of international projects</i>
Final examination upon the completion of the study programme	PhD Thesis

Study programme forms

Full time studies - 3 years - latvian

Study type and form	<i>Full time studies</i>
Duration in full years	3
Duration in month	0
Language	<i>latvian</i>
Amount (CP)	120

Admission requirements (in English)	<i>Master's degree or equivalent higher education in information technology, computer engineering, electronics, telecommunications, computer management and computer science and related fields of science. If the education was obtained in another branch of science, an entrance exam must be taken.</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Doctoral Degree Doctor of Science (Ph.D.) in Engineering Science and Technology</i>
Qualification to be obtained (in english)	-

Places of implementation

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

Full time studies - 3 years - english

Study type and form	<i>Full time studies</i>
Duration in full years	<i>3</i>
Duration in month	<i>0</i>
Language	<i>english</i>
Amount (CP)	<i>120</i>
Admission requirements (in English)	<i>Master's degree or equivalent higher education in information technology, computer engineering, electronics, telecommunications, computer management and computer science and related fields of science. If the education was obtained in another branch of science, an entrance exam must be taken. English language skills at least B2 level.</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Doctoral Degree Doctor of Science (Ph.D.) in Engineering Science and Technology</i>
Qualification to be obtained (in english)	-

Places of implementation

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

3.1. Indicators Describing the Study Programme

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

Since the previous study direction accreditation sheet was issued, the following changes have been made:

1. The head of the study programme changed for the information technology (IT) doctoral study programme. The changes came into effect in the 2014/2015 academic year.
2. Part-time correspondence studies are no longer implemented.
3. In 2020, the awarded degree was changed to "Doctor of Science degree Doctor of Science (Ph.D.) in electrical engineering, electronics, information and communication technologies" due to changes in the regulatory documents of the Republic of Latvia.
4. Currently, the degree to be awarded for the evaluation procedure is being changed to "Doctor of Science (Ph.D.) in Engineering Science and Technology", due to changes in the Law on Higher Education Institutions.

Other parameters of the study programme did not change since the previous accreditation sheet was issued for the field of study.

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

Graduates of the doctoral study programme in Information Technology are awarded the scientific degree of doctor of engineering sciences (annex: Doktora_diploms_Informacijas_EN.pdf), thus achieving the goal of the doctoral studies: to encourage progress in IT engineering and to train a generation of highly qualified, world-class young scientists in the field of information technology, and to provide the Latvian University of Biosciences and Technologies (LBTU) Faculty of Information Technologies (ITF) with academic and research staff.

Having completed the study programme and defended their doctoral thesis, the doctoral student knows and understands the latest scientific theories and findings in the field of Information and Communication Technology (ICT), the language of science, and databases related to their field of research, the student has a systemic understanding of problems and patterns in their field of research, and a grasp of the current theoretical and empirical research methodologies in their field of research.

A holder of a doctoral degree can independently evaluate and choose the appropriate methodology for scientific research, can independently conduct theoretical and empirical research, while cooperating with their advisor and other persons involved in the research process, can independently improve their scientific qualifications by participating in research projects, speaking at conferences, debating in seminars and work groups, can create new knowledge and new understanding in the chosen field of research by conducting original research of significant scope, some of which being at the level of internationally cited publications, can responsibly evaluate research and its results in the context of interdisciplinarity and sustainability, and can manage research or development tasks in companies, institutions, and organisations, and discuss their field of scientific activity with industry specialists, broader scientific circles, and the public as a whole.

The graduate can independently put forward innovative research ideas, critically analyse, synthesise, and evaluate them in the context of their ICT field and across fields; they can perform significant ICT research in a responsible, critical, analytical, and evaluative manner, publishing research results both in Latvia and abroad in internationally recognised and cited publications; the student can independently plan and manage scientific projects, including international ones; they can lead research and be involved in teaching young scientists; they can contribute to the sustainable development of the ICT field in academic and professional contexts.

The right to participate in the competition for LBTU ITF doctoral studies in information technology, computer engineering, electronics, telecommunications, computer management and computer science in the field of study is for persons who have obtained a master's degree or an equivalent higher education in information technology, computer technology, electronics, telecommunications, computer management and computer science and related sciences. in industries. For those admission applicants who obtained a master's degree in another field of science, the director of the relevant doctoral study program and the department/institute may set an entrance exam in the chosen field of science.

The main evaluation criterion of the entrance exam is the applicant's level of knowledge in the basic theoretical topics of the specialisation chosen as part of the study programme.

In the appendix *dok_stud_progr_Informācijas tehnoloģijas_AIP_atzinums_EN.docx* the conclusion of the Council of Higher Education is added, because less than 250 full-time students are expected to study in the doctoral study program.

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

There are many ICT companies in Latvia (the total number of companies in the ICT industry in 2020 is 7056 according to the data of the Central Statistical Bureau (CSB) and the number of people employed in the ICT sector is more than 38 thousand (according to CSB data). ICT is an expanding industry in Latvia, showing much potential, demonstrated by the rapid growth of the industry. The turnover of the ICT industry already exceeds EUR 4 billion (according to CSB data, see https://data.stat.gov.lv/pxweb/lv/OSP_PUB) and more and more Latvian companies offer services internationally.

The shortage of ICT specialists in Latvia is considerable, as evidenced by the fact that more than 80% of final-year students already start working in their specialisation field. The Ministry of Economics of Latvia also recognises the lack of ICT specialists. Long-term labour market forecasts

prepared by the Ministry envisage wider use of various technologies and innovations on a daily basis, covering the employment needs of industries. The Ministry's 2020 report on the development of Latvia's national economy (<https://www.em.gov.lv/lv/informatie-zinojumi>) predicts that by 2027 there will be a shortage of ICT and engineering specialists (up to ~14 thousand in STEM industries).

Articles and data published in mass media and news portals show that the information technology sector is one of the most in-demand on the job market (<https://www.delfi.lv/businesses/versijas/lilita-trupa-it-specialistu-trukums-nozare-un-request-continues-growing.d?id=53308893>).

Every year, around 700 young specialists complete their studies in the field of information technologies in Latvia; however, this number falls well short of what is needed to raise the IT field in Latvia to a quality approaching the global level (<https://ir.lv/2021/07/16/it-specialistu-trukums-nozare-un-pieprasijums-turpina-augt/>).

Graduates of the study programme have great employment opportunities in Latvia, working in local and international scientific/technical projects that require knowledge and skills in ICT. In analysing the potential, one should note that the development of this part of the national economy does not require significant material resources, but it does need significant human resources. The field of ICT has become one of the niches for the Latvian economy, as the country has competent specialists trained to an appropriate level.

The doctoral study programme in IT prepares a broad range of highly qualified IT specialists with integrated education and systemic thinking, independent scientific and teaching skills, capable of working in economic entities, in research institutes, IT companies, municipal government, ministries, and to function as evaluators of scientific achievements, experts within international organisations, etc.

Data from the website Algas.lv (<https://www.algas.lv/algu-informacija/informacijas-tehnologijas>) was used when evaluating the remuneration of IT industry specialists. As of 8 November 2022, the salary range for related positions in IT is currently as follows: EUR 950.00 (minimum salary) to EUR 3106.00 (top average; the actual top salary is higher). About 10% of the employees may have a salary lower than the specified minimum, and 10% higher than the specified maximum.

More than 60 job offers have been posted on this same website since 22 September 2022, with a salary range of 1100 to 8000 EUR.

Starting from 2013, during the reporting period 85% or 11 graduates of the LBTU IT doctoral study programme with a scientific degree were employed in the education sector, of which 8, or 62% of the total number of graduates, work at LBTU ITF or at LBTU, as academic and/or research staff. The remaining 15% are not directly associated with the education sector and their duties are related to work in a ministry (1 graduate), and for a company operating in the field (1 graduate).

The graduates work in the following institutions: Latvian University of Life Science and Technology (8 graduates), University of Latvia (1 graduate), Riga Technical University (2 graduates), Ministry of Agriculture (1 graduate), and Logics Research Centre (1 graduate).

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

The total number of full-time doctoral students in the 2021/2022 programme was 6 (see Annex phd_studentu_dati_lv_en.pdf). Between the 2014/2015 and 2021/2022 academic years, the number of doctoral students varied from 5 to 10. The variability in the number of doctoral students in the programme can be largely explained by the changing number of ICT master graduates in all Latvian universities, including the variability in the number of LBTU ITF bachelor and master students, as well as the huge demand for IT students on the labour market, where bachelor and master students and graduates are employed at various levels of ICT companies, without the need for a higher academic degree.

As statistical data shows (see annex phd_studentu_dati_lv_en.pdf), two groups should be distinguished, with students who have completed their doctoral studies and students who have not completed their doctoral studies, who can be classified as dropouts. Student dropout mainly takes place during the initial semesters of studies, when the students who come for doctoral studies realise that there is a greater emphasis on the student's independent research, and not on traditional approaches to learning, such as in bachelor or master studies, and therefore are unable to perform proper scientific work and continue their studies. Meanwhile, the students in the second group have successfully completed the training of the theoretical courses of the doctoral studies, but for various reasons cannot successfully manage writing a scientific paper (doctoral thesis). The most common reason for this is that their research that started as a result of rapidly developing trends in the ICT technologies loses its relevance, and the originality of the paper, and the groundwork that has been done for it during the studies, requires serious restructuring, which doctoral students are often unable to find time for because of professional or family duties.

From the very beginnings of LBTU ITF as a faculty, in order to deliver a comprehensive study process, many teaching staff members were also brought in from other scientific institutions, and since the first ITF graduates, their involvement in this faculty as permanent academic and scientific workers enabling their further education in master and doctoral studies was taken into account. It can be concluded that one of the main goals of the ITF doctoral study programme, which is to 'provide the academic and scientific staff to the Faculty of Information Technology', is being successfully implemented, which can also be demonstrated by the education of the academic and scientific staff currently working at the faculty. However, statistical data on current doctoral students also shows that the number of doctoral students is no longer as high as it was at the beginning of the faculty's existence.

During the reporting period, 3 part-time students were admitted to the study programme and they successfully completed their doctoral studies, with only 1 graduate (with a defended doctoral thesis). Although there has been interest, and all the necessary infrastructure, materials, and equipment are available, no foreign doctoral students were admitted during the reporting period.

The working languages of the study programme are Latvian and English. Doctoral studies involve participation in scientific conferences and the preparation of scientific publications, of which at least a minimum number must be included in indexed databases (Scopus, Web of Science, etc.), meaning that English is logically a language that is integral to the studies, regardless of the nationality of the doctoral student.

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

3.2. The Content of Studies and Implementation Thereof

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

The doctor of engineering degree that one gains as part of the IT doctoral programme is based on the latest achievements and knowledge of the field of electrical engineering, electronics, information and communication technologies. This is enabled by the qualifications of the academic staff involved in the teaching of the study programme, through active research activities on a national and international scale, and with the involvement of foreign reviewers in the review of the doctoral thesis. Every 6 years, the professors/academic staff involved in the study programme have to demonstrate their qualifications, academic and research activities that they performed in the last years as part of competition for the position, thus confirming that their work is in accordance with the latest achievements and knowledge in the industry. The content of individual courses of the doctoral programme is adjusted according to the needs of the industry and the labour market and current trends related to the scientific topic chosen by the doctoral student.

A detailed course curriculum assessment was done in 2019 and 2020, within the ESF project 'Improvement of LBTU management' (<https://www.ltu.lv/lv/projekti/apstiprinatie-projekti/2018/latvijas-lauksaimniecibas-universitates-par-valdibas-pilnveide>), the evaluation of the study programme content and the development of the improvement plan was carried out based on recommendations by foreign industry experts. A detailed evaluation by Dynamic University, which pointed at the programme's potential weaknesses and strengths, also helped improve the study programme (a sample of the study programme's improvement plan prepared as a result of the project is offered for the master study programme in the annex [itf_pilnveides_plans_en.pdf](#)).

The results of the study programme are achieved gradually during the full cycle of the studies (see annex [phd_studiju_plans_lv_en.pdf](#)).

The goals, results, and content of the courses (see annex [phd_kursu_programmas_en.zip](#)) enable the achievement of the goals and expected results of the study programme.

Detailed information is gathered through the mapping of the study programme (see annex [phd_studiju_kursu_kartejums_lv_en.xlsx](#)), and one can track the results of individual courses and the study programme as a whole.

Within the IT doctoral programme, the degree is awarded by the LBTU doctoral promotion board working in the fields of electrical engineering, electronics, information and communication

technology. The composition of the doctoral promotion board is approved by the order of the rector, and it includes the number of experts of the Latvian Council of Science (LSC) required by the Cabinet Regulation. The current board includes 6 Latvian Council of Science experts. The order may determine the term of office of the board. The members of the doctoral promotion board may change, for example, if the Latvian Council of Science term of office changes for some of its members, or in the case of interdisciplinary doctoral theses, a representative of the relevant industry is included in the board as part of the defence of the doctoral thesis in question. Usually, the doctoral promotion board mainly consists of LBTU, RTU, and UL doctors. According to Cabinet Regulation 1001 'Procedure and criteria for the award of a doctoral degree in science', the degree in science is awarded for a doctoral thesis that is independently prepared and publicly defended under the guidance of an experienced scientist (thesis advisor), and which contains the results of original scientific research and provides new knowledge in the relevant field or subfield of science. The doctoral promotion board evaluates the submitted papers in accordance with the existing legislative requirements, incl. in terms of originality and relevance to the field of science in question. All papers submitted during the reporting period were successfully defended with the doctoral promotion board in the fields of electrical engineering, electronics, and information and communication technology.

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

The doctoral degree in engineering earned through the Information Technology Doctoral Studies Program is rooted in the most recent advancements and understanding in the areas of electrical engineering, electronics, information, and communication technology. This is maintained through the high qualifications of the professors involved in the program and their active research activities both nationally and internationally, as well as the involvement of foreign evaluators in the examination of the doctoral thesis. Every six years, those professors and academic staff participating in the program must demonstrate their qualifications, academic and research endeavors in the recent years through a competition for a job position, thereby verifying their work aligns with the newest developments and insights in the field. The course material for individual studies within the Doctoral Studies Program is adjusted based on the industry and job market needs and current trends related to the scientific theme chosen by the doctoral candidate.

There are four fields of study in the IT doctoral study programme: Computer Control of Technical Systems; Computer Control of Biosystems; Systems Analysis, Modelling, and Design; E-learning Technologies and Management.

As part of the Computer Control of Technical Systems course, the doctoral students focus on studying the latest trends in the computer control of technical systems, trying to predict their development in the future. Their analysis includes the potential of speeding up the development of computer control, of reducing expenses, improving energy efficiency, increasing safety, and implementing other desirable improvements through modern IT methods.

As part of the Computer Control of Biosystems course, the doctoral students focus on studying the latest trends in computer control and analysis of biosystems. The potential of using computer

technologies in solving the tasks of bioinformatics, systems biology, and synthetic biology is analysed. The course examines the methods that can be used to predict the behaviour of modified biological systems and the side effects caused by the modifications.

As part of the Systems Analysis, Modelling, and Design course, the doctoral students learn theoretical methods and tools for preparing and explaining solutions to complex problems; they research, develop, and modify methods, models and system modelling and simulation software, database systems, decision support systems, information systems and smart systems. They get familiar with operations research, systems engineering, risk analysis and assessment, including data collection, analysis and use of statistical methods, as well as smart computer technologies.

As part of the E-learning Technologies and Management course, the doctoral students study in detail the uses of information and communication technologies in the creation and maintenance of e-learning systems, and knowledge creation and transfer processes. E-learning solutions are discussed at the individual, organisational, and societal level. Different e-system approaches to user interaction using different interfaces and methodologies are evaluated.

The research fields taught as part of doctoral studies largely determine the range of topics covered in bachelor and master theses, especially given that many doctoral thesis advisors also supervise master and bachelor theses.

Doctoral students studying in the department play an important role in the development of the scientific direction of the faculty. A large part of doctoral students already during their studies start active research on topics related to the respective scientific branch and participate in scientific projects. A large number of doctoral students solve interdisciplinary problems and get involved in one of the faculty's primary science directions: "IT solutions, application of mathematical modeling and statistics in agriculture, environment and forestry".

Some of the interdisciplinary topics chosen by doctoral students, which are related to the scientific directions defined by the faculty: "Possibilities of using open data in precision agriculture", "Combination and analysis of data from multiple sources for interactive processing and visualization", "Intelligent algorithms for optimization of forest management planning processes", "Innovative traffic flow organization smart city concepts", "Application of decision support system in the management of multi-object biological systems", "Classification of data binding to data protection regulations with machine learning methods", "Geospatial data infrastructure application solutions", "Implementation of geographic information system solutions for the development of precision beekeeping".

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

The main principles of doctoral studies are defined in the LBTU doctoral studies regulations. The information technology doctoral study programme can be studied full-time with state funding, and

full-time or part-time, with the funding provided by individuals or legal entities. During the studies, the doctoral student completes individual theoretical courses, takes doctoral promotion exams, conducts research, presents research results at scientific conferences, publishes them in internationally recognised and cited scientific publications. At the end of the studies, they prepare a doctoral thesis and its summary and submit it for defence.

The study programme is learned through lectures, seminars, practical lessons, independent assignments and consultations with course instructors and scientific advisors. The teaching methods used in the courses are chosen to ensure the achievement of the programme's goals.

The study results are formulated in the descriptions of the courses taught in the information technology doctoral study programme, and the teaching methods chosen as part of the study process ensure the best possible achievement of these results, taking into account the individual needs of the doctoral students.

Taking into account the specifics of the study programme and the number of doctoral students, it is possible to implement a maximally personalised approach to the doctoral students of the doctoral study programme and to take into account the diversity of the conditions of their studies and their needs, for example by linking the content of a course to the topic of the doctoral student's doctoral thesis or the relevant field of science. As part of the doctoral studies, the student's independence is encouraged as much as possible, while providing the necessary guidance and support of the teaching staff, scientific advisor, or head of the study programme. Such an approach also builds mutual respect between the doctoral student and the scientific advisor, ensuring the implementation of the principles of student-centred education in the study process.

IT doctoral study programme students can submit applications and complaints pertaining to the implementation of the study process, to breaches of study and work regulations, and can receive an official response within the specified period, in accordance with the procedures specified in Section 10 of the Doctoral Study Regulations.

It is planned to create the Doctoral School at LBTU, grouping doctoral study programs in the following areas of specialization: biosciences, engineering sciences and social sciences.

The long-term goal of the doctoral school is to ensure high-quality implementation of doctoral-level studies and the development of professional, including research and teaching, competences of doctoral students in an interdisciplinary environment, as well as in individual branches and sub-branches of science in accordance with the development strategy of LBTU.

The main tasks of the Doctoral School are:

- 1) attract applicants for admission in an open competition to vacant study places in doctoral study programs;
- 2) organize the implementation of a licensed or accredited doctoral study program, as well as a joint doctoral study program, including in cooperation with other doctoral schools and cooperation partners of the doctoral school;
- 3) to ensure the critical capacity of the academic environment, dynamic development and openness to international cooperation in doctoral study programs,
- 4) to ensure and monitor the quality of conducting doctoral theses in accordance with regulatory enactments and university regulations
- 5) to organize the establishment of a doctoral thesis defense, the process of awarding a doctoral degree, and materially and technically ensure the work of the doctoral thesis;

- 6) organize the distribution of funding for the implementation of doctoral study programs and the operation of the doctoral school;
- 7) provide doctoral students with study courses for the acquisition of widely applicable skills, regardless of the study direction of the doctoral study program;
- 8) organize and develop cooperation opportunities with other doctoral schools;
- 9) promote interdisciplinary scientific research;
- 10) ensure and organize the mobility of doctoral students;
- 11) to provide career support for doctoral students, taking into account their individual goals and motivation, the situation in the labor market, as well as the possibilities of doctoral career choices both in the higher education and research environment and outside of it.

In order to implement the set goals and tasks, LBTU plans to establish the Doctoral School within the framework of a common management model. Structural changes must take place at LBTU, because currently doctoral level studies are not completely separated from basic studies and master's level studies, they are currently coordinated and administered by the LBTU Study Center. It is planned to make amendments to the structure of LBTU, transferring the functions of the Study Center for supervising the studies of doctoral students to the competence of the Vice-Rector of Sciences within the framework of the Doctoral School.

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

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

As stated in the regulations of the LBTU doctoral promotion council (annex LBTU_Promocijas_padomes_nolikums_en.pdf), a doctoral degree in science is awarded for a doctoral thesis that is independently prepared and publicly defended under the guidance of an experienced scientist ('thesis advisor'), and which contains the results of original scientific research and provides new knowledge in the relevant field or subfield of science. Working towards a second degree in another field of science, one can prepare a doctoral thesis without the supervision of a thesis advisor, using consultations with industry leading specialists ('consultants'). The main results of the doctoral thesis must be published in scientific publications.

A doctoral thesis can be:

* a thesis;

* a thematically unified collection of scientific publications. The publications must be published or approved for publication in scientific periodicals that are anonymously peer reviewed, available in international repositories of scientific information, and are cited in internationally available databases;

* a monograph: a peer-reviewed scientific book dedicated to one topic, available in international repositories of scientific information, and containing a bibliography and a summary in a foreign language.

The requirements for the scope, structure and format of the doctoral thesis are set in the 'Regulations on the technical formatting of the scientific papers to be submitted to the doctoral promotion board' approved by the study council of the LBTU (Annex LBTU_Darba_noformejuma_noteikumi_en.pdf).

The doctoral promotion process is described in the LBTU regulation 'Regulations on the promotion councils and the promotion' (Annex LBTU_Promocijas_padomes_nolikums_en.pdf), which covers matters pertaining to the doctoral thesis and its management, the submission of a doctoral thesis, its evaluation and public defence, the award of the degree, and options of challenging and appealing decisions.

According to the procedure for awarding a doctoral degree in science set in Section 11 of the Law on Scientific Activity, the degree is awarded to a person after they successfully defend their doctoral thesis with the doctoral promotion board. The Cabinet of Ministers sets the procedure for awarding the doctoral degree in science. With their thesis, the candidate for the doctoral degree in science demonstrates that they have independently conducted original research, they know how to independently plan research, they have mastered the research methodology and the methods required for work in their specialisation, they can independently analyse the obtained results and draw appropriate conclusions. The doctoral thesis may be defended by a candidate for the doctoral degree in science who has successfully completed the academic part of an accredited doctoral study programme and prepared a doctoral thesis for its defence, or whose academic activity performed outside this programme is equivalent to it, observing the procedures specified in this programme, and according to the criteria set by the Cabinet of Ministers; the person must also successfully pass the exams in the chosen field of science. The Cabinet of Ministers assigns the right to award doctoral degrees in science to the university having received the expert opinion of the Latvian Council of Science. A university can submit an application to the Latvian Council of Science to give it the right to award a doctoral degree in science, if it teaches an accredited doctoral study programme, and no less than three Latvian Council of Science experts are involved in the teaching of the programme. The award of a doctoral degree is supervised by the State Scientific Qualification Commission established by the Cabinet of Ministers. This commission operates according to the procedure established by the Cabinet of Ministers. The doctoral thesis may be submitted in the official language of Latvia, or in another official language of the EU, accompanied by a translation of the summary of the doctoral thesis into the official language of Latvia. The public defence can take place in the official language of Latvia or in one of the other official languages of the European Union, subject to agreement with the author and with the approval of the doctoral promotion board in question.

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

The topic of the doctoral thesis is chosen by the potential doctoral student before they enter the doctoral programme. Before the submission of the documents, the applicant agrees with the potential advisor of the thesis on the supervision of the thesis and its topic. When submitting documents for enrolment to doctoral studies, the applicant submits a candidate application, in which they indicate the advisor for the doctoral thesis, the topic of the doctoral thesis, the basis and practical application for the doctoral thesis, the relevance of the topic (compliance with the priority research fields defined in the LBTU Strategy), research goals and tasks, methodology, as well as research experience and scientific achievements. The admission of applicants to doctoral studies is decided at the meeting of the Council of Science, where the applicant presents their proposed research to the members of the council.

In some cases, the topics of doctoral theses are chosen as a continuation of the research started in the master thesis, but most often in connection with the field of the doctoral student's work or research projects, as well as in accordance with the priority research fields determined in the LBTU Strategy, such as 'Uniform quality model for information technology studies and development', 'Development of principles for uniform document management systems in state administration institutions', 'Prototype of interactive decision-making support system with a automatic rejection mechanism', 'Development of a learning competence management solution', 'Use of a decision assistance system in the management of multi-object biological systems', 'Implementation of geospatial information infrastructure', etc.

The doctoral thesis prepared at the end of doctoral studies must be defended with the LBTU doctoral promotion board for electrical engineering, electronics, information and communication technology. After a successful defence of the doctoral thesis, the doctoral student obtains a doctoral degree in science (PhD) of the Republic of Latvia, which is confirmed by a diploma issued by the doctoral promotion board. The decision to award or refuse a degree is taken by the council, by a simple majority of open votes cast. All papers submitted to the doctoral promotion board are successfully defended.

3.3. Resources and Provision of the Study Programme

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

The infrastructure available for the teaching of the study programme is described in Section 2.3.2 of the general features of the field of study.

The students have access to all necessary study literature. All the resources and services of the LBTU Fundamental Library described in Sections 2.3.1–2.3.3 of this report are available to the students of all major study programmes, including doctoral students. Special literature is also available in the ITF libraries, located in all the departments of the faculty, and available from

individual course instructors (see Section 2.3.3). Their materials are expanded every year, including using the publications offered annually by publishers. Taking into account the extremely rapid development of the IT industry, printed publications in many cases do not manage to follow quickly enough; however, the availability of information online is broadly developed in the industry. For example, training materials for the certification of different levels of employees, such as those of the International Software Testing Qualifications Board, <http://www.istqb.org/>, and IEEE Computer Society, <https://www.computer.org/education/bodies-of-knowledge/software-engineering>

Within the LBTU information system, logged-in doctoral students and teaching staff have access to the e-book database Taylor & Francis Group CRC Press, EBSCO eBook Academic Collection e-books, EBSCO e-journal database, ScienceDirect journals and Wiley Online Journals.

The LBTU Fundamental Library provides ample opportunities for getting learning and scientific literature on the topics of information and communication technologies. It is possible to use interlibrary subscription services. Sectoral publications for studies and research work are available in the Subscription, Study Literature Subscription, Reading Room, and Deposit Library of the United Nations Food and Agriculture Organisation. Factual and bibliographic inquiries on various issues related to IT and other sectors are available at the Bibliographic Information Division.

Faculty and doctoral students are informed about the databases to which access is granted on a trial basis. Databases of instructor publications and doctoral theses have also been created. The library staff regularly organises new seminars on the use of databases and on new databases available; it provides consultations on its latest offers, and advises students on how to search for scientific information.

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

For the preparation of high-quality research papers as part of the study programme, doctoral students are provided with the base science funding allocated to the Faculty of Information Technology, and the scientific equipment available in the rest of LBTU, as well as the regularly announced doctoral grant competitions of LBTU.

LBTU ITF is awarded base science funding every year, intended for various scientific activities by doctoral students and faculty members. The base science funding can be used to pay for publication as part of various international scientific conferences, and to pay conference participation fees. Various international conferences, seminars for doctoral students are organised within the university; there is also the LBTU scientific journal, Rural Sustainability Research, indexed in the Scopus database, and the international scientific journal Baltic Journal of Modern Computing, where doctoral students can publish their scientific articles without fees. The Baltic Journal of Modern Computing is a quarterly international scientific gold open-access electronic peer-reviewed journal, published in cooperation with several universities: LBTU, University of Latvia, Liepāja University, Vidzeme University of Applied Sciences, Vilnius University. The aim of the journal is to provide a platform for established and emerging scholars and academics worldwide, so that they can share their professional and academic expertise in the fields of computer science, software engineering, information technology, information systems, computer engineering, computational didactics, and related disciplines.

Over many years, LBTU, as a scientific university, has set up various research laboratories and equipped them with modern scientific equipment and precise measuring devices, which all doctoral students can use as part of their research. With reference to the 2020–2026 LBTU Doctoral Study Programme Development Plan for the Introduction of the New Doctoral Model, it can be concluded that even now doctoral studies at LBTU are fully based on research practice, as doctoral students are actively involved in various research projects, and they have access to research infrastructure and laboratory equipment located at LBTU, its subordinate scientific institutes, and experimental bases. Doctoral students have access to services provided by the Technology and Knowledge Transfer Unit and the Centre for Bioeconomy and Sustainable Resource Management. By 2026, it is also planned to improve the research environment available to LBTU doctoral students, with the intention of creating at least 50 doctoral student grant places for all LBTU doctoral programmes, along with a doctoral student salary of EUR 1000 per month for 50% full-time work, additionally providing at least 25% of full-time work at LBTU or in research projects set up by scientific institutions.

Furthermore, LBTU regularly announces various competitions for doctoral student assistance grants, which include compensation for the doctoral student engaging in studies or research, and for the research costs incurred by the doctoral student as part of their research, including the purchase of materials necessary for their research, cost of protection of technology rights and outsourcing, training costs and costs of networking events, including business trips, conference and information event participation fees, based on the per-unit cost methodology approved by the managing institution. The purpose of awarding a doctoral grant is to strengthen the staff of higher education institutions and scientific institutions in strategic areas of specialisation, increasing the number of specialists who have a doctorate degree and can plan, create, and bring products and services with high added value to production, promoting the development of the national economy based on innovation, to enable the training of competitive scientists for the international research community and to create a research environment for doctoral students that serves as a basis for the further development of the branch of science and the implementation of the ideas of applied research in practice.

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

The number of state-funded student places is coordinated via a trilateral agreement between the Ministry of Education and Science (MoES), the Ministry of Agriculture (MoA), and Latvia University of Life Sciences and Technologies (LBTU). The trilateral financing agreement determines the base cost of one student place, study level coefficients, social provisioning per student place, and tuition coefficients in topic fields of education. The coefficients for each topic field of education are different. They are stipulated in Cabinet Regulation 'Procedure in which universities and colleges are financed from the national budget'.

Every year, the LBTU Senate, and since 2022, the LBTU Council, approves the distribution of revenue and expenses within the LBTU general budget structure, prepared in accordance with the

Law on the State Budget adopted by the national Parliament every year, and the annual LBTU Rector Order 'On LBTU General Budget Planning'. Control and audit of the general budget is performed by an independent sworn auditor, whose opinion and report are reviewed and approved by the Senate of LBTU.

Before the approval of the allocation of the LBTU general budget revenue and expenses in the Senate, it is reviewed, discussed, and approved by the Work Group for Resource Use and Development, which consists of the rector, vice-rectors, chancellor, LBTU director, deans of all faculties, the head of the resource accounting centre/chief accountant, head of the financial planning centre, key economists, and key specialists in real estate and legal issues.

The allocation of income and expenses approved by the LBTU Senate determines that 80% of the funding provided by the state consists of remuneration costs, and 20%, of other costs. 60% of the funding of the studies consists of remuneration costs, and 40% other costs, of which 20% is directly at the disposal of the faculty that implements the respective study programme. The amount of basic science funding is calculated and allocated annually based on active research activities. 50% of the basic science funding is at the immediate disposal of the faculty, and 50% is intended to cover centralised costs. Science funding consists of funding acquired for the implementation of projects.

The **2022** trilateral agreement on state funding for study programmes stipulates that the base cost of one student place is EUR 1630.11, with the study level coefficient for doctoral programmes being 3 and the social provisioning of the student place for bachelor programmes being EUR 1009.53, the topic area of education cost coefficient for the doctoral programme 'Information technology' being 1.85. Thus, the cost per student in the doctoral programme 'Information technology' is EUR 10,043.89, which has remained unchanged since 2021.

In previous years, the cost per student was as follows:

- in 2021: EUR 10043.89,
- in 2020: EUR 9779.50,
- in 2019: EUR 9778.83,
- in 2018: EUR 9469.33,
- in 2017: EUR 9139.50,
- in 2016: EUR 7776.00,

3.4. Teaching Staff

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

In line with the LBTU Doctoral Studies Regulations, the doctoral study programme is taught by the

highly qualified academic and scientific staff of LBTU. The doctoral thesis advisor may be a doctor of science who conducts research in a relevant (sub)field of science, who has generally recognised peer-reviewed scientific publications covering research in this field of science, and who participates with reports in international scientific conferences.

The Law on Higher Education Institutions requires that at least five persons with a doctoral degree participate in the teaching of an academic doctoral study programme, of which at least three are experts in the respective field, as approved by the Latvian Council of Science.

LBTU ITF doctoral students, in order to successfully complete their theoretical doctoral training, must complete 4 mandatory courses, but they can optionally choose other theoretical courses offered to LBTU doctoral students, the training process of which involves both instructors from other university units and from ITF, and the credit obtained during these courses counts towards the students' scientific activities. Because as part of the process of theoretical studies, doctoral students take two of the four mandatory courses with their research advisor, while the doctoral promotion examination is headed by three members of the examination commission who are mainly selected from the available teaching staff of the faculty, then in the teaching of the study programme it is considered that any of the LBTU ITF academic or research staff who have a doctoral degree in science can be a potential thesis advisor or member of the examination committee. So, it can be considered that, overall, all teaching staff of the faculty with a doctoral degree, a total of 24, are currently involved in the execution of the programme. Eight (33%) of them are Latvian Council of Science experts in various branches of science, while five are Latvian Council of Science experts in the fields of engineering and technology: electrical engineering, electronics, information and communication technology.

The higher the qualifications of the teaching staff, the faster and more fully the study results can be achieved, taking into account that doctoral studies involve much closer and more individualised cooperation between the teaching staff and the doctoral students, and the teaching staff can transfer their knowledge, skills, and competences to the doctoral student much more effectively. In addition to that, academic staff members must complete the 'Innovations in university didactics' professional development programme once during their elected term in office, as part of which they improve their teaching skills.

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

The composition of the academic staff changed significantly during the reporting period, as one of the basic goals of the LBTU ITF doctoral programme is to provide the Faculty of Information Technology with academic and scientific staff. Currently, the LBTU ITF academic and research staff consists of 13 employees who have a doctoral degree and were hired by LBTU ITF during the reporting period or got a doctorate degree in another LBTU division or another university and were hired by LBTU ITF, ensuring the quality of the studies.

It should also be mentioned that the study course "Preparation of Scientific Articles" was conducted by the professor, Dr.agr. Zinta Gaile, who reduced her academic load due to reaching retirement age, has been taken over by associate professor, Dr.sc.ing. Ruslans Šmigins. Considering that one expert of the Latvian Science Council has been replaced by another expert, the quality of studies is maintained.

In total, 26 employees are currently involved in the teaching of the programme. These include: 8 (31%) professors, emeritus professors, and guest professors, 8 (31%) associate professors, emeritus associate professors, and guest associate professors, 7 (27%) docents and guest docents, 2 leading researchers and one guest lecturer.

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

The number of scientific publications of the academic staff involved in the implementation of the doctoral study program in the reporting period reaches 568 publications. It is the total number of all the contributions of the academic staff involved in this review period to scientific activity, both including publications that were published in journals that are indexed in Scopus or WoS databases, as well as publications at various levels of international and local conferences and conference materials. The list with the number of publications of the academic staff involved in the implementation of the doctoral study program during the reporting period can be found in the annex "phd_macibspeki_publicaciju_skaitis_lv_en.pdf", while the list of the most important scientific publications of the academic staff involved in the teaching of the information technology doctoral study programme can be viewed in the annex "phd_svarigako_publicaciju_saraksts_lv_en.pdf". In most cases, the topics and content of the publications are related to the research interests of the teaching staff and doctoral students in the relevant branch of science. At the same time, it should be mentioned that the publications are developed in accordance with the content settings of the implemented research projects, which are not always directly related to the research interests of teaching staff and doctoral students in the relevant branch of science.

Five academic staff involved in the teaching of the doctoral study programme are Latvian Council of Science experts in the field of Engineering and Technology: Electrical Engineering, Electronics, Information and Communication Technologies:

- Irina Arhipova, status expires on: 03.02.2024,
- Vitālijs Komašilovs, status expires on: 31.03.2024,
- Armands Kviesis, status expires on: 31.03.2024,
- Gatis Vītols, status expires on: 04.05.2025,
- Aleksejs Zacepins, status expires on: 31.03.2024,

three staff members involved in the teaching of the doctoral study programme are Latvian Council of Science experts in the field of Engineering and Technology: Environmental Engineering and Energy Engineering:

- Laima Bērziņa, status expires on: 02.06.2024,
- Vitālijs Osadčuks, status expires on: 06.04.2025,
- Ruslans Šmigins, status expires on: 02.12.2023,

meanwhile, one staff member involved in the teaching of the doctoral study programme is Latvian Council of Science expert in the field of Agriculture, Forestry and Veterinary Sciences: Animal and Dairy Science:

- Līga Paura, status expires on: 06.10.2024.

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

A list of the academic staff involved as project leaders of the IT doctoral programme research projects can be viewed in the annex 'phd_projektu_saraksts_lv_en.pdf'.

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

Cooperation among the academic staff also takes place regularly using such cooperation mechanisms as the teaching commissions of the Faculty of Information Technology and the meetings of its council, where course curricula, final thesis topics, and other important issues related to the teaching of the study programme and the necessary changes are discussed. Members of the teaching commission evaluate and make recommendations on improvements to courses. This process includes such elements as the allocation of lectures and practical lessons, the use of evaluation methods, the analysis of course curriculum topics, and others.

Specific topics of the doctoral work are regularly discussed at department meetings and/or council meetings, where the annual study plans and reports of completed works of each doctoral student are examined and heard. Cooperation between teaching staff within the study program is mainly subordinated to the topic of the doctoral student's research. The teaching staff of the theoretical courses of the program communicate with the supervisors of doctoral theses in order to clarify individual tasks according to the topic of the doctoral thesis.

The proportion of students to teaching staff in the study programme at the time of the submission of the self-assessment report is 6,6.

Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	Doktora_diploms_Informācijas_EN.pdf	Doktora_diploms_Informācijas_LV.pdf
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)	dok_stud_progr_Informācijas_tehnoloģijas_AIP_atzinums_EN.docx	dok_stud_progr_Informācijas_tehnoloģijas_AIP_atzinums.edoc
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period	phd_studentu_dati_lv_en.pdf	phd_studentu_dati_lv_en.pdf
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard		
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)		
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	phd_studiju_kursu_kartejums_lv_en.xlsx	phd_studiju_kursu_kartejums_lv_en.xlsx
The curriculum of the study programme (for each type and form of the implementation of the study programme)	phd_studiju_plans_lv_en.pdf	phd_studiju_plans_lv_en.pdf
Descriptions of the study courses/ modules	phd_kursu_programmas_en.zip	phd_kursu_programmas_lv.zip
Description of the organisation of the internship of the students (if applicable)		
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)	LBTU_apliecinajums_studiju_virzienam_Informācijas_tehnoloģijas_EN.docx	LBTU_apliecinajums_studiju_virzienam_Informācijas_tehnoloģijas.edoc
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)	LBTU_apliecinajums_studiju_virzienam_Informācijas_tehnoloģijas_EN.docx	LBTU_apliecinajums_studiju_virzienam_Informācijas_tehnoloģijas.edoc