

I. INFORMATION ABOUT THE STUDY FIELD

“ARCHITECTURE AND CONSTRUCTION”

Objectives and tasks of the field of study

According to the Development Strategy of the Latvian University of Life Sciences and Technologies (hereinafter referred to as – the LBTU) of 2023-2027, LBTU implements higher education at three levels, promoting a student-centred study process, developing the capacity of academic staff, promoting cooperation and strengthening LBTU's academic competitiveness both in Latvia and at the international level. The LBTU Development Strategy of 2023–2027 ensures the succession of goals and tasks of the University's Development Strategy of 2015–2022. It has been developed in accordance with the priorities defined in the strategic development and planning documents of the European Union (EU) and Latvia.

The objectives of the study field Architecture and Construction are based on:

- LBTU Development Strategy of 2023-2027 and three action programmes (education, research, administration);
- the shortcomings identified in the international evaluation of the fields of study (2011/2012) and the proposals put forward;
- general tendencies of higher education development and industries in Latvia and Europe;
- the needs and development tendencies of the society and national economy.

The vision of LBTU stipulates that the Latvian University of Life Sciences and Technologies is a modern, nationally and internationally recognised science university – a leader in the creation of innovations related to the bioeconomy and related industries and in the sustainable use of natural resources in the Baltic Sea region.

The mission of LBTU is to create an internationally competitive, innovative, creative and sustainable future for the development of society.

The University's mission includes three strategic objectives:

- research excellence and innovation capacity;
- high-quality studies;
- excellence in university management.

To achieve the objectives, the LBTU Development Strategy includes three action programmes based on the achievement of the objectives:

- Research Programme;
- Study and Lifelong Learning Programme;
- Management Programme.

The objectives and tasks set for implementing the study field “Architecture and Construction” are closely related to the overall objectives and action programmes set out in the LBTU Development Strategy. The objectives of the study programme Architecture and Construction:

- to provide **high quality studies and further education opportunities** in the fields of land management and geodesy, construction, landscape architecture and planning, ensuring the **recognition and competitiveness** of the field of study and its programmes in addressing current issues and strengthening fundamental knowledge in the represented industries;
- to promote the **integration of studies and research, the transfer of innovations to the economy, scientific succession** and the development of research schools in the fields of land management and geodesy, construction, landscape architecture and planning;
- to promote **internationalisation and international recognition** of studies and research, to develop a Baltic-wide landscape architecture study and research centre at Valdeka Castle, a GIS Competence Centre and research laboratories in the Faculty of Forest and Environmental Sciences (FFES) study building, to strengthen cooperation in studies and

research with foreign higher education institutions in the fields of land survey and management, construction and geodesy, landscape architecture and planning;

- to implement the quality of the study and research environment, **the management of the study field** promoting student-orientated studies.

Tasks of the study field "Architecture and construction":

- to provide students with a **practical and scientific** basis for professional activity, developing scientific analysis abilities and the ability to solve technical problems, as well as to prepare students for further research work and studies in master's and doctoral studies;
- promote the development and use of students' **theoretical and practical knowledge**, cognition, and research skills in various sectors of the economy;
- to **develop the abilities of young specialists** to be creative and to be involved in the solution of national and international level scientific and research projects, as well as to develop the skills of pedagogical work.

The main factors contributing to the development of the field of study "Architecture and Construction" are: **sustainability, adaptation to changing technologies and current trends in the field, competitiveness**. These principles are emphasised in the LBTU Development Strategy and are in line with the general trends in the field of education in Latvia and Europe. These principles are therefore also intertwined in all areas of the field of study "Architecture and Construction", thus providing opportunities for growth and development.

The main directions of future activity of the field of study "Architecture and Construction", similarly to the action programmes defined in the overall LBTU strategy, are: implementation of **the study process, scientific activity and innovation transfer**, improvement of **management**. Improvement of management also includes improvement of **the social environment**, creating a positive work, study and recreational environment, promoting mutual communication between the academic and general personnel of the faculty, students and LBTU management.

For the development of a field of study to be sustainable, all these fields need to support and complement each other, as well as feedback links shall be formed between them. Research should contribute to the improvement of the study process, and vice versa – the study process, in addition to practical training, should also be research-oriented, providing an innovative contribution to the industry. Competitiveness is ensured through the development of specific fields of study, adaptation to changing industry trends (e.g. digitalisation of construction and management processes), high quality of studies and future opportunities in the labour market.

LBTU study field of "Architecture and Construction" has a great potential in all the above-mentioned directions of activity, as it represents sub-directions supporting the development of the Latvian economy – Land Management and Surveying, Civil Engineering, including hydraulic and rural construction, Landscape Architecture and Planning. These directions are aimed at the sustainable use of natural resources to improve the quality of the society's living environment. The relevance and importance of the fields of study for the national economy is already evidenced by the active **cooperation with industry in both the implementation of the study process and in research. Students are involved in real research and projects, tackling issues**, research and practical tasks **of importance to local authorities or businesses**. This is also in line with the professional and applied orientation of LBTU and its programmes. Graduate surveys also show that study programmes of the field of study "Architecture and Construction" are relevant and in demand in the industry, with an average of 90% of graduates working in their speciality after studies, depending on the subfield. Most students of professional bachelor's study programmes start working in the industry during their senior years of study. Master's and PhD students are mainly oriented towards gaining a broad range of knowledge and improving qualification, often also as a result of working for a public company or university.

Study programmes included in the study field “Architecture and Construction”

No.	Title	Programme level	Amount CP
1.	Civil Engineering, short cycle (p)	short-cycle professional higher education study programme	180
2.	Landscape Architecture and Planning, a(b)	academic bachelor study programme	140
3.	Civil Engineering, p(b)	professional bachelor study programme	270
4.	Land Management and Surveying, p(b)	professional bachelor study programme	240
5.	Landscape Architecture and Planning, p(m)	professional master study programme	60/120
6.	Civil Engineering, p(m)	professional master study programme	60
7.	Landscape Architecture, PhD	doctoral study programme	180
8.	Civil Engineering, PhD	doctoral study programme	180

Compliance of the study programme with the field of study

The professional bachelor study programme “Geoinformatics and Remote Sensing” ensures the fulfilment of the objective included in the LBTU strategy, as it promotes modern education that meets the requirements of the future labour market, which will contribute to the transformation of the national economy and the development of competences, entrepreneurship and creativity necessary for the implementation of the priorities of the Latvian Smart Specialisation Strategy, and will be included in the study direction *Architecture and Construction*.

The field of study in *Architecture and Construction* implemented by LBTU plays an important role in the overall development of the Latvian economy, as it includes specialisations and fields closely related to sustainable land management and planning, as well as environmental design and construction, including the use of local natural resources. It thus has a major impact on the quality of living environments and spaces, sustainable management and use of natural resources, spatial planning and smart development. All these aspects are highlighted in a number of international strategies of relevance today, such as the **UN General Assembly resolution of 25 September 2015 “Transforming Our World: the 2030 Agenda for Sustainable Development”**. It is the first global document to provide for universal and comprehensive action. This resolution sets out 17 sustainable development goals, which include economic, social and environmental aspects. The principles of sustainable development and the green economy are included in a number of other international strategies, such as the **“European Green Deal”**. These initiatives are also related to the provision of biodiversity, ecosystem services, development of climate-smart solutions (**EU Biodiversity Strategy; EU Green Infrastructure Strategy**, etc.). These principles, in turn, are included in the Latvian Sustainable Development Strategy and in several initiatives based on the introduction of the circular economy in Latvia (**Latvian Bioeconomy Strategy**, etc.). Quality living environment and spatial development, including the strengthening of national identity, are also included in several Latvian strategic documents, such as the **National Development Plan for 2021-2027, the Sustainable Development Strategy of Latvia 2030**, etc.

The thematic areas of the programmes implemented in LBTU’s field of study of *Architecture and Construction* are also in line with a number of important sectoral documents, in the implementation and enforcement of which education and research play an important role. For example, in the **Latvian Construction Sector Development Strategy for 2017-2024**, it is noted that one of Latvia’s construction development goals is to attract smart and skilled professionals and develop efficient construction processes. The Strategy, as well as the **Construction Law** renewed in 2014, focuses on quality construction at all levels, including digitalisation of the

construction process. The objective of **the Geospatial Information Law (2010)** justifies the need to establish an institutional framework in the field of geospatial information, including the conditions for the production, use, exchange and maintenance of geospatial information (including geodetic and cartographic master data) in order to create a geospatial information infrastructure in the Republic of Latvia. The **European Landscape Convention**, which aims to identify, preserve and transmit to future generations the special character of each country's landscapes and to realise everyone's right to a quality living environment and landscape. The objective of **the Spatial Development Planning Act (2011)** is also to ensure that the development of the territory is planned in such a way that the quality of the living environment can be improved, the use of the territory and other resources can be sustainable, efficient and rational, and the economy can be developed in a targeted and balanced way. Similar findings and objectives are also included in **the Land Management Law (2015)**. These insights are purposefully incorporated and emphasised in all study programmes, including the Professional Bachelor Study Programme "*Geoinformatics and Remote Sensing*".

Wise use of land and natural resources is also defined in the LBTU vision, which emphasises the sustainable use of natural resources to improve the society's quality of life. The research blocks of the programme are in line with the directions set out in the LBTU development strategy:

- Sustainable construction, development of new innovative building materials and research into their features;
- Safety and performance of building structures under long-term loading;
- Remote sensing, geodesy and geospatial research;
- Urban and rural landscape research and development
- Land and property management studies.

The Faculty of Forest and Environmental Sciences of LBTU has **accumulated many years of experience** in the implementation of sub-fields and programmes in the study field of "Architecture and Construction".

Despite the many years of experience of implementing the field of study, the content and form of the programmes included are continuously improved and updated according to the demand and current trends in the industry. For example, study plans have been revised to include courses that include ICT technologies and a digitalisation component (Building Information Modelling (BIM) in the field of construction, the use of geospatial data in land surveying, spatial research and planning, the development of 3D scenarios and virtual walks in the field of landscape architecture). Updating programmes in line with industry trends, including improving study infrastructure and providing professional development for teaching personnel, enables the preparation of knowledgeable and professional specialists. Eventually, it is planned to develop further education programmes (through the LBTU Lifelong Learning Centre (LLC)) for those already working in the industry, which would also allow them to adapt to the latest trends in the industry. Anyone interested can already apply for study courses through MC, and attend them as a listener. The ability to adapt to new trends is closely linked to the economic rationale for implementing the programmes, which is closely linked to the industry's demand for specific professionals.

The **social rationale** for the design and implementation of the programmes is based on their link with the strategic objectives of sustainable development, in particular the responsible use of resources, the creation of an inclusive and quality living environment for different social groups, and the satisfaction of everyone's right to a clean and attractive environment. In all study programmes, close cooperation with local authorities takes place in the study and research process through joint implementation of study and research projects, involvement and education of local residents (elaboration of spatial development plans, guest lectures, involvement of the public in various project activities).

II. STUDY PROGRAMME “GEOINFORMATICS AND REMOTE SENSING” DESCRIPTION

1. Characteristic parameters of the study programme

1.1. Study programme parameters (only indicate those parameters that are relevant to the study programme).

1.	Title of the study programme in Latvian	Ģeoinformātika un tālīzpēte	
2.	Title of the study programme in English	Geoinformatics and Remote Sensing	
3.	Study programme code according to the Latvian Classification of Education	42581	
4.	The science field of the study programme (applicable to doctoral study programmes)		
5.	Type of the study programme	professional bachelor study programme	
6.	Qualification level awarded upon completion (NQF/EQF)	6	
7.	Volume of the study programme (credits, and ECTS as a recommendation)	240 CP/ECTS	
8.	Form, type, duration (if incomplete years, then show in months), and teaching language		
	full time studies	4 years	Latvian and English
	full time extramural studies		
	part time studies		
	part time extramural studies	5 years	Latvian
	extramural studies		
9.	Place of implementation	Latvia University of Life Sciences and Technologies	
10.	Admission requirements	Secondary education. For English language studies, a student shall also have at least B2 level of English.	
11.	Obtainable degree, professional qualification or degree and professional qualification, so called specialisation (if applicable)	Professional Bachelor Degree in Geoinformatics and Remote Sensing, Professional qualification – Geoinformatics engineer	
12.	Professional standard, year of its approval (if applicable)	Profession: Geoinformatics engineer Profession code: 2165 09	
13.	The final examination at the end of the study programme	Diploma project	
14.	Director of the Study programme	Vita Celmiņa, Ph.D.	

1.2. Aim of the study programme

The aim of the study programme is to ensure the acquisition of theoretical knowledge and practical skills in geoinformatics and remote sensing for application in agriculture, forestry, transport logistics, spatial land administration and spatial organisation of crisis management, so that a specialist with an engineering qualification can successfully enter the Latvian and global labour market, as well as to ensure the development of research skills for further studies at the master's level.

1.3. Tasks of the study programme

Tasks of the study programme:

- to provide students with a professional, practice-oriented education that enables them to enter the labour market and carry out scientific research;
- to provide graduates with the theoretical knowledge and skills that will enable them to enter the world of practice after completing their studies;
- to provide up-to-date general knowledge, fostering students' analytical skills, engineering thinking and competence in developing geospatial solutions;
- to develop general abilities to work in or lead teams, to solve professional problems and tasks;
- to provide students with adequate theoretical and practical training, enabling them to obtain the qualification of Geoinformatics Engineer, as well as to continue their education at the master's level.

1.4. Learning outcomes to be achieved

Knowledge:

- has acquired the most characteristic basic and specialised knowledge in geoinformatics-related fields of work – agriculture, forestry, transport logistics, spatial land administration and spatial organisation of crisis management;
- is familiar with the key concepts and rules, legal issues, professional ethics and requirements in the field of geoinformatics;
- is familiar with the principles and conditions for the design and construction of spatial infrastructure;
- is familiar with the acquisition, processing and usability of geospatial data.

Skills:

- is able to independently acquire, select and analyse information and use it to make decisions and solve problems related to geoinformatics and remote sensing in the fields of agriculture, forestry, transport logistics, spatial land administration and spatial organisation of crisis management;
- knows how to apply and use information technology infrastructure in geospatial solutions;
- knows how to work with specialised computer software, collect, systematise and analyse data, use specialised literature relevant to the field and use professional terminology.

Competencies:

- is able to demonstrate in practice knowledge and professional attitudes in geoinformatics and remote sensing technologies;
- can develop geospatial solutions for agriculture, forestry, transport logistics, spatial land administration and spatial organisation of crisis management;
- can demonstrate a scientific approach to problem solving, take responsibility and initiative when working individually or in a team, make decisions, find creative solutions in changing or uncertain circumstances.

2. Topicality of the study programme

In the development of the economy in the directions of modern – smart technologies application, the availability of quality and adequate environmental (spatial) information, together with the sufficiency of quality specialists in the field, is a direct factor of development promotion. The current economic situation is characterised by a significant shortage of qualified geoinformatics specialists – which in practice is compensated by partially trained or self-taught specialists in various fields related or even not directly related to geo-informatics. As a result, the country's economic development in the use of modern smart technologies systematically lags

behind the EU level. The technologies (and technical equipment) purchased are mostly not used to their full capacity and efficiency – as a direct result of the lack of trained professionals. A number of GIS development and modernisation projects implemented in the country (both in state and local government institutions and in the business environment) over the last decade have failed to achieve the planned indicators or have ended without any results at all, and the lack of GIS knowledge and experience has played a decisive role.

2.1. Justification for creation

The shortage of geoinformatics specialists and the need to develop this study programme is justified by a survey of local governments conducted in 2020 as part of the doctoral thesis “Spatial Development Planning Model for Geographic Information Systems Environment”.

Employers and professionals in the industry who participated in the development of the Geoinformatics Engineer Professional Standard point out that there is a growing need for geoinformatics specialists who can analyse geospatial information quickly, link it to data collected from different industries, and publish the analysis on the World Wide Web, thus providing access to information for the needs of many decision-making processes.

The INSPIRE Directive, or the Infrastructure for Spatial Information in the European Community Directive, emphasises that along with its implementation conditions and process, for example that “... implementing measures should be laid down to facilitate the use of spatial data from different sources in the Member States. Those measures should be designed in such a way that spatial data sets are interoperable and Member States should ensure that any data or information necessary for interoperability is made available under conditions that do not restrict its use for that purpose. Implementing rules should, as far as possible, be based on international standards and should not impose excessive costs on Member States” (<https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32007L0002>), the importance of geospatial data in Europe is increasing, which in turn causes the need for specialists.

Given the rapid development of geoinformatics and remote sensing technologies and their application in several sectors of the economy in Latvia and abroad, there is a growing need for suitably educated specialists in the labour market.

In accordance with the LBTU strategy, the study programme corresponds to the priority direction and area of the Latvian Smart Specialisation Strategy – Smart Materials, Technologies and Engineering Systems and Information and Communication Technologies, in the engineering research block with the main direction – Remote Sensing, Geodesy and Geospatial Research.

A significant set of interdisciplinary support specialisation knowledge and skills functions, that support and significantly influence the implementation of almost all LBTU strategic specialisation and research programmes in all cases where they are directly or indirectly related to the influence of the spatial situation and position of the land on the design, implementation and outcomes of specific programmes, which are always related to specific territories, distances, infrastructure, objects and their spatial positioning influences. The study programme ensures the fulfilment of the objective included in the LBTU strategy, as it promotes modern education that meets the requirements of the future labour market, which will contribute to the transformation of the national economy and the development of competences, entrepreneurship and creativity necessary for the implementation of the priorities of the Latvian Smart Specialisation Strategy, and will be included in the study direction *Architecture and Construction*.

2.2. Outline of content

The content of the professional bachelor study programme and the implementation mechanism correspond to the objective, tasks and study results of the programme.

The plan regarding the Professional Bachelor study programme “Geoinformatics and Remote Sensing” can be found in Annex 1.

The study programme complies with the Cabinet Regulation No. 305 of 13 June 2023 “Regulations regarding the State Standard for Professional Higher Education”, which is supported

by Annex 2 – *Compliance of the Professional Bachelor's Study Programme "Geoinformatics and Remote Sensing" with the State Education Standard*, which analyses the compliance of the programme indicators with the requirements set out in the Education Standard. The analysis shows that the volume of the study programme is 240 CP, which is appropriate for a professional bachelor's programme, as well as the volume of the study programme parts, including the final thesis, because the **study programme consists of:**

1. Compulsory study courses 30 CP;
2. Field Theoretical basic courses 54 CP;
3. Field Professional specialisation courses 90 CP;
4. Elective courses 9 CP;
5. Practices 39 CP;
6. State examinations 18 CP.

The content of the study programme **corresponds to** the current version of the **Professional Standard "Geoinformatics Engineer"**, which was agreed on at the meeting of the Tripartite Cooperation Sub-Council of Vocational Education and Employment on 6 February 2019, Minutes No. 1 (<https://registri.visc.gov.lv/profizglitiba/dokumenti/standarti/2017/PS-105.pdf> (LV only)). The compliance is supported by Annex 3 – *Compliance of the Professional Bachelor's Study Programme "Geoinformatics and Remote Sensing" with the Professional Standard*, which analyses the acquisition of knowledge necessary to perform the basic tasks of the professional activity set out in the Professional Standard "Geoinformatics Engineer" in the programmes of the relevant study courses of the study programme.

The volume of the study programme is 240 CP for both full time studies and part time extramural studies: 183 CP for study courses, 39 CP for practices and 18 CP for the state examination (study programme plan is attached in Annex 1). The choice of study courses of the study programme, the scope and content of study courses, as well as the content of internships, have been developed in accordance with the Professional Bachelor Degree in Geoinformatics and Remote Sensing and the Qualification of a Geoinformatics Engineer in accordance with the professional requirements set forth in the professional standard "Geoinformatics engineer". The descriptions of the study programmes have been prepared in all languages in which the study programme is implemented and comply with the requirements set out in Section 56.1 (2) and 56.2 (2) of the Law on Higher Education Institutions.

The Professional Bachelor Degree in Geoinformatics and Remote Sensing and the Qualification of Geoinformatics Engineer are awarded after acquiring the theoretical study courses, completing practices tasks and defending the diploma project at the State Examination Commission meeting.

The multidisciplinary approach used in the implementation of the study programme allows the students to apply the knowledge acquired in the theoretical part of the programme in practice by solving the current problems of the companies and institutions of the industry, which allows the students to integrate into the labour market as much as possible. The implementation of the study programme is focused on the application of innovative technologies for the development of the national economy.

Annexes to the description of the study programme content:

1. Study programme plans – Annex 1;
2. Compliance with national education standards – Annex 2;
3. Compliance with the professional standard – Annex 3.

2.3. A list and justification of the changes made to the study programme since the licensing of the study programme

The Professional Bachelor's study programme "Geoinformatics and Remote Sensing" was licensed on 29 June 2022. The professional bachelor study programme "Geoinformatics and Remote Sensing" started on 1 September 2022 and lasts for two years. During this period, the

study process is evaluated, and in this short period, there are no reasons as to why it would have been necessary to make changes in the study programme.

The only change that has affected the study programme is the introduction of a new credit point system at LBTU. On the basis of the new credit point system defined in Section 1 of the Law on Higher Education Institutions and the deadlines set in Section 93 for the introduction of the new credit points and study programme volume in credits in higher education institutions, the conversion from credit points (CP) to European credit points (ECTS) has been carried out. Credit point (CP) – an accounting unit of studies which corresponds to the amount of study work based on the study outcomes defined in the study programme or part thereof and a student workload related to their achievement. 60 credit points correspond to the results of full-time study in one academic year according to the European Credit Transfer and Accumulation System (ECTS).

In the process of the conversion from Latvian credit points (CP) to European credit points (ECTS) the content of study course programs has not changed. Only the amount of study work hours has changed for individual study courses, which resulted in an incomplete number of credit points (for example, 6.5) as a result of recalculations. As a result, the number of hours was adjusted for individual courses by rounding the number of credits to a whole number.

2.4. Information for students

The professional bachelor study programme “Geoinformatics and Remote Sensing” is implemented as full-time studies and part time extramural studies. The studies are planned to be conducted in Latvian and English, but currently the studies only take place in Latvian.

The new study programme was open to students from 1 September 2022.

In the licensing report was indicated that 25 state-paid budget places are planned to be allocated to full-time studies of the professional bachelor study program "Geoinformatics and Remote Sensing", with the language of implementation - Latvian. In the 2022 admission, 5 state-paid budget places were allocated, which were 100% filled, and 2 students started their studies on personal funds, while in the 2023 admission, 12 state-paid budget places were determined, which were 100% filled.

The professional bachelor study program "Geoinformatics and Remote Sensing" in part-time extramural studies with the language of implementation - Latvian, was planned to be implemented with at least 10 students. Since part-time extramural studies are based on personal funding, the university stipulates that the study course will be accepted if there are at least 5 students. In 2022, 5 part-time extramural studies students were admitted. In 2023, the number of applications for part-time extramural studies was less than 5, therefore potential students were not admitted.

Table 2.1.

Number of students as of 01.10.2022

Course	Full-time studies	Part-time extramural studies
Year 1	7	5

On 1 September 2022, 7 full-time students started their studies, 5 of whom started their studies with state funding (there were 5 budget places) and 5 part-time extramural studies students studying using personal funding.

Table 2.2.

Number of students as of 01.10.2023

Course	Full-time studies	Part-time extramural studies
Year 1	12	-
Year 2	6	5

On 1 September 2022, 12 full-time students started their 1st year of studies. State funding for 12 budget places was planned for the programme.

All full-time students study with state funding. Part-time extramural studies students study with personal funding.

2.5. Employment perspectives for graduates

Taking into account the fact that the tasks in the field of geoinformatics and remote sensing change depending on the current economic challenges and the rapid development of technologies, we believe that a graduate of the study programme should have a comprehensive, broad knowledge so that a specialist could find a job at any time.

Employers and professionals in the industry point out that there is a growing need for geoinformatics specialists who can analyse geospatial information quickly, link it to data collected from different industries, and publish the analysis on the World Wide Web, thus providing access to information for the needs of many decision-making processes. Therefore, the study programme is aimed at preparing specialists in the field of geoinformatics and remote sensing with broad competences in engineering, economic and legal issues to work in companies, municipalities, state administration institutions, educational and research institutions. Great emphasis is also placed on the acquisition and processing of various types of data, looking at the latest technologies and methods.

In the development processes of the industry in the world and in the EU, a rapid increase in the volume of geoinformatics data acquisition and use is marked, which is beginning to cover an increasing number of institutions of the national economy and business environment. Examples include the Latvia's State Forests (LVM), the Rural Support Service (LAD), the Latvian Geospatial Information Agency (LGIA), and the State Land Service (VZD), which actively acquire data using the latest remote sensing methods, process it and offer various geoinformatics products for everyday users, companies and other public administrative institutions. Many municipalities already employ geoinformatics specialists to maintain and upgrade their existing geographic information systems (GIS). There are also many private companies involved in the active acquisition and maintenance of geodata and geo-solutions, for which such specialists are needed. In areas such as air navigation, sailing, armed forces, represented in Latvia by the Civil Aviation Agency (CAA), Maritime Administration of Latvia (LJA), National Armed Forces (NAF), there is a growing interest in graduates who are familiar with and able to work with different types of geospatial data.

As research in geoinformatics and remote sensing develops, there are increasing opportunities for students and graduates to get involved in both local and international projects, where the demand for specialists with this expertise is high.

Graduates have the opportunity to improve their competitiveness, academic and research skills and to start studies in LBTU Master's study programmes, such as the academic Master study programme "Geoinformatics and Remote Sensing".

3. Resources and supplies

The Professional Bachelor's study programme "Geoinformatics and Remote Sensing" is a relatively new study programme, which requires an extensive material and technical base, part of which was already available at the Institute of Land Management and Geodesy, while some of its parts were developed anew. It is being developed and improved independently.

3.1. Assessment of the study base necessary for the implementation of the study programme

The Professional Bachelor study programme *Geoinformatics and Remote Sensing* is implemented by the Institute of Land Management and Geodesy of the Faculty of Forest and Environmental Sciences (MVZF), in cooperation with the Institute of Landscape Architecture and Environmental Planning of the Faculty of Forest and Environmental Sciences (MVZF); the Institute of Construction and Woodworking of the Faculty of Forest and Environmental Sciences

(MVZF); the Language Centre; the Institute of Mechanics and Design of the Faculty of Engineering and Information Technologies (IITF); Institute of Business and Management Sciences of the Faculty of Economics and Social Development (ESAF); Institute of Soil and Plant Sciences of the Faculty of Agriculture and Food Technology (LPTF); Institute of Forestry of the Faculty of Forest and Environmental Sciences (MVZF); and Institute of Computer Systems and Data Science of the Faculty of Engineering and Information Technologies (IITF). The main task of the teaching staff of these units is to ensure the implementation of the respective study courses and internships by developing the study course programme, methodological materials for practical and laboratory work, coursework and course projects, as well as uploading the developed study course materials into the e-learning environment. The tasks of the units involved in the study process for the implementation of the programmes are summarised in Table 3.1.

Table 3.1.

Units involved in the implementation of the study programme “Geoinformatics and Remote Sensing”

No.	Unit name	Faculty	Tasks in the implementation of the study programme
1.	Institute of Land Management and Geodesy	MVZF	<p><i>To manage, organise and supervise the process of the professional Bachelor’s study programme “Geoinformatics and Remote Sensing”.</i></p> <p><i>Ensure the following courses of study:</i></p> <ul style="list-style-type: none"> • Topicalities of Geoinformatics and Remote Sensing; • Introduction Into Geoinformatics and Remote Sensing; • Scientific Work in Geoinformatics and Remote Sensing I; • Scientific Work in Geoinformatics and Remote Sensing II; • Basics of Scientific Work in Geoinformatics and Remote Sensing; • Geodesy; • Land Management Framework; • Basics of Transport Logistics; • Fundamentals of Crisis Management; • Cartography; • Basics of Geographic Information Systems; • Technologies of Remote Sensing; • Quality of Geospatial Data; • Legal Regulation in Geoinformatics and Remote Sensing; • Photogrammetry; • Application of Remote Sensing Technologies; • Geographic Information System Softwares; • Computer Graphics in Geoinformatics; • Geospatial Solutions I; • Geospatial Solutions II; • Geospatial Solution Management; • Transport Logistics; • Spatial Organization of Crisis Management;

			<ul style="list-style-type: none"> • Land Spatial Administration; • 3D Modelling and Visualisation. <p><i>Ensure the following practices:</i></p> <ul style="list-style-type: none"> • Geodetic Measurements; • Photogrammetry; • 3D Modelling; • Geoinformatics and Remote Sensing. <p><i>Manage, organise and supervise the State Examination – Diploma Project in Geoinformatics and Remote Sensing.</i></p>
2.	Institute of Landscape Architecture and Environmental Engineering	MVZF	<i>Ensure completion of the study course – Environmental Protection and Sustainable Development</i>
3.	Institute of Construction and Woodworking	MVZF	<i>Ensure completion of the study course – Computer Graphics in Geoinformatics.</i>
4.	Language Centre		<p><i>Ensure the following courses of study:</i></p> <ul style="list-style-type: none"> • Professional English (in the study programme implemented in Latvian); • Latvian Language I (in the study programme implemented in English).
5.	Institute of Mechanics and Design	IITF	<i>Ensure completion of the study course – Communication Psychology.</i>
6.	Institute of Business and Management	ESAF	<i>Ensure completion of the study course – Entrepreneurship</i>
7.	Institute of Soil and Plant Sciences	LPTF	<p><i>Ensure the following courses of study:</i></p> <ul style="list-style-type: none"> • Natural Resources in Agriculture; • Agriculture
8.	Institute of Forestry	MVZF	<p><i>Ensure the following courses of study:</i></p> <ul style="list-style-type: none"> • Labour and Civil Protection; • Introduction to Forestry • Basics of Forestry.
9.	Institute of Computer Systems and Data Science	IITF	<p><i>Ensure completion of the study course -</i></p> <ul style="list-style-type: none"> • Mathematical Statistics in Geoinformatics; • Structure of Computers and Computer Systems; • Programming Basics; • Programming in Geoinformatics I; • Programming in Geoinformatics II; • Security of Information Systems and Data I; • Security of Information Systems and Data II; • Geospatial Data Storage. <p><i>Ensure an practice – Programming in Geoinformatics.</i></p>

In the process of implementing the study programme, the auxiliary staff of the participating units will also be involved in order to ensure the functioning of the study process. The main tasks of the records management officer at the Institute of Land Management and Geodesy are related to the preparation of practices contracts, practices orders, preparation and circulation of records, etc. The main tasks of the laboratory manager are related to the preparation, issuance, receipt and testing of geodetic and other measuring equipment sets for the development of laboratory work

and provision of teaching practice assignments. Supervision of computer classrooms, auditoriums, Geodetic instrument calibration laboratory and Geospatial modelling computer class and preparation for the development of laboratory works. Supervision of the laboratory equipment of the GIS Competence Centre and preparation for the development of laboratory works. Preparation, issuance, receipt and testing of remote sensing measuring equipment sets for the development of laboratory works and provision of practice tasks. The main tasks of the accounting specialists, laboratory managers, senior laboratory assistants and laboratory assistants of the structural units involved in the implementation of the study programme will be similarly determined taking into account the scope and specifics of the study courses to be implemented by the teaching staff of the structural units involved in the study process. Existing auxiliary staff are able to carry out the tasks without additional human resources.

Assessment of the information and methodological base

LBTU has developed and students have access to an informative and methodological base, which acquaints students with the requirements and rules of studies and facilitates the fulfilment of the study process. The LBTU website contains information on undergraduate study programmes, detailed information on admission rules, the admission procedure and forms of admission documents to be prepared <https://www.lbtu.lv/lv/pamatstudijas> (in Latvian) or <https://www.lbtu.lv/en/degree-programmes> (in English) Potential undergraduate students can get acquainted with the admission criteria for state-funded study places: <https://www.lbtu.lv/lv/pamatstudijas> (in Latvian) or <https://www.lbtu.lv/en/article/2023-05-03/geoinformatics-and-remote-sensing-bachelor> (in English) This information allows potential students to evaluate their compliance with a specific study programme, and to prepare documents.

All LBTU normative documents related to undergraduate studies are easy to find and access on the LBTU website: Order on procedures for the admission process at LBTU; Order on the mutual rights of the applicant and LBTU and measures in the admission process; Admission rules for studies in the 2024/2025 study year.

In order to facilitate studies, a register of study courses has been created, where students can get acquainted with the descriptions of study courses, obtain information about the acquisition of courses, assessment requirements <https://lais.llu.lv/pls/pub/kursi.startup?l=2>. In the study process, the teaching staff widely uses the LBTU e-learning system, in which study materials are placed, tests and submission of homework are organised, etc. In the LBTU information system (LBTU IS), each student can use his/her user account to follow his/her study progress.

The Fundamental Library of LBTU provides wide opportunities to obtain scientific literature. One of the main tasks of the library is to collect and concentrate in the library's collection all editions published in Latvia, and, as far as possible, also published abroad, related to crop production, gardening, agricultural economics, natural sciences, agricultural machinery, animal husbandry, veterinary medicine, food industry and nutrition, home economics, wood processing, forestry, etc. issues. The library's collection includes a large number of publications in the natural, technology and social sciences. 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, Deposit Library of United Nations Food and Agriculture Organisation. Factographic and bibliographic inquiries on various issues related to agriculture and other 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. Information can be obtained at the Reference and Information Centre of the LBTU Fundamental Library, and interlibrary loan services can also be used. The search engine Primo Discovery, a unified search engine of the LBTU Fundamental Library, online databases BIS Aleph, online databases created in the LBTU Fundamental Library (8 databases of different meanings) are available for searching scientific literature. When using the LBTU IS user account, a number of subscribed databases are available: CAB Abstracts; CRC Press e-books; EBSCO

databases; EBSCO eBook Academic Collection; ScienceDirect journals; Scopus; Web of Science and other databases.

The faculty and students are informed about the databases to which access is granted temporarily. Databases of publications, doctoral theses and master's theses of LBTU teaching staff and researchers have also been created. The staff of the library provides consultations on current events, as well as advises students on searching for scientific information.

The informative and methodological base of Latvia University of Life Sciences and Technologies is detailed, transparent, and structured so that students can quickly obtain all information related to studies, get acquainted with the study course materials and study course requirements in the LBTU e-learning environment, and the LBTU Fundamental Library provides students with a very wide range of teaching and scientific literature as well as access to a variety of databases.

Students of LBTU also have access to a number of **materials developed by the teaching staff** – teaching aids, books, methodological instructions, etc. The study base for the students of the study programme as well as for the teaching staff is mainly available **in the electronic environment** LBTU IS. The system is designed as a comprehensive single identity and login system, providing an e-learning environment, lesson and session plan system, research support system, etc. To intensify the study process, students are provided with continuous access to the LBTU unified study support system. For the time being, students are provided with:

- lectures, practical work, laboratory work, seminar presentations and materials posted online;
- online delivery of the lessons, as well as uploading the videos that are prepared in advance or automatically recording them online;
- electronic processing of tests, test papers, as well as independent work;
- information about the student's progress;
- approach to the documents governing the study process and changes to them;
- etc.

The information and methodological base is fully sufficient to ensure the study process of the professional bachelor study programme "Geoinformatics and Remote Sensing".

Information on the financial basis

The Professional Bachelor study programme *Geoinformatics and Remote Sensing* is implemented as full-time studies in Latvian and English and part time extramural studies in Latvian.

LBTU funding is sufficient for the implementation of the study program. Since the beginning of the licensing and implementation of the study program, the sources of financing (state funding and tuition fee revenues), the proportions of the distribution of study program costs between salaries for teaching staff/support staff and expenses for maintenance and ensuring the study process (60% and 40%), as well as academic work hours of teaching staff number per year (professor – 900 h; associate professor – 920 h; assistant professor – 940 h; lecturer/lecturer/assistant – 960 h) has not changed, but the following changes have taken place in 2024:

1. increased state funding for one state-paid study place - it amounts to EUR 6,382.33 (in 2021, it amounted to EUR 5,217.66). The increase of one study place consists of changes:
 - the increased base funding of the study place - it amounts to 1,867.60 EUR (in 2022 it was 1,630.11 EUR);
 - the minimum value of the increased study cost factor in the thematic field of education – it is 3.28 (in 2022 it was 3.1);
 - increased social security costs of the place of study 265.5 EUR (in 2022 it was 164.34 EUR).
2. a larger number of study places paid for by the state, they are 33 study places (25 study places were planned in 2022);
3. in order to realize the paid study program (full time in English), the minimum number of students in the program has been increased, it is set at 8 (5 were planned in 2022);

4. in order to implement a paid study program (part time in Latvian), the minimum number of students in the program has been increased, it is set at 8 (in 2022, 7 were planned);
5. the salary rates of teaching staff increased. The assistant professors rate per workload is 1,423 EUR (in 2022 it was 1,124 EUR) and thus the total salary of teaching staff has also increased for the year, it amounts to 80,407.09 EUR, because the number of students is 49 (8 paid students in English, 8 part-time students and 33 students studying in Latvian for state funding) will form 5 groups of students.

Assessment of material and technical base

The professional bachelor study programme “*Geoinformatics and Remote Sensing*”, similarly to other study programmes of the study field Architecture and Construction, is mainly implemented by the LBTU Faculty of Forest and Environmental Sciences (MVZF), however, for provision of some study courses the resources of other faculties as well as LBTU centralised resources, for example, the LBTU Fundamental Library, are also used. Study programme lessons are also held in the auditoriums, computer classrooms and laboratories of the Faculty of Engineering and Information Technologies, the Faculty of Economics and Social Development, the Faculty of Agriculture and Food Technology, which are equipped with all the necessary material and technical facilities for the implementation of the study programme.

As the Faculty of Forest and Environmental Sciences (MVZF) provides the specific infrastructure and material and technical base of the study field and the professional bachelor study programme “*Geoinformatics and Remote Sensing*”, the infrastructure available at the MVZF, which is located in the MVZF building at Akadēmijas iela 19, is described in detail below.

The Institute of Land Management and Geodesy has 4 auditoriums, 2 computer classrooms, 3 laboratories – ***GIS Competences Centre, Surveying Teaching Laboratory*** and ***Geodetic Instrument Calibration Laboratory***. Each auditorium has a stationary control computer or laptop connection, a projector, an automatic drop-down screen or multimedia equipment, and internet access. Auditorium 902 is equipped with an interactive whiteboard. Two auditoriums are provided with movable interactive screens. The Institute has two computer classrooms, computer classroom 901 – equipped with 20 workstations, where computer hardware and software are constantly updated and is accessible to all students of the study programme, and computer classroom 304 – equipped with 12 workstations, powerful computer equipment, which has been purchased within the framework of the Interreg Latvia-Lithuania cross-border project GISEDU. The computer equipment has all the latest computer software necessary to ensure the study process at a high-quality level, such as MicroStation, AutoCAD, TRIMBLE business centre, Pix4D, ArcGIS Pro, QGIS, Terrasolid, etc.

Thanks to funds from the ESF, INTERREG, etc. projects, modern, up-to-date instrument sets have been purchased, such as electronic total stations, digital levellers, optical theodolites, optical levellers, digital rangefinders, global positioning devices (single-frequency and dual-frequency), closed engineering communications search equipment, robotic total station, terrestrial scanner, unmanned aerial vehicle (drone), photogrammetric camera, as well as levelling staffs, tripods, measuring tapes, reflectors, etc., materials necessary for the surveying process. A large-format scanner for scanning cartographic images, as well as a plotter and a 3D printer are located in the GIS Competence Centre, which students can use in the process of developing scientific and diploma projects. A geodetic instrument calibration laboratory is set up in the laboratory block. Additional equipment, tools and equipment purchased – Stonex S700A GNSS tool kit; Stonex X300 terrestrial 3D laser scanner kit; Unmanned Aerial Vehicle (drone) kits.

The computer equipment in the computer classroom 901 has been upgraded, as large volumes of data are increasingly used, the processing of which requires high-performance workstations. The computer classroom is equipped with MicroStation, ArcGIS and other software.

New measuring equipment has been purchased for the surveying teaching laboratory, because the existing working base of measuring equipment had worn out and it was necessary to upgrade it. 7 optical theodolites Fet 500, Geo-Fennel; rotary leveller EL 515 Plus SEt, Geo-fennel; 7 optical theodolites with electronic display Stonex STT 402L; GNSS equipment kit Stonex S900A; Stonex

S40 with Cube-A software have been purchased.

Also, computer software (Microstation, ArcGIS), which is necessary for the study process, is maintained and subscribed annually from the faculty's funds. AutoCAD programme offered in the Academic Network is also available at the Faculty.

Table 3.2.

***The material base necessary for the implementation of the
Geoinformatics and Remote Sensing study programme at the MVZF***

No.	Unit	Title	Description
<i>Computer classrooms</i>			
1.	Institute of Land Management and Geodesy	Geospatial modelling computer classroom	901. computer classroom – 20 workstations, equipped with software for spatial planning and surveying (Microstation, ArcGIS Pro, etc.)
2.	Institute of construction and woodworking	BIM computer classrooms	Classroom 803 equipped with 24 and Classroom 702 equipped with 21 high performance computers, BIM support software (AutoCAD, Revit, Microsoft Project, ArcGIS, Mathcad, PHPP, Saoundplan, Dlua RFEM and Axis VM)
<i>Laboratories, equipment</i>			
1.	Institute of Land Management and Geodesy	GIS Competences Centre	Equipped with 12 workstations with MicroStation, ArcGIS Pro, TerraSolid, etc. 3D modelling and remote sensing data processing and analysis software, various remote sensing instruments (including 15 unmanned aerial vehicles, 1 robotic total station, etc.)
		Surveying Teaching Laboratory	Equipped with sets of optical and digital geodetic measuring instruments (levellers, theodolites, tachometers, GNSS, etc.).
		Geodetic Instrument Calibration Laboratory	Equipped with a calibration camera and equipment for ensuring the calibration process

The study plan of the Professional Bachelor study programme “*Geoinformatics and Remote Sensing*” includes 4 study practices. 3 practices will be organised by the Institute of Land Management and Geodesy, i.e. the equipment of the Surveying Training Laboratory and the Geodetic Instrument Calibration Laboratory will be used in the implementation of the *Geodetic Measurements* practice, the equipment of the GIS competence centre and the Surveying Training Laboratory will be used in the implementation of *Photogrammetry* practice, the equipment of the GIS competence centre will be used for the implementation of the *3D modelling* practice, the course of one practice will be organised by the IITF Institute of Computer Systems and Data Science, i.e. the equipment of the Institute will be used for the implementation of the *Programming in Geoinformatics* practice – a computer classroom and software for performing programming activities.

It should be noted that the infrastructure of the material and technical base is used to attract new students by organising various schools for young professionals, including the School for Young Geoinformatics Specialists and Remote Sensing Researchers, and open-door events, by cooperating with vocational secondary schools and technical schools and demonstrating experiments in the Faculty's laboratories to school students, as well as by cooperating with other Latvian and foreign higher education institutions.

The material and technical base is sufficient and corresponds to the specifics and implementation of the Professional Bachelor's study programme "*Geoinformatics and Remote Sensing*".

3.2. During the reporting period, analysis of changes in the composition and qualifications of teaching staff and evaluation of these changes has been carried out (impact on the quality of studies, implementation conditions and compliance with the requirements of regulatory enactments).

In the process of implementing the professional bachelor study programme "*Geoinformatics and Remote Sensing*", teaching staff members and highly qualified professionals with relevant work experience have been recruited, whose characteristic indicators are described in the CV. A list of academic staff members is included in Annex 4. The composition of the teaching staff corresponds to the specificity of the study courses and the requirements for their implementation. The qualifications of the teaching staff involved in the implementation of the study programme meet the conditions for the implementation of the study programme and the requirements of the regulatory enactments.

LBTU teaching staff elected to academic positions, lecturers, as well as doctoral students are involved in the implementation of the study programme. The study programme also involves teaching staff members who work on various research projects, so that the knowledge gained from the projects can be transferred to the study programme to improve the content of the study courses. It should be noted that these teaching staff members have been elected to the positions of leading researchers, researchers and research assistants, which, according to the regulatory documents, are also academic staff.

In total, 29 teaching staff members, including 5 professors, 6 associate professors, 4 assistant professors, 2 elected lecturers, 12 lecturers, are involved in the implementation of the Professional Bachelor study programme "*Geoinformatics and Remote Sensing*". Of the 29 teaching staff members, 18 have been elected as leading researchers, researchers or research assistants, respectively – 11 leading researchers, 3 researchers and 4 research assistants. A total of 23 teaching staff members have elective status. Three doctoral students are involved in the implementation of the study programme.

The teaching staff of the Institute of Land Management and Geodesy **is actively involved in professional development courses (including in foreign countries), conferences, seminars, attends exhibitions** in order to incorporate the acquired experience and knowledge into the content and teaching methods of the study course. For example, 3 teaching staff members have attended the modules offered by LBTU in the courses "*Innovations in University Didactics*", 7 teaching staff members have attended 3D modelling and printing training at LBTU, 6 teaching staff members have participated in drone piloting training, and several teaching staff members have obtained the licence to pilot a drone, 7 teaching staff members have participated in 3D geospatial data software TerraSolid training courses. The advanced qualifications of each teaching staff member contribute to improving the content and quality of the courses they teach, leading to better achievement of the course outcomes and the overall study programme learning outcomes.

The relevance and high level of qualifications of the teaching staff is substantiated by international and local awards and recognitions.

In general, it can be concluded that the qualifications of the teaching staff involved in the implementation of the study programme meet the conditions for the implementation of the study programme and the requirements of the regulatory enactments, ensure the achievement of the objectives and study outcomes of the study programme and the corresponding study courses.

A list of the teaching staff members involved in the study programme can be found in Annex 4.

Since the launch of the Professional Bachelor study programme “Geoinformatics and Remote Sensing”, two new teaching staff members has been recruited. The curriculum vitae of the newly recruited teaching staff members (in Europass format) is attached in Annex 5.

4. Implementation of the recommendations received during the licensing of the study programme

The licensing process assessed that the objectives, tasks and outcomes of the study programme are interrelated and coherent. The study programme is in line with the university’s strategy and industry trends, and its development prospects are justified.

The recommendations provided by experts for improving the quality of studies are defined as long-term recommendations. Both the recommendations and the information on the actions undertaken and implemented are summarised in the table below.

Table 4.1.

Overview of implementation of recommendations

No.	Expert group recommendation	University activity	Expected results	Deadline for implementation	Implementation of the recommendation
1.	To supplement the course descriptions in both Latvian and English with revised and updated reading lists. For example, including study materials and literature in English (for the English language form of study)	To supplement course descriptions in both Latvian and English with revised and updated reading lists.	The reading lists for course descriptions have been supplemented with materials in foreign languages.	Until the start of the implementation of the study program	Recommendation fulfilled
2.	Work with industry to improve the content of the programme, given that this is a new and innovative field and continuous feedback from the labour market is needed.	Collaborate with various institutions and companies in the field, both by organising or participating in seminars, scientific conferences and other public events where industry news and issues are discussed. Examples include	The theoretical and practical content of existing courses is updated. Evaluate whether new courses are needed.	No deadline (long-term recommendations)	The recommendation is being implemented

		<p>the annual scientific and practical conference "Land Management and Geodesy" and the international scientific conference "Baltic Surveying". Teaching staff members participate in or conduct research related to geoinformatics and remote sensing, using their knowledge to improve the programme. Develop cooperation with the University of Latvia and RTU, where similar study programmes are offered.</p>			
3.	<p>Improve the library's print resources specifically in the field of geoinformatics and remote sensing.</p>	<p>In cooperation with the LBTU Fundamental Library, the provision of the most up-to-date printed materials related to the field of geoinformatics and remote sensing is organised. Based on the specificities of the programme and current trends in the world, we need to increase access to a wide range of up-to-date electronic resources.</p>	<p>The range of printed materials available in the LBTU Fundamental Library has been expanded. Increased range of electronic resources available</p>	<p>No deadline (long-term recommendations)</p>	<p>The recommendation is being implemented</p>

4.	Considering that during the visit the employers were not ready to confirm that they are ready to provide professional practice for foreign students, think about practice opportunities for foreign students as well	Cooperate with industry representatives, identify those employers who would be ready to provide and offer practice to foreign students.	Potential list of practice where foreign students could acquire practical skills. Agreements on the maintenance of practice places.	No deadline (long-term recommendations)	The recommendation is being implemented
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III. ANNEXES

1. Study programme plan for all forms and types of study programme implementation
2. Assessment of the compliance of the study programme with the national education standard
3. Compliance of the study programme with the professional standard
4. List of teaching staff members involved in the implementation of the study programme
5. CVs of newly recruited teaching staff members
6. Supplemented descriptions of study courses in both Latvian and English, with clarified and supplemented lists of literature