

# 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 the implementation of 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 the ability of scientific analysis and the ability to solve technical problems, as well as to prepare students for further research work and studies at master's level, as well as doctoral studies;
- to promote the development and use of students' theoretical and practical knowledge, cognitive and research skills in various sectors of the economy;
- to develop the ability of young specialists to be creative and to engage in scientific and research projects at national and international level, as well as to develop teaching skills.

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"**

<b>No.</b>	<b>Title</b>	<b>Programme level</b>	<b>Amount CP</b>
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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 study field *Architecture and Construction* is accredited until 27 October 2028. The field of study comprises 3 levels of study, with a final level of doctoral studies.

The professional master's 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 Master's 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. CHARACTERISTICS OF THE STUDY PROGRAMME “GEOINFORMATICS AND REMOTE SENSING”

### 1. Characteristic parameters of the study programmes

#### 1.1. Parameters of 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	45581
4.	The science field of the study programme (applicable to doctoral study programmes)	
5.	Type of the study programme	academic master's study programme
6.	Qualification level awarded upon completion (NQF/EQF)	7
7.	Volume of the study programme (credits, and ECTS as a recommendation)	120 CP/ECTS
8.	Form, type, duration (if incomplete years, then show in months), and teaching language	
	full time studies	2 years
	full time extramural studies	
	part time studies	
	part time extramural studies	
	extramural studies	
9.	Place of implementation	Latvia University of Life Sciences and Technologies
10.	Admission requirements	Bachelor's degree in agricultural sciences, forestry, transport logistics, land management and surveying, geodesy, landscape architecture, environmental sciences or other natural and engineering sciences. If you have a degree in another field of study, you will need at least 2 years' professional experience in a field related to the specialisation of your chosen Master's degree programme. For studies in English, in addition, a minimum B2 level of English
11.	Obtainable degree, professional qualification or degree and professional qualification, so called specialisation (if applicable)	Master of Engineering in Architecture and Urban Design (Mg.sc.ing.)
12.	Professional standard, year of its approval (if applicable)	
13.	The final examination at the end of the study programme	Master's thesis
14.	Director of the Study programme	Aivars Ratkevičs, Mg.sc.ing., lecturer

## **1.2. Purpose of the study programme**

Aim of the master's study programme:

To prepare highly qualified specialists for scientific, pedagogical, as well as professional and management work. The specialists shall be well-versed in scientific research and competent in solving scientific and practical problems related to geoinformatics and remote sensing in agriculture, forestry, transport logistics, spatial land administration, spatial organisation of crisis management. 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 in the field of science or in the labour market at any time. Therefore, the study programme is aimed at preparing specialists in the field of geoinformatics and remote sensing with broad competences in scientific research, engineering, economic and legal issues to work in companies, municipalities, state administration institutions, educational and research institutions.

## **1.3. Tasks of the study programme**

Master's programmes shall ensure that young professionals:

- can formulate, independently carry out or organise scientific research in geoinformatics and remote sensing, apply the acquired results in agriculture, forestry, transport logistics, spatial land administration and spatial organisation of crisis management;
- choose state-of-the-art geospatial solutions, technologies and methods, recognised and used in scientific practice worldwide, for problem solving in agriculture, forestry, transport logistics, spatial land administration and spatial organisation of crisis management;
- provide theoretical knowledge and skills that enable them to identify the most relevant areas of research and teaching activity, and to continue their education at the doctoral level or to pursue self-education.

## **1.4. Learning outcomes to be achieved**

### **Knowledge:**

- have a systematic approach and critical understanding in analysing problem situations and possible solutions in the chosen specialisation.

### **Skills:**

- be able to work independently in the interdisciplinary field of geoinformatics, using theory and appropriate methodology in research activities, reasonably explaining and discussing aspects and current affairs of the field.
- be able to effectively organise work independently and in a team, establishing communication and cooperation with Latvian and international partners.

### **Competencies:**

- have a good understanding of the specificities of geoinformatics and remote sensing, be able to conduct and independently carry out scientific research, organise the practical application of research results, and engage in pedagogical work.

## **2. Topicality and description of the study programme**

In the development of the economy towards the application of modern, smart technologies, the availability of quality and adequate environmental (spatial) information, together with the sufficiency of quality specialists in the field, is a direct factor in promoting development. 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 geoinformatics. As a result, the country's economic development in the use of modern - smart technologies is systematically lagging 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 and relevance to industry trends**

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 analyses 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://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:108:0001:0014:LV:PDF> – LV only), the importance of geospatial data in Europe is increasing, which in turn drives 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 the study programme content**

The plan regarding the Academic Master's study programme "Geoinformatics and Remote Sensing" can be found in Annex 1.

The study programme complies with the applicable national education standard of the Cabinet Regulation No. 240 of 14 May 2014 "Regulations on the National Standard of Academic Education", which is supported by Annex 2. The volume of the study programme is 120 CP, which corresponds to the volume of the academic master's study programme. The planned duration of the study programme is 2 years.

The studies consist of a compulsory part in the amount of 57 CP, a State examination, Master's thesis in the amount of 33 CP. The remaining part is an elective part Choice and a limited elective part in the amount of 6 CP and 24 CP respectively, where students can choose one of the specialisation areas – geoinformation provision of agriculture and forestry, land spatial administration or spatial organisation of crisis management. Most of the theoretical courses are planned at the beginning of studies (1st year), where students learn data processing methods, supplement their knowledge of foreign languages with scientific terminology, as well as acquire and strengthen practical knowledge in the use of various data acquisition and processing technologies. In the 2nd year, a student's specialise in a chosen field of study, corresponding to their chosen field of science or field of research. It provides a broader theoretical knowledge and practical skills related to the field, its specific requirements, development potential and application possibilities.

In order for the studies to be assessed as successful, each semester the master's student must obtain the amount of credit points indicated in the study programme plan. The process of implementation and supervision of the study programme is designed to be understandable to the master's student; its implementation should be reviewed and regularly evaluated, which promotes the achievement of study results.

Upon completion of the study programme, the Master of Engineering in Architecture and Urban Design shall be awarded.

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

The Academic Master's study programme "Geoinformatics and Remote Sensing" was licensed on 29 June 2022. The Academic Master's study programme "Geoinformatics and Remote Sensing" started on 1 September 2022 and it 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 system at LBTU. On the basis of the new "credit point" term 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 credit points 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).

The content of the study programmes has not changed as a result of the transition from Latvian to the ECTS credit system. Only the number of hours of study work has changed for some study courses, for which the conversion resulted in a partial number of credits (e.g. 6.5). As a result, the number of hours has been adjusted for some courses by rounding the number of credits to the nearest whole number.

## **2.4. Information about students**

The Academic Master's study programme "Geoinformatics and Remote Sensing" is implemented as full-time, and the form of study is classroom learning. The studies are planned to be implemented 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. The licensing report indicated that the full-time Academic Master's degree programme "Geoinformatics and Remote Sensing" was planned to have 20 state-funded budget places. For the 2022 enrolment, 5 state funded budget places were allocated and 100 % filled, while for the 2023 enrolment, 8 state funded budget places were allocated and 100 % filled.

Number of students, as of 01.10.2022

<b>Course</b>	<b>Full time</b>
Year 1	5

On 1 September 2022, 5 full-time students started their studies, 5 of whom started their studies with state funding (there were 5 budget places).

Number of students as of 01.10.2023

<b>Course</b>	<b>Full time</b>	<b>On academic leave</b>
Year 1	8	-
Year 2	3	1

On 1 September 2023, 8 full-time students started their 1st year of studies. 3 students started their studies in the 2nd year, one was on academic leave and one had terminated their study contract.

All full-time students study with state 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 doctoral study programmes. The University currently implements 11 different doctoral programmes.

### 3. Resources and supplies

“Geoinformatics and Remote Sensing” is a relatively new Master’s 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 Academic Master’s study programme “Geoinformatics and Remote Sensing” will be implemented by the Institute of Land Management and Geodesy of the Faculty of Forestry and Environmental Sciences, in cooperation with the Institute of Landscape Architecture and Environmental Planning, the Institute of Construction and Woodworking, the Institute of Forestry, the Language Centre, the Institute of Soil and Plant Sciences and the Institute of Animal Sciences of the Faculty of Agriculture and Food Technology, and the Institute of Computer Systems and Data Science of the Faculty of Engineering and Information Technologies. 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	FFES	<i>To manage, organise and supervise the process of the academic Master’s study programme “Geoinformatics and Remote Sensing”.</i>

			<p><i>Ensure the following courses of study:</i></p> <ul style="list-style-type: none"> <li>• Geodetic Reference Systems</li> <li>• 3D Modelling</li> <li>• Remote Sensing and Photogrammetry</li> <li>• Use of Geographic Information System Technologies</li> <li>• Development of Scientific Work</li> <li>• Transport Infrastructure and Logistics</li> <li>• Development of Geo-information Products and Works</li> <li>• Acquisition and Maintenance of Geo-information Data</li> <li>• Sustainable Land Management</li> <li>• Geodata in the Real Estate Cadastre</li> <li>• Spatial Development Planning</li> <li>• Land Information Systems</li> <li>• Crisis Management</li> <li>• Application of Geo-information in Predicting the Origin of Crises</li> <li>• Geo-information capability calculations and preparation for crisis management</li> <li>• Geo-information Products and Actions for Crisis Management</li> <li>• Geo-information Professionals and Entities in Crisis Management</li> </ul> <p><i>Manage, organise and supervise the National Examinations – Master's Thesis I,II.</i></p>
2.	Institute of Landscape Architecture and Environmental Engineering	FFES	<i>Ensure completion of the study course – Hydrological Modelling.</i>
3.	Institute of Construction and Woodworking	FFES	<i>Ensure completion of the study course – Geo-information for Sustainable Construction.</i>
4.	Language Centre		<p><i>Ensure the following courses of study:</i></p> <ul style="list-style-type: none"> <li>• English language in the Master's programme (in the study programme implemented in Latvian);</li> <li>• Latvian Language II (in the study programme implemented in English).</li> </ul>
5.	Institute of Soil and Plant Sciences	ISPS	<p><i>Ensure the following courses of study:</i></p> <ul style="list-style-type: none"> <li>• Geology and Soil Information</li> <li>• Crop Production Systems</li> <li>• Crop Pests and their Monitoring</li> </ul>
6.	Institute of Animal Sciences	ISPS	<i>Ensure completion of the study course – Animal Production Systems</i>
7.	Institute of Forestry	FFES	<p><i>Ensure the following courses of study –</i></p> <ul style="list-style-type: none"> <li>• Risk Management in Forestry</li> <li>• Forestry and Management Principles</li> </ul>

8.	Institute of Computer Systems and Data Science	FEIT	<i>Ensure completion of the study course –</i> <ul style="list-style-type: none"> <li>• Information Technologies in Geoinformatics</li> <li>• Geodata Management and Protection</li> </ul>
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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 and circulation of records. The main tasks of the laboratory manager are related to the preparation, issuance, receipt and testing of geodetic and other measuring equipment sets for laboratory work. Supervision of the 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 internship 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 master's study programmes, detailed information on admission rules, the admission procedure and forms of admission documents to be prepared <https://www.lbtu.lv/lv/magistra-studijas> (LV only). Information is also available to potential applicants for master's studies from abroad: <https://www.lbtu.lv/en/master-study-programmes>. This information allows potential students to evaluate their compliance with a specific master's study programme, and to prepare documents. Taking into account the fact that doctoral study programmes are intended not only for those who have obtained a master's degree at LBTU, and in order for the admission process to be completely clear, a scheme for the admission procedure has been created.

Study and scientific literature necessary for the implementation of the study programme is available in the LBTU Fundamental Library.

The following **free services** are available in LBTU FL:

- computers with internet connection and wireless internet access,
- possibilities to use *Autodesk EDU Master suite 2018 (AutoCAD, AutoCAD Structural Detailing, Autodesk Robot Structural Analysis professional, etc.)*, *CorelDRAW X7*, *SPSS Statistics v21*, *VISION 2013*,
- 24/7 use of library databases, subscriptions and free online databases,
- issuing/receiving books, serials and other documents,
- training in working with full-text and bibliographic databases, computer and internet consultations,
- classes for LBTU teaching staff, including online classes on information search, retrieval, creation of personal accounts, adding publications from the LBTU teaching staff and researcher publication database to the LBTU IS personal account, Mendeley, creation of ORCID and Research ID accounts, etc,
- classes for PhD students, master's students, undergraduate students, including in English,

- supporting materials for each target audience (scientists, students, other users) and sending them on request,
- reference services and consultations on the library and its use,
- editing of reading lists, e-mailing of examples of descriptions on request,
- creating exhibitions by order.

The following **paid services** are available in LBTU FL:

- photocopying (colour, black and white),
- printing (colour, black and white),
- scanning,
- execution of written thematic enquiries,
- SBA and SSBA services (postal service costs must be covered),
- delivery of copies of documents (at suppliers' rates),
- spiral binding.

The Library offers the following **e-services**:

- 24/7 use of the electronic catalogue,
- electronic book reservation, 24/7 extension of the return deadline,
- using the *PRIMO DISCOVERY* single search engine,
- 24/7 use of library-created, subscribed and free online databases (both full-text and bibliographic), possibility to use the "Ask a Librarian" service in the EBSCO database,
- possibilities to connect to subscribed databases of e-journals and e-books outside the LBTU network by using *EZproxy* and LBTU IS user account 24/7,
- use of the *Mendeley* scientific information search engine,
- the possibility to use other online information resources from the library's website,
- the possibility to connect to the electronic catalogues of information centres and information offices of LBTU faculties from the library website (BIS ALEPH500),
- possibilities to use the information resources help materials prepared by LBTU FL and offered by the database maintainers from the library website,
- electronic document delivery,
- "Write to a Librarian" on Skype,

LBTU FL users have the possibility to search for information in the field of geoinformatics and remote sensing in the following subscribed foreign and Latvian online databases:

- *CAB Abstracts*,
- *CRC Press* e-books,
- The *EBSCO eBook Academic Collection* database, which covers a wide range of multidisciplinary topics and contains more than 228515 eBooks,
- *EBSCO host database Academic Search Complete*, *MasterFILE Premier* and others,
- *ScienceDirect Journals*,
- *Scopus*,
- *Web of Science*,
- *Wiley Online Journals*

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.

Readers are also offered databases created by the LBTU Fundamental Library:

- *Publications by Latvia University of Life Sciences and Technologies faculty and researchers,*
- *Doctoral theses defended at the Latvia University of Life Sciences and Technologies,*
- *Latvia University of Life Sciences and Technologies conference materials,*
- *Patent publications by Latvia University of Life Sciences and Technologies faculty members and researchers,*
- *Publications about the Latvia University of Life Sciences and Technologies*

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 academic Master's study programme "Geoinformatics and Remote Sensing".

### **Information on the financial base**

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

1. the state funding per state-funded Master's study place has increased to EUR 9 440.76 (in 2021 it was EUR 7 744.32). The increase per study place is due to changes in:
  - Increased base funding per study place, amounting to EUR 1 867.60 (EUR 1 630.11 in 2022);
  - the increased minimum value of the study cost factor in the thematic area of education, which is 3.28 (3.1 in 2021);
  - the increased social security cost of a study place EUR 265.5 (2022: EUR 164.34).
2. an increase in the number of publicly funded Master's study places to 25 (20 were planned for 2022);
3. the minimum number of students in the programme has been increased to 8 (5 was planned in 2022);
4. the salary rates of teaching staff increased. The assistant professor's rate per load is EUR 1 423 (EUR 1 124 in 2022) and the total annual remuneration of the teaching staff has increased to EUR 53 815.77, as the number of 33 students (8 fee-paying students and 25 publicly funded students) will form 3 student groups.

## Assessment of material and technical base

Study programme “Geoinformatics and Remote Sensing” is mainly implemented by the Institute of Land Management and Geodesy of the Faculty of Forestry and Environmental Sciences (FFES) of LBTU, 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. The study programme lessons will also be held in the auditoriums, computer classrooms and laboratories of the Faculty of Agriculture and Food Technology and the Faculty of Engineering and Information Technologies, which are equipped with all the necessary facilities for the implementation of the study programme.

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.

Within the framework of the ongoing ERDF projects “Strengthening of Research and Development Infrastructure and Institutional Capacity of LBTU and the Scientific Institutions under its Supervision” (No.1.1.1.4/17/I/003) and “Modernisation of STEM Study Programmes” (No.8.1.1.0/17/I/001), as well as by investing the funds earned by the Institute, significant repairs have been carried out, computer hardware, equipment and instruments have been purchased, and equipment has been acquired. The Geodetic Instrument Calibration Laboratory has been established in the laboratory building, for which equipment, instruments and equipment have been purchased – GNSS equipment set Stonex S700A; Surface 3D laser scanner kit Stonex X300; Desktop HP EliteOne 800 G5 AIO 23.8" 5NW35AV with Win10Pro and 5gg

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 (10 Capital NEO GX33 MT desktop computers with Win10Pro and 3G were purchased). 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, Dluat 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 study programme “Geoinformatics and Remote Sensing” includes the development of a scientific thesis and a Master’s thesis, which will be organised by the Institute of Land Management and Geodesy. The equipment of the Surveying Training Laboratory, Geodetic Instrument Calibration Laboratory and GIS Competence Centre will be used according to the research topic.

The material and technical base is sufficient and corresponds to the specifics and implementation of the academic Master’s study programme “Geoinformatics and Remote Sensing”.

### **3.2. Analysis of changes in the composition and qualification of the teaching staff during the reporting period and evaluation of these changes**

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 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 faculty 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, 30 teaching staff members, including 7 professors (including 1 professor emeritus), 5 associate professors, 6 assistant professors, 12 lecturers, have been recruited for the Master’s study programme “Geoinformatics and Remote Sensing”. Of the 30 teaching staff members, 20 have been elected as leading researchers, researchers and research assistants, respectively – 14 leading researchers, 3 researchers and 3 research assistants. A total of 24 teaching staff members have elective status. Three doctoral students are involved in the implementation of the study programme. Information on the teaching staff involved in the study programme is included in Annex 3 “List of teaching staff involved in the implementation of the study programme”.

### **Compliance of the qualification of the teaching staff with the requirements specified in the laws and regulations**

Section 55 of the Law on Higher Education Institutions determines the requirements to be met by academic study programmes. The Master’s study programme “Geoinformatics and Remote Sensing” fully meets these requirements.



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 instance, 3 teaching staff members have attended the modules offered by LBTU in the courses “Innovations in University Didactics”, 4 teaching staff members have attended 3D modelling and printing training at LBTU, 3 teaching staff members have participated in drone piloting training, and several teaching staff members have obtained the right to pilot a drone, 4 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.

Since the launch of the academic Master’s study programme “Geoinformatics and Remote Sensing”, 2 new teaching staff members have been recruited. The curriculum vitae of the newly recruited teaching staff members (in Europass format) are attached in Annex 4.

### **3.3. Justification for awarding a master’s degree in achievements and findings in the field of geoinformatics and remote sensing**

As the master’s study programme “Geoinformatics and Remote Sensing” is relatively new, the first graduation will take place only in 2024, when 1 student will graduate. To date, there has been no involvement of students in scientific research projects in Latvia.

This is a rapidly evolving area of education worldwide. Latvian students have participated and are participating in research programmes in these fields and topics in other countries and institutions. Students and those interested in studying in the programme show that they have already encountered a lack of full knowledge of geoinformatics and its applications in their practical work.

In the course of the programme, active monitoring is given to current projects and research in the field of geoinformatics and remote sensing, both in Latvia and abroad, which to date demonstrates an acute shortage of such fully trained specialists in public administration and the public sector, not only in Latvia, but throughout Europe.

## **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.

### Report on the implementation of the study programme licensing recommendations

No.	Expert group recommendation	University/college 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 (annex 5).	Until the start of the study programme	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 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.	The theoretical and practical content of existing courses is updated. Evaluate whether new courses are needed.	No deadline (long-term recommendations)	Implementation of a recommendation is ongoing
3.	Improve the library's print resources specifically in the field of geoinformatics and remote sensing.	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 specifics of the programme and current trends in the world, we need to increase access to a wide range of up-to-date electronic resources.	The range of printed materials available in the LBTU Fundamental Library has been expanded. Increased range of electronic resources available	No deadline (long-term recommendations)	Implementation of a recommendation is ongoing

### **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. List of teaching staff members involved in the implementation of the study programme
4. CVs of newly recruited teaching staff members
5. Updated course descriptions in both Latvian and English, with revised and updated reading lists.