APPLICATION

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

Study field	*Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science*
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Self-evaluation report

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

Ventspils University College

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1. Information on the Higher Education Institution/College

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

Ventspils University of Applied Sciences (hereinafter - 'VUAS') is an accredited state institution of higher education and a scientific institution, whose main activities are higher education, scientific activity, commercialization of knowledge, and lifelong learning. VUAS has been registered as a scientific institution in the Register of Scientific Institutions since May 20, 2013. Ventspils University of Applied Sciences was founded on 23rd July, 1997, by the order of the Cabinet of Ministers of the Republic of Latvia (hereinafter - the Cabinet') No. 384 "On the Establishment of Ventspils University of Applied Sciences". As a State-founded institution of higher education, VUAS is under the supervision of the Ministry of Education and Science of the Republic of Latvia, but it promotes its activities and development in accordance with the development guidelines of Kurzeme Region and Ventspils city, thereby contributing to the polycentric development of the State. VUAS complies with the Law on Higher Education Institutions, the Law on Scientific Activity, the Education Law, the Constitution of Ventspils University of Applied Sciences and other international, national, and regional development planning documents and regulatory enactments.

In accordance with the Cabinet Decree No. 449 of 21st June, 2022, "On the Strategic Specialization of State Institutions of Higher Education", VUAS strategic specialization was set for the following scientific fields:

- natural sciences (thematic field of education – physical science, computer science, and education programme group electronics and automatics);
- social sciences (thematic field of education – commercial studies and administration);
- humanities and arts (thematic field of education – humanities).

The **mission** of VUAS for 2021-2027 is to provide modern, tailored to the changing requirements of the labour market, research-based, accessible education for all, and to become a platform for excellence and innovation in education, where young specialists discover their talents and where knowledge is disseminated by professionals. The **future vision** of VUAS is a digitally open and accessible European-level university that is internationally recognized and makes a significant contribution to the development of the economy and science.

VUAS consists of three faculties. The Faculty of Economics and Management ("the FEM"), the Faculty of Translation studies ("the FTS") and the Faculty of Information Technology ("the FoIT"). There are four fields of study, with 17 study programs, six of which are at the FoIT.

VUAS fields of study:

- Management, administration, and real estate management;
- Translation;
- Language and cultural studies, native language studies and language programmes;
- Information technology, computer hardware, electronics, telecommunications, computer management and computer science.

Values defined by VUAS for 2021-2027:

- excellence;
- collegiality;

- team;
- flexibility;
- creativity;
- academic integrity;
- scientific advances.

Three strategic development goals have been defined at VUAS, supplemented by four horizontal or transversal goals for the period 2021-2027. These goals are related to four strategic development directions of VUAS: St – studies, Sc – Science, M – Management and L – lifelong learning.

Development goals of VUAS:

- A1. Modernization and digitalization of the educational offer in order to train specialists who are in demand on the labour market today and in the future, with relevant skills of the 21st century in priority areas of study;
- A2. The excellence of science and the transfer of knowledge in the national economy, as well as the increase of the innovation capacity, the social and economic values of knowledge and research in cooperation with external ones, incl. international partners;
- A3. Developing a modern, needs-based lifelong learning offering and promoting a culture of lifelong learning.

Horizontal goals of VUAS:

- H1. Systematic development of cooperation framework with external partners (industry, social partners, cooperation networks, other educational and scientific institutions) at national and international level;
- H2. Internationalisation of VUAS and creation of an international reputation and environment for effective cooperation in education, science and development;
- H3. VUAS resource development and effective management, incl. human resources, technology, management and financial efficiency;
- H4. Social responsibility for sustainable growth of the national economy.

The dynamics of the number of students at VUAS can be seen in Table 1.1 below, choosing three criteria illustrating the dynamics – the number of students enrolled, the total number of students, and the number of graduates. When analysing data on the dynamics of student numbers, it should be noted that there are two significant deviations in the number of students admitted from the overall upward trend - the academic year 2020/2021 (a rapid rise) and the academic year 2021/2022 (a rapid drop). The rise is partly due to a steep increase in the number of students enrolled in the FoIT (probably reflecting a national and global assessment of the importance of the pandemic and the related leap in the ICT industry). With the number of students enrolled in the FoIT in the academic year 2021/2022 declining to almost the same level as in previous years, there was a drop in enrolments in all faculties. This is at least partially due to uncertainty about the state of emergency and related restrictions (potential students who did not want to get vaccinated against COVID-19 were not able to participate in the face-to-face study process during the first two months of the study year). One should note that the number of students enrolled in the academic year 2022/2023 rose by more than 13%, reflecting an upward trend and pointing to the fact that the COVID-19 pandemic restrictions had a significant impact on enrolment results during the reporting period.

Table 1.1

Dynamics of the number of students at VUAS 2017/2018 - 2022/2023 AY *

	2017/2018 AY	2018/2019 AY	2019/2020 AY	2020/2021 AY	2021/2022. AY	2022./2023 AY
Number of students enrolled	238	230	269	301	239	273
Total number of students	817	794	725	767	743	713
Number of graduates	160	139	150	151	130	124

* data recorded on 1st October of the reporting year and available in the State Education information system (hereinafter - VIIS).

A summary of the Strategy of the Ventspils University of Applied Sciences for 2021-2027 in Latvian is available here: https://www.venta.lv/augstskola

in English: https://www.venta.lv/en/university

The complete Strategy of Ventspils University of Applied Sciences for 2021-2027 in Latvian is available here: https://irp.cdn-website.com/f6b5d556/files/uploaded/VeA_Strategija_2021_2027.gadam.pdf

The complete Strategy of Ventspils University of Applied Sciences for 2021-2027 in English is available here: https://irp.cdn-website.com/9945ff8b/files/uploaded/VENTSPILS%20UNIVERSITY%20OF%20APPLIED%20SCIENCE_STRATEGY_2021-2027.pdf

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

The structure of VUAS has been formed in a united hierarchical system to ensure that the activities of VUAS are in the public interest, observing the principles of good governance, which include openness, data protection, and just implementation of procedures within a reasonable time. It is set up to implement the efficient accomplishment of the mission, vision, and goals of the VUAS, based on the decision-making process and obligations arising from the functions specified by collegial decision-making bodies and decision-making bodies provided for in the Law on Higher Education Institutions.

According to the Constitution of Ventspils University of Applied Sciences, the governing bodies of the VUAS are:

- VUAS Constituent Assembly – an institution of representation of academic and general staff, and students of VUAS;
- VUAS Council – a collegial senior decision-making body of VUAS, responsible for sustainable development and strategic and financial supervision of VUAS, as well as for ensuring the operation of VUAS in accordance with the goals set out in its development strategy. The VUAS' Council protects VUAS' autonomy and respects and promotes the academic freedom of academic staff and students;
- VUAS Senate – a collegial highest academic decision-making body of VUAS, responsible for the excellence of VUAS education, research, and creative activity, its development and compliance with internationally recognized quality standards. The VUAS Senate regulates VUAS' academic, creative, and scientific fields of activity;
- VUAS Rector – a senior official who exercises the general administrative management of VUAS and represents VUAS without special authorization;
- VUAS Academic Arbitrage – a collegial decision-making body of VUAS composed of representatives of academic staff and students. It decides issues which affect restrictions or violations of academic freedoms and rights specified in the Constitution; it also decides on disputes between the officials of VUAS, as well as administrative institutions of structural units which are in a subordinate relationship.

The Ventspils University of Applied Sciences' Constitution is available here (Only in Latvian): https://irp.cdn-website.com/f6b5d556/files/uploaded/VeA_Satversme_saskanosanai_IZM%20%281%29.pdf

There is a Student Council established at VUAS, and it is the highest student self-governing body. The VUAS Student Council is an elected, independent institution representing students' rights and interests, and it defends and represents students' interests with regard to the academic, material, and cultural life in VUAS and other State institutions in accordance with the Law on Higher Education Institutions and the by-law of the VUAS' Student Council.

In order to ensure effective decision-making, the VUAS has collegial advisory and sector-specific decision-making bodies:

- VUAS' Audit Commission;
- VUAS' Councillors' Convention;
- VUAS' Ethics Commission;
- VUAS' Academic Integrity Commission;
- VUAS' Study Council;
- VUAS' Science Council;
- VUAS' faculty councils;
- Scientific councils of VUAS scientific institutes;
- VUAS' study programmes' councils;
- VUAS' Strategy, Quality Management, and Risk Monitoring Commission;
- The VUAS' Project Supervision Board;
- VUAS' Management Working Group;
- VUAS' Council of Deans.

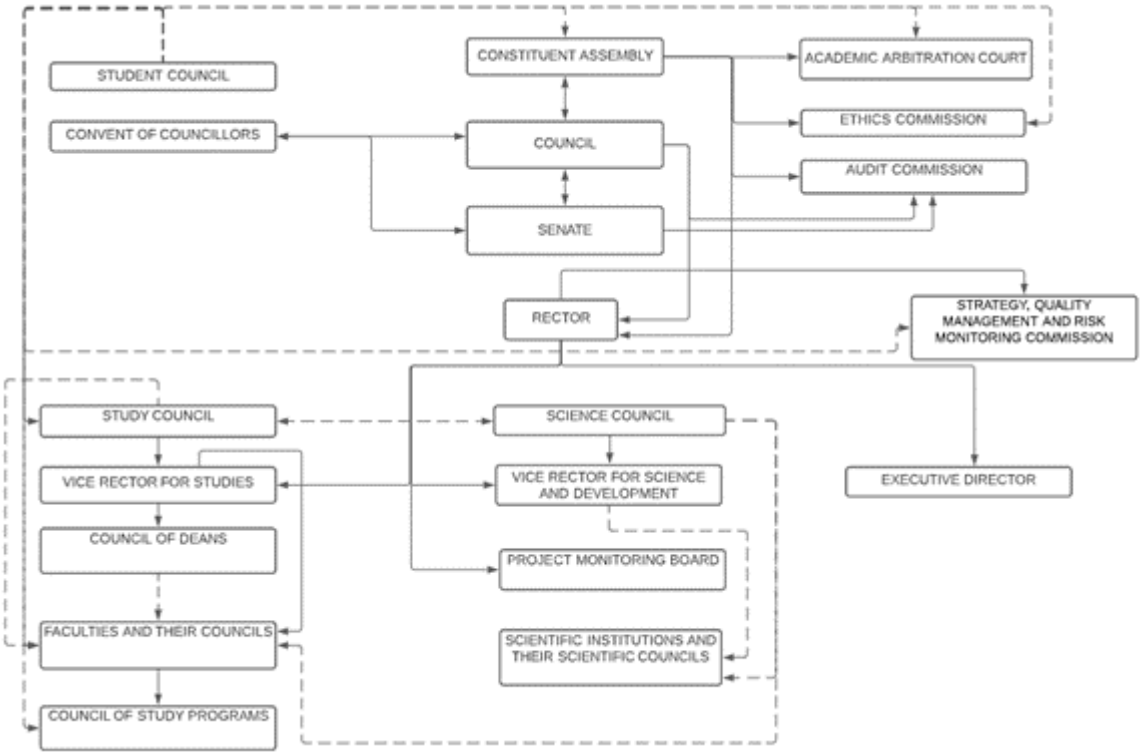

Figure 1.1. **Structural scheme for strategic, operational, and functional management of Ventspils University of Applied Sciences**

The details of this section are available in the attached annexes:

- Annex No. 1.1.: A list of the main internal regulations;
- Annex No. 1.2.: VUAS organisational chart;
- Annex No. 1.3.: characterization of the main authorities involved in decision-making, their composition, and their powers.

In accordance with the Law on Higher Education Institutions, the main decision-making bodies of the Ventspils University of Applied Sciences are:
- Constitutional Assembly;
- The Council;
- Senate.

The following principle of representation of the staff of the VUAS is followed in determining the number of members of the Constituent Assembly:
- Academic staff - 60 per cent (18 representatives);
- students - 20 per cent (6 representatives);
- general university staff - 20 per cent (6 representatives).

Student representatives in the Constituent Assembly of the VUAS shall be elected by the Student Council of the VUAS in accordance with the procedure established by the Student Council in order to ensure, as far as possible, the representation of students at all levels of study at the VUAS. The Council of the VUAS shall consist of five members, two of whom shall be members nominated by the VUAS Senate in accordance with the selection procedure laid down in the Constitution, two of whom shall be members nominated by the Cabinet of Ministers in accordance with the procedure laid down in the Constitution and one of whom shall be a member nominated by the President of the Republic of Latvia. The VUAS Senate shall be elected by the Constituent Assembly for a term of three years from among the academic and general staff of the VUAS. The Senate shall be composed of not less than 75 per cent of the academic staff, not less than 20 per cent of the student

representatives, and the Rector in accordance with the position held. The Senate shall consist of 20 senators: 15 representatives of the academic staff, 4 representatives of the students and the Rector. Student representatives in the VUAS Senate shall be elected by the VUAS Student Council in accordance with the procedure laid down by the Council in order to ensure, as far as possible, the representation of students at all levels of study at VUAS. The main collegiate decision-making body at the Faculty of Information Technologies is the Council of the Faculty of Information Technologies.

The Council of the Faculty of Information Technologies shall be composed of 12 members, of whom:
- 8 representatives of the elected academic staff;
- 1 representative of the general staff;
- 3 representatives are students.

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

VUAS quality assurance focuses on a unified operation and development of VUAS in the strategic specialisation areas in accordance with the priorities of the policy planning cycle for the development of economics and society, specified in policy planning documents. The VUAS quality management system is implemented in accordance with the European Quality Management Fund Excellence Model (EFQM Excellence Model), in accordance with the requirements laid down in the VUAS Development Strategy, as well as the quality criteria set by European Union and the Republic of Latvia.

VUAS quality management system is designed to improve the quality of study acquisition, which in accordance with labour market requirements provides the human resources necessary for the future needs of the national economy, state, and society, facilitating the possibility to adapt dynamically to changes in the external environment.

In order to strengthen the quality assurance of education and management capacity, VUAS quality management policy focuses on:

- cooperation with interested parties;
- strategic approach and leadership;
- the involvement of staff;
- process management and improvement;
- consistency;
- data approach to decision-making;
- continuous improvement.

The VUAS quality management system and its assurance processes are structured according to the following cycle: plan — perform — test — act (PPTA).

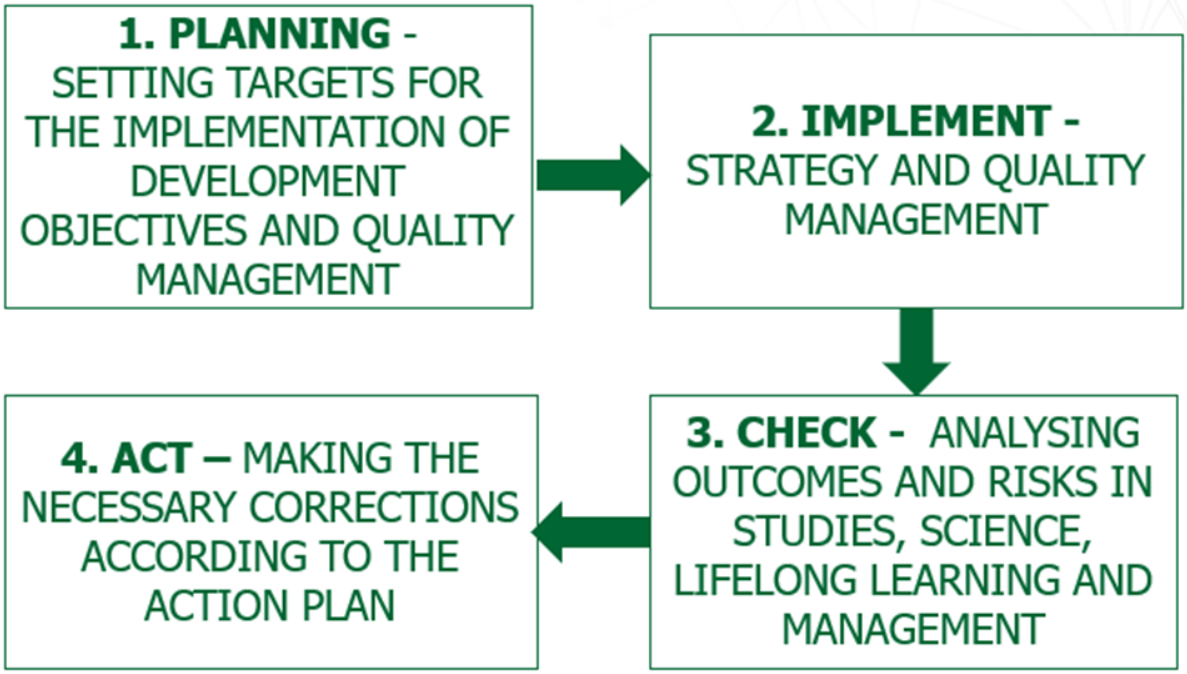

Figure 1.2. **Quality assurance cycle scheme**

The VUAS quality management system has been established as a three-tier system:

1. VUAS' DIRECTION, consisting of the VUAS' Strategy, and defining clear, relevant, and measurable goals, tasks and criteria to be attained;
2. VUAS' ACTION comprised of the implementation of higher education, scientific activity and lifelong learning through management, operational assurance and support processes, implementing procedures to ensure the achievement of goals and the accomplishment of tasks;
3. MONITORING of VUAS' RESULTS, overseen and evaluated by VUAS decision-making bodies.

In order to ensure the quality of VUAS' higher education, the following mechanisms and procedures are applied within the three levels of the system:

- licensing and accreditation of study fields and study programmes;
- consistency of study program goals, assignments, and content with the VUAS' development strategy and international, national and regional developments;
- comparison of international and national competitiveness of study programmes with other programmes of institutions of higher education that have been recognized by a European Union member State;
- annual evaluation of self-assessments of study programmes, weaknesses and strengths of study programmes, changes, possibilities for development, and improvement of programmes;
- provision of the resources and digitalization of the study programme;
- evaluation of the student-centred approach;
- assessment and management of student performance;
- assessment of the participation of students in research;
- assessment of student satisfaction;
- assessment of the activities and positioning of graduates in the work and business

environment;

- an assessment of the annual results to be achieved by the academic staff;
- analysis and improvement of processes and documentation;
- analysis of the development of cooperation with sectoral associations and employers, as well as analysis of their opinions;
- monitoring of strategy, quality management, and risks.

A Strategy, Quality Management, and Risk Monitoring Commission has been established for ensuring strategy, quality management, and risk monitoring, and it includes the rector, the study pro-rector, the science and development pro-rector, the executive director, faculty deans, directors of scientific institutes, a student representative and heads of units. This working group compiles, at least once a year, the performance of the responsible departments in order to carry out a conformity analysis of strategic indicators and quality principles, as well as to identify risks. The rector of VUAS defines the measuring methodology, regularity, and persons responsible for processes in VUAS. VUAS quality management system process contains a stage in which the achievements of goals are monitored and evaluated, comparing the achievements with the tasks set. The visualisation of strategy, quality management and risk monitoring is shown in Figure 1.3.

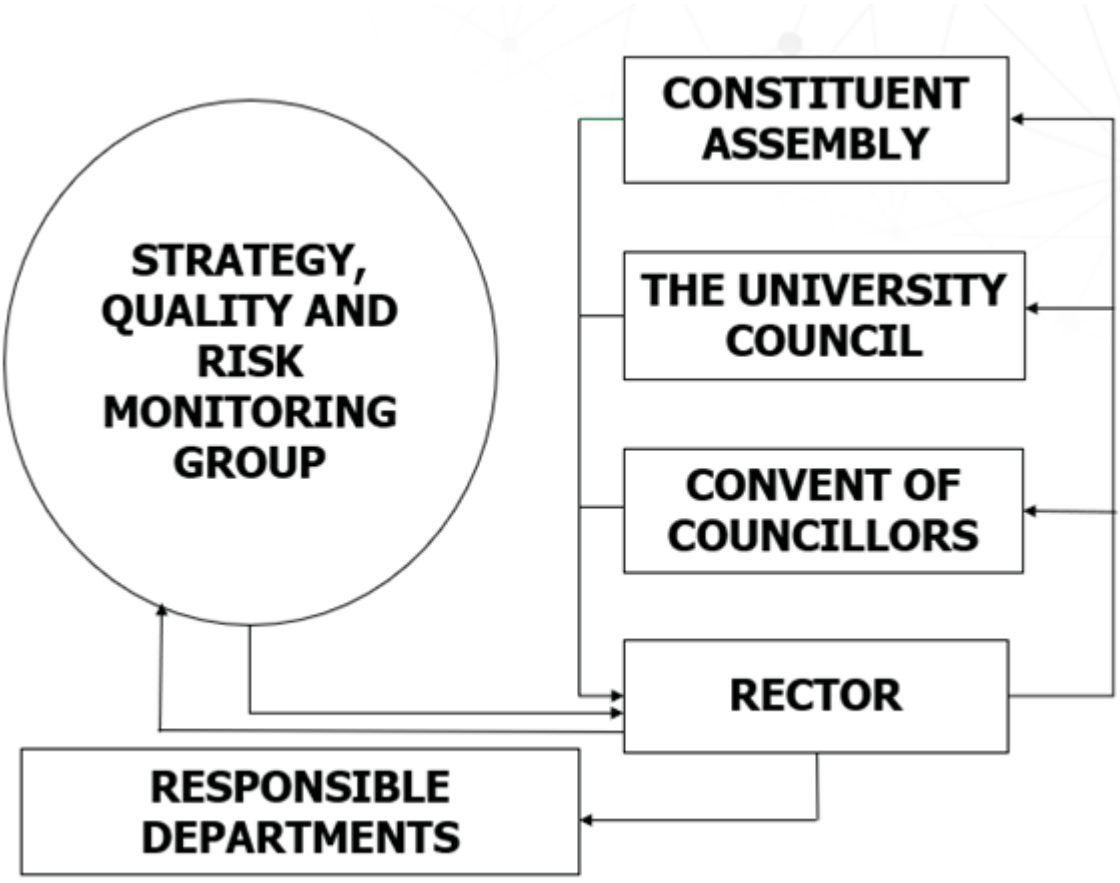

Fig. 1.3. VUAS' strategy, quality management and risk monitoring

VUAS' Quality Management Manual (which also contains VUAS' quality management policy), as well as other binding internal regulations are published on VUAS' website and are available to VUAS' staff, students, cooperation partners, and other stakeholders (available Only in Latvian at: https://www.venta.lv/augstskola/parskati-un-zinojumi).

VUAS' Quality Management Guide is available at (Only in Latvian): https://irp.cdn-website.com/f6b5d556/files/uploaded/VeA_Kvalitates_vadibas_rokasgramata.pdf

VUAS' quality management system processes and related information, as well as related VUAS'

internal regulations can be accessed in the VUAS' internal network information content management system in the MOODLE environment.

Ventspils University of Applied Sciences Quality Management Policy available at:
in Latvian: https://www.venta.lv/augstskola/kvalit%C4%81tes-politika
in English: https://en.venta.lv/augstskola/quality-assurance

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

1.	The higher education institution/ college has established a policy and procedures for assuring the quality of higher education.	COMPLIANT VUAS has introduced and maintains a quality management system with a quality manual, defined processes and responsibilities in line with external and internal laws and regulations. Ventspils University of Applied Sciences Quality Management Policy available at: in Latvian: https://www.venta.lv/augstskola/kvalit%C4%81tes-politika in English: https://en.venta.lv/augstskola/quality-assurance Further information on quality management processes (including process flowcharts), administration responsibilities and related laws and regulations is available to VUAS staff in the e-learning environment Moodle.
2.	A mechanism for the creation and internal approval of the study programmes of the higher education institution/ college, as well as the supervision of their performance and periodic inspection thereof, has been developed.	COMPLIANT The procedure for the development and upgrading of a study program and further motion for licensing of it at Ventspils University of Applied Sciences is stipulated by the regulations "Procedure for Development, Licensing and Improvement of Study Programmes at Ventspils University of Applied Sciences" approved by the Senate of VUAS January 25, 2023, available on the VUAS website, in the section "Documents" (only in Latvian): https://irp.cdn-website.com/f6b5d556/files/uploaded/VeA_Studiju_programmu_izstrades_licencesanas_pilnveides_nolikums.pdf For detailed information about the supervision and periodic review of the operation of a study program, see Chapter 2.2.2 of the self-assessment report.

3.	The criteria, conditions, and procedures for the evaluation of students’ results, which enable reassurance of the achievement of the intended learning outcomes, have been developed and made public.	COMPLIANT The evaluation criteria, conditions, and procedure are determined by the “Regulation on procedures for the organisation of examinations and assessment of students' knowledge at Ventspils University of Applied Sciences” approved at the Senate meeting on 15th January, 2020, “Regulation on procedures for studies at Ventspils University of Applied Sciences” approved at the Senate meeting on 20th December, 2022, “Regulation on evaluation and recognition of the volume and content of study courses at Ventspils University of Applied Sciences” approved at the Senate meeting on 11th August, 2021, and “Regulation on general requirements for the development and implementation of study courses at Ventspils University of Applied Sciences” approved at the Senate meeting on 20th December, 2022. VUAS defines the goals, tasks and achievable study results of each study programme, which are coordinated with the results to be achieved by the study course and the criteria for evaluation of knowledge, skills and competences in the descriptions of study courses. For guidance on publicity and accessibility of regulating documents, see Annex No.1-1-a "Ventspils University of Applied Sciences (Ventspils Augstskola - VUAS) main internal acts and regulations". See Chapter 2.1.5 of the self-assessment report for details.

4.	Internal procedures and mechanisms for assuring the qualifications of the academic staff and the work quality have been developed.	COMPLIANT In order to achieve the development and efficient management of the human resources of VUAS, a specific action line “Human Resources Development” related to the promotion of the renewal and continuity of academic and general staff has been set. The implementation of these future plans of VUAS is done in accordance with the Human Resources Management Policy and Development Plan for 2021-2027, developed and approved by VUAS, which operates in close liaison with the gender equality policy of VUAS. The evaluation of the qualification and quality of work of the academic staff is performed in accordance with the provisions of VUAS regulation “Joint remuneration system of Ventspils University of Applied Sciences” and the Cabinet Regulation No 129 of 25th February, 2021, “Procedures for Evaluating the Scientific and Teaching Qualifications or Results of Artistic Creation Work of an Applicant for the Position of Professor or Associate Professor and of a Professor or Associate Professor Holding the Position” and the procedures approved by the Senate of Ventspils University of Applied Sciences on 31st August, 2021, “Regulation on elections for academic positions at Ventspils University of Applied Sciences and the procedures for recruiting academic personnel to Ventspils University of Applied Sciences”. The professional improvement of teaching staff is evaluated in accordance with the Regulations "On Professional Development of Elected Academic Staff and its Record keeping at VUAS” approved by the VUAS Senate on 22th February, 2023. For guidance on publicity and accessibility of regulating documents, see Annex No.1-1-a "Ventspils University of Applied Sciences (Ventspils Augstskola - VUAS) main internal acts and regulations". For further information, see Chapter 2.3.5 of the self-assessment report.

5.	The higher education institution/ college ensures the collection and analysis of the information on the study achievements of the students, employment of the graduates, satisfaction of the students with the study programme, efficiency of the work of the academic staff, the study funds available, and the disbursements thereof, as well as the key performance indicators of the higher education institution/ college.	COMPLIANT VUAS ensures that the following information is collected and analysed: ● on the achievements of students in accordance with the “Regulation on procedures for the organisation of examinations and assessment of students' knowledge at Ventspils University of Applied Sciences” approved by the Senate on 15th January, 2020; ● on the employment of graduates, the satisfaction of students with the study programme, and the efficiency of the work of the academic staff in accordance with the “Regulation on surveys of students, graduates and employers for evaluation and improvement of the study process” ratified by the VUAS Senate on 13th February, 2019; on the available study resources and their costs, essential indicators of the activities of VUAS in accordance with the analysis of the performance of strategic indicators as set in the VUAS Strategy for 2021-2027 and under the auspices of the annual budget development of VUAS in accordance with the “Regulation on the principles for the development of the budget of the Ventspils University of Applied Sciences”, approved by the decision of the VUAS Council of 26th August, 2022. For guidance on publicity and accessibility of regulating documents, see Annex No.1-1-a "Ventspils University of Applied Sciences (Ventspils Augstskola - VUAS) main internal acts and regulations". For further information, see Chapter 2.2.4 of the self-assessment report.

6.	The higher education institution/ college shall ensure continuous improvement, development, and efficient performance of the study field whilst implementing their quality assurance systems.	COMPLIANT The VUAS Senate, in accordance with the information provided in the annual self-assessment report of the study field, evaluates and decides on activities and development of the study field and its study programmes in accordance with the strategic development directions of VUAS. The procedure for preparation and submission of the annual study field self-evaluation report is regulated by the Regulation "Regulations on the Procedure for Preparation and Submission of the Annual Self-Evaluation Report of the Study Field at Ventspils University of Applied Sciences" (only in Latvian) approved by the VUAS Senate on 25 January 2023, available in the e-learning environment Moodle, in the section "For Study Programme Directors". At the level of faculty and study field, internal quality, control, and development is ensured by the faculty council, the faculty's councils of study programmes, the dean of the faculty, and the directors of the study programmes. At the level of the study programme, the internal quality and development is ensured by the director of the study programme. Internal quality control at the level of the study programme is performed by the dean of the faculty. At the level of the study course, the quality and development is ensured by the academic staff implementing the study programme, and the control is performed by the director of the study programme. For details see Chapters 2.1 and 2.2 of the self-assessment report.

2.1. Management of the Study Field

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

The study field of higher education “Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management and Computer Science” (hereinafter - ‘field of study’) at VUAS was established in accordance with the development strategy of VUAS and Ventspils City and is implemented in accordance with the strategy of VUAS for 2021-2027 (https://irp.cdn-website.com/9945ff8b/files/uploaded/VENTSPILS%20UNIVERSITY%20OF%20APPLIED

%20SCIENCE_STRATEGY_2021-2027.pdf). This field of study is being implemented at the VUAS' Faculty of Information Technologies. The study field is part of VUAS' strategic specialisation "natural sciences (thematic areas of education – physical sciences, computers and education programmes' group of electronics and automatics)".

The field of study corresponds to the **mission** defined in the strategy of VUAS: to provide modern, tailored to the changing requirements of the labour market, research-based, accessible education for all, and to become a platform for excellence and innovation in education, where young specialists discover their talents and where knowledge is disseminated by professionals.

The field of study follows the VUAS vision (future vision): a digitally open and accessible European-level university that is internationally recognized and makes a significant contribution to the development of the economy and science.

The objective of the field of study is:

to prepare highly skilled specialists in computer sciences and electronics with a profound knowledge that would enable them to adapt independently for professional activities in changing labour market conditions, as well as to prepare students for further studies in higher level programs, scientific activities, and further self-education.

The field of study fulfils the **development objectives of VUAS' Strategy**:

- A1. Modernization and digitalization of the educational offer in order to train specialists who are in demand on the labour market today and in the future, with relevant skills of the 21st century in priority areas of study.

  Main activities of the field of study for achieving this objective:

  Digitalization of the study courses of the field of study, development of new study courses, involvement of industry specialists both in the provision of study courses and in the updating and improvement of course content

- A2.The excellence of science and the transfer of knowledge to the national economy, as well as the increase of the innovation capacity, the social and economic values of knowledge and research in cooperation with external ones, incl. international partners.

  Main activities of the field of study for achieving this objective:

  Topics of and consultants for graduation papers are provided by companies and scientific institutions (both in Latvia and abroad), participation of students in projects. Examples of cooperation with companies, research institutions and involvement of students in different projects are provided in chapters 2.4.5. "Involvement of the students in scientific research and/ or applied research and/or artistic creation", 2.4.6. "A brief description and assessment of the forms of innovation used in the higher education institution, especially in study field subject to the assessment, by giving the respective examples and assessing their impact on the study process" and 2.5. "Cooperation and Internationalisation".

- * A3. Developing a modern and community-based offer of lifelong learning and promoting a culture of lifelong learning

* The goal is met indirectly by providing a number of information technology-related training offers in lifelong learning

The field of study fulfils also **VUAS' horizontal objectives**:

- H1. Systematic development of cooperation framework with external partners (industry, social partners, cooperation networks, other educational and scientific institutions) at national and international level.

  Main activities of the field of study for achieving this objective:

  Active work with industry representatives both in Latvia and abroad, ensuring different forms of cooperation (e.g. student internships and involvement in research projects). Cooperation with the Society of Physics' Teachers and Society of Informatics' Teachers.

- H2. Internationalisation of VUAS and creation of an international reputation and environment for effective cooperation in education, science and development.

  Main activities of the field of study for achieving this objective:

  Motivating students to participate in ERASMUS+ studies and internships outside Latvia, work with foreign students, cooperatation with foreign higher education and scientific research institutions.

- H3. VUAS resource development and effective management, incl. human resources, technology, management and financial efficiency;

  Main activities of the field of study for achieving this objective:

  Systematization and automation of administrative documents (including for calculation of teaching staff's work loads, determination of the cost and prices of the study programs). Development of the faculty's human resources by supporting doctoral studies of the teaching staff, attracting foreign guest teaching staff, hiring top graduates at the Information Technology Faculty (FoIT) and Ventspils International Radio Astronomy Center (VSRC). As the program provider, FoIT manages and regularly updates significant infrastructure resources, including laboratories, by mobilising ESF funding.

- H4. Social responsibility for sustainable growth of the national economy

  Main activities of the field of study for achieving this objective:

  The education system developed is in line with the labour market requirements and trends of the national economy sectors (professional programmes are developed in accordance with professional standards, company recommendations are considered and often implemented in the study content); Active employer connection with undergraduates is taking place (both for internships and drafting of graduation works).

The necessity and socio economic justification for the field of study's programmes, as well as the development needs of the society and national economy can be found in the following planning documents for the economic policy of the government, as well as national, regional and city level policy development:

- Sustainable Development Strategy of Latvia until 2030;
- Latvian National Development Plan 2021-2027;
- Education Development Guidelines 2021-2027 "Future Skills for the Society of the Future";
- Draft National Skills Strategy of the OECD;
- Guidelines for Science, Technology Development, and Innovation 2021-2027;
- *National Industrial Policy Guidelines 2021-2027;*
- Summary of Knowledge Ecosystems: Smart Specialization Strategy;
- Digital Transformation Guidelines 2021-2027;
- *Regional Policy Guidelines 2021-2027*

- Conceptual Report on the Change of the Internal Governance Model of Universities;
- *Sustainable Development Strategy for Kurzeme Planning Region 2015-2030;*
- Joint Sustainable Development Strategy of Ventspils State City Municipality and Ventspils Municipality until 2030 - Action Plan;
- Ventspils City Development Programme 2021-2027.

According to the Ventspils City Development Programme 2021-2027, at least 800 people are planned to work in the ICT sector in Ventspils (as at 2019, 545). To provide businesses with skilled employees, the programme envisages increasing the number of students in VUAS IT-related programmes to at least 300 (as of 2022 - 254). The graduates of this field of study are in demand both in Ventspils' companies and ICT and electronics companies throughout Latvia, as well as successfully develop their careers in foreign commercial enterprises or research institutes.

Table 2.1

Programmes included in the field of study and their interrelation, compliance with the strategic development goals of VUAC

No	Study programme	Connection of continuation of studies with other study programmes	Connection of the study process with other study programmes	Corresponding objectives of VUAS' Development Strategy
1.	Academic Bachelor's study programme "Computer Science" (43484)	After graduation from the study programme, it is possible to commence studies in the academic **Master's** study programme **"Computer Science"**.	Some courses are implemented together with the professional Bachelor's study programme "Electronics Engineering" and the 1st level professional study programme "Programming Specialist".	A1,A2,H1,H2,H4
2.	Academic Master's study programme "Computer Science" (45481)	*Possibility to study for a PhD at other universities.*		A1,A2,H2,H4
3.	Professional Bachelor's study programme "Electronics Engineering" (42523)	After graduation from the study programme, it is possible to commence studies in the professional **Master's** study programme **"Electronics"** or in the academic **Master's** study programme **"Computer Science"**.	Some courses are carried out in conjunction with the academic Bachelor's programme "Computer Science".	A1,A2,H1,H2,H4

4.	Professional Master's study programme “Electronics” (47523)	*Possibility to study for a PhD at other universities.*		A1,A2,H1,H2
5.	The 1st level professional study programme “Programming Specialist” (41484)	If a student has changed his/her mind and nevertheless wishes to study in an academic programme in the field of computer science, it is possible to align individual courses and work on an individual plan in the academic Bachelor’s study programme “Computer Science”.	Some courses are carried out in conjunction with the academic Bachelor's programme “Computer Science”.	A1,A2,H4
6.	Joint professional Bachelor's study programme “Smart Technologies and Mechatronics” (42523)		Most of the study courses conducted by VUAS are implemented in conjunction with the professional Bachelor's study programme “Electronics Engineering”	A1

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

A self-assessment report of the field of study is prepared each year for the evaluation of the quality of the field of study. It is drafted through cooperation of study programs’ directors, the dean of the faculty, the specialist-clerk responsible for administration of faculty’s studies and the study unit. The report is confirmed by the FoIT’s Council and VUAS’ Senate. This self-assessment report also includes SWOT analysis.

SWOT analysis of the field of study:

Strengths:

1. high student satisfaction with the VUAS' IT Faculty and the provided studies;
2. high-quality studies that provide up-to-date and relevant knowledge to the industry and develop competencies that enable the graduates to be in demand and competitive on the labour market;
3. European-level studies: tools to promote the intelligibility of qualifications, the European Credit Transfer and Accumulation System (ECTS) and Common European Diploma Supplement are in place;
4. practice opportunities in leading industry enterprises (incl. Accenture Latvia, SIA TestDevLab, SIA Tele 2 SSC, SIA BTG, IZI VSRC, SIA Hansamatrix Ventspils, Ventspils Digital Centre);
5. up-to-date software as well as state-of-the-art technical support for lecture-rooms and laboratories that facilitate implementation of effective and high-quality study programmes;
6. provision of courses in an e-environment, as well as appropriate technical equipment for distance learning that facilitates independent learning of the course's content in a way accessible to students;
7. a high proportion of academic staff up to 35 years old (40%), as well as a high proportion of academic staff with doctoral degrees and teaching staff with doctoral degrees;
8. the small size of the university allows for direct and collegial contacts between lecturers and students;
9. scientific activity has been ensured and a system has been established that facilitates participation of students in scientific conferences and various research projects (e.g. IZI VSRC regularly involves FoIT students in research projects, as well as provides access to unique infrastructure at the Irbene Radio telescope complex);
10. strong and open cooperation with industry enterprises, employers, concluded cooperation agreements with ICT and electronics companies;
11. cooperation with Latvian and foreign higher education institutions (dialogue and joint activities, incl. the Institute of Electronics and Computer Sciences, Tartu University and Tartu Observatory, Lorena University, etc.);
12. organised information campaigns for attracting students, informing pupils about study opportunities and career development opportunities, promotion of field of study;
13. providing an attractive environment for students to work independently;
14. the students influence improvement of the study process through their feedback;
15. an equalising course in high school mathematics is being provided;
16. all students requiring a place in the student dormitory are provided one;
17. support from Ventspils City Municipality.

Weaknesses:

1. insufficient internationalisation within the field of study/IT Faculty:
    a. insufficient involvement of foreign guest lecturers;
    b. insufficient involvement of foreign students;
    c. insufficient exchange of students with foreign universities;
    d. insufficient traineeships for teaching staff at foreign universities;
2. gradual decreasing of the number of students in the Master's study programmes;
3. evening or distance learning study programs are not provided, which reduces the possibility of attracting would-be students working full-time;
4. slow renewal of professors and associate professors;
5. impact of the pandemic on the situation:
    a. staff burnout has occurred and sickness has also intensified during the pandemic;
    b. support for further training and professional development of teachers has decreased, especially for participation in international conferences;

Opportunities:

1. to purposefully identify and attract funding from the EU funds for improvement of infrastructure and material and technical base, improvement of the study programs and content, strengthening of the human resources capacity and qualification;
2. to shape and develop European level higher education study programs integrating up-to-date methods, technologies, modern environment, and approaches;
3. to improve the content of the current study programs through the already established collaboration with industry enterprises working closely with industry stakeholders and co-operation partners that could meet the students' needs and market demand (e.g. to invite guest lecturers, and send and admit students who are trainees);
4. to attract internationally acknowledged teaching staff and professionals working in the industry, thus contributing to the quality and recognizability of the study programmes;
5. to implement various formal and informal, local and international information measures in order to raise awareness of the potential students about the study opportunities and promote their engagement from neighbouring and other regions of Latvia;
6. to include more distance learning and online courses in the study process, thus also attracting students from remote locations and other regions to the study process;
7. to establish joint study programmes in cooperation with other institutions of higher education both in Latvia and abroad in line with the demand;
8. to establish and implement a joint ICT PhD study program (with Latvian or Baltic partner University);
9. to promote mobility and organisation of experience exchange events not only at national, but also at the international level, strengthening the competences and opportunities of the teaching staff to adapt good practices;
10. to attract foreign students from low-risk countries as well as Erasmus exchange programmes' students;
11. to support financial involvement of enterprises in the provision of the study process;
12. to initiate, at the university level, development of new support mechanisms to ensure a competitive remuneration policy and attractive working environment for bringing in highly qualified academic staff.

Threats:

4. demographic decline, decreasing number of young people, emigration and drain of human capital at national, regional and urban levels, contributing to the decrease in the number of potential students;
5. the choice of young people from Ventspils City and municipality to continue higher level studies elsewhere in Latvia;
6. high competition in the training of ICT specialists:
    a. among higher education institutions in Latvia;
    b. professional courses and training offered by the labour market;
7. high proportion of student drop-outs and unfinished studies, early involvement of students in the labour market, which hinders the students from completing their studies fully and qualitatively;
8. low level preparedness of applicants, in particular, in sciences;
9. low popularity of sciences subjects among secondary pupils;
10. uncertainties about knowledge acquired by the graduates of the High School Programme *Skola2030*;
11. low material security of students (many students are holding paid jobs outside university in parallel to the studies);

12. ensuring continuity of academic staff;
13. The inadequately rapidly growing demand for ICT specialists with pedagogical skills at basic and secondary education levels due to the *Skola 2030* Programme - impact on the availability and workload of the teaching staff;
14. insufficient public funding for higher education and science;
15. incomplete methodological materials and teaching aids in the Latvian language;

Preventing/correcting weaknesses and linking them with the objectives of the VUAS' Development Strategy:

1. Objectives A1, A2, H1 and H2;
2. -3. Objectives A1, A3 and H4, we work on an education offer for people with principal work;

4.H1, H2 and H3 objectives, we work on motivation of the docents to become professors and associate professors;

5. individual communication with personnel (open discussion), human-oriented management style in contact with the teaching staff, together with the Study Unit we try to balance as best as possible the additional materials to be mastered and the workload of the teaching staff.

Avoiding threats:

1., 2.3. - H1, together with the employers we create the content of the studies that is maximally adjusted to the labour market, balancing it in academic programs with the knowledge necessary for scientific activity;

4., 5., 6., 7. - Work with secondary school pupils, visits to schools, additional preparatory courses;

8. General and direct scholarships of the Ventspils City Council are available for ICT students at the institution of higher education;

9., 10. - H4, redirecting our graduates and students to further careers, also in pedagogy, to reduce this demand and it would impact less our own teaching staff;

12. Use of various projects for the planned updating of teaching materials.

At the moment, most human resources are focusing on the prevention of weaknesses and avoiding threats, so the opportunities' section is not being given proper attention. However, efforts are also in place to update this section and exploit its potential at the university level.

The development plan for the field of study for the next six years was drawn up in 2021-2022 in accordance with the VUAS' Development Strategy and development plans for other fields of study. The directors of the study programs and the dean of the faculty were involved in drafting the plan. The development plan of the field of study has been discussed with the deans of other faculties and pro-rector of the studies, it has been analysed and approved at the FoIT Council meeting.

The strategy of Ventspils University of Applied Sciences for 2021-2027 defines four strategic development directions of VUAS: studies, science, management, and lifelong learning. The following tasks and performance indicators have been formulated for implementation of the study development direction:

tasks

- training of professionals;

- implementation of modern education;
- introduction of new study approaches and forms;
- implementation of various forms of external cooperation;
- promoting export worthiness of study programs;

performance indicators

- number of students,
- number of graduates,
- availability of study programmes,
- satisfaction of the parties involved.

The actions and achievable indicators outlined in the development plan of the field of study are related to the tasks set for the field of study.

Annexed Development Plan for VUAS' Studies (incl. the field "Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management and Computer Science" under the titles marked "FoIT").

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

Management of the field of study is based on the VUAS' organisational structure and according to that the direction "Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management and Computer Science" is managed by the dean of the FoIT, while the activity of the direction is supervised by the pro-rector of the studies. The study programs of the field of study are managed by the directors of the study programs. The activities of the field of study, current developments and development perspectives, as well as updates on the study programs, are regularly monitored and improved at the meetings of the FoIT Council, as well as at the Board meetings of the study programs, if required. The day-to-day study process is ensured by the Faculty's study administration specialist-clerk and employees of the Study Unit.

The **study pro-rector** coordinates and manages the issues related to study content, organisation and planning, and oversees the work of the Study Unit.

The **dean of the faculty** ensures the operational management of the faculty in accordance with the by-laws of the FoIT of VUAS. The dean is responsible for:

- compliance of the activities of the faculty, its structural units, the directors and personnel of the study programmes being implemented in the faculty, with internal and external laws and regulations;
- organisation and quality of studies and scientific work;
- faculty staffing;
- execution of decisions and orders of the Faculty's Council and of VUAS management regarding matters concerning the activities of the faculty;
- organisation of the economic and financial matters within the competence of the faculty;

- issuance, within the limits of his/her competence, of orders binding on the faculty's personnel;
- performance of other duties according to the job description.

The dean's duties include coordinating the activities of the faculty with other institutions of higher education, scientific institutions and other institutions on matters within the competence of the faculty. The dean represents the faculty at VUAS institutions and in relations with other natural and legal persons. The dean determines the duties of the faculty's study administration specialist-clerk and controls their performance thereof, and supervises the activities of the faculty's structural units and personnel.

The director of the study programme is responsible for the quality of the content and implementation of the study programme. The director of the study programme:

- organises development of the study programme in accordance with the current requirements of the scientific sector and ensures the systematic improvement of the programme during its implementation;
- is responsible for drawing up a description of the study programme;
- is responsible for drawing up study courses' descriptions of the study programme;
- participates in development of advertising information (abstracts, descriptions, booklets, a.o.) and in the promotion of the study programme;
- ensures the intellectual and material provision of the study programme;
- is responsible for the implementation of the study program in accordance with the regulatory documents governing the study process;
- informs students and the teaching staff about mobility opportunities;
- organises cooperation with potential employers;
- follows the course of studies, evaluates and analyses performance of students;
- determines compliance of the scope, content and evaluation of the study courses previously acquired at VUAS or other higher education institutions, with the study programme;
- organises the preparation of the study programme for self-assessment, expert assessment, accreditation, etc.;
- prepares reports on implementation of the study program, submits them upon request to the dean of the faculty, head of the Study Unit, pro-rector of the studies;
- develops and submits a study plan to the dean of the faculty;
- is responsible for field practices of students;
- annually, provides the dean of the faculty with all the information necessary for preparation of the report regarding the activities performed for improvement of the field of study.

The study administration specialist-clerk manages and arranges documentation of the faculty, assists the dean in fulfilling the decisions of the Faculty's Council, and is involved in ensuring the organisation of the study process.

The Head of the Engineering Unit of the FoIT under whose authority there are several laboratory assistants is responsible for the maintenance of the training laboratories and provision of technical support. The laboratory assistants of the Engineering Unit shall ensure successful work of the field of study's teaching staff and students at the VUAS' laboratories. This includes regular installation, maintenance, recording and marking of the laboratory equipment, electronic equipment and other necessary equipment, diagnostics and minor repairs within the scope of their competence, configuration of the computers according to the lecturers' instructions, installation of the necessary software on the workplace computers, a.o. duties.

The faculty has two Councils of Study Programmes:

- the Council of the Engineering Study Programmes of the FoIT
    - Professional Bachelor's study programme “Electronics Engineering” (42523)
    - Professional Master's study programme “Electronics” (47523)
    - Joint professional Bachelor's study programme “Smart Technologies and Mechatronics” (42523)
- the Council of the Computer Science Study Programmes of the FoIT
    - Academic Bachelor's study programme “Computer Science” (43484)
    - Academic Master's study programme “Computer Science” (45481)
    - The 1st level professional study programme “Programming Specialist” (41484)

Given the different specificities of the teaching staff as well as the differences of the employers among these programs, it was decided to form two separate study programmes’ councils.

FoIT’s Council

The highest decision-making institution of the faculty is the faculty’s Council (hereinafter - the Council). The Council decides on the academic, scientific, and economic activities of the faculty. The Council is attended by the teaching staff, representatives of the faculty’s administration, as well as representatives of the students (the representatives of students are elected by the Students’ Council of VUAS and they are approved by the faculty’s Council). The faculty’s Council includes the most active students of each faculty who want to directly influence their studies.

Analysis of the effectiveness of the management structure

Each programme pursues its own objective, which jointly covers the objective of the field of study. The directors of the study programmes, in cooperation with each other, arrive at the proposals for improvement of implementation efficiency of the study programmes, discuss them with the faculty’s dean, and after that the proposals are forwarded either to the councils of study programmes or faculty’s Council depending on the specificities of issues. The initiatives of the study programmes’ directors may be implemented operatively if the proposals are justified and it is possible to implement them within the existing budget. Problem situations can be identified and discussed rather quickly due to a weekly meeting in the FoIT’s dean’s office where an issue can be raised in an informal environment. Often, the study administration specialist-clerk is the first person the students approach when unsure who to reach out to, and the issue then is forwarded quickly to the right person or the student receives advice on how to deal with the situation.

A new position - “Methodologist of Studies” - is currently being created and formalised. The purpose and the main task of the position of the methodologist of studies is to coordinate the study process of the faculty, to cooperate with the directors of the study programmes and the teaching staff of the faculty. Draft documentation necessary for provision of the faculty’s study process. This is necessary to enable the faculties to segregate efficiently the coordination, the administrative and the planning work, as the university grows. The position’s job description is currently under discussion and the position should become operational starting from the following year.

Administrative and technical staff of the university provides, in accordance with their duties, the necessary support for implementation of the study process of the faculty.

VUAS has established a robust framework for management and development of the study programmes. Proposals for making changes to the study programmes are prepared by the director of the study programme on the basis of the recommendations of academic staff, employers' feedbacks, student surveys, the latest trends in the national economy and the labour market. Proposals are discussed with the dean of the faculty and study pro-rectors and submitted for

evaluation to the Council of the study programme. The matter is then assessed and, if accepted, it is confirmed in a FoIT Council meeting. Significant changes to the study programme are forwarded for approval to the VUAS' Senate, and further to the Study Quality Commission of the Academic Information Centre (AIC). Technical support for the field of study and programmes is ensured by the study administration specialist-clerk of the faculty, the Study Unit, as well as the *ITML* Unit.

The structural chart for the management of the field of study is attached in Annex No 2.2.

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

The procedures for admission to VUAS are supervised by the Admissions Commission established by the order of the rector, consisting of the head of the Study Department, directors of the study programmes, and other persons involved in the admissions process. Enrollment in basic study programmes is organised through the portal www.latvija.lv via Unified Enrollment in the basic study programmes, but study applications for the Master's and Doctor's study programmes (not yet operational as the establishment of the doctoral study programme is taking place) are accepted in person or remotely through the internal information technology resources of VUAS. The "DreamApply" application system is used to enrol foreign students.

"Admission Rules and Matriculation Procedure at Ventspils University of Applied Sciences for the Academic Year 2022/2023" (only in latvian) governing enrollment of students are available at: https://irp.cdn-website.com/f6b5d556/files/uploaded/Uznemsanas%20_noteikumi_2023_2024.pdf

"Terms of admission and the matriculation process of Ventspils University of Applied Sciences for international candidates in in the academic year 2022/2023" are available at:

https://irp.cdn-website.com/9945ff8b/files/uploaded/23-04_Uznemsanas_noteikumi_arzemniekiem_ENG_2023-24.pdf

Recognition of previous education and professional experience of students is regulated by two internal regulatory enactments with one of them explaining recognition of previously acquired formal education and the other - recognition of non-formal education and professional experience.

"Regulation on recognition of study results achieved in previous education or professional experience" (only in latvian) is available at: https://irp.cdn-website.com/f6b5d556/files/uploaded/15_Par_profesionalas%20pieredzes%20atzisanu_nolikums.pdf

The regulation prescribes the procedures by which the director of a study program evaluates the study courses previously acquired and how the recognition protocol is drawn up. The recognition protocol and the individual study plan included therein is annexed to the study pro-rector's order

regarding recognition of the study results achieved in previous education. At VUAS this procedure is uniform for all 4 fields of study. According to the price list of paid services set by VUAS, the students who wish to recognize the study courses previously acquired at VUAS are charged EUR 5.00 for the service. The price list of paid services of Ventspils University of Applied Sciences is available here: https://moodle.venta.lv/moodle/pluginfile.php/84821/mod_folder/content/0/Paid%20service%20price%20list/Paid%20service%20price%20list.pdf

"Regulation on the recognition of competences acquired outside formal education or professional experience and study outcomes achieved in previous education" (only in latvian) is available at:

https://irp.cdn-website.com/f6b5d556/files/uploaded/14_Par_profesionalas%20pieredzes%20atzisanu_nolikums.pdf

In order to execute the processes referred to in the regulation, an order of the rector is issued regarding the composition of the Commission for Recognition of Study Results of VUAS in a particular field of study. Following the decision of the Commission, a recognition protocol of a particular format is prepared and an individual study plan is determined, both of which are approved by the study pro-rector's order. According to the price list of paid services set by VUAS, this service costs EUR 75.00.

Information on the requirements and all documents are publicly available, links enclosed in this section lead to the documents on public website of VUAS - https://www.venta.lv/ .

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

The criteria, conditions, and binding procedures for evaluating the academic results are laid down in VUAS Senate-approved regulations available in the Moodle environment (as well as in VUAS web page, available only in Latvian https://www.venta.lv/augstskola/parskati-un-zinojumi):

- Regulation on the procedures for organising examinations and evaluation of the students' knowledge at VUAS;
- Regulation on the study procedures at VUAS.

The study results to be achieved in the study programme are evaluated in accordance with two criteria:

- qualitative criterion – evaluation in the 10 points system;
- quantitative criterion – the volume of the study subject expressed in credit points, obtaining a successful evaluation regarding the acquisition of the mandatory content of the study course.

The amount of credit points to be obtained each semester is indicated in the study plan. The work performed is evaluated quantitatively each semester and study year, thus monitoring the conformity of the amount of work performed by the student with that set in the study plan.

The examinations of students evaluate the knowledge, skills, and competences, which are laid down in the study programme and in each individual study course. According to the rules of VUAS

“Regulation on Procedures for Organization of Examinations and Assessment of Students' Knowledge at Ventspils University of Applied Sciences”, the following main types of examinations are specified:

- Study course examinations – at the end of each study course, students must take a study course test, in which the degree of achievement of study results in a particular study course is evaluated. The forms of study course examinations may be: examination, test, study paper, in exceptional cases – combined examination, for field practice – defence.
- Intermediate examinations – students must pass intermediate examinations during implementation of the study course. Intermediate examinations may include: laboratory work, practical work, test work, homework, test, presentation, report, essay, and other types of examination according to the specificity of the study program.
- Final or State examination – final examinations are regulated by the by-laws of the VUAS Final Examinations Commission (FEC), while State examinations are regulated by the by-laws of the VUAS State Examination Commission (SEC).

The number and frequency of intermediate examinations is set by the teaching staff of the study course in accordance with the description of the study course. Each course may have several interim examinations. The assessments obtained by the students in the interim examinations may be taken into account during assessment of the study course examination. The forms of the examination, as well as the types of examination, are set by the teaching staff of the study course, in accordance with the description of the study course. Each study course has only one final examination of the course.

Different types of testing are used for evaluation of study results and they are evaluated on a 10-point scale or with a rating “passed/failed”. The degree of achievement of the study results within the scope of the final examination of the study course of the mandatory part of the study programme with the assessment “passed/failed” may be evaluated if the volume of the study course does not exceed 2 credit points.

Assessments ranging from “almost mediocre” (4) to “outstanding” (10) and “passed” are considered successful.

The course studies are considered successful if the requirements laid down in the course programme are met as outlined by the lecturer in the course standard until the end of the examination period, unless specified otherwise (e.g. an extension of the examination’s time-limit has been received).

At VUAS teaching and knowledge assessment methods are objective and are consistently used in pedagogical activities, and these methods comply with the requirements of the Cabinet of Ministers regulations and are based on the following principles:

- principle of openness of evaluation – in accordance with the objectives and tasks of the study programme, as well as the objectives of study courses, VUAS has determined a set of requirements for evaluation of study results;
- mandatory nature of the assessment – necessity to obtain a positive assessment regarding the acquisition of the programme’s content, i.e. for each study course of the programme intended for acquisition;
- diversity of the types of examinations used in the evaluation, using tests and examinations as the basic forms;
- the principle of the possibility of the review of the assessment - students may appeal to the lecturer or program director if they consider their assessment to be in error;
- conformity of assessment – while taking the tests the students are given the opportunity to

demonstrate their analytical, creative and research abilities, acquired knowledge and skills in application of scientific conclusions;
- openness and clarity of requirements – upon commencement of studies, the student is informed about the content, requirements, and evaluation procedure of the relevant study course.

A detailed description of the course has been developed for each study course, in which the objective of the study course is defined, the study results of the study course have been provided, as well as their connection to the results to be achieved by the study programme, the type of independent work organisation of students and evaluation of study results have been described, the content of the study course and calendar plan of the study course have been determined, as well as the literature used is given. The teaching staff chose teaching and assessment methods based on the objectives of the study programme and study courses. Assessment of study results is impartial and documented. Assessment of the students' seminar work, projects, field practices and final papers is regulated by appropriate VUAS documents.

The State examination, the component of which is the development and defence of qualification paper or Bachelor's paper, is evaluated by the State Examination Commission, the chairperson and composition of which is approved for the relevant academic year in accordance with the Regulation on the State Examination Commission (VPK) of VUAS. The Commission acts in accordance with this Regulation.

The final examination that includes drafting and defence of the Bachelor's paper, is assessed by the Final Examinations' Commission, the chairperson and composition of which is approved for the relevant academic year in accordance with the Regulation on the Final Examinations Commission (GPK) of VUAS. The Commission acts in accordance with this Regulation.

The criteria, conditions, and binding procedures for evaluating the academic results are laid down in VUAS Senate-approved regulations available in the Moodle environment (as well as in VUAS web page, available only in Latvian https://www.venta.lv/augstskola/parskati-un-zinojumi):

- Regulation on the procedures for organising examinations and evaluation of the students' knowledge at VUAS;
- Regulation on the study procedures at VUAS.

Evaluation procedures and their efficiency are evaluated on a permanent bases, both consulting with class representatives and in informal discussions with employers and graduates.

The study results to be achieved in the study programme are evaluated in accordance with two criteria:

- qualitative criterion – evaluation in the 10 points system;
- quantitative criterion – the volume of the study subject expressed in credit points, obtaining a successful evaluation regarding the acquisition of the mandatory content of the study course.

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

Academic integrity is one of the core values mentioned in the VUAS Development Strategy for

2021-2027. That means upholding the highest standards of professionalism and accuracy, principles of objectivity and sincerity, morality and ethics, integrity.

In order to inform and help students to observe academic honesty, the Regulations "Procedures for Organization of Examinations and Assessment of Students' Knowledge at Ventspils University of Applied Sciences", the Regulations "Academic integrity in Ventspils University of Applied Sciences" and the Methodological Instructions for Development, Presentation and Defence of Master's Thesis, Bachelor's Thesis and Graduation Paper have been developed and published in the section "Academic Integrity" of the VUAS' website (https://www.venta.lv/akad%C4%93miskais-god%C4%ABgums0519d53b):

Once submitted to the dean's office the students' course, bachelor's and master's thesis are loaded into and processed by the Unified Computerised Plagiarism Control System (PLAG3) for plagiarism control purposes. All cases where a coincidence with the work of another author is determined is evaluated by the specialist of the Study Department and the dean. In the event of an infringement, a commission is convened to examine the matter and decide on imposing sanctions on the student. During the study process, in the subjects where reports have to be made, the good academic style and culture of making references are discussed.

During the last year there have been no plagiarism cases. The introduction of a plagiarism control system has motivated the students' interest in the right methodology of citing their own and other people's works. Students are being informed what is plagiarism and how to avoid it in first year as well as during the writing of their final papers and in study courses where a larger written home assignments are performed.

2.2. Efficiency of the Internal Quality Assurance System

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

The quality management system developed and approved by the Senate of VUAS is used for the management of the study programme and it also includes the quality assurance of the study process. Its description is provided in Paragraph 1.3, Part I of the self-assessment report.

The assessment of the efficiency of internal quality system of the study field is performed:

- as the general analysis of the study field: faculty working groups and discussions, meetings of the Faculty Council;
- as content analyses of study programmes: meetings with industry representatives and employers, associations and societies, comparison with other universities, meetings with representatives from general and vocational secondary schools;
- by collection of regular feedback from students, graduates and employers: meetings with graduates, employers and other cooperation partners, regular student surveys once per semester, analysis of survey data, review of FEC and SEC reports and evaluation of Councils of Study Programs opinions at the meeting of the Faculty Council once per year;
- assessment of student performance: regular assessment of knowledge, skills and

competences according to the quantitative and qualitative criteria of the study programme;
- cooperation with the student self-governance body (VUAS Student Council): meetings with the Student Council, course leads, individual meetings with students;

planning of financial and other resources for the study field: when the annual budget is developed, the faculty budget at the level of study programmes and the faculty in total is assessed and confirmed.

The aim of the study course and learning results are set out in the description of each study course according to the common results (learning results) of the study programme. The study quality is ensured by analysing FEC and SEC reports, student feedback and comments provided by various means, as well as by maintaining communication with employers, and by accordingly improving and developing study programmes and study courses. The academic quality assurance processes are organised by faculty members responsible for the respective subject, the director of the study program, the Dean of the FoIT, the Study Department and the vice-rector for studies. The quality assurance processes are described in greater detail in paragraphs 2.2.2 to 2.2.5 of this chapter.

Feedback from students on the content of study programmes is collected directly and at various levels:

- assessment of student satisfaction by surveying them twice per year (once per semester) according to internal regulation “On surveys of students, graduates and employers to evaluate and improve the study process” (available to the staff of VUAS on the e-learning platform Moodle in the section “For study programme directors”);
- during meetings of course leads of each programme with the dean;
- during meetings of programme directors with students;
- by involving student representatives in the Faculty Council;
- by involving student representatives in councils of study programs at the faculty;

Representation of student interests at administrative level also takes place by actively engaging with various bodies and commissions during their day-to-day activities:

- Senate;
- Constituent Assembly;
- Study Council;
- Scholarship Commission;
- Academic Arbitration Court;
- etc.

Each study programme of VUAS has a director who is responsible for the quality of the content and implementation of this programme. Study programmes are regularly reviewed: both when the results of student surveys are received (once per semester), and when academic plans are prepared for a new semester (once per year), as well as when self-assessment reports are prepared and reviewed (once per year), and when the results of the State Examination Commission (SEC) and the Final Examination Commission (FEC) are reviewed (once per year) during a meeting of the Faculty Council. In addition to the director of the study program, the dean of the faculty and the vice-rector for studies are also involved in the evaluation of the study program. The evaluation of the program, and the required changes are considered by the councils of study programs and the Faculty Council.

To acquire quantitative feedback from students, graduates and employers, questionnaires described in Paragraph 2.2.4. are used.

Regulations included in the QMS of VUAS on the analysis of the quality of study process and the

results of study programmes, as well as on the review of study programmes and development of new programmes are:

- Regulation on Study Procedures at Ventspils University of Applied Sciences (Only in Latvian)

https://irp.cdn-website.com/f6b5d556/files/uploaded/10_Nolikums_par_studiju_kartibu_VeA_%2827.01.2021.%29.pdf

- Regulation on Organizing Examinations and Assessment of Students' Knowledge at Ventspils University of Applied Sciences (Only in Latvian)

https://irp.cdn-website.com/f6b5d556/files/uploaded/Nolikums%20par%20p%C4%81rbaud%C4%ABjumu%20organiz%C4%93%C5%A1anu.pdf

- Regulation on Surveys of Students, Graduates and Employers (available to the staff of VUAS on the e-learning platform Moodle in the section “For study programme directors”);
- Regulation on Rotation

https://irp.cdn-website.com/f6b5d556/files/uploaded/12_Nolikums%20par%20rotaciju_2020.pdf

- Regulation on the Study Council of Ventspils University of Applied Sciences (Only in Latvian)

https://irp.cdn-website.com/f6b5d556/files/uploaded/Studiju-padomes-nolikums.pdf

- Regulation on General Requirements for Developing and Implementing Study Courses at Ventspils University of Applied Sciences (available to the staff of VUAS on the e-learning platform Moodle in the section “For study programme directors”);
- Regulation on Developing New Study Programs at Ventspils University of Applied Sciences (Only in Latvian) (https://irp.cdn-website.com/f6b5d556/files/uploaded/Nolikums_Par_studiju_programmu_izstrades_kartibu_VeA_19-12_20190116.pdf)
- Regulation on the Councils of Study Programs (available to the staff of VUAS on the e-learning platform Moodle in the section “For study programme directors”).
- Regulation on Organising Part-time and Distance Learning Studies at Ventspils University of Applied Sciences (Only in Latvian)

https://irp.cdn-website.com/f6b5d556/files/uploaded/11_VeA_nolikums_neklatiene_talmaciba.pdf

Implementation of the above documents is described in VUAS QMS processes:

- assessment of student satisfaction levels:
- improvement of study programmes,
- development and licensing of study programmes,
- cooperation with employers, industry associations.

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

Development and preparation of new study programmes for licensing at Ventspils University of

Applied Sciences is regulated by “Regulation on Developing New Study Programs” approved by the Senate meeting of 16th January, 2019, (https://irp.cdn-website.com/f6b5d556/files/uploaded/Nolikums_Par_studiju_programmu_izstrades_kartibu_VeA_19-12_20190116.pdf). The purpose of this Regulation is to develop quality study programmes that meet statutory requirements.

According to this regulation, the dean of the respective faculty is responsible for supervising the development of study programs, while acting director of the respective study program approved by the Faculty Council – for preparation of the study program and the submission of related documents for approval. Licensing documents of the new study program are reviewed and approved by the Councils of Study Programmes, the Faculty Council and the Senate of VUAS.

The content of the study program is reviewed by the Council of Study Programme of the relevant field of study, which also includes representatives of students, graduates and employers, who express their criticism and recommendations, which are then discussed at the council and subsequently at the meeting of the Faculty Council, if the desired changes require the approval of the Faculty Council.

During the reporting period, a new first level professional undergraduate program “Programming Specialist” was developed and licensed under the study field. During discussions with potential students, employer representatives and career advisors at schools the need for a professional program that would include an internship and grant graduates a professional qualification was identified. With regard to employers, in computer sciences and programming there was a high demand for students actively engaging with businesses already during the first and second year of their studies. The study programme was developed in accordance with the aims set in the 2016-2020 Development Strategy of VUAS (approved on 09.11.2016 by Decision No. 16-93 of the VUAS Senate): 1. “Increase the number of enrolled students and decrease the number of drop-outs,” 3a. “ “Improvement of study fields and programmes, better content and teaching quality taking into account the demand of the labour market and its trends.” and 3d. “Involvement of industry specialists in the study process”.

- The above information was discussed in the FoIT Council, and on 17 May 2016 the Council adopted a decision to start work on the development of the first-level higher education professional programme "Programming Specialist" (FoIT Council Decision No 16-05-03, 17.05.2016.) and authorised lect. Raita Rollande to start developing the content and licensing documents for the programme.
- R. Rollande analysed the demand in the labour market, and prepared the description, content, etc., for the programme. Intensive consultations with industry employers SIA Accenture, SIA TestDevLab, SIA Visma, SIA Baltijas Datoru Akadēmija, PSIA Ventspils Digitālais centre, and the industry association LIKTA were held re the content of the study courses of the program, and an agreement was reached on involving nine experts from these companies in preparing the programme courses and teaching them as guest lecturers. Memorandums of Intent were concluded with five companies on potential internships for students of the newly created program.
- The prepared description of the study programme “Programming specialist” and the licensing documents were reviewed by the FoIT Council on 3 April 2017. The Council made a decision to forward licensing documents for consideration to the Senate of VUAS and appoint Assoc. Prof. R. Rollande to become the acting director of the program (Decision No. 17-04-02).
- After the approval by the Vice-rector for Studies of VUAS and the Study Department, on 12 April 2017 the licensing documents were reviewed by the Senate of VUAS. The Senate approved licensing documents by Decision No. 17-64 and authorised Assoc. Prof. R. Rollande

to submit the documents to the AIC Academic Qualification Commission.

- The evaluation visit of licensing experts at VUAS took place on 7 June 2017, and their opinion was prepared on 3 July 2017. For an overview of the implementation of the recommendations of licensing experts, see Annex 2.18.
- After the decision of the AIC Academic Qualification Commission on approval of the licence, a director of the study programme was elected by the FoIT Council, the director was approved by the Senate of VUAS, and the program was launched in the autumn semester of 2017.

During the 2018 reporting period, significant changes were made to the academic bachelor program "Electronics". The transformation of this program into a professional program took place according to the aims of the 2016-2020 Development Strategy of Ventspils University of Applied Sciences (approved on 09.11.2016 by Decision No. 16-93 of VUAS Senate): 1. "Increase the number of enrolled students and decrease the number of drop-outs," 3a. " "Improvement of study fields and programs, better content and teaching quality taking into account the demand of the labour market and its trends." and 3d. "Involvement of sectoral experts in the academic process", as well as according to Paragraph 3.4 of the "Plan for modernization of STEM scientific direction and learning programs" of VUAS that was approved by the Ministry of Education and Science (No. 01-13e/2207 of 06.06.2017) "Create a professional bachelor program "Electronics"." These changes were discussed with the stakeholders and were based on:

- reports of the heads of the Final Examination Commission and the State Examination Commission on the results of a graduate survey of the FoIT Electronics Programme: the graduates and students indicated that they would like to increase the practical part of the study programme and that they would be interested in receiving a professional qualification;
- the opinion expressed by career advisors from Kurzeme regional schools during a meeting that took place in 2016. i.e., that a programme that allows to receive a professional qualification after graduation is more attractive and useful to the young;
- the report of the Commission of Accreditation Experts "Joint Report by the Committee for the Assessment of the Study Field: Information technology, computer engineering, electronics, telecommunications, computer managment and computer science in Ventspils University of Applied Sciences, 2017" under project "Support to EQAR requirements", where it was recommended to introduce mandatory internship during the academic bachelor program "Electronics";
- discussions with the management of electronics companies Hansa Matrix and EuroLCD's, as well as LETERA confirmed that businesses operating in this sector were interested in new electronic engineers with practical experience in electronics.

Preparation of documents for significant changes in the program, submission to AIKA Licensing Committee for Study Programs, evaluation and implementation took place according to the internal regulations of VUAS.

- On 13 February 2018, the the FoIT Council made a decision to make significant changes in the bachelor program "Electronics" by transforming it from an academic to a professional bachelor program, Decision 18-02-07, and decided to ask lecturer Jānis Šate to prepare documents that may be needed to implement these changes.
- For the purposes of the professional bachelor program "Electronics engineering", consultations with electronics businesses and industry association LETERA were held on the knowledge, skills and competencies that students require. LETERA invited Aigars Krauze, VUAS FoIT docent, to participate in the working group developing the professional standard "Electronics engineer". According to the standard, the academic plan of the program was expanded by 40 credit points, the learning time was extended from 3 years to 4 years, and

an internship worth 20 credit points and six study projects were included by focusing on increasing the scope of practical activities of students and learning practical skills during the studies. During the preparation process, agreements were reached with industry businesses on preparation of individual study courses and involvement of their experts as guest lecturers.

- The FoIT Council examined the documents and adopted Decision No. 18-04-01 of 3 April 2018 to approve the documents introducing changes;
- After an approval by the vice-rector for studies of VUAS and the Study Department, on 4 April 2018 the Senate of VUAS adopted Decision No. 18-38 to approve the prepared document package to proceed with these substantial changes and transform the academic bachelor program into the professional bachelor program "Electronics engineering" (qualification level 5), and authorised Jānis Šate to submit these changes to AIKA Academic Licensing Commission.
- The visit of the assessment expert took place on 2 July 2018. For an overview of implementation of the expert's recommendations, see Annex 2.18.
- When the licence was granted, implementation of the professional bachelor program "Electronics engineering" started during the 2018/2019 academic year.

During the implementation and development of study programs, principles of the Latvian Qualifications Framework (LQF) and the European Qualifications Framework (EQF) are observed.

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

At the beginning of each academic year the staff involved in the teaching process, i.e., the rector, vice-rector for studies, the dean, the director of the study programme, a representative of the Study Department, an external relations officer, the chair of the Student Council, and other invited parties meet with students and provide information of interest to them.

Students may submit their proposals and complaints in writing or orally. Written complaints must be submitted according to the "Procedure for submitting and reviewing proposals and complaints from students of Ventspils University of Applied Sciences" (available in Latvian https://irp.cdn-website.com/f6b5d556/files/uploaded/Nolikums%20par%20stud%C4%93jo%C5%A1o%20s%C5%ABdz%C4%ABbu%20un%20priek%C5%A1likumu%20izskat%C4%AB%C5%A1anas%20k%C4%81rt%C4%ABbu%20Ventspils%20Augstskol%C4%81.pdf). In most cases, questions are answered and complaints are resolved promptly. Complaints and questions are considered, and a decision is made on the necessary action. Students are able to easily approach both the academic and the administrative personnel and the management, e.g., the dean, the vice-rector for studies and the rector are open to communication with all students.

To ensure that all issues that are related to the learning process are promptly solved, students nominate a course lead, who is added to the VUAS FoIT internal communication platform (e.g. WhatsApp, Telegram, etc.). On this platform, the sean and the study administration specialist-clerk

are also active. If there are questions, the internal communication platform is used to discuss whom the students should approach with their particular problem: teaching staff., the director of the study programme, the Study Department or the faculty. Often, the questions are answered by more senior students. If there is something unclear, students may also approach the faculty in person to be forwarded to the responsible party to respect the hierarchical structure and ensure good management of processes (by explaining to the student why such action is needed).

Students may submit complaints regarding test and examination results according to the "Procedure for organising examinations and assessment of students' knowledge".

No later than in three business days after the publication of exam (oral and written) results, students may contest the assessment by submitting an application to the dean of the faculty who organises an appeal hearing within three business days. First, the student's performance is re-evaluated by the teaching staff of the study course. If the student does not agree with this assessment, no later than in three business days after the publication of exam results, he/she may contest the assessment once more by writing an application to the dean of the faculty who organises an appeal hearing within three business days. By an order, the dean appoints a commission consisting of three teaching staff members of the faculty that do not include the lecturer who assessed the student's paper. The commission evaluates student's performance and no later than in 3 business days prepares an opinion and submits it to the dean of the faculty, who informs the student about their decision. For a more detailed description of the procedure, see the regulation.

Examples of complaint resolution:

During the autumn semester of 2022/2023 academic year, students of the academic bachelor program "Computer Science" had to take the course "Databases". During the second month of the semester, both students and the lecturer submitted a complaint about the attitude of the other party, as well as the teaching methods and the quality of the course. The lecturer voiced her complaints with the director of the study programme, while students – with the director of the study programme and the dean of the faculty. After a discussion with the lecturer, the director of the study programme and students, compromise solutions were found to continue with the course. None of the involved parties submitted further complaints.

During the autumn semester of 2017 the Year 2 students of the academic bachelor programme voiced their dissatisfaction with the quality of the guest professor's course "Operating Systems" and that the literature sources during the practical classes were in the Russian language only. The programme director discussed the arguments of the students with the guest professor. During the semester, parts of the course (the practical classes) were entrusted to an elected VUAS lecturer. In the education quality survey conducted during the semester, the average assessment of the students for the course "Operating Systems" taught by a guest professor was very low: 2.45 (maximum possible 7), information was collected from 30 respondents. Some of the students commented: "Recommend to change the lecturer. In seminars, he uses a textbook that was published in 1992 and contains outdated information", "The material of the lectures was not connected with the practical use and usage possibilities. It feels as if the professor is not interested in teaching students!", "Unclear lectures, hard to understand, in practical classes makes us simply copy the code in C language from a book written in Russian, without explaining why we are doing it". Having discussed the problem with the dean of the faculty, a decision was made not to invite the visiting professor for the 2018/2019 academic year. The decision was approved by the FoIT Council and the Senate, when they approved the workload plans for 2018. Both during interviews with students and by analysing the results of education quality surveys, no problems were found in this subject during the coming years.

During the 2021/2022 academic year, the Year 2 students of the bachelor program “Electronics Engineering” orally complained to the director of the study programme re the fact that the practical tasks that they had to do for the study course “Basic microcontroller programming II” required too much time and could not be finished during the time allocated for independent study. The director of the study programme spoke with the faculty member teaching the course about the change of teaching methods and taking into consideration the student workload. As a result, the approach to practical assignments was changed, and no further complaints from students were received.

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

Key statistics is collected and compiled in the study administration information system LAIS or manually via Google forms and data analysis tools.

Table 2.2

Methods for collection of statistical data at Ventspils University of Applied Sciences

Type of statistical data	Collection frequency	Use of results in the study field	Person responsible for data collection
Answers of students to “Student survey on assessment and improvement of the study process”	Once per semester	The results are reviewed and taken into account during preparation of study plans for future semesters, drafting the self-assessment report and overall monitoring of the education quality in the study field.	Study Department
Answers of students to “Alumni survey for assessment of completed education”	Once per year	The results are reviewed and taken into account during preparation of study plans for future semesters, drafting the self-assessment report, analysing the employment indicators of VUAS graduates, and the overall monitoring of the education quality in the study field.	Study Department
Number of ex-matriculated students and reasons	Once per semester	The dynamics of ex-matriculation is considered together with ex-matriculation surveys, where reasons, recommendations and complaints are indicated. These results are reviewed by the director of the study programme and the Dean of the faculty to reduce the number of cases that can be influenced by VUAS.	Methodologist

Results of student enrollment	Once per year	Taken into account when the schedule of classes and the number of classes for lecturers are planned to ensure efficient use of resources and the best approach to new VUAS students.	Study Department, Methodologist
Student performance assessments	Once per semester	Student performance is the main criterion during the competition for the state financed study places or rotation at the end of each semester. Performance is also taken into account in distributing the minimum state scholarships. These results also determine whether the number of groups will have to be changed during the next semester.	Academic study administration specialist-clerk
Number of graduates	Once per year	Taken into account in planning the development of the study field and cooperation with the industry.	Study Department
Use of the e-learning environment Moodle	Once per semester	Reviewed and analysed to determine if all learning materials that students may need are available to students and comply with internal regulations.	Study Department, administration of the faculty
Results of employer surveys	Once per year or every three years	In professional and academic programs, in planning the content of programs and agreeing about the skills and competences required by VUAS graduates in the labour market.	Methodologist

Every year, a self-assessment report for each study field of the faculty is prepared; during this process, improvement of study programs at Ventspils University of Applied Sciences is described. At the end of each semester, a survey of students is carried out to regularly collect information from students on the quality of the study process at Ventspils University of Applied Sciences. This survey has to be completed electronically in LAIS on each study course that was taught during the current semester, and includes questions on the evaluation of the course content and the performance of the lecturer. The survey includes questions on the opinion of students re the following: is the course needed for professional development of students, is it needed during their practical activities, what is the level of course organisation, what is the scientific and pedagogical qualification level of the teaching staff. Completing a survey is a mandatory pre-condition to register for study courses during the next semester. The results of the survey are collected, analysed and included in the annual self-assessment report. If the survey data include indicators that are noticeably lower, the director of the study programme or the dean discusses them individually with the respective course lead to understand the general qualitative situation. However, such problems usually become apparent already during the semester and are discussed during the meeting of course leads with the dean of the faculty.

At the end of each academic year, a survey of graduates who have graduated from Ventspils University of Applied Sciences during the current academic year is carried out to collect their opinions on the quality of the completed education, the used teaching methods and the evaluation of the study program in general. These surveys are carried out according to “Regulation on surveys of students, graduates and employers to evaluate and improve the study process” (available to the

staff of VUAS on the e-learning platform Moodle in the section “For study programme directors”), and their results and recommendations for improvement of the study process are discussed during the meetings of the Faculty Council, councils of study programs and the Senate of VUAS.

Although no formal quantitative survey of employers was not carried out in the last two years, qualitative feedback is still collected on regular basis during meetings with employers and discussions of details related to internship opportunities and other cooperation models; we also discuss our graduates, and if any changes are recommended, they are discussed during the coffee break (once per week) with the members of the faculty and during a Faculty Council meeting, where student representatives also participate. More in depth summary of surveys can be found in Annex No. 2.6.

Classes taught by the teaching staff (in particular before or after their election) are observed to assess the teaching style and its suitability, as well as the used materials. It is done by the dean, the director of the program or experts appointed by the Faculty Council (if lecturers are elected).

During coffee breaks, informal meetings are organised to ensure proper organisation at the faculty and collection of feedback. All members of the faculty are invited to a coffee break in the dean's office once per week (during a lunch break). During this time, topical issues and problems can be identified and discussed, but if there are no news, it is a possibility to just have a cup of coffee together, tell jokes and listen to music.

Representatives of students are also elected to both councils of study programs, where issues related to implementation and further development of study programs are discussed.

Potential improvements:

The pandemic demonstrated the importance of transparent communication with course teachers and the fact that they can be essential in supporting quality control, thus, in the nearest future it is planned to introduce an informal, but regular survey of the teaching staff to collect information on their views about the current situation, as well as about elements that function well at the faculty and the required improvements.

Though information and feedback are collected from employers and alumni, it is recommended to introduce a systematic way to inform the graduates and employers about the results of these surveys and planned changes.

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

Information on the study field and its study programmes in Latvian and in English is published on the website of Ventspils University of Applied Sciences: https://en.venta.lv/faculty/faculty-of-information-technologies. The Marketing and Public Relations Department is responsible for posting information on the website in Latvian and in English. The administration of the faculty and directors of study programs prepare and coordinate this information with the faculty, and convey it to the Marketing and Public Relations Department. The Study Department and the vice-rector for studies monitor that information published on the website

complies with official registers, VIIS and the e-platform.

2.3. Resources and Provision of the Study Field

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

The structure of sources of funding for the VUAS' FoIT study process is comprised of a State Budget grant, local government budget funding, revenue from study fees and other revenue from paid services related to the Ventspils University of Applied Sciences' Faculty of Information Technology.

The main source of financing of the study direction is a State Budget grant for implementation of accredited and licensed study programs and student scholarships. Every year an agreement is concluded with the Ministry of Education and Science regarding the financing of a specific number of study places by means of a State Budget grant.

From the time of its founding, VUAS has received significant financial support from Ventspils State City Council (hereinafter – the Ventspils Council). The Ventspils Council funds allowances for lecturers and researchers with a PhD. In addition to State Budget funding, VUAS attracts financial resources by implementing international and local projects, including:

- Scientific and infrastructure projects co-financed by EU Structural Funds, which are implemented through the Ministry of Education and Science of the Republic of Latvia, the Ministry of Environmental Protection and Regional Development, the Ministry of Finance, the Ministry of Economics and other ministries and agencies (CFLA, VIAA, VRAA, LIAA, etc.);
- Scientific and infrastructure projects co-financed by EU Structural Funds under the aegis of the European Commission's Horizon 2020 program;
- Scientific projects financed by the European Space Agency;
- Research projects financed by Latvian Council of Science grants.

On 1 September 2022, there were a total of 254 students in the FoIT, of which 58 were paid for by natural or legal persons and 196 were funded by the State Budget. (during the study semester, both the number of students and the ratio of "budget" and "fee-paying" students changes).

The funds available for the implementation of study programs are planned taking into account the expected revenue of the faculty, which consists mainly of a State Budget grant, basic funding of science and revenue from study fees.

For study programs implemented by VUAS FoIT, an indicative cost estimate is conducted, adding the following cost items to expenditures:

- directly impacting costs (these would not exist if the programme were not implemented):
    - remuneration of the teaching staff for teaching study courses;
    - remuneration of programme directors;
    - expenditures required for the final examination processes;
    - student grant costs.

- indirect costs (expenditures impacted by the number of students and study programs):
    - expenditures related to the acquisition of fixed assets for FoIT purposes;
    - books and materials;
    - laboratory maintenance costs;
    - goods and services for the operation of the FoIT;
    - equipment purchase and modernization costs;
    - software licence fees.
- fixed costs:
    - remuneration of the faculty's general and administrative staff;
    - other additional expenditures.

It should be noted that the items in the cost estimate cannot be used without the related context (e.g., the costs of student grants are directly related to the number of budget places allocated by the State).

Every year, the funding of Ventspils University of Applied Sciences' delivery and 25% of the revenue of any structural unit is allocated to payment of utility charges, infrastructure maintenance and administration functions directly related to these works.

Remuneration of the teaching staff, in accordance with the provisions of Cabinet Regulation No. 445 of 05 July 2006, "Regulations Regarding Remuneration of Teachers", is determined in accordance with the VUAS' rules regarding a single remuneration system, and in conformity with the VUAS budget, which is approved by the meeting of the VUAS Council, which is based on: the academic workloads in study programs reviewed and approved at meetings of the collegial bodies of VUAS, i.e., the FoIT Council and VUAS Senate.

The remuneration of the study programme directors is determined in accordance with the VUAS rules on a single remuneration system and in accordance with the VUAS budget approved at the VUAS Council meeting, taking into account the criteria linked to the indicators of each study program.

The size of remuneration of the faculty's general and administrative staff is precisely known and is divided among the study programmes in proportion to the number of students in each study programme at time of the calculation of study programme costs.

Student scholarships are taken into account in the calculation, in accordance with the data provided by the Ministry of Education and Science regarding the State grant allocated for studies.

Expenditures for the acquisition of fixed assets include costs related to the acquisition of the activities of the FoIT, including the fixed assets required for the provision of the study process. A significant amount of funding for the acquisition of fixed assets in 2018-2022 was provided in the form of ESF funding in the project "Modernization of Ventspils University of Applied Sciences' STEM Teaching programs" (No. 8.1.1.0/17/I/007).

The costs of goods and services include expenditures directly incurred for the FoIT (and approved by the faculty's dean), in accordance with the approved VUAS budget. The proportion of FoIT from the total maintenance expenditure of VUAS is calculated based on the volume of VUAS infrastructure required for the provision of the FoIT study process. The calculated proportion of the FoIT shall be applied to each study programme, in accordance with the proportion of students per programme in relation to the total number of FoIT students.

Other additional expenditures for the operation of the FoIT include specific expenditures related to the operation of the FoIT and the study process, such as business trips of the teaching staff, tax expenditures other than workforce taxes (e.g. VAT or fees related to the drawing up of documents

for foreign students), as well as health insurance expenditures of FoIT study process employees. These FoIT costs are allocated proportional to the number of students in each study programme.

Traditionally, most study programme expenditures consist of remuneration (remuneration + employer's tax and insurance costs) for lecturers – approximately 75%. Other expenditure items consist of the aforementioned utilities and maintenance services, book purchase expenses, professional trip expenses, and other services.

The allocation of funding to provide for the research work of teaching staff is determined by the following by-laws (VUAS internal regulations, available to the users of venta domain in the VUAS server):

- Ventspils University of Applied Sciences' Regulations regarding a Single Remuneration System (approved by Senate Decision No. 18-98 of 21.11.2018)
- Regulation regarding Additional Remuneration for Employees of Ventspils University of Applied Sciences (approved by VUAS Senate decision No. 12-02 of 11.01.2012);
- Regulation regarding the Procedures for Granting Financing for professional trips to participate in conferences (approved by Decision No.17-83 of the VUAS Senate of 24.05.2017);
- Regulation regarding the Granting of Funding for the Issuance of Training Materials, Scientific Monographs and Scientific Articles (approved by Decision No 17-104 of the VUAS Senate of 21.06.2017);
- "Development of Scientific Work at Ventspils University of Applied Sciences" Competition Regulation (approved by Decision No 17-86 of the VUAS Senate of 24.05.2017).

Planning of financial resources planned for the study direction is performed and expenditures are supervised by the dean of the faculty, controlled by the Finance Division and the Executive Director.

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

The technical and information base of the Ventspils University of Applied Sciences is used to facilitate the study process in the field of study. Classes are held at the VUAS premises at Inženieru iela101 and 101a, Ventspils. The provision of studies is comprised of modern classrooms and laboratories, and a branch of Ventspils Library at the university, technical equipment for providing high level studies (projectors, interactive boards, monitors), several computer classes, two modern amphitheatre auditoriums with 190 and 130 places respectively, equipped with multimedia audio-visual equipment and simultaneous translation equipment, as well as teaching staff's offices with computerised workspaces.

6 computer classes with 25-31 computer workstations each, and three with 16-24 workstations, plus 3 labs with 10-13 computer workstations each, are available to provide the study process during the 2022/2023 academic year. All auditoriums are equipped with computers and projectors. In many places there has already been a shift from projectors to interactive boards, both due to image quality and energy savings. The university network has a total of about 300 computers to provide for the learning process. All university computers are connected in a single network. In

addition, a wireless network, as well as EDUROAM network is available on the premises of the university and the service hotel. Seven laboratories with 16 workstations each and two specialised laboratories with 8 workstations each have been created for the studies in electronics programmes, as well for studies in physics in computer science programmes.

For students of electronics, a permanent working space has been allocated and equipped with all necessary measuring instruments, soldering stations, and it is available for student practical works 24/7, and almost all computer classrooms are available to students and lecturers during the time in which they are not in use for classes. As far as possible, lecturers and guest lecturers who require offices at the university are provided with them. Office computers are also connected to the common network and resources (e.g. printers and common university file servers).

Lecturers who require short-term overnight accommodation in Ventspils are provided with the opportunity to stay overnight in the VUAS service hotel within the budget framework. It is also possible to apply to Ventspils municipality for a service apartment.

Several projects were implemented and continued in order to consolidate infrastructure at VUAS, of which the projects of the Latvian Academic Network and “Strengthening the excellence and capacity of the Ventspils University of Applied Sciences as a scientific institution” played a significant role in modernizing IT infrastructure. Within the framework of ESF SAM 8.1.1., VUAS has implemented, in 2018-2021, the project “Modernization of Ventspils University of Applied Sciences’ STEM teaching programs”. Within the framework of this project, nine auditoriums were refurbished, with the creation of a modern interior and furnished with new ergonomic auditorium furniture. Auditoriums were equipped with modern interactive boards and other technological equipment, ensuring access to technologies necessary for study programs. Information and communication technology solutions necessary for the university have been introduced and computer hardware has been modernized. Thanks to this project, the quality of studies at Ventspils University of Applied Sciences matches that required for a modern study process and corresponds to the requirements of the labour market, giving students the opportunity to work with the latest technologies and acquire as many practical skills as possible, attracting more students from Ventspils, the Kurzeme region, as well as the whole of Latvia and other countries. In addition, under the auspices of this project, access to Building A has been upgraded to meet the needs of people with physical handicaps. An elevator has been installed to allow easy movement between all the floors in Building A. In addition, a diagonal elevator has been installed to enable handicapped people to move between Buildings A and B. Implementation of the project ensures that all VUAS’ buildings are fully adapted to meet the needs of handicapped people.

In 2015, VUAS connected to the Latvian academic network with 10 Gbps broadband. The VUAS campus network has been upgraded, with its core network running at least 10 Gbps, with terminals capable of operating at speeds of at least 1 Gbps. Similarly, some wireless network equipment has been modernised, and VUAS has a 802.11ac standard wireless network. Software has been bought and updated for scientific research work, including Matlab network licences for employees and computer classes, SPSS and other types of software. Computers in computer classes and for personnel are replaced so that they are no more than 5 years old.

At the university data centre, all servers are virtualized and deployed in a cluster that runs on ProxMox. Open code products are essentially chosen for service solutions. For example, VUAS was one of the first Latvian universities to introduce the open-source e-learning system Moodle, which is currently also widely used by other universities. Ventspils University of Applied Sciences uses Google Apps for Education as an e-mail system.

Since 2012, VUAS has introduced the Latvian University Information System (LAIS), which includes part of the functionality of the University of Latvia information system (LUIS), which has been

adapted to the needs of universities. LU provides VUAS with access to the LU server resources it needs to use the LAIS at VUAS. LU ensures the introduction of LAIS, consultation and access to the functions introduced or newly created by VUAS in the following LAIS software subsystems: administration, student register, student orders, student payments, employee registration, course enrollment, study plan, student grades, student contracts, preparation of diplomas and diploma supplements.

Ventspils University of Applied Sciences participates in several programs including Microsoft Education 365 A3, Azure Developer Tools for Education, Oracle Academy and Cisco Networking Academy. These programs provide software, training courses and other resources that can be used by lecturers and students during the study process, as well as for self-learning and raising qualifications.

Maintenance of the material technical provisioning of Ventspils University of Applied Sciences is performed by the Informatics and Technical Teaching Aid (ITTA) Section. In addition to maintaining computers, servers, the computer network, audio-visual equipment and other technical equipment, the ITTA Section also provides an information resource offering for various services including Moodle, the Notice Board, Wiki, etc.

On average, 10,000 euros are allocated annually in the faculty budget for the renewal of technical teaching aids and materials.

Student Lounge D0

The basement in Building D is home to a large, refurbished student lounge where students can relax, study or meet other students. This room is also used to host events, meetings or simply as a meeting place. The room contains a pool table, table football and table tennis table, sofas, a small stage for presentations, and a large table at which you can easily learn, play games or have tea, because cups and a kettle are also available. During the session (in both June and January), it is open 24 hours a day. From September to December: 06.00-03.00 and from February to May: 06.00-03.00. However, from 22.00 to 06.00 in the lounge, students have agreed to observe silence so that all those who choose to work during the night can carry out study assignments in peace.

Equipment specially intended for specific study programs is specified in Chapter 3 of Part III under the corresponding study program.

All the mentioned infrastructure and material-technical support is available to teaching staff, including cabinets for work, computer laboratories, computers, lodging, software, labs and internal and external electronic systems.

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

Students and lecturers use the services of VUAS and Ventspils City Library to facilitate the learning process.

VUAS Library is located on two floors with a vast section devoted to teaching literature, periodicals as well as fiction. The reading room offers access to both the latest dictionaries from different sectors, audio and audiovisual materials, an e-book reader, as well as the latest books and periodicals. The University Library Foundation has a collection of books comprised of ~ 32,600 volumes and ~ 800 audiovisual materials (CDs, DVDs, CD-ROMs, audio and video cassettes) in mathematics, physics, computer science, electronics, governance, economics, law, philosophy, psychology, linguistics, translation, literature science, etc.).

Thanks to the bright and spacious premises, the university library is suitable for the performance of various group activities. There is also the possibility to use the quiet reading room, which is currently located in the premises of the multimedia library.

Five freely accessible computers with an Internet connection are available in the library for work and study purposes. All databases subscribed to by the VUAS library are available free of charge on all fixed computers in the library premises.

VUAS students and lecturers also have access to a vast collection of fiction, humanitarian, technical and other scientific publications, which is housed in the city library's central building in at Akmeņu iela 2, Ventspils. All publications at the library are recorded in a single electronic catalogue (https://ventspils.biblioteka.lv/Alise/en/home.aspx), and reader service is automated. Automation of all of the library's operating realms is provided by the ALISE system, including the capability to publish library catalogues on the Internet, as well as to access other libraries' catalogues via the network. An inter-library subscription is also available – both locally between the units of Ventspils Library and other academic libraries of the biggest universities, as well as the National Library of Latvia.

The following databases are available to users of the VUAS computer network free of charge:

- LETA;
- Letonika;
- Lursoft – newspaper library; company database;
- EBSCO;
- Britannica Online Academic Edition;
- Filmas.lv;
- Periodika.lv;
- NLL Digital Library;
- Scopus;
- Science Direct;
- Web of Science.
- To facilitate the scientific activities of the project "Unified Latvian Academic Core Network of National Significance", access is provided to Science Direct, SCOPUS and Web of Knowledge databases.

Since the EBSCO database (where a wide range of electronic books is available) offers a complete set of additional materials required to ensure the study process, VUAS teaching staff and students use the databases directly to obtain information, and therefore the library does not need to buy printed materials in large numbers. Science Direct, Scopus and Web of Knowledge databases also provide a sufficiently comprehensive range of scientific publications for the purpose of conducting scientific research.

The library also performs archive functions for bachelor's and master's theses prepared by VUAS

students, as well as lecturers' lecture materials.

Library opening hours:

- Monday to Thursday: 9:00 to 20:00;
- Friday, Saturday: 11:00 to 18:00;
- Sunday - closed.

The library's opening hours are generally adapted to the needs of the students. Consideration is being given to the possibility of reopening the library on Sundays (a practice that was suspended during the pandemic).

Services offered by the Ventspils University of Applied Sciences Library:

- subscribed databases;
- CD-ROM databases;
- computers with an internet connection;
- group and individual information literacy classes;
- e-book reader usage within library premises;
- reservation of publications, extension of return deadlines;
- a muted reading room equipped with the necessary apparatus for conducting private classes (audio and
- video hardware and a computer with an Internet connection);
- copying, computer printing;
- Kurzeme virtual general catalogue;
- multimedia library;
- periodicals (newspapers, magazines, etc.);
- scanning;
- inter-library subscriptions;
- information, consultations.

The library has 100 reader spaces.

Ventspils University of Applied Sciences also provides the university's students and employees with remote access to resources through the university's proxy server (proxy). Thus, access is also available outside the university network to the resources available to the university, authenticating with the university's username and password.

Resource renewal:

Every year, the faculty refreshes the library's offering by buying the necessary books in coordination with the library. In 2022, the FoIT budget allocated EUR 1000 to augment the textbooks required for the field of study. During the past three years, the selection of ICT sector books has been augmented with the addition of 11 books. Most current resources on the subject are initially available electronically and have often partly lost their relevance by the time they are published. Therefore, greater emphasis is placed on electronic resources and databases. In order to apply for a new electronic database, costs are determined by contacting the Culture Information Systems Center. Next, an application has to be made to Ventspils City Library to add the specific database, and it must be ascertained whether it can be financed from the faculty budget (accordingly included in the budget plan for the next year) or else an application must be made to finance it from the library's funds.

Electronic database usage statistics:

The number of views of the electronic databases has been increasing over the years, with 721 (609

unique views) in 2020, 763 (653 unique views) in 2021 and 826 (690 unique views) in 2022. Unfortunately, there are currently no tools available to determine more precisely which databases were accessed, how long an individual session lasted and so on. But quantitative statistics indicate that the use of electronic databases is increasing at VUAS.

Potential improvements:

The current system providing for the teaching staff's desire for new materials is quite informal, so it is planned to systematise and formalise it (most likely by introducing an official Google forms template to be filled in by lecturers, discussed within the faculty and sent to the library, for example, once every two months) over the next two years.

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

Information and communication technologies (hereinafter - ICT) at the disposal of the teaching staff and students of Ventspils University of Applied Sciences are systematically used and developed in order to ensure the transparency and efficiency of learning processes. Table 2.3 below shows the name and status of solutions, and provides a brief description of the ICT system.

Table 2.3

ICT solutions used in the study process

No	ICT system	Status	A brief description of the functions used by the system
1.	Moodle	Active	The main place for study course materials, public information for students from the dean's office, recordings of seminars given by teaching staff, etc.
2.	BigBlueButton	Active	Open-source online conference system hosted on VUAS servers. It was actively used during the period of COVID-19 pandemic restrictions and is used when it is necessary for teaching staff to connect remotely at any stage of the teaching process.
3.	Google Workspace	Active	Gmail - for the active receipt and delivery of information to students; Drive - for delivery of materials with a bigger file size; Meet - an alternative back-up solution for providing lectures in remote mode; Sites - for more interactive placement of individual subject materials; Classroom - solutions for submitting and testing work in individual subjects; Presentations, forms, calendar - depending on the situation and requirements.

4.	VUAS Notice Board	Active	Internal information notification system (parallel to email): events, study information, scholarships and competitions, student council, advertisements.
5.	LAIS	Active	Information system of Latvian institutions of higher education, where the study process is administered (student grade assessments, orders, registration for study courses, etc.).
6.	VeApp	Developed, in the process of implementation	A modern and up-to-date information reference and reporting system, along with a list of class planners and classes, with the capability to publish current changes.
7.	VUAS server infrastructure	Active	Student profiles are maintained so that students and teaching staff can store the materials required for the study process and their work on their profiles.
8.	GitLab	Active	Version control system for submitting homework and storing personal work.
9.	Office365	Active	Available to make use of the functionality available in Microsoft Office.
10.	Namejs	Active	Document management information system, which ensures uniform, transparent and controllable registration, processing and control of the implementation of received, sent and the university's internal documents throughout the university, in conformity with the State regulatory requirements for circulation of documents in regard to both electronic and paper documents.
11.	VUAS proxy server	Active	Used to also provide students and teaching staff with access to the library resources at the disposal of the university (Chapter 2.3.3) outside VUAS premises.
12.	VUAS Virtual Private Network	Active	Used to provide students and teaching staff with access to university network infrastructure outside VUAS facilities.
13.	VUAS Web Print Service	Active	A common system by means of which teaching staff and students can use all publicly available printing equipment on the VUAS network.

Example of a real scenario of tools used in the training process:

Students are enrolled in the LAIS system, where they can see their subjects to be learned and posted final grades. Within the VUAS server infrastructure, students are issued with a username and password, allowing them to access the Moodle system, Google services (with lietotajvards@venta.lv Google account) as well as the Notice Board and other internal services. Moodle courses are divided into study programs and years, so that you can connect and find the appropriate courses. If an individual lecture is conducted online, a link is provided on the Moodle course to lectures and consultations, which are used in accordance with the lecture schedule posted on Moodle.

Analysis of the use of technology for the learning process:
The system is not overly fragmented and flexible enough to be used with minor modifications to ensure teaching of all faculty courses.

Potential improvements:

Automatic enrollment for Moodle courses after student enrollment in the LAIS system.

Making information accessible and transparent

For each course of FoIT studies at the beginning of the semester, a course is created on the Ventspils University of Applied Sciences Moodle site, where general information on the course requirements, schedule and content is available.

Staff in the study department are assigned the role of “site manager”, so they have access to each course, making evaluation as necessary. For example, whether it contains all the basic elements, specifies teaching subjects, and materials. A similar role is given to the deans of each faculty, so they can access and browse study courses within the faculty framework. Moodle roles are assigned by the Moodle administrator.

Currently, the majority of lecturers are already using the Moodle site for placement of materials, tests, and input of grades.

Improvements currently being made:

Currently ways to post materials on the Moodle site as interactively and conveniently as possible are being considered, as well as alternative technologies (such as Google Classroom). Professional upgrading courses in these technologies are occasionally conducted for lecturers, as well as discussions in order to understand potential advantages and shortcomings in relation to the introduction of a solution as a compulsory standard for all study courses.

Usage of technology in communication

The university’s Google Workspace ecosystem-based email system, as well as an internal notice board are used to provide information and for communication between teaching staff and students. Students can also ask teaching staff a question within the framework of their course in the Moodle system using the correspondence option. Likewise, teaching staff can assign a task to students. If necessary, a WhatsApp/Telegram group, a Discord server or some other solution best suited to the course specifics can be created for high-speed messaging for a specific study course. This is organised by the teaching staff and the students themselves.

Course seniors have a joint Telegram group with the faculty dean, where problematic issues can be raised and where meetings are held regularly (especially during the pandemic) to discuss issues and to refer the course's seniors to the right people to resolve specific issues.

Next development steps:

Launch the VeApp information reference and reporting management solution that has been developed, which includes separate sections on important and up-to-date information for students and teaching staff, including on scholarships and internships, ERASMUS+, etc.

In addition, an updated notice board, along with a contact section for communication with lecturers, maps of the university with auditoriums (particularly relevant for new Year 1 students), and a quality monitoring system where students can submit questions regarding a proposed topic. The VeApp solution also has a blog section with articles from students and teaching staff detailing their experience.

A very important component is the lesson planner and class list. Together, this can be called “University in Your Pocket”. Students and teaching staff can view the class schedule on their smartphone, lecturers can make entries about changes, etc., and students will receive a pop-up window notification (if this has been activated in the settings).

The VeApp solution has been developed for both a desktop version and for Android and iOS smartphone operating systems. The desktop version provides a convenient and practical means of scheduling lessons, replacing the traditional method in Excel spreadsheets.

It is essential to work on activities in order to facilitate lecturers making the best possible use of the communication opportunities provided by Moodle.

Teaching materials

Although teaching staff choose the best solutions for themselves for teaching materials, we try not to saturate study programs with too many different technologies and solutions. On the part of Ventspils University of Applied Sciences, it is required that the material is available in the relevant Moodle course in the form of uploaded files or as a hyperlink. In previous years, Ventspils University of Applied Sciences has actively supported teaching staff in learning new technologies. Development seminars are held on a regular basis and instructions and other supporting materials are available, including on creating video lectures, creating interactive content with H5P and various Moodle activities, etc.

Next development steps:

Continued support for teaching staff in the creation of contemporary teaching materials by organising seminars and practical workshops, taking into account the digital skills of each lecturer. As a result, such training can be organised according to skill levels, strengthening digital literacy in the long term, and achieving equal balance. The teaching staff in our study field are often pioneers in learning technologies and in discussions about choosing the most convenient technologies, as well as helping representatives of other study directions to learn the skills they need more quickly.

Teaching process

The provision of the teaching process in person and remotely is based on two main pillars:

Teaching materials are posted on the Moodle platform, assignments are issued, tests are organised and a feedback loop is provided. The online conference solution BigBlueButton mounted on VUAS servers is used for remote communication (alternatively Zoom or Google Hangouts if, for some reason, it decided to use an alternative).

An important role in the teaching process is also played by the opportunities offered by Google Workspace, including cloud storage, creating common documents, spreadsheets, and presentations on Google Drive, and creation of questionnaires on Google Forms.

Teaching staff actively use a range of other technologies, including online surveys and teaching subject-specific solutions. The university supports these efforts by encouraging the exchange of experience among the teaching staff and by collating best practice.

Next development steps:

Prepare the transition to Moodle 4.0 in 2023, including provision of closer links between Moodle and BigBlueButton, reworking of support materials, provision of information to the teaching staff, etc.; further development of guidelines, instructions and pedagogical development proposals to facilitate the effective use of education technologies in the teaching process.

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

assessment of their transparency.

Recruitment and employment of teaching staff are conducted in compliance with regulatory requirements and with the principles of good corporate governance practices, including transparency and openness of human resource management processes. Appointment to academic posts is regulated by Cabinet Regulation No. 129 of 25 February 2021 “Procedures for Evaluating the Scientific and Teaching Qualifications of an Applicant for the Position of Professor or Associate Professor and of a Professor or Associate Professor Holding the Profession” and the procedures approved in the Senate of Ventspils University of Applied Sciences on 31 August 2021 “Procedures for the Recruitment of Academic Personnel at Ventspils University of Applied Sciences” (only Latvian):
https://irp.cdn-website.com/f6b5d556/files/uploaded/Noteikumi_akademiska_person_atlases_kartiba.pdf

In order to promote the development of higher education and science, in accordance with the requirements of the national economy and the interests of Latvia’s economic development, and to direct the work of VUAS into that of a competitive European university, which makes a significant contribution to the development of education and science internationally, creating prerequisites of equality and competitiveness in regard to setting remuneration, in order to attract and retain highly professional human resource capital at VUAS, the VUAS Senate has drawn up and approved “Ventspils University of Applied Sciences’ Regulations regarding a Single Remuneration System”.

Available vacancies are listed on the Ventspils University of Applied Sciences website, in the section University - > Vacancies: https://en.venta.lv/university/vacancies

In order to ensure the recruitment of quality teaching staff, parallel to the announcement of vacancies, the most suitable and appropriate candidates are discussed and identified by the faculty, who are then individually approached and invited to apply for the specific vacancy.

The recruitment of trainers over four years (2018-2022) was supported by the ESF project “Strengthening the Academic Staff of Ventspils University of Applied Sciences in the Fields of Strategic Specialization” (Project No: 8.2.2.0/18/A/009). One of the activities of the project was to involve PhD students in academic work, strengthening the capacity of the academic staff of the VUAS and promoting its renewal. FoIT recruited four PhD students for the implementation of the study field. One of these PhD students has already defended his doctoral thesis and was elected to the position of docent at the FoIT in 2022. The second major activity was related to the involvement of foreign academic staff in academic work, with the aim of increasing the competitiveness of the VUAS study programmes and improving the content of study courses. In the study field programmes, cooperation has been established with four foreign lecturers, one of whom has been elected as a docent at the FoIT in 2022, while two others are ready to continue their cooperation as guest lecturers in the future after the European Social Fund support ends. All faculty members were recruited through open advertisements in the EURAXESS database, in “Official Publisher of the Republic of Latvia” and on the websites of the VUAS and the Ministry of Education and Science.

2.3.6. Specify whether there are common procedures for ensuring the qualification of the academic staff members and the work quality in place and provide the respective assessment thereof. Specify the options for all teaching staff members to improve their qualifications (including the information on the involvement of the teaching staff in different activities, the incentives for their involvement, etc.). Provide the respective

examples and specify the way the added value of the possibilities used for the implementation of the study process and the improvement of the study quality is evaluated.

The professional improvement of the teaching staff includes graduation from appropriate professional improvement programs and the exchange of experience and participation in conferences and seminars, which shall be certified by the documents issued at the end thereof.

In accordance with the regulation regarding the procedures according to which VUAS teaching staff are awarded academic leave of absence to conduct scientific research or scientific field work outside their workplace (VUAS internal document, available to the users of venta domain in the VUAS server), every six years academic personnel are entitled to a paid six calendar month long academic leave of absence for the performance of scientific work outside their workplace.

The procedures, according to which the professional improvement of the teaching staff elected by VUAS is evaluated and listed in conformity with the professional qualifications required by a higher education teacher are stipulated by the "Regulation regarding the Professional Teaching Improvement of Ventspils University of Applied Sciences' Teaching Staff and Listing thereof", approved in the VUAS Senate on 2017.09.20., Decision No 17-125. ((VUAS internal document, available to the users of venta domain in the VUAS server), which was drawn up in accordance with LR Cabinet Regulation No.662 of 28 October 2014 "Regulations regarding the Education Required by Teachers and the Procedures for Improving the Professional Competence of Teachers".

The teaching staff elected by VUAS may obtain a qualification corresponding to professional improvement by graduating from a professional improvement programme regarding innovations in the higher education system, university didactics or educational work management or by implementing the measures corresponding to the objective of professional improvement listed in Section 3.2 of the regulation.

Every teaching staff is responsible for his or her professional development. VUAS teaching staff have, until the end of the election period, to graduate from a professional improvement program of 160 hours (including at least 60 contact hours). Once a year, VUAS teaching staff submit a report on professional improvement, accompanied by the relevant certificates.

VUAS teaching staff are regularly offered the opportunity to undertake various professional development courses at VUAS premises. In the academic year of 2020/2021, due to the spread of the COVID-19 virus, only a small number of professional improvement courses were organised for the teaching staff. In the academic years 2020/2021 and 2021/2022, the following courses took place, including within the framework of the project "Strengthening the Teaching Staff of Ventspils University of Applied Sciences in the fields of Strategic Specialization" (No. 8.2.2.0/18/A/009):

- Electronic documents and signatures – where to start?;
- Control of anxiety during a public speech, in front of the camera;
- Minimum requirements for the use of Moodle (funded by the project "Next Generation
- Micro Cities of Europe" (hereinafter - NextGen));
- Moodle Course Building Guide (funded by the NextGen Project);
- Moodle Tests and Surveys (funded by the NextGen project);
- Creation and Management of H5P Activities (funded by the NextGen project);
- "Introduction to Power BI";
- "Leadership – Emotional Intelligence";
- "Leadership – the Manager as a Leader";

- “Leadership – Team Management”;
- “Leadership – Self - and Speech-Giving Skills in Front of the Public”;
- “Learning Videos: from Content to Recording”.

As of February 2021, within the framework of the ESF project “Strengthening the Teaching Staff of Ventspils University of Applied Sciences in the fields of Strategic Specialization” (Project No. 8.2.2.0/18/A/009), the teaching staff could start internships with businesses in Latvia.. The objective of the project is the targeted development of VUAS teaching staff in order to improve the quality of the study process, to ensure the improvement and updating of the competences of teaching staff, as well as to strengthen collaboration with external partners. The study field teaching staff also took advantage of this opportunity and active internships took place within various ICT companies, such as RoutedIn and AsyA, which not only increased the staff’s knowledge of professional processes within the industry, but also strengthened active communication between businesses and the faculty about study processes.

The teaching, scientific and organisational work of teaching staff is evaluated by examining the self-assessment report of the study field at the meeting of the faculty council, reviewing the report regarding the professional improvement implemented. The individual assessment of teaching staff is performed in accordance with the provisions of the VUAS regarding a single remuneration system at VUAS, taking into account the work complexity, mental effort, cooperation, management function, responsibility for work results, responsibility for decisions, contribution of pedagogical, organisational and scientific work, education and professional experience necessary for performance of official duties, as well as additional annual review of individual maps of the results to be achieved by teaching staff with a doctoral degree. When analysing the contribution of staff with doctoral degrees to the city’s ICT processes, the Ventspils Council pays an additional bonus to teaching staff with a doctoral degree. Students have the opportunity to express their opinion about the teaching staff and the study course they teach by participating in LAIS surveys.

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

Implementation of the study field during the academic year of 2022/2023 is performed by 58 teaching staff, 14 of whom have been elected to the FoIT.

The balancing of the academic, administrative and research workload of teaching staff takes place through collaboration among faculty deans, the Human Resources Department and the Science and Development Department. In order for the academic workload not to be too excessive, if it exceeds 1.2 (teaching load), a separate decision by the Faculty Council and VUAS Senate is necessary for the approval of the workload.

Overall, the pedagogical workload for the teaching staff is quite high, especially for elected staff, which also results in a smaller number of teaching staff mobilities. Work is being done on regeneration, but in the short term we are trying to attract guest teaching staff (which helps with the transfer of industry knowledge to students and to balance out the workload), but clearly this is not a sustainable solution. Currently, four of the guest lecturers or lecturers are studying for PhDs and are expected to be elected as permanent docents after their PhD theses are defended.

The following items have been added to the Annex:

- basic information about the teaching staff involved in the implementation of the study field (Annex No 2.8.);
- biographies of the teaching staff (Curriculum Vitae in Europass format)(Annex 2.9.);
- certification that the knowledge of the official language of the teaching staff involved in the implementation of study programmes conforming to the study field conforms to the provisions regarding the amount of knowledge of the official language and the procedures for testing the fluency of the official language for the performance of professional and official duties (Annex 2.10.);
- certification regarding the proficiency in the relevant foreign languages of the lecturers involved in the implementation of the study programme at least at Level B2 in accordance with European language proficiency assessment levels(Annexe 2.11.).

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

Support for students in the study process is mainly provided by a faculty study administration specialist-clerk, which includes providing information about the events related to the study process and record keeping. In certain matters, students may consult Study Department specialists, the director of the study programme, and the dean of the faculty. Foreign students are supported by specialists in external relations matters.

Students may also turn to the heads of relevant fields of the Student Council of Ventspils University of Applied Sciences for support, for example, in academic matters the head of study field may be consulted, international students receive information and support on visa applications, as well as on various everyday issues from the External Relations Service, and Student Council representatives support students in dealing with various everyday and emotional situations.

Students are helped in their career development by the annual Career Days organised by the Student Council, where students have the opportunity to meet companies and institutions that offer jobs for young professionals. Contacts with employers' representatives are also facilitated by study programme directors, as well as visiting lecturers from companies and institutions, who inform students about job opportunities in the companies and institutions they represent.

The “Regulation on Study Procedures at Ventspils University of Applied Sciences” provides all students of Ventspils University of Applied Sciences with the possibility to receive professional psychological or career support in matters related to studies, as necessary, in cooperation with the Ventspils Education Board. A student may apply for consultations from a psychologist or career counsellor by applying to the study department with a written submission or in person. When evaluating a student's application, a study department specialist may redirect the student to a specialist of the Ventspils Education Board or, if possible, resolve the situation within the scope of his or her competence.

The regulation can be found (only Latvian) in webpage section https://www.venta.lv/augstskola/parskati-un-zinojumi . Direct link to the file:

https://irp.cdn-website.com/f6b5d556/files/uploaded/Nolikums%20par%20studiju%20k%C4%81rt%C4%ABbu%20Ventspils%20Augstskol%C4%81.pdf

2.4. Scientific Research and Artistic Creation

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

Scientific research of the study field takes into account the objectives of the scientific development direction defined in the Development Strategy of the Ventspils University of Applied Sciences for 2021-2027:

- Expand participation in national and international research projects and networks, including international excellence and involvement in technology development and front-line research in radio astronomy and other smart specialisation directions, growth priorities and areas, as well as increased participation in European Union and other international programmes and projects.
- Increase the number of publications indexed in international databases.
- Ensure the regeneration of scientific staff based on VUAS graduates and attract young scientists from other universities, including:
    - Increasing the proportion of scientific staff with a doctoral degree.
    - Attraction of highly qualified (including foreign) researchers to facilitate the further development of VUAS science and increase its international competitiveness.
    - Recruitment of young scientists to take part in VUAS scientific research.
    - Involvement of students in conducting studies and the preparation of publications, thus ensuring the principle of succession in the study fields to be carried out by VUAS.
- To improve cooperation with businesses and scientific institutions of the region, state and EU by ensuring transfer of competence and research results to economic development, including:
    - To carry out research in sectors pertinent to economic development and ICT, especially in the field of specialisation of machine learning
    - Increase the proportion of commissioned and collaboration studies.
    - Facilitate the commercialization of knowledge and technology.

The academic staff involved in the study field are highly qualified and competent to ensure that students acquire the necessary research skills, theoretical knowledge, skills and competences. Some teaching staff are also involved in scientific research alongside their teaching process, involving students in that research, also. The Faculty conducts scientific work in close association with the Institute of Engineering Ventspils International Centre for Radio Astronomy (*VSRC*) and the Centre for Technology Transfer and Innovation (TPIC). In addition to faculty teaching staff who work for VSRC and TPIC, the scientific work of Ēvalds Urtāns, who specialises in applied research into machine learning, is particularly active.

During the reporting period, lecturers and students of the study field also conducted scientific and

applied research at the Smart Technology Research Center (STRC) (status of a research institute within the VUAS), which in 2021 was integrated into the *VSCR*. Most of the teaching staff of the study field are elected researchers at the *VSCR*, as well as *VSCR* engineers participate as guest lecturers in professional programmes, thus linking research work with study work.

The main tasks of the *VSCR* are:

- to carry out fundamental research in radio astronomy;
- to develop research in geo-information satellite technologies and other applied space technologies;
- to carry out applied research in mathematical modelling, computer science, electronics and electrical engineering and related fields (links with both computer science and electronics study programmes);
- to carry out research in the field of applied information technology (links with the computer science programmes of the study field);
- participate in the training of masters and PhD level specialists in their fields of scientific activity;
- participate in the implementation of bachelor, master and doctoral study programmes and in the teaching of courses in electronics, physics, mathematics and computer science.

In the international assessment of Latvian research institutes carried out in 2013, *VSCR* was ranked among the top fifteen research institutions in Latvia and assessed as a quality international player. In the 2020 assessment, the status of a quality local player was awarded, as the experts took into account a lower number of publications than the Institute's researchers have published, and listed a number of parameters to be improved, which are also being worked on within the faculty. In the reporting period until 2018, the *VSCR* in cooperation with the State Education Development Agency, Ventspils City Council and the foundation "Ventspils High Technology Park" implemented the ERDF project "Establishment of the Single Research Centre "Information, Communication and Signal Processing Technologies of National Importance (*IKSA-CENTRS*)"". The project included the modernisation of the Irbene radio telescopes and the establishment of a Space Data Processing Centre. VUAS was the lead partner in this project, which also involved the University of Latvia (*LU*), Riga Technical University (RTU), the Institute of Electronics and Computer Science (IECS) and the Institute of Mathematics and Informatics (IMI) of LU.

During the reporting period, VUAS participated in the implementation of 4 national research programmes (6 national research programme projects) - "Next Generation Information and Communication Technologies (ICT) Research National Programme (NexIT)", "Multifunctional Materials and Composites, Photonics and Nanotechnologies (IMIS2)", "EKOSOC_LV", "Letonika - Latvian History, Languages, Cultural Values".

During the reporting period, Ventspils University of Applied Sciences is implementing four projects under the European Space Agency's PECS programme.

Senior undergraduate and postgraduate students are also involved in the implementation of projects. The quality of the FoIT and *VSCR* results is confirmed by several VUAS MSc graduates who continue their work at the Paul Scherrer Institute (Switzerland), the University of Tartu and Tartu Observatory in the Estcube satellite team (Estonia), as well as further studies in PhD programmes and research work in Latvia and abroad (Germany, France, Estonia, Denmark, UK, Italy).

The teaching staff present the results of their research at the annual scientific conferences of the VUAS (in December), and once a year student scientific conferences are organised (April-May), where students present the results of their research. Every 3-4 years, VUAS Engineering Institute Ventspils International Radio Astronomy Centre (*VSCR*) organises international scientific

conferences, where lecturers and students of the study field also present their research.

In 2018, the FoIT organised the Latvian Mathematics Conference.

In 2018, the VTPC organised a neuroscience conference and summer school (6th Baltic-Nordic School on Neuroinformatics BNNI 2018).

On 23-24 September 2021, the *VSCR* organised a conference "Baltic Applied Astroinformatics and Space data Processing" BAASP 2021. This conference is regularly organised in Latvia, Estonia and Lithuania.

Teaching staff also participate in conferences organised by other Latvian universities and foreign universities.

The teaching staff of the bachelor and master programmes in electronics (five *VSCR* researchers have also been elected to the academic positions of docents and lecturers of the faculty), who conduct classes in the specialisation courses in the field, carry out applied research in the Electronics and Satellite Technology Department and other departments of the *VSCR*. Three engineers from the *VSCR* Technical Service, who are developing new radio receiver solutions for the Irbene radio telescopes, also work as guest lecturers in the study field, teaching several courses each. One of the most prospective lines of research is satellite engineering, with research taking place in the following areas:

- Satellite communications and programmable radio, development of a high data rate communication module
- Embedded parallel signal processing
- High reliability and redundant embedded control systems.

As antennas are one of the most important components of any communication system or receiver, research is also being carried out in the field of increasing antenna efficiency:

- Low noise amplifiers for weak radio signals
- High performance and compressive sensing
- Aperture, grating and planar antenna technologies
- Beamforming and directivity optimisation
- Development of the Low Frequency Array Radio Telescope (LOFAR).
- Modernisation of the Irbene radio telescopes - development of the S-band receiver, testing of RT-16 and RT-32.

Teaching staff of bachelor's and master's degree programmes in Computer Science carry out research activities mainly in the Remote Sensing and Discrete Signal Processing Department and the High Performance Computing Department of the *VSCR*. Five of the FoIT elected lecturers are researchers in these *VSCR* departments, and two other *VSCR* researchers are visiting lecturers in the study field programmes. Main research areas:

- Development of specialised methodologies for transforming remote sensing data into information products.
- Research and testing of remote sensing data processing methods
- Software development
- Monitoring of forest resources and facilitation of forest inventories using satellite images, aerial photographs and LIDAR data (tree canopy cover determination, individual tree identification and canopy separation, tree species classification, forest stand stock and biomass estimates).

- Oil slick detection in natural water bodies (primarily marine) using Synthetic Aperture Radar (SAR) data.
- Urban mapping (identification of buildings, distribution of green vegetation).
- Precision agriculture
- Scientific and engineering tasks where the computational requirements are so high that calculations are not possible with everyday computers. High-performance computing uses computers called "supercomputers".

The research of the High Performance Computing Department of the *VSCR* focuses on three main areas:

1. Research in engineering physics.
2. Research on radio astronomical data processing and methodology development.
3. Near Space Research.

Teaching staff working at the faculty write scientific articles, participate in international scientific conferences, participate in and conduct national and international research, as well as, by maintaining regular contacts with entrepreneurs in Ventspils state city and Kurzeme region, promote the implementation of modern management science insights in practice.

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

The link between research and the study process is characterised by the research work of the teaching staff, the results of which are used for the improvement and updating of the content of the study courses they teach, as well as for the development of students' research skills. Work on research projects is integrated into the teaching process and participation in them broadens the horizons of lecturers and improves their qualifications. Coursework, bachelor's and master's theses supervised by the teaching staff are mostly connected to their field of research.

For example, given his high administrative and pedagogical workload, doc. Vairis Caune continues his research, leading bachelor's and master's theses on the topic of brain signal processing. The results of his previous years' research are used in the course he teaches, "Processing Medical Signals".

Another example worth mentioning is Ēvalds Urtāns, who moved to Ventspils a few years ago and started a machine learning study group at Ventspils Business Development Center to raise interest and competence among students about machine learning. This has also resulted in job offers from companies and has generally given good support to Ventspils' common machine learning knowledge base.

Prof. J.R.Kalniņš conducts research within the High Performance Computing Department of *VSRC* and teaches the course "Information Theory and Cryptography" in the master's programme "Computer Science".

Assoc.prof. G. Hiļķeviča is a researcher in this department, she regularly participates in scientific conferences with her research results, and she teaches several higher mathematics courses in both bachelor and master programmes.

Assist.prof. A. Vrubļevskis integrates the results of his research on solar plasma physics into the course "Electricity and Magnetism" and the course "Electrodynamics and Antenna Theory".

Assist.prof.. J. Trokšs, who is also a senior researcher at the *VSRC* Radio Telescope Technical Service, shares his experience with students in the course "Power Supply of Electronic Equipment".

Assist.prof. L. Gulbe, leading researcher at the Remote Sensing and Discrete Signal Processing Department of *VSRC*, teaches the course "Methodology of Scientific Research" to students of master's programmes "Computer Science" and "Electronics".

Lecturer K. Šķirmante, researcher at the High Performance Computing Department of *VSRC* , teaches several programming courses in the study programmes "Programming Specialist", "Computer Science" (Bachelor) and "Electronics Engineering".

Jānis Šate, a research assistant at the Electronics and Satellite Technology Department of *VSRC* and a PhD student at the University of Latvia, includes his PhD research results in the courses "Signal Theory and Processing", "Programmable Integrated Circuits", etc.

Donerblics and M. Bleiders, engineers of the *VSRC* Technical Service, who are studying for a PhD at RTU, incorporate their experience in the development of radio-frequency electronic equipment and the results of their research into their courses in the master's programme "Electronics" and the bachelor's programme "Electronics Engineering".

This does not represent the whole list.

During the reporting period several teaching staff of the study field have presented their research results at international conferences abroad - assoc.prof., leading researcher. J. Hofmanis, assist.prof., researcher V. Caune, guest assist.prof., leading researcher. G. Korāts, assist.prof., leading researcher. J. Freimanis, assist.prof., leading researcher. A. Vrubļevskis and others. Participation in such conferences helps researchers to maintain international contacts, to keep up-to-date with the latest research in science, as well as to involve master and bachelor students in their research by supervising their master and bachelor theses.

Several lecturers of the study field - assoc.prof. R. Rollande, assoc.prof. J. Hofmanis, assist.prof. Ē. Urtāns, assist.prof. M. Maltisovs while working part of the time in companies in the industry, can bring not only academic, but also applied research experience to the faculty, offering students internships' and final thesis' topics. For final theses, especially in master's programmes, it is very important to link them to current problems in fundamental scientific research or applied research.

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

VUAS' Resarch Institute for Engineering Sciences *VSRC* is a well-known and internationally recognised player in the field of radio astronomy. The involvement of the teaching staff of the study field in international cooperation is carried out through international projects of *VSRC*, through ERASMUS programme cooperation activities, through project applications to EU research programmes (HORIZON) together with other Latvian scientific research institutions, as well as through personal contacts with foreign scientific institutions.

The most important international cooperation project in the Horizon 2020 programme in the past years for Ventspils University of Applied Sciences has been the development of the LOFAR (Low Frequency Array) radio telescope in collaboration with the Netherlands Institute of Radio Astronomy "Astron" and the University of Manchester. Project title: "Baltics" (Building on Advanced Lofar Technology for Innovation, Collaboration, and Sustainability), Nr. 692257, implemented 2017-2019, funding amount 1 MEUR. Within the project, *VSRC* staff, including study field teaching staff, as well as several students of the masters programme "Electronics" attended several training seminars at the Astron Institute, as well as a six-month training and internship at the Radio Astronomy Institute of the University of Manchester "Jodrell Bank Centre for Astrophysics" (JLBC). As part of the Baltics project, researchers from the Netherlands and the UK conducted a week-long 2-credit (3 ECTS) training programme in signal processing for *VSRC* researchers and electronics students at VUAS. *VSRC* gained skills to develop directional low and high frequency antennas by software processing, to process and perform reduction of LOFAR radio telescope data arrays. The project has started collaborative research and cooperation has continued in 2020-2022.

Through contacts with the Swedish Institute of Space Physics (SISP), *VSRC* established a collaboration with the Swedish Space Corporation (SSC) in the development of satellite communications. As SSC is working on the possibility of establishing a satellite launching site in northern Sweden, they are interested in using the Irbene radio telescopes as professional ground stations for satellite communications. Several *VSRC* engineers - teaching staff in the study field - are involved in the cooperation.

Since 2015, the FoIT has been regularly participating in European Space Agency competitions and has implemented several projects. Eight master and bachelor students were involved in the European Space Agency (ESA) project "Development of a Satellite Technology Curriculum at VUAS", which continued until the end of 2017. In the summer of 2017, as part of this project, VUAS FoIT organised an international summer school "FPGA Applications in Satellite Technology", which was attended by 28 students and researchers from 6 different universities.

In 2016/2017 academic year VUAS participated together with Estonian partners in the EU cross-border project SpaceTEM to promote the use of smart technologies for young people, which included an internship at VUAS in summer 2017, as well as a joint seminar of project participants in Ventspils (*"Training the next generation enterpreneurs with handson methods in space STEM". No.Est-Lat13.)*.

In 2018, VUAS launched another ESA project to set up a nanosatellite ground station in Irbene.

From 01.11.2020 to 30.06.2023 the project "R&D to establish RT-16 X-band capability for TT&C service" (Nr. 4000135982/21/NL/SC/hm) of the European Space Agency employs Roksolana Amarova, a student of the Professional Master degree programme "Electronics".

The ESA project "Development of university course - Satellite communications systems" (000136022/21/NL/SC LVR1_21) in the study course "Satellite communications" was launched in 2022. According to the project conditions, the content of the course is developed based on the needs of stakeholders, companies and organisations. The practical part of the course is to be carried out at the radio telescope complex in Irbene, using the equipment available there for satellite communications.

In the field of medical signal processing, VUAS FoIT collaborated with the University of Lorraine (FR). This collaboration resulted in three VUAS graduates studying for their PhD at this university, defending their PhD degrees and returning to VUAS. The new PhD graduates set up the Smart Technology Research Centre (STRC / *VTPC*) at the FoIT. Jānis Hofmanis continues to work as Associate Professor, Vairis Caune as assistant professor in Computer Science bachelor and master

programmes and as the Dean of the Faculty (since 2019), Gundars Bergmanis - Korāts after several years as a researcher and guest assistant prof. at VUAS has moved to the NATO Strategic Communication Centre of Excellence (NATO StratCOM COE, Riga). One Master student from Lorraine University was working on his Master's thesis at Ventspils University of Applied Sciences in the 2019-2020 academic year. J. Hofmanis is a member of IEEE (Institute of Electronics and Electrical Engineers).

In 2018, STRC (*VTPC)* organised the Baltic-Nordic International Summer School on Neuroinformatics - BNNI 2018, (International Summer School / Workshop) at Ventspils University of Applied Sciences.

The project for the refurbishment of the RT-32 and RT-16 radio telescopes in Irbene enabled the *VSRC* to become a member of the JIVE-ERIC European Large-Baseline Interferometry Network (VLBI). Membership of this international network allows observations to be carried out in Irbene in collaboration with radio astronomers from other countries, as well as *VSRC* researchers to engage in joint projects with colleagues from other countries. Since 2018, a close cooperation with the Torun Radio Astronomy Observatory in Poland has been established, which includes staff internships at each other's radio observatories. In collaboration with researchers from the University of Bielefeld in Germany and the University of Orleans in France, *VSRC* researchers have carried out the first pulsar observation in Latvia with the Irbene LOFAR radio telescope, https://www.venta.lv/pirmais-veiksmigais-pulsaru-noverojums-vsrc-vesture (article available in Latvian). FoIT assist.prof. Jesus Alberto Cazares Montes, who teaches higher mathematics courses in the English-language bachelor's programme "Computer Science" was also involved in these calculations. Participation in the JIVE-ERIC network allows the *VSRC* to participate in the new European Commission funded project RADIOBLOCKS, too: (https://www.venta.lv/radioblocks-jauns-eiropas-konsorcijs-nakamas-paaudzes-radioastronomijas-infrastrukturu-tehnologiju-izstradei)

The Department of Engineering of the VUAS FoIT has a long-standing cooperation with the University of Tartu Observatory in the framework of electronics study programmes. Each year, one or more students from the bachelor's and master's degree programmes in electronics do an internship at Tartu Observatory in the ESTCUBE nanosatellite development team.

VSRC and VUAS FoIT, alternating with colleagues from Tartu Observatory, regularly organise the international conference "Baltic Applied Astroinformatics and Space data Processing" (BAASP). It has been held in Ventspils in 2017, 2019 and 2021, and is usually attended by around 100 scientists from more than 10 countries.

International cooperation in scientific research takes place in the teaching staff's field of research. This is reflected in the list of accompanying scientific publications.

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

Involvement of teaching staff in scientific research at VUAS is encouraged in several ways.

According to Section 27 (2) and (4) and Section 28 (3) of the Law on Higher Education Institutions, the duties of professors and associate professors include conducting scientific research for 8-9

academic hours per week within their basic workload (if the teaching load is full-time). The faculty members involved in the study field have the possibility to participate in research projects implemented by the *VSRC*. Permanent lecturers (elected by the faculty) of the VUAS may also be elected as *VSRC* researchers.

In accordance with the Regulation “Regarding Additional Remuneration for Employees of Ventspils University of Applied Sciences”, additional remuneration is awarded to VUAS elected teaching staff with a doctoral degree, who have fulfilled one of the criteria referred to in Paragraph 3 of the regulation in the previous two academic years. In accordance with this regulation, teaching staff who have acquired the status of an Latvian Science Council (LSC) expert are awarded a one-off payment.

In accordance with the regulation for the allocation of financing for professional trips to participate in conferences, VUAS teaching staff are paid to participate in international scientific conferences – transport and accommodation expenses and participation fees at the conference are covered.

The teaching staff are also awarded funding for internal self-initiated research projects in accordance with the rules of the regulation “Development of Scientific Activity at Ventspils University of Applied Sciences”. In accordance with this regulation, projects for the competition at VUAS may be submitted by university staff with a doctoral degree. The condition is that at least one master and/or doctoral student or young scientist (up to five years after obtaining a doctoral degree) should be included among those implementing the project. Involving students in the implementation of the project gives bonus for evaluation.

In accordance with the Regulation on the procedures according to which academic staff of the Ventspils University of Applied Sciences (VUAS) are Granted Academic Leave for Scientific Research or for doing scientific work outside their workplace, lecturers who have served at least six years in elected academic positions at VUAS and who last took this type of leave at least six years ago are entitled to request paid academic leave of six calendar months.

Annex includes:

- A summary of quantitative data on scientific and/or applied research activities relevant to the study field, of teaching staff during the reporting period - publications of the teaching staff, participation in conferences, participation in projects, sorted by importance (Annex 2.12.);
- Scientific articles of academic staff related to the study programme in publications to be reviewed or research accomplishments and patents during the past six years (Annex 2.13.).

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

Research activity is a vital part of the implementation of the study program. To consolidate and

develop the research knowledge and skills of students, each bachelor's and master's study programme includes a study course on study methods, methodology. In all study programs, students must write qualification, bachelor or master's thesis during the final semester. Although Ventspils University of Applied Sciences is a small regional higher education institution, one of its

departments is the Ventspils International Radio Astronomy Centre (VIRAC / *VSRC)*, an internationally renowned and respected scientific institute that can offer students the opportunity to engage in high quality scientific and applied research

The first-level professional study programme, “Programming Specialist” does not include direct research, but it does include a component of creativity that needs to be demonstrated both in mandatory practice and during the development and defence phase of the qualification work. Students in this study program are involved, as far as possible, not just in internships, but also in applied projects that require programming knowledge and skills. Accordingly, students gain additional experience and also contribute to the economy.

Students of the academic bachelor program “Computer Science” are involved in similar activities and projects to those mentioned above, too - with programming tasks. However, the knowledge of these students in mathematics and natural sciences means that they can be given more academically complex tasks and allow them to formulate their own methodology and way of formalising the specific problem environment in the language of computer science. They are also offered to work on bachelor's papers related to the research fields of VUAS teaching staff, but which are too time consuming for the teaching staff to deal with themselves. Accordingly, students are gradually involved in scientific activity, laying the ground for the regeneration of teaching staff. Parallel to this, these students are also offered to develop their graduation papers on subjects provided by businesses VUAS collaborates with (or who express a desire to supervise jobs provided that students can agree on a topic, work purpose, and tasks with their tutors). Although these works are usually distinctly technical, they clearly demonstrate that a student is able to use information technologies to address issues important to the industry and then academically describe and analyse the progress of the work.

Students from the academic master's Computer Science program are involved even more deeply in the academic environment. Many of the masters’ students already work at the VUAS *IZI VSRC* alongside their studies and are engaged in research or, at least, in tackling problems that are already very close to the area of research. Graduate students often write their master's theses on a research topic developed by teaching staff or guest teaching staff in the FoIT. Oftentimes, graduate students start creating and publishing their first publications together with their lecturers (this occurs with undergraduates, too, but more rarely).

Students are offered opportunities to participate in research and projects conducted by VUAS. For example, during the period from 1 September 2019, the project “Kurzeme Innovation Grants for Students” was implemented by VUAS, financed from ESF (KInGS, Project No.1.1.1.3/18/A/004). The aim of the project is to encourage young people to become aware as early as possible of their ability and skills to engage in real-life challenges, creating innovations both in process optimization and in the development of new products, so as to create as many success stories as possible after graduation, building on the practical experience already accumulated. About 240 students have taken part in the project, and they have gained practical experience performing studies commissioned by companies or working on their own research and business ideas. Almost every team had at least one, but typically several, computer science or electronics study program students doing practical prototyping.

Under the auspices of research done as part of bachelor's and master's theses, issues of urban, regional and national importance are studied and solutions are sought to current problems. For some examples, see works shown in Table 2.4 below.

Table 2.4

Examples of bachelor's and master's papers on topics of urban, regional and national

relevance

Thesis title in Latvian	Thesis title in English
Bachelor's theses	
Vāju radioastronomisko objektu novērojumu datu apstrāde - kalibrācija, filtrēšana un rezultātu analīze	Weak radioastronomical object observation data processing - calibration, filtration and result analysis
Ēku modeļu 3D rekonstrukcija, izmantojot lidara datus	Reconstruction of building 3D models using lidar data
Ievaddatu korekcijas metožu izpēte un risinājuma realizācija mobilās lietotnes prototipā "Jaunā Botāniskā Vārdnīca (JBV)"	Research of input data correction methods and implementation of solution in mobile application prototype "New Botanical Dictionary (NDB)"
Neironu aktivitātes pīķu noteikšana un klasifikācija, izmantojot klasiskos mašīnmācīšanās un dziļo apmācību algoritmus	Neural activity spike detection and sorting: practical application using classical and deep learning approaches
VSRC radioteleskopu parametru vizualizācijas risinājuma izstrāde	Development of VSRC radio telescope parameter visualization solution
SIA ""Ventspils nafta" terminmāls" terminālu drošības apgaitas sistēmas projektēšana	Design of Safety Observation Rounds System for the Terminals of Ventspils Nafta Terminal Ltd
Iebrukumu atklāšanas sistēmas izveidošana VeA datortīklā	Building of IDS for the VeA network
Radio astronomisko datu apstrādes metodikas izveide, pielietojot mašīnmācīšanās algoritmus RFI filtrēšanai	Developing a methodology for processing radio astronomical data using machine learning algorithms for RFI filtering
Master's theses	
Vāju signālu radio astronomisko datu apstrādes metodikas uzlabojumi, pielietojot Karhunen–Loève transformāciju, Singulāro Spektru analīzi un mašīnmācīšanās algoritmus	Improvements of weak radio signal processing methodology, using Karhunen–Loève transformation, Singular Spectrum Analysis and machine learning algorithms
Cilvēku plūsmas analīze, pielietojot konvolūcijas tīklus	Human flow analysis using Convolutional Neural Networks
Vienlaicīga lokalizācija un kartēšana autonomiem mobiliem robotiem	Simultaneous Localization and Mapping for autonomous mobile robots

In order to involve students more in research work, VUAS implements several research projects at Ventspils, Latvian and international level, in which students and postgraduate students of the study field have the opportunity to participate. The work in the projects is integrated into the learning process and participation in them increases the qualification and competitiveness of students and postgraduates. For example, in 2017, the *VSRC* employed (according to the full-time equivalent PLE methodology) 2 full-time undergraduate students and 2.21 full-time master students in various projects; in 2018, 3.94 full-time undergraduate students and 2.1 full-time master students.

Eight master and bachelor students were involved in the European Space Agency (ESA) project "Development of Satellite Technology Curriculum at Ventspils University of Applied Sciences", which

continued until 2018. In the summer of 2017, an international summer school "FPGA Applications in Satellite Technology" was held at VUAS within this project, which was attended by 28 students from different universities and researchers from six countries.

In the academic year 2016/2017 VUAS participated as a partner in the EU cross-border project SpaceTEM for the promotion of space technologies for youth, and development, which included an internship at VUAS in the summer of 2017, as well as a joint seminar in Ventspils (Training the next generation entrepreneurs with hands-on methods in space STEM). No.Est-Lat13. In 2018, VUAS launched another ESA project on the establishment of a nanosatellite ground station in Irbene.

ZIBIT, the competition for the best bachelor's and master's theses in computer science (informatics) at Latvian universities, organised by the University of Latvia Foundation in collaboration with Exigen Services Latvia and Accenture Latvia, awarded the third place in the competition of master's theses to Alvils Stūre, a student of VUAS, for his thesis "Detection and classification of neural activity peaks using classical machine learning and deep learning algorithms" in 2019; the first place in the competition of bachelor's theses was awarded to K. Spruģevics, a student of VUAS, for his thesis "3D reconstruction of building models using lidar data" in 2020.

As of 2015, a team of VUAS students with the project "IRBE" participates in the international stratospheric balloon competition Global Space Balloon Challenge. During the competition, about 200 stratospheric probes (balloons) equipped with cameras and measuring equipment were simultaneously launched into the stratosphere from 44 countries. The team passed the baton to the undergraduates, and students of electronics bachelor programme G.Dreifogels, K.Prūsis and A.Nikolajevs won the first place for the best design in the 2017 competition with the probe "IRBE-3".(Winners of International Global Space Balloon Challenge 2017 in category “Best Design”).

In the 2021/2022 academic year, a team of students developed the IRBE-5 stratospheric probe to estimate the stratospheric ozone density as a function of altitude by measuring the intensity of ultraviolet radiation from the Sun.

In 2017, two FoIT students, Klāvs Kalnejs and Dāvids Egle, started their own start-up and worked in the VHTP incubator.

In the H2020 Twinning project on human capital development implemented by *IZI VSRC* "Building on Advanced Lofar Technology for Innovation, Collaboration, and Sustainability" (No. 692257 - BALTICS) involved Master students of Electronics Gints Dreifogels, Atvars Nikolajevs, Kaspars Prūsis, who all completed internship at the University of Manchester, where they were trained in data array processing technologies and software tools for LOFAR data reduction and processing. Many students from electronics and computer science programmes have been involved in training at VUAS that were organised within the project.

On 23 June 2017, Latvia's first artificial Earth satellite, Venta-1, orbited the Earth. A research team was set up to communicate with the satellite and process the information received from it, consisting of Assist. Prof. Aigars Krauze, Master of Electronics, Engineer Gints Dreifogels, as well as 2nd year Bachelor of Electronics students Renārs Mičulis and Klāvs Reinis Ozols.

From 14.06.2017 to 31.01.2020 Romāns Peženkovs, 2nd year student of the professional master's study programme "Electronics", was involved in the project "Studies of Physical and Chemical Processes in Interstellar Medium" (No.1.1.1.1/16/A/213).

From 2018 to 31.01.2020 the project "Research on Physical and Chemical Processes in Interstellar Medium" (Nr.1.1.1.1.1/16/A/213) involved Jānis Šteinbergs, 1st year student of the academic master's study programme "Computer Science". J. Šteinbergs prepared his first publication as a student while working on this project.

In 2018, the European Regional Development Fund's financed Competence Centre for Smart Materials and Technologies project "Experimental 3D printer with integrated software for prototype printing" (Project No 1.2.1.1.1/16/A/005) involved Alvils Stūre, a student of the bachelor study programme "Computer Science".

From 07.05.2019 to 28.02.2021 the project "Environmentally friendly small power generator with linear rotor motion (DrauGen)" involves 3rd year students of the professional bachelor study programme "Electronics Engineering" Emīls Vēveris and Andrejs Andrievs Dzelme.

From 01.11.2019 to 31.05.2021 the project (Laboratory network for testing, characterisation and conformity assessment of electronic products developed by SMEs (TEST-4-SME) (Nr. R040) involves 3rd year student of professional bachelor study programme "Electronics Engineering" Kristers Dēnavs.

From 01.11.2020 to 30.06.2023 the project "R&D to establish RT-16 X-band capability for TT&C service" (Nr. 4000135982/21/NL/SC/hm) of the European Space Agency employs Roksolana Amarova, a student of the Professional Master's degree programme "Electronics".

From 01.01.2020 to 31.05.2021 the project "Cryogenic insulation thermal conductivity testing system" (Nr.1.2.1.1/18/A/006) involved the 2nd year student of the professional master study programme "Electronics" Klāvs Kalnejs and the 3rd year student of the professional bachelor study programme "Electronics Engineering" Kristers Dēnavs.

In the academic year 2020/2021, electronics students Klāvs Reinis Ozols and Andrejs Andrievs Dzelme completed their internships and final theses at the Netherlands Institute of Radio Astronomy Astron.

Within the Erasmus+ mobility programme, three 4th year students of the study programme "Electronics Engineering" at the Faculty of Information Technologies - Aleksandra Smirnova, Mareks Krišjānis and Eleonora Harčuka - had an internship in Estonia, Tartu Observatory, in the ESTCUBE-2 team in the autumn semester of 2022.

Rodrigo Lavrinovičs, a student of the bachelor degree programme "Electronics Engineering", is doing an internship in Darmstadt, Germany, at the European Space Agency's (ESA) European Space Operations Centre in 2022, as the first student from Latvia, working on the development of the OPS-SAT2 nanosatellite.

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

In process innovations, a slightly modernised way of collecting study plan and workload information in the faculty is worth mentioning. As a compromise between Excel tables, where it is difficult to retrieve the required information and databases that require additional overtime maintenance and are difficult to learn for administrative staff without an additional learning, Google Docs was selected, where all information is entered about the courses, lecturers, groups, etc., presented during the astronomical year. From this information, it is convenient to retrieve both the cost of study programs, along with study plans for testing and the workload of the teaching staff. This facilitates the process of redistribution and organisation of workloads and represents a significant

improvement to the previous process.

Investment in expanding ICT opportunities is a crucial part of the study process, resulting in technological innovations. Since November 1, 2018, VUAS has been involved in the project “Next Generation Micro Cities of Europe”. A number of innovative products have been developed during the implementation of the project for the introduction and usage of digital solutions in the study process. These innovative products can be used by both VUAS staff and students.

One of these products is the VeApp information system, which was developed as a unique daily learning and an activity planning, information sharing and communication tool for the convenience of VUAS students and staff. VeApp is available to iPhone, iPad and Android smartphone users.

On this application, users can view their current learning or event calendar. Students can now find and connect with faculty and VUAS staff, and quickly find rooms at the university. With the registration feature built into the app, students can easily register themselves at lectures and events using smartphones to scan QR codes displayed on special LCD screens at the most commonly used classes. These screens will display a list of lectures, any published changes and QR codes required for digital registration via a smartphone. In addition, the app serves as an informative platform through which important notifications about news and opportunities at the university can be shared in real time. Meanwhile, the WeApp content control system allows VUAS' administrative staff to easily and securely control the app's sections and content in real time, allowing them to adapt quickly and efficiently to varying levels of change.

Other innovative advances and improvements include the new video studio, which serves as a tool for creating new materials and updating existing ones. The studio provides professional filming, lighting and sound hardware and premium editing and recording software. The machine and software can be used for streaming and online classes, video recording and editing for various purposes. In autumn 2021, for example, footage was filmed in a video studio and four study courses worth 1 credit each were created, and offered to students as optional choice study courses: “Computer Game Development Fundamentals,” “Introduction to Electronics Engineering,” “Understand Business,” “Computer Game Localization.”

During the project, the C406 space was refurbished and turned into an interactive digital classroom to help teaching staff with their daily work by means of a range of tools. This provides teaching staff with a comfortable lecture presentation, either face-to-face, remotely, or in mixed mode, even if students are in person and the lecturer is working remotely. The classroom is equipped with a microphone and camera for online transmission of the instructor, as well as webcams for students, digital tablets for drawing and writing on a computer, and an interactive board that provides remote access.

In the project, the word “innovative” is not limited to technology and tools, but also includes a methodology that plays a crucial role. For example, 36 hours of training were organised on topics related to the development of a modern online course, tools and diverse capabilities in Moodle, including the use of interactive tools, upgraded FIT courses developed by VUAS faculty staff and the Lifelong Learning Centre. Distance learning courses with video content were also created as a starting point for the development of distance learning studies at the university in all directions. Momentum has grown for the efficient and meaningful use of various ICT tools in the course teaching process.

FoIT teaching staff and students participate in the development of product innovations in cooperation with commercial companies and by participating in projects of the Latvian Investment and Development Agency (LIAA). One of the projects within the LIAA Commercialisation Support Programme was the development of wireless sensors for remote elderly care (KC-PI-2017/101) in

2018.

Within the Competence Centres Support Programme implemented by LIAA, VUAS cooperated with SIA "Baltic3D" in the development of integrated software for an experimental 3D printer for the production of personalised orthoses and prostheses (2017 - 2018).

From 2020, VUAS cooperates with SIA "Cryogenic and Vacuum Systems" (Ventspils) in the European Space Agency (ESA) project "Development and production of a universal measuring system that meets the requirements of the ECSS standards system (MeasureRight), contract with ESA No.4000132235/20/NL/SC, VUAS contract with CVS No.SAD 20-12. The project also involves students from the electronics programme.

The faculty members of the study field also participate in the *VSRC* agreement with Spire Global, Inc. (USA), setting up a ground station in Irbene for satellite data reception. As a result of the contract, VUAS subsidiary start-up company "IrbGS" Ltd. has been established. The project employed R. Lavrinovičs, a Bachelor of Electronics student, who as a result of the cooperation was given the opportunity to participate in an ESA internship (2022).

Students of the study programme "Electronic Engineering" regularly participate in the ESTCUBE team of the University of Tartu in the development of Estonian nanosatellites (ESTCUBE - 1, ESTCUBE - 2).

Students of the Faculty gain experience in product and process innovation by participating in the project "KInGS" (Kurzeme Innovation Grants for Students) (project No.: 1.1.1.3/18/A/004), both by proposing their own innovation ideas and by participating in the development of innovation ideas proposed by commercial companies.

2.5. Cooperation and Internationalisation

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

The development of study programs for the study field has taken place and is being implemented in direct co-operation with the country's leading specialists in the ICT sector. Employers' representatives as members of the FoIT Councils of Study Programs participate in both the development of new study programs and the updating of existing study programs. The aim of the study field is to prepare highly qualified specialists in computer science and electronics with fundamental knowledge that would allow them to independently adapt to professional activity in changing labour market conditions, as well as to prepare students for further studies in higher level programs, scientific activity and further self-education.

The study and research work of the FoIT is conducted in close cooperation with employers and professional and scientific organisations. VUAS is a member of the Latvian Information and

Communication Technology Association (LIKTA), the Latvian Electrical Engineering and Electronics Industry Association (LETERA) and the Mechanical Engineering and Metalworking Industry Association (MASOC), and a member of the Technology Transfer Commission of the Latvian Chamber of Commerce and Industry (LCCCI). The teaching staff of the study field are representatives of the VUAS in the above-mentioned organisations - Associate Prof. R. Rollande - LIKTA and lect. J. Šate - LETERA, VUAS was represented in the LTRK commission by STRC *(VTPC)* Director D. Biteniece. VUAS representatives participate in events organised by associations, take part as jurors in competitions organised by LETERA for schoolchildren with the aim of promoting electronics studies among them, take part in working groups for development of professional standards of industry associations (e.g. professional standards for electronics engineer and leading electronics engineer).

Representatives of the VUAS FoIT and senior students regularly participate in the discussion events "Ventspils ICT cluster Meetup", which bring together representatives of IT companies and business support organisations working in Ventspils and are organised by the IT cluster of the Ventspils Digital Centre. Such events allow the VUAS to get to know the IT companies operating in Ventspils better, and the companies to get to know the University's offer of educational services.

Employers' representatives manage and review qualification, bachelor's and master's papers, participate in the defence thereof, conduct separate lessons within the scope of study courses, become guest lecturers and teach study courses, provide the opportunity to visit companies/institutions and become acquainted with their activities in person, as well as offer students internship places. Sometimes, this cooperation results in a new member of the teaching staff, which increases the workload in higher education and is elected to the faculty.

Cooperation with the Ventspils City Council is very important for Ventspils University of Applied Sciences. The municipality financially supports VUAS by signing a cooperation agreement each year, which stipulates the results to be achieved by VUAS and the amount of support for the VUAS' marketing activities and the motivation of teaching staff. The funding of the Ventspils Municipality for ten annual ICT scholarships for students is very important. These scholarships were established on the basis of a tripartite agreement between the Ventspils City Municipality, Accenture Ltd. and VUAS with the aim of establishing an English-language bachelor degree programme in Computer Science and attracting foreign students.

In order to support the culture of innovation at the University and promote the commercialisation of research results, VUAS has established cooperation with business support organisations - the Investment and Development Agency of Latvia (LIAA), LIAA Business Incubator in Ventspils, Ventspils Municipality Business Support Centre, VHTP Business Incubator. Within the framework of the LIAA Technology Transfer Promotion Programme, seminars on intellectual property protection issues have been held for the University's academic staff and students, and VUAS has submitted several applications to this support programme. Dean of VUAS' FoIT 2016-2019 assist.prof. Māris Ēlerts was included in the advisory board of LIAA Business Incubator in Ventspils, and participated in the selection of commercial companies to be incubated. After M. Ēlerts, the advisory board includes L. Resele, Dean of the VUAS Faculty of Economics. VUAS is one of the founding members of the Ventspils High Technology Park (VHTP). The mission of the VHTP is to promote the development of companies and products in advanced industries and to contribute to increasing competitiveness. The VHTP Business Incubator operates in the premises of the VUAS, through which several graduates of FoIT study programmes have started their own businesses and created new companies, including TestDevLab Ltd, which has today reached an annual turnover of several million EUR.

VUAS is a partner in the foundation "LEO Research Centre" (Latvian Competence Centre for

Electrical and Optical Equipment Manufacturing, https://www.leopc.lv/partneri/, accessed 19.12.2022.). The task of the Industry Competence Centre is to carry out applied research in the interests of commercial companies in cooperation with scientific institutions, where VUAS has participated in a number of research projects, for example, EU Fund Strategic Objective 1.2.1.1 project No 1.2.1.1/18/A/006, research No 2.8 "Cryogenic insulation thermal conductivity testing system", where the client is SIA "Cryogenic and Vacuum Systems", 2019 - 2021,

(https://www.leopc.lv/projekts/petijums-nr-2-8-kriogenas-izolacijas-siltumvaditspejas-testesanas-sistema/, accessed 19.12.2022). Another competence centre, the foundation "Competence Centre for Smart Materials and Technologies", has carried out research in cooperation with SIA "Baltic 3D" in project No 1.2.1.1/16/A/005, study No 26 "Experimental 3D printer with integrated software adapted for prosthesis printing", 2018 - 2019.

(https://vmtkc.lv/portfolio/26-protezu-drukasanai-pielagots-eksperimentals-3d-printeris-ar-integretu-programmnodrosinajumu/, accessed 19.12.2022).

The Faculty cooperates with the Ventspils Education Board and the Kuldīga Education Board. The cooperation is implemented within the framework of service agreements, where the FoIT Engineering Department provides the use of its laboratories for regular visits of pupils to perform laboratory work in secondary school programmes of the above-mentioned municipalities. On its own initiative, the FoIT Engineering Division has set up a "STEM Club" for students (https://www.venta.lv/studijas/stem-klubs). The STEM Club is open to all students in Latvia, but in practice the majority of visitors are pupils from Ventspils.

VUAS has cooperation agreements with the University of Latvia and Riga Technical University. The agreements allow students of one university to study courses at the other university in their individual study plans. Researchers at the *VSRC* are working on a plan to establish a joint master's degree programme with the Faculty of Physics and Mathematics of the University of Latvia in radio astronomy, as a need has been identified to promote the generation of researchers who could carry out research with the VUAS Irbene radio telescopes in the future.

In 2020, cooperation with the University of Liepaja was initiated for the development of a joint professional bachelor programme "Smart Technologies and Mechatronics". The programme was licensed and has been running since September 2021. The purpose of the cooperation was assessed taking into account the competences of VUAS in the field of electronics, the resources of VUAS laboratories in the field of electronics, as well as the geographical proximity of the two universities.

A particularly important cooperation in the field of student exchange within the ERASMUS+ programme is VUAS' cooperation with the University of Tartu, where almost every year students from VUAS' bachelor and master programmes go for internships or final thesis development in the field of satellite technologies within the Estonian ESTCUBE team. This cooperation has started and developed with both universities specialising in space technology and nanosatellite development.

Cooperation with the Institute of Electronics and Computer Science (IECS) has been essential during the reporting period. Modris Greitāns, academician of the Latvian Academy of Sciences, was involved as a guest lecturer in the study course "Signal Theory and Signal Processing" in the bachelor programme "Electronics" for many years. Several students of the VUAS Bachelor's degree programme in Electronics have had internships and developed bachelor theses at IECS, and are currently continuing their work at the research institute as graduates. VUAS and IECS have jointly participated in research projects.

Cooperation also takes place during career days, various seminars and conferences, and other events, as well as during teaching staff’s personal contacts. Employers also provide financial

support, both through sponsorship of various events and in the form of student grants. Examples include the SIA Bucher Municipal scholarship, the Prof A. Claus Scholarship created by VUAS FEM graduate Mārtiņš Lauva, the SIA Hansamatrix scholarship, as well as the ICT scholarship of Ventspils State City.

Among the companies/institutions with which the FoIT enjoys close relationships with are Accenture (guest lectures, open lectures, practices) and TestDevLab (guest lectures, practices, participation in the Council of the Study Programmes) as the two largest, but there are many smaller companies with similar types of close interactions. Such cooperation with companies makes it possible to rapidly respond to market trends, to be informed about the development processes and trends of the sector, as well as to ensure graduates with stable job opportunities right here in Ventspils.

Businesses and institutions for potential cooperation are selected primarily on the basis of the overlap of areas and specificities of activity. For different study programmes, the same company may fit very well or not entirely. Oftentimes, good candidates are companies where our graduates work and employers are happy with them and have realised from experience that our graduate preparedness coincides with companies' requirements. Secondly, it is identified whether mutual synergy exists, as well as potential for mutually beneficial cooperation. Thirdly, it is analysed how this cooperation will help us develop in the short and long term. Fourthly, we are trying to build cooperation with all the ICT and electronics companies and large companies (Ventspils nafta, Bucher Municipal) in Ventspils that make extensive use of information technology. Cooperation is usually through a cooperation agreement with the company concerned.

In addition, the attraction of employers also takes place under the auspices of various projects and activities (for example, KInGS project companies are happy to continue to negotiate cooperation with us and provide joint project applications). Also, hackathons from different sectors and domains, where jury members are usually field specialists and very good potential collaborators, can be mentioned here. And, of course, informal communication - conversations with graduates at reunions or other meetings - also plays an immeasurable role.

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

Under the aegis of the study field, cooperation with foreign institutions mainly takes place through exchanges of lecturers and students and personal acquaintances of potential cooperation partners of the other party. Students of electronic study programs often attend exchange programs at Tartu University and the Observatory, working on the EST-CUBE satellite series and related projects. Computer science students go to the University of Lorrain (FR) in research practice, with which a long-standing collaboration has been developed, which has resulted in dozens of publications and three PhD graduates who have returned to work at Ventspils University of Applied Sciences after graduating with a degree. (Janis Hofmanis, Gundars Bergmanis-Korāts and Vairis Caune).

Cooperation is being developed in a meaningful way so that their potential results dovetail with the

strategy of Ventspils University of Applied Sciences as well as the aim of the study field.

VUAS has over 50 Erasmus + cooperation agreements with universities in around 20 countries providing for the exchange of FoIT staff and/or students. The list of Erasmus + partner universities is available on the VUAS website under External Relations. The mobility of students and lecturers to relevant partner universities takes place on an annual basis.

Thanks to one of the start-ups founded by VSCR, Ltd. "IrbGS", which was able to provide a student with a job in a Latvian space industry company, Rodrigo Laurinovičs, a student of the professional bachelor study programme "Electronics Engineering", the first Latvian student to be an intern at ESA, was able to obtain internship position with the European Space Agency.

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

Various activities are carried out to facilitate the attraction of foreign students:

- educational exhibitions overseas are attended;
- information is posted on educational platforms where potential students look for opportunities to

study abroad;

- potential students are also addressed on social networks and via agents.

Webinars are organised for students and agents to facilitate the dissemination of true and complete information. VUAS specialists responsible for attracting foreign students contact potential students and agents and provide all necessary information regarding study opportunities at VUAS, life in Ventspils and Latvia, immigration and local issues. Students are provided with support not only before they start their studies, but also during their studies and often after graduation from VUAS. VUAS has set minimum requirements for students, which are necessary in order for their applications to be evaluated, as well as signing a good practice agreement with the MoES on attracting foreign students and VUAS is a Member of the Association for the Export of Higher Education. For an application to be reviewed, at least 60% of previous education results must be achieved and there must be no minimum positive mark in profiling subjects (Mathematics and English). Entrance tests are organised and interviews are conducted with all students before their approval for studies. If necessary, additional requirements may be laid down like submission of documents or re-interview.

Mechanisms for attracting foreign teaching staff include personal contacts of VUAS teaching staff, participation in conferences, cooperation under the aegis of projects, studies, events and advertisements. Teaching staff are given access to infrastructure and resources to the same degree as local staff. During the reporting period, foreign lecturers in the study programmes of the study field were recruited within the project “Strengthening the Academic Staff of Ventspils University of Applied Sciences in the Fields of Strategic Specialization” (Project No: 8.2.2.0/18/A/009. The project was launched in 2018 with a call for proposals on the EURAXESS portal, as well as in the "Official Publisher of the Republic of Latvia", on the Ministry of Education and Science website and on the

VUAS website. Several lecturers were selected through a competitive selection process, and in the 2018/2019 academic year, Guest assist.prof., PhD Jesus Alberto Cazares Montes (previous experience at universities in Mexico and Croatia) and guest assist.prof. Juris Kļonovs (previous experience at Aalborg University, Copenhagen and the Italian Centre for Applied Research, Milan) started working in the English language flow of the bachelor programmes in Computer Science and Electronic Engineering, in 2019, in the master's programme "Electronics" some study courses were started to be taught by Guest Associate Professor Yuri Bobkov (Minsk University of Electrical Engineering, Belarus) and guest assist.prof. Olaf Henssler (University of Oldenburg, Germany). Unfortunately, due to COVID restrictions, the cooperation with J. Bobkov and O. Henssler has not continued, but J.A.C. Montes was elected as a permanent assistant prof. at the FoIT in 2022 to work in the English language flow programmes.

Visiting lecturers for short-term lectures have been involved under the ERASMUS+ programme, mostly from Lithuania, but also from the partner institute "Astron" (The Netherlands).

Outbound and incoming mobility of students at VUAS as a whole and at the FoIT during the academic years of 2020/2021 and 2021/2022 has declined due to the COVID-19 pandemic.

The following items are enclosed in the Annex:

- statistics on foreign students and teaching staff (Annex 2.15.);
- statistics on student mobility by study program (Annex 2.16.);
- statistics on outgoing and incoming mobility of teaching staff (A

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

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

In the previous accreditation of the study field, international experts made a total of 58 recommendations. For each study program, 14 to 15 recommendations were made separately, although many of them were identical for all four study programs. The majority - 73% of the recommendations - applied to all programs together or to the university’s quality management system, formalisation and institutionalisation of processes: introduction of formalised quality assurance procedures and better communication of them to all stakeholders in accordance with European standards and guidelines (ESG) in order to obtain a traceable and reliable structure; introduce a common standard for course descriptions; to introduce formalised procedures for the development, updating and implementation of study course descriptions; develop a study program based entirely on a learning (study) outcome approach; introduce formalised procedures for the development, approval and updating of programs; implement formalised study program management processes and implement them throughout the development, description, monitoring, evaluation and change cycle; introduce formalised methods to involve external stakeholders in the process of developing and/or updating academic programs.

The VUAS Study Department prepared an action plan, which specified the tasks of VUAS structural units or employees involved. In implementing the action plan, the University's internal regulations drawn up in previous years were amended, in addition to which new internal regulations required were prepared and approved in the Senate. The VUAS quality management system was improved during this process, as well as internal rules and process descriptions developed were presented in Sections 1.3, 1.4, 2.1.4 and 2.2.1 of the Self-assessment Report. An overview of the implementation of the specific recommendations and a link to the relevant internal regulation are provided in Annex 2.18. Amended and newly developed regulations of individual processes have enabled the formal procedures of various processes to be implemented more accurately in the work of the FoIT, thus having a positive impact on the implementation of study programs. Mapping of study (learning) results has been developed for study programs, and the learning results of the study course are harmonised with it during the process of drafting the description of each study course, thus ensuring accomplishment of the learning results of the study program.

Recommendations, unrelated to formal procedures:

- "To provide clearer information regarding the admission of EU and foreign citizens to separate programs, admission criteria for foreign citizens cannot be linked to the results of centralised examinations of the Republic of Latvia". Implemented - every year VUAS approves admission rules for foreign students that specify requirements for internationally recognized English language tests and a test of the VUAS in mathematics, as well as a remote interview. These rules are published in English on the VUAS homepage.
- "To ensure that the compulsory literature referred to in course descriptions is available in the University's library." This requirement is explained to the teaching staff, every year the faculty submits proposals to the VUAS Library for the purchase of literary sources. Course descriptions are currently in a uniform form, but in light of the specificity compared to other fields, much of the teaching process in our faculty consists of information delivered and synthesised by the lecturer. Work is ongoing to synchronise part of the core literature so that the literature list is created on a uniform basis for all courses.
- "Establish a permanent labour market monitoring mechanism" - the Faculty's management is obtaining the labour market information of industrial sectors related to the study field from the annual Report on Labour Market by the Latvian Ministry of Economics, direct information is available to the FoIT as a member of the industry associations LIKTA and LETERA, as well as from contacts with employers' representatives represented in the Councils of Study Programs, from guest teaching staff - specialists representing industry companies, and from companies that host students for internships.
- "Consider making internship compulsory for all students of the Bachelor "Electronics" program" - recommendation has been implemented by transforming the study program to the professional Bachelor program "Electronics Engineering".
- "Expand the operational scope and also focus on the international labour market in the electronics program" - Graduates of the VUAS FoIT electronics' bachelor and master programs successfully work for Latvian exporting companies with expert knowledge of the standards and requirements of the international market, as well as for foreign companies and research institutions (UK, Netherlands, Finland, Switzerland, Estonia, etc.).
- "Consider renaming the academic master's study program "Computer Science" and the degree, to more accurately reflect the graduates' scientific area of knowledge" - changing the title and narrowing the specialisation would also reduce the range of potential students. Instead, it was decided to reduce the dominance of signal processing subjects, enhancing the

study course offering with recommendations from employers in the professional and academic world, thus expanding the field of vision of master students and bringing it more into line with the title “Computer Sciences”. It should also be mentioned here that the Regulations regarding the Classification of Education in Latvia stipulate that the code must be changed for study programs with codes XX481, as a result of which the code for this program is being clarified.

- “In the master programs “Computer Sciences” and “Electronics” introduce additional optional courses to the program.” - The university offers students the opportunity to choose optional courses in other study programs, as well as offering them the possibility to take study courses they are interested in at the LU or RTU, with which VUAS has student exchange cooperation agreements. Graduate students are offered opportunities in the form of an individual plan to take courses outside the specific program.

An overview of the implementation of recommendations received in the previous accreditation is attached in the Annex No.2.18.

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

Changes during the reporting period (2017-2022): first-level higher education professional program “Programming Specialist” and a joint (with Liepaja University) professional bachelor program “Smart Technologies and Mechatronics” have been licensed, substantial changes have been made to the bachelor program “Electronics”, transforming it into a professional bachelor’s program, substantial changes have been made to the academic bachelor program “Computer Sciences” and the first-level higher education professional program “Programming Specialist”, complementing both programs with English as a second implementation language.

Key recommendations from evaluation experts

Licensing of the first-level professional program “Programming Specialist”:

- “In accordance with Cabinet Regulation No. 408 of 14 July 2015, “Regulations regarding Licensing of Study programs”, it has to be assessed whether the “study program conforms to the development strategy of a university or college”. - The development of this program took place in accordance with the aims of the 2016-2020 Development Strategy of VUAS (approved on 09.11.2016 by Decision No. 16-93 of the VUAS Senate): 1. “Increase the number of enrolled students and decrease the number of drop-outs,” 3a. “ “Improvement of study fields and programs, better content and teaching quality taking into account the demand of the labour market and its trends.” and 3d. “Involvement of industry specialists in the study process”. During discussions with potential students, employer representatives and career advisors at schools the need for a professional program that would include an internship and grant graduates a professional qualification was identified. As far as employers are concerned, in computer sciences there was a high demand for students actively engaging with businesses already during the first and second year of their studies, which set the duration of the programme - two years.
- “In accordance with the information on the characteristics of the study program (Section 2.2,

p. 13, *qualification work 8CP*), "the qualification work is independent or a project implemented in a group. Clarify how the defence (presentation) of a qualification work developed in a student group takes place"". - If a qualification (bachelor's, master's) work is developed on the same subject by two or more students in the same institution, then each student has to clearly separate and describe the objectives, tasks and work accomplishments of his or her work. Each student has to provide his or her specific results or conclusions, providing overall information about the joint research results of the work or team. The development of the final thesis (including qualification work) is regulated by the VUAS FoIT "Regulation on Methodological Guidelines for the Preparation and Defense of Final Theses", supplemented in the FoIT Council on 19.12.2022 and confirmed with the FoIT Council's decision No 22-15-01 .

- "It is recommended to edit the text of paragraphs 2 and 3 of page 22 of Chapter 5 of the characteristics of the study program regarding the role of employers in the development and implementation of the study program, as contradictions have been identified, which are as follows: Paragraph 2 states that "cooperation with employers is planned in 3 directions: the content, guest lectures and practice of the study program", but the next paragraph mentions that "... sectoral experts as guest speakers will be involved in implementation, while separate study courses have been developed in cooperation with employers." - Implementation of co-operation with employers in development of the content of the study program means that employers provide recommendations and comments regarding the total content of the program, as well as develop individual study program courses. Collaboration in guest lectures means that employers' specialists (the best industry experts) are involved in the provision of courses as guest lecturers. Collaboration in the area of internships means that employers offer internship topics from their business. Cooperation agreements with commercial enterprises regarding internships have been in place since the licensing of the program, and are still active and implemented.
- "Clarify the internship regulation" - a new version of the internship regulation was approved at the FoIT Council meeting on 20.11.2018 and updated on 10.02.2021, Decision No 21-02-04, as well as on 19.12.2022, Decision No 22-15-03.
- "6.1. first practice task: replace the text "carry out an independent ... *project*" with "carry out an independent ... *task*" " - implemented;
- "6.2 in accordance with information provided in interviews, the faculty is involved in providing student internships. Revise the Internship regulation in accordance with this information (the text contains a reference indicating that the traineeship is sought by students (Annex 5 to the Characteristics of the Study program, Internship Regulation, page 1, last sentence)." - Paragraph 4 of the current Regulation stipulates that the internship is to be firstly chosen by the student. In the experience of the faculty, if a student is having difficulty finding an internship place, the study program director or other faculty lecturers help to reach an agreement with one of the companies, who offer internship places every year.
- "6.3. Clarify the assessment of the internship - whether the assessment is with or without a grade (see Annex 5 to the Description of the Study program *Internship Regulation*. Page 3)" - Paragraph 8 of the Regulation on Internship of the Study Programme "Programming Specialist" provides that the internship evaluation committee evaluates the work on a 10-point scale.

Joint professional Bachelor's study program "Smart Technologies and Mechatronics":

- "The study program management should regularly meet manufacturing company managers and leading specialists, in order to understand their wishes regarding the knowledge and skills necessary for the engineer of mechatronics, and to make expeditious changes to the content of the study program, thus ensuring its relevance and competitiveness" - Mikus

Brakanskis, CEO of the Ventspils company SIA “Bucher Municipal”, is a Member of the VUAS Convent of Councillors. Representatives of several electronics industry companies are members of the Council of Electronics Study Programmes. Thus, VUAS has the opportunity to ensure the necessary exchange of the information to improve the program after the results of the first years in operation.

- “On the website of Ventspils University of Applied Sciences, post information regarding the principles for introduction of student-centric education.” - the principles of student-centric education are defined by VUAS in the “Regulation on the Procedures for Studies at Ventspils University of Applied Sciences”, changes approved by VUAS Senate on 20.12.2022, Decision No. 22- 65. The regulation is posted on VUAS' website and e-study environment in Moodle and is available to all students, lecturers and staff (Only in Latvian):

(https://irp.cdn-website.com/f6b5d556/files/uploaded/Nolikums%20par%20studiju%20k%C4%81rt%C4%ABbu%20Ventspils%20Augstskol%C4%81.pdf)

- “To conduct regular surveys in order to learn the opinion of students regarding implementation and development of the study program to be licensed” - every semester VUAS conducts student satisfaction surveys, which are provided for in the VUAS “Regulation on Surveys of Students, Graduates and Employers for Evaluation and Improvement of the Study Process,” which was approved by Senate Decision No.19-25 2019.02.13. The process of conducting the survey and the results of its implementation are determined by the VUAS QMS process “Evaluation of satisfaction of Students”.

Professional bachelor program “Electronics”:

- “Schedule programming-related study courses in the first study year, such as the Python programming language, because it has numerous practical applications.” - In the first study year, the program has two programming-related study courses: “Programming in C language” (2 CP) and “Logic and Programming (Arduino Platform)” (2 CP). On the other hand, the programming language Python is acquired in the 2rd year of study as part of the study course “Object-oriented programming I” and practical work with Python takes place in the 3rd year of study as part of the course “Algorithm theory”.
- “Reduce the dependence of the study program on specific lecturers” - by attracting guest lecturers, the workload of the program director, lecturer Jānis Šate, in the program has been reduced; he currently has a 0.6 average lecturer workload.
- “Further work should be carried out on improving the qualification of teaching staff and increasing the proportion of elected teaching staff.” - Since the 2018/2019 academic year, the program “Electronics Engineering” has been conducted with the participation of PhD student Matīss Maltisovs as a lecturer, since the 2019/2020 academic year, three other doctoral students have received support under the auspices of the ESF project “Strengthening the teaching staff of the Ventspils University of Applied Sciences in areas of Strategic Specialization” (No. 8.2.2.0/18/A/009), which was implemented at VUAS from 2018 to 2022. After defending his promotion thesis, Mr Maltisovs was elected as a VUAS FoIT docent in 2022. Under the terms and conditions of the ESF project, the other three doctoral students are required to defend their promotions by the end of 2024, when they will be eligible to be elected to docent’s positions.

Significant changes to the Bachelor's study program “Computer Sciences” and the first-level professional higher education program “Programming Specialist”, adding English as the language of implementation:

- “To ensure that all teaching staff have a sufficient command of English to implement studies during the study process.” - ESF project “To strengthen the teaching staff of Ventspils

University of Applied Sciences in the fields of strategic specialization" (No. 8.2.2.0/18/A/009, 2018-2022) included activities for improvement of the competences of VUAS teaching staff, including professional English language training. Under the auspices of this project, in 2018 VUAS FoIT recruited foreign guest lecturer Jesus A.C. Montes, who teaches courses in the Bachelor's program "Computer Sciences" in English. In 2022, J.A.C. Montes was elected to the position of docent for six years (Only in Latvian). https://www.venta.lv/noslegusies-darbibu-istenosana-ventspils-augstskolas-projekta

- "In light of the fact that the study program "Computer Sciences" has different program directors for the Latvian and English language flows, to ensure coordination of the directors of both programs" - the academic bachelor program "Computer Sciences" in Latvian and English has one study program director Assoc. Prof. Gaļina Hiļķeviča. The implementation of the study program in English is coordinated by the Deputy Director of the study program Estere Vītola. Both lecturers are also members of VUAS FoIT Council, where decisions essential to study programs are decided. Accordingly, cooperation is ensured in the implementation of the program.
- "Update conversations with internship hosts for students about their readiness to welcome foreign students" - the faculty has close collaboration with IT companies Accenture, Routed In, Emergn, TestDevLab, Asya (all have an office in Ventspils) and DevLead (providing remote work opportunities), who have so far provided internships for students in English. The working language of both Accenture and Emergn is English. This recommendation is no longer directly relevant for the Level 1 professional program "Programming Specialist", as it is no longer planned to be implemented in English, but it still applies to programs that are also implemented in English.

A detailed overview of the implementation of all recommendations is provided in Annex 2.18.

Annexes

I - Information on the Higher Education Institution/ College		
Information on the implementation of the study field in the branches of the higher education institution/ college (if applicable)		
List of the governing regulatory enactments and regulations of the higher education institution/ college	1_1_appendix_Main internal acts and regulations_ENG.pdf	1-1_pielikums_Saraksts ar galv ieks dok_LV.docx.pdf
The management structure of the higher education institution/ college	1-2_appendix_VeUAS Management structure_ENG.pdf	1-2_pielikums_VeA parvaldibas struktura_LV.pdf
II - Description of the Study Field - 2.1. Management of the Study Field		
Plan for the development of the study field (if applicable)	2-1_appendix_Study-development-plan-2021-2027.pdf	2-1_pielikums_Studiju_attistibas_plans_2021_2027_kor.pdf
The management structure of the study field	2-2_appendix_Stud direction manag structure_ENG.pdf	2-2_pielikums_Stud virz parvald strukt_LV.pdf
A document certifying that the higher education institution or college will provide students with opportunities to continue their education in another study programme or another higher education institution/ college (agreement with another accredited higher education institution or college) if the implementation of the study programme is terminated.	2-3_appendix_study-continuence-in-other-programmes.docx.pdf	2-3_pielikums_studiju-turpinasana-citas-studiju-programmas.pdf
A document certifying that the higher education institution or college guarantees compensation for losses to students if the study programme is not accredited or the study programme license is revoked due to actions (actions or omissions) of the higher education institution or college and the student does not wish to continue studies in another study programme.	2-4_appendix_Declaration_on_loss_compensation_for_students.docx.pdf	2-4_pielikums_apliecinājums-par-zaudējumu-kompensāciju-studējošajiem.edoc
Standard sample of study agreement	2-5_appendix_study-contract-example.pdf	2-5_pielikums_studiju-liguma-paraugs.pdf
II - Description of the Study Field - 2.2. Efficiency of the Internal Quality Assurance System		
Analysis of the results of surveys of students, graduates and employers	2-6_appendix_survey-answers.docx.pdf	2-6_pielikums_aptauju-rezultati.docx.pdf
II - Description of the Study Field - 2.3. Resources and Provision of the Study Field		
Basic information on the teaching staff involved in the implementation of the study field	2-8_Appendix_Faculty members involved_ENG.pdf	2-8_pielikums_Stud virziena macibspeku_ITF.pdf
Biographies of the teaching staff members (Curriculum Vitae in Europass format)	2-9_appendix_Teaching_Staff_CV_ENG.pdf	2-9_pielikums_Macibspeku_biografijas_CV_LV.pdf
A statement signed by the rector, director, head of the study programme or field that the knowledge of the state language of the teaching staff involved in the implementation of the study programmes within the study field complies with the regulations on the state language knowledge and state language proficiency test for professional and official duties.	2-10_appendix_teaching-staff-latvian-language_ENG.pdf	2-10_pielikums_apliecinajums par valsts valodu_LV.pdf
A statement of the higher education institution/ college on the respective foreign language skills of the teaching staff involved in the implementation of the study programme at least at B2 level according to the European Language Proficiency Assessment levels (level distribution is available on the website www.europass.lv, if the study programme or part thereof is implemented)	2-11_appendix_teaching-staff-English-language_ENG.pdf	2-11_pielikums_apliecinajums par anglu valodu_LV.pdf
II - Description of the Study Field - 2.4. Scientific Research and Artistic Creation		
Summary of quantitative data on scientific and/ or applied research and / or artistic creation activities corresponding to the study field in the reporting period.	2-12_appendix_quantitative-data-on-academic-staff-research-activitiy-ENG.pdf	2-12_pielikums_Kvantitat dati par akad pers petniec darbibu_LV.docx.pdf
List of the publications, patents, and artistic creations of the teaching staff over the reporting period.	2-13_appendix_teaching-staff-scientific-resarch-experience.xlsx	2-13_pielikums_Docetaju publikaciju konf proj saraksts.xlsx
II - Description of the Study Field - 2.5. Cooperation and Internationalisation		
List of cooperation agreements, including the agreements for providing internship	2-14_appendix_list-of -cooperation-agreements_ENG.pdf	2-14_pielikums_Sadarbibas ligumu saraksts_LV.pdf
Statistical data on the teaching staff and the students from abroad	2-15_appendix_Stat data on foreign stud and acad personnel_ENG.pdf	2-15_pielikums_Stats dati par arvalstu stud un macibspekiem_LV.docx.pdf
Statistical data on the incoming and outgoing mobility of students (by specifying the study programmes)	2-16_appendix_Statistical data on student mobility per study program_ENG.pdf	2-16_pielikums_Stat dati par studejoso izej un ienak mobilitati_LV.docx.pdf
Statistical data on the incoming and outgoing mobility of the teaching staff	2-17_appendix_Stat data academic personnel mobility_ENG.pdf	2-17_pielikums_Stat dati par macibspeku mobilitati_LV.docx.pdf
II - Description of the Study Field - 2.6. Implementation of the Recommendations Received During the Previous Assessment Procedures		
Report on the implementation of the recommendations received both in the previous accreditation and in the licensing and/ or change assessment procedures and/ or the procedures for the inclusion of the study programme on the accreditation form of the study field.	2-18_appendix_implementation_of_recommendations.docx.pdf	2-18_pielikums_VeA-rekomendaciju-ieviesanas-parskats.pdf
An application for the evaluation of the study field signed with a secure electronic signature	2-19_appendix_application-for-study-field-evaluation.pdf	2-19_pielikums_lesniegums studiju virziena novērtēšanai.pdf
III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme		
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)		
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period		
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard		
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)		
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme		
The curriculum of the study programme (for each type and form of the implementation of the study programme)		

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

Other annexes

Name of document	Document
1-3_Galveno lēmumu pieņemšanā iesaistīto institūciju, to sastāva un pilnvaru raksturojums	1-3_pielikums_Galveno lemejinstituciju raksturojums_LV.docx.pdf
1-3_Characteristics of the institutions involved in the main decision-making, their composition and powers	1-3_appendix_Characteristics of main decision making institutions_ENG.docx.pdf
2-7_akademiska-personala-atlases-kartiba-VeA	2-7 Noteikumi_akademiska_person_atlases_kartiba.pdf
1-1-a_VeA galvenie iekšējie dokumenti un regulējumi	1-1-a_pielikums_Saraksts ar galv ieks dok_LV.docx.pdf
1-1-a_VUAS main internal acts and regulations	1-1-a_appendix_Main internal acts and regulations_ENG.pdf

Computer Science (43484)

Study field	*Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science*
ProcedureStudyProgram.Name	*Computer Science*
Education classification code	*43484*
Type of the study programme	*Academic bachelor study programme*
Name of the study programme director	*Gaļina*
Surname of the study programme director	*Hiļķeviča*
E-mail of the study programme director	*galina.hilkevica@venta.lv*
Title of the study programme director	*Dr.math.*
Phone of the study programme director	
Goal of the study programme	*To prepare highly skilled computer science specialists with profound knowledge in computer science, higher mathematics, and engineering fundamentals that would enable them to adapt independently to professional activities in the changing labour market conditions, as well as to prepare students for further studies in higher level professional programs and Master's courses, scientific activities, and further self-education.*
Tasks of the study programme	*The tasks of the study program are:* *- to provide students with the necessary theoretical and practical knowledge in computer science;* *- accustom the students to learning independently and creatively, as well as to evaluating and applying the new achievements of the computer science sector;* *- develop the scientific analysis capacities of the students, ability to solve problems on their own;* *- encourage their involvement in solving practical and scientific problems;* *- create motivation and promote meeting the students' continuing education needs, including motivation to continue learning in both professional and academic Master's and Doctor's programmes;* *- ensure that the study process is staffed with a qualified teaching staff, and training complies with up-to-date requirements;* *- ensure that the students have circumstances and an environment that promotes creative study processes.*

Results of the study programme	*Expected result: specialists in computer science with an academic Bachelor of Science degree and knowledge, skills and competencies corresponding to level 6 of the European Qualifications Framework (EQF) have been prepared.* *Knowledge:* *• Able to demonstrate comprehensive knowledge of facts, theories, and relationships required for personal development and growth, civic engagement, social integration and continuation of education;* *• Able to understand in detail and demonstrate complex knowledge of specific facts, principles, processes and concepts in computer science in standard and non-standard situations;* *• Knows technologies and methods used to perform study or work tasks in the profession;* *Skills:* *• Able to plan and organise work, use various methods, technologies, software development tools and environments to perform tasks and solve problems;* *• Able to find, evaluate and creatively use information to perform academic or professional tasks and to solve problems;* *• Able to work, learn and develop independently to adapt to the professional environment in varying labour market conditions.* *Competencies:* *• Motivated to develop his/her career, continue education and life-lond learning in knowledge-based, democratic, multilingual, and multicultural societies in Europe and in the world;* *• Able to plan and perform academic or professional tasks alone, by working in a team or managing the team, describe, present, and explain the results of the work in a well-reasoned manner;* *• Able to take responsibility for the quality and quantity of academic and professional performance.*
Final examination upon the completion of the study programme	*Bachelor's thesis*

Study programme forms

Full time studies - 3 years - latvian

Study type and form	*Full time studies*
Duration in full years	*3*
Duration in month	*0*
Language	*latvian*
Amount (CP)	*120*
Admission requirements (in English)	*Secondary education.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Bachelor's degree of Natural Sciences in Computer Science*
Qualification to be obtained (in english)	*-*

Places of implementation

Place name	City	Address

Ventspils University College	VENTSPILS	INŽENIERU IELA 101, VENTSPILS, LV-3601

Full time studies - 3 years - english

Study type and form	*Full time studies*
Duration in full years	*3*
Duration in month	*0*
Language	*english*
Amount (CP)	*120*
Admission requirements (in English)	*Secondary education and level of English knowledge at least B2.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Bachelor's degree of Natural Sciences in Computer Science*
Qualification to be obtained (in english)	-

Places of implementation

Place name	City	Address
Ventspils University College	VENTSPILS	INŽENIERU IELA 101, VENTSPILS, LV-3601

3.1. Indicators Describing the Study Programme

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

In 2018, changes were made to the study direction “Information Technologies, Computer Hardware, Electronics, Telecommunications, Computer Management and Computer Science” implemented by the FoIT, adding the second language of implementation - English - to the Bachelor's study program “Computer Science”. The changes were made on the basis of the study development objectives outlined in the Development Strategy of VUAS for 2016-2020 (approved on 09.11.2016 by the Senate Decision No 16-93 of VUAS): 1. “Increase the number of enrolled students and decrease the number of drop-outs,” 2. “Increase the number of full-time foreign students at VUAS” and 3.e. “Implementation of study programmes in foreign languages”.

The first students in English flow were matriculated in the 2019/2020 academic year.

The Education Qualification Code of the Republic of Latvia (from 43481 to 43484) is being changed, in accordance with the changes in the Regulations regarding the classification of education of Latvia. No other changes have been made to the parameters of the study program (meaning title, duration, volume, form, objectives and tasks).

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

The title, code, degree to be obtained, as well as the goal and tasks of the asademic bachelor's study program “Computer Science” of the study direction “Information Technologies, Computer Hardware, Electronics, Telecommunications, Computer Management and Computer Science” conform to the Regulations regarding Classification of Education in Latvia (Cabinet of Ministers Regulations No 322, adopted on 13.06.2017).

The title of the academic bachelor study programme “Computer Science” and the degree to be obtained conforms to the content of the study programme, providing students with knowledge not only in practical programming, but also in the subjects of computer sciences relevant to the bachelor's level.

The code of the study programme (43484) complies with the education classification of the Republic of Latvia:

- **43** - Academic education (bachelor's degree), applicable after general or professional secondary education. Duration of studies in full-time studies is three to four years.
- **43(4)** - Sciences, mathematics and information technologies
- **434(8)** - Computing
- **4348(4)** - Programming

The new education classification in sciences of the Republic of Latvia provides only for three groups of educational programs: “Computer use (482)”, “Computer systems, databases and computer networks (483)” and “Programming (484)”. The latter is the most appropriate in accordance with ISCED-F classification code 6013, however, the name “Computer science” will be kept as the most appropriate description of the study programme compared to narrower naming, such as programming.

The academic bachelor's study programme “Computer science” corresponds to the study field “Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science” (directly to the part “Computer Science”) in terms of its aims, main results to be achieved as well as the contents of the study programme.

The name of the study program and its code are mutually connected, because ISCED-F classification code 6013 corresponds also to “Computer Science”.

Aims and main tasks of the study programme are derived from general aims and tasks of academic bachelor's programmes and the code of the study programme.

The purpose of the study programme is: to prepare highly-skilled specialists in computer science with profound knowledge in the field of computer science, higher mathematics, and engineering fundamentals that would enable them to adapt independently to professional activities in changing labour market conditions, as well as to prepare students for further studies in higher level professional programs and Master's courses, scientific activities and further self-education. This objective is in alignment with the aim of the study field (Chapter 2.1.1).

The tasks of the study program are:

- to provide students with the necessary theoretical and practical knowledge in computer science;
- to accustom the students to learning independently and creatively, as well as to evaluating and applying the new achievements of the computer science sector;
- to develop the scientific analysis capabilities of the students, ability to solve problems on their own;
- to encourage their involvement in solving practical and scientific problems;
- to create motivation and promote meeting the students' continuing education needs, including motivation to continue learning in both professional and academic Master's and Doctor’s programmes;
- to ensure that the study process is staffed with qualified teaching staff and training complies with up-to-date requirements;
- to ensure that the students have circumstances and an environment promoting creative study process.

Study results planed for by the study program

Knowledge:

- Able to demonstrate comprehensive knowledge of facts, theories, and relationships required for personal development and growth, civic engagement, social integration and continuation of education;

- Able to understand, in detail, and demonstrate complex knowledge of specific facts, principles, processes and concepts in computer science in standard and non-standard situations;
- Knows technologies and methods used to perform academic or professional tasks;
- Knows the legal basis of the industry;
- Knows documentation and technical standards.

Skills:

- Able to plan and organise work, use various methods, technologies, software development tools and environments to perform tasks and solve problems;
- Able to find, evaluate and creatively use information to perform academic and professional tasks and solve problems;
- Able to speak and write in at least two languages in familiar and unfamiliar contexts;
- Able to work, learn and develop independently to adapt to the professional environment in varying labour market conditions;
- Able to cooperate with experts from other sectors;
- Able to formulate and solve computer science problems strategically and analytically;
- Able to design, program, test and analyse information systems;
- Able to work with professional software;
- Able to apply occupational safety, fire safety and environmental protection rules;
- Able to participate in project development, implementation and management.

Competencies:

- Motivated to develop his/her career, continue education and life-long learning in knowledge-based, democratic, multilingual and multicultural societies in Europe and in the world;
- Able to plan and perform academic or professional tasks alone, by working in a team or managing the team, describe, present and explain the results of the work in a well-reasoned manner;
- Able to take responsibility for the quality and quantity of academic and professional performance;
- Able to work and perform duties in compliance with quality standards by continuing to seek and implement innovations to improve the current performance and resources.

Knowledge, skills and competencies defined in the Bachelor's study programme “Computer Science” match the descriptions of knowledge, skills and competencies outlined in the “Regulations regarding Classification of Education in Latvia” at the 6th level of the Latvian Qualifications Framework (LQF).

The academic vachelor's study programme “Computer Science” and the goals it sets are in line with the mission and future vision articulated in the Development Strategy of Ventspils University of Applied Sciences for 2021-2027 that was approved in 2021.

The academic bachelor study programme “Computer Science” is prospective and is implemented in accordance with the interests of the Republic of Latvia and European Higher Education Area.

The study programme is implemented in the Latvian and English languages in the form of full-time studies (3 years).

The academic bachelor's study programme “Computer Science” enrols applicants who have general secondary education or secondary vocational education (qualification level 3) in accordance with VUAS Admission Rules (“Admission Regulations and Procedures for Matriculation at Ventspils University in the Academic Year 2023/2024” are available online (in Latvian):

https://irp.cdn-website.com/f6b5d556/files/uploaded/22-55_Uznemsanas%20_noteikumi_2023_2024_LV.pdf [viewed: 17.12.2022],

Admission Rules and Matriculation Procedure for Foreign Students in the English Language Study Programs of Ventspils University of Applied Sciences in the Academic Year 2023/2024 are available online:
https://irp.cdn-website.com/9945ff8b/files/uploaded/22-56_Uznemsanas_noteikumi_arzemniekiem_ENG_2023-24.pdf [viewed: 17.12.2022]).

Admission requirements

Citizens of the Republic of Latvia (LR) and persons with non-citizen passports of the Republic of Latvia, as well as persons who have been issued permanent residence permits, are eligible to study in the academic bachelor study program "Computer Science". Foreigners can study in the program in accordance with Section No. 83 and No.85 of the Law on Higher Education Institutions of the Republic of Latvia.

Applicants who have general secondary education or vocational secondary education (qualification level 3 in accordance with Section 5 (3) of the Vocational Education Law of the Republic of Latvia) are admitted to the program. At the time of admission to the study programme, the applicants' total score is made up of four parts:

- the overall score of the centralized examination of mathematics (60%),
- the overall score of the centralized exam in a foreign language or the result of the foreign language test of an international testing institution (in accordance with Cabinet of Ministers regulations No. 543 "Regulations on the replacement of the centralized examination in a foreign language in a general secondary education programme by an examination in a foreign language by an international testing institution") (20%),
- the overall score of the centralized examination in Latvian (10%),
- the average of the scores of all centralized examinations (10%).

The rules for the admission of foreign students (applies to the version of the study program in English) state that the applicants' total score is made up of two parts:

- VeA entrance exam in mathematics evaluation (60%),
- the result of the English language test of an international testing institution (40%).

The admission procedure is defined by the Admission Rules of VUAS, while the admission requirements for the academic bachelor study program "Computer Science" are based on the knowledge acquired during secondary education, which is necessary in the study process.

In the academic bachelor study program "Computer Science" **with an implementation option in Latvian**, in the admission rules, 60% of the total score is the score of the centralized examination in mathematics. In the "Computer Science" study program, a large number of study courses are related to mathematics and programming. Analytical and algorithmic thinking is required in these study courses, which is acquired at the basic level in mathematical orientation courses at the general secondary education or vocational secondary education stage.

For the admission rules, 20% of the total score is the score of a centralized examination in a foreign language or the result of a foreign language test by an international testing institute. The study courses cover the latest technologies in software development and current technology documentation is mostly available in a foreign language, so applicants need to have an adequate level of foreign language skills to be able to successfully study the course materials.

In the admission rules, 10% of the total score is the score of the centralized Latvian language

examination. For the study program, which is implemented in Latvian, the classes in the study courses are held in Latvian, therefore, in order to effectively learn the subject matter, the applicant must know the Latvian language at the appropriate level.

In the admission rules, 10% of the total score is an average score of all centralized examinations, on the basis of Part No. 4, Paragraph No. 10 of the Cabinet of Ministers Regulation No. 846 (10.10.2006) "Regulations Regarding the Requirements, Criteria and Procedures for Admission to Study Programmes".

In the academic bachelor's study program "Computer Science" **with the implementation option in English**, in the admission rules, 60% of the total score is the score of the centralized examination in mathematics. In the "Computer Science" study program, a large number of study courses are related to mathematics and programming. Analytical and algorithmic thinking is required in these study courses, which is acquired at the basic level in mathematical orientation courses at the general secondary education or vocational secondary education stage.

In the admission rules, 40% of the total evaluation is made up of the result of the English language test of an international testing institution. For the study program, which is implemented in English, the classes in the study courses are held in English. In several study courses the latest technologies in the development of software solutions are learned, and the current technology documentation is mostly available directly in English, therefore, in order for the applicant to successfully learn the study material of the study courses it is necessary to have an appropriate level of English language skills.

The rules for admission are updated each academic year.

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

There is a strong demand for ICT specialists in Latvia, as well as across Europe. This is evidenced both by the continued interest of the Latvian and foreign companies in potential employees and by the labour market forecasts of the Ministry of Economics of the Republic of Latvia, which state that in the medium term (2020-2030) 3 thousand specialists will be required in the information and communication services sector, but in the long term (2031-2040) that figure might amount to 7 thousand specialists (see Figure 3.1).

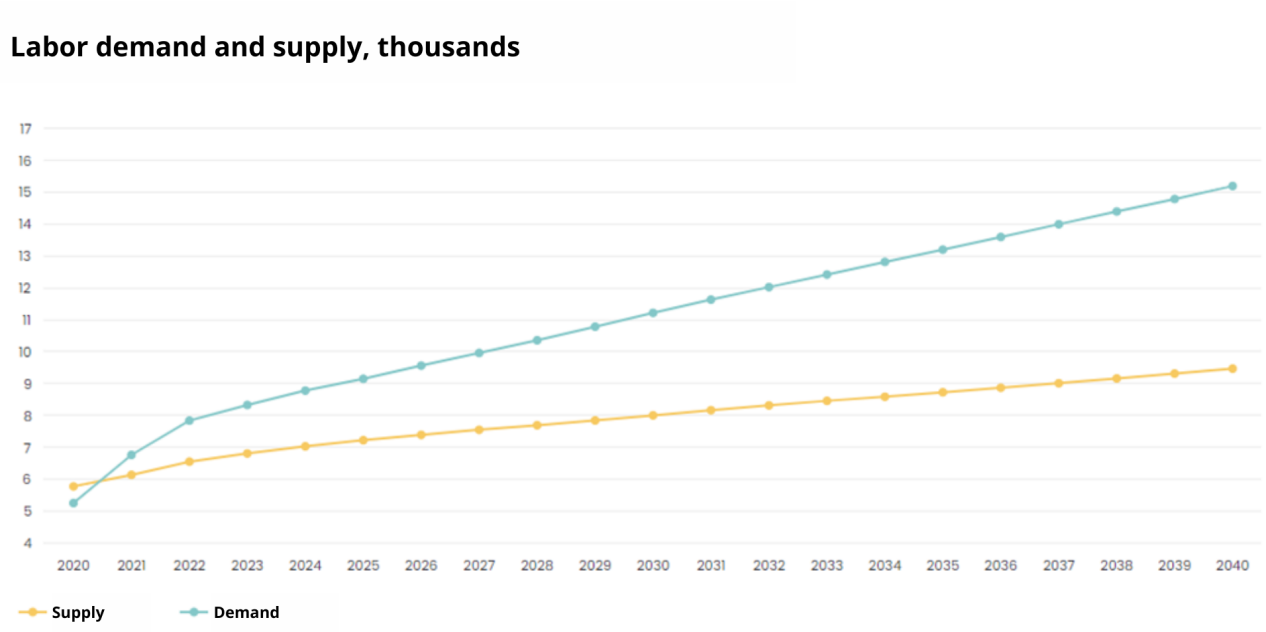

Figure 3.1 **Labour market situation and forecasts (2020-2040) by the Ministry of Economics for the sector of "Information and Communication Services", the field of education "Natural Sciences, Mathematics and Information Technologies"** (source: https://prognozes.em.gov.lv/en/correspondence-demand-supply , viewed [17.12.2022.])

To evaluate the employment of graduates, the monitoring of graduates created by the Ministry of Education and Science was used (for graduates starting from 2017 for the tax years 2018, 2019 and 2020). In 2018, 85% of the graduates of the 2017 academic bachelor study program "Computer Science" were employed, and 69% were employed in 2020. But in 2020, there were 85% of such graduates who were employed, emigrated or about whom there was no information. Of the 2018 graduates, 100% were employed in 2019, 94% were employed in 2020. 80% of the 2019 graduates were employed in 2020.
It should be noted that some of the graduates are not employed, because they continue their studies, for example, in master's study programs both in Latvia and abroad.
Using slide 24 of the presentation "Employment data of graduates of higher education institutions" (source avaiable only in Latvian : https://www.viis.gov.lv/en/node/439 , viewed [22.02.2023]) "Employment of university graduates in highly qualified professions* and income** (2020, all years of graduation (2017, 2018, 2019))", it can be seen that the graduates of Ventspils University of Applied Sciences' Academic Bachelor's study program "Computer Science" has one of the best results in Latvia.

The study programme has been established and is implemented with active participation of employers. For example, the study course "Software Testing and Automation" is implemented in cooperation with TestDevLab and the content of the course "Web Programming (JAVA)" and lecture materials have been developed in cooperation with Accenture. The involvement of employers in the development and delivery of study courses ensures that the content of the courses meets the requirements of the real working environment, creates a mutual connection between students and representatives of industry companies, and promotes faster integration of graduates into the working environment.

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

See the dynamics of the number of students from 2016 to 2022 in Table 3.2.

Table 3.2.

Dynamics of the number of students

Study program	2016	2017	2018	2019	2020	2021	2022
Academic Bachelor's study programme “Computer Science”	183	178	167	132	165	165	128
Academic Bachelor's study programme “Computer Science” (in English)				2	6	2	19
Total	**183**	**178**	**167**	**134**	**171**	**167**	**147**

See the breakdown of the number of students by funding sources (state budget places, private financing) in Table 3.3.

Table 3.3.

Breakdown of the number of students by funding sources

Academic year	Number of students in state-funded studies	Number of students paying tuition fees	Total number of students
2017/2018	119	59	178
2018/2019	120	47	167
2019/2020	99 (+1eng)	33 (+1eng)	132 (+2eng)
2020/2021	138 (+1eng)	27 (+5eng)	165 (+6eng)
2021/2022	134 (+1eng)	31 (+1eng)	165 (+2eng)
2022/2023	96 (+14eng)	32 (+5eng)	128 (+19eng)

In the academic year 2022/2023 the Faculty of Information Technologies of Ventspils University of Applied Sciences has enrolled, in the academic Bachelor study programme “Computer Science”, six Ukrainian citizens studying on the State budget resources and 5 students on personal funding representing the following countries: Brazil, India, Nigeria, Russia, and Belarus.

See the number of enrolments by year from 2016 to 2022 in Table 3.4.

Table 3.4.

Number of students enrolled

Study programme	2016	2017	2018	2019	2020	2021	2022
Academic Bachelor's study programme “Computer Science”	55	52	41	45	69	49	40
Academic Bachelor's study programme “Computer Science” (in English)	0	0	0	2	4	0	19
Total	**55**	**52**	**41**	**47**	**73**	**49**	**59**

Decrease in the number of students enrolled in the academic year 2022/2023 is typical for all Latvian institutions of higher education.

In the academic year 2022/2023, the decrease in the number of students enrolled in the Latvian language flow’s study programme “Computer Science” of VUAS is related to the fact that a proportion of students prefer faster acquisition of the profession and entering the labour market, which is offered by VUAS first level higher education study program “Programming Specialist” (study duration - 2 years). Conversely, the number of students enrolled in the English language flow has increased and this has been largely influenced by the geopolitical situation in the world.

See the number of graduates by year from 2016 to 2022 in Table 3.5.

Table 3.5.

Number of graduates

Study programme	2016	2017	2018	2019	2020	2021	2022
Academic Bachelor's study programme “Computer Science”	24	13	18	25	22	18	23
Academic Bachelor's study programme “Computer Science” (in English)							1
Total	**24**	**13**	**18**	**25**	**22**	**18**	**24**

From 2019 to 2022, out of 195 students enrolled between 2016 and 2019 in the Bachelor's programme of Computer Science, 89 students graduated, representing 45.64%.

In 2022, 24 of the 47 students enrolled in 2019 graduated, representing 51%.

A large drop-out of students is related to insufficient level of knowledge in the secondary school’s STEM subjects, as well as mistaken choice of study programme.

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

3.2. The Content of Studies and Implementation Thereof

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

Name of the study programme: Academic Bachelor's study programme “Computer Science”.

Degree and professional qualification to be obtained: Bachelor of Science academic degree in Computer Science.

The purpose of the study programme is: to prepare highly-skilled specialists in computer science with profound knowledge in the field of computer science, higher mathematics, and engineering fundamentals that would enable them to adapt independently to professional activities in changing labour market conditions, as well as to prepare students for further studies in higher level professional programs and Master's courses, scientific activities and further self-education.

The tasks of the study program are:

- to provide students with the necessary theoretical and practical knowledge in computer science;
- to accustom the students to learning independently and creatively, as well as to evaluating and applying the new achievements of the computer science sector;
- to develop the scientific analysis capabilities of the students, ability to solve problems on their own;
- to encourage their involvement in solving practical and scientific problems;
- to create motivation and promote meeting the students' continuing education needs, including motivation to continue learning in both professional and academic Master's and Doctor’s programmes;
- to ensure that the study process is staffed with qualified teaching staff and training complies with up-to-date requirements;
- to ensure that the students have circumstances and an environment promoting creative study process.

Study results planed for by the study program

Expected result: specialists in computer science with an academic Bachelor of Science degree and knowledge, skills and competencies compliant with level 6 of the European Qualifications Framework (EQF) have been prepared.

Knowledge:

- Able to demonstrate comprehensive knowledge of facts, theories, and relationships required for personal development and growth, civic engagement, social integration and continuation of education;

- Able to understand, in detail, and demonstrate complex knowledge of specific facts, principles, processes and concepts in computer science in standard and non-standard situations;
- Knows technologies and methods used to perform academic or professional tasks;
- Knows the legal basis of the industry;
- Knows documentation and technical standards.

Skills:

- Able to plan and organise work, use various methods, technologies, software development tools and environments to perform tasks and solve problems;
- Able to find, evaluate and creatively use information to perform academic and professional tasks and solve problems;
- Able to speak and write in at least two languages in familiar and unfamiliar contexts;
- Able to work, learn and develop independently to adapt to the professional environment in varying labour market conditions;
- Able to cooperate with experts from other sectors;
- Able to formulate and solve computer science problems strategically and analytically;
- Able to design, program, test and analyse information systems;
- Able to work with professional software;
- Able to apply occupational safety, fire safety and environmental protection rules;
- Able to participate in project development, implementation and management.

Competencies:

- Motivated to develop his/her career, continue education and life-long learning in knowledge-based, democratic, multilingual and multicultural societies in Europe and in the world;
- Able to plan and perform academic or professional tasks alone, by working in a team or managing the team, describe, present and explain the results of the work in a well-reasoned manner;
- Able to take responsibility for the quality and quantity of academic and professional performance;
- Able to work and perform duties in compliance with quality standards by continuing to seek and implement innovations to improve the current performance and resources.

Computer science specialists – the holders of Bachelors' Degree can study for a Master's Degree, work as administrators of the computer systems and computer networks, programmers, system analysts, etc. In Latvia the need for computer science specialists is very acute currently. But in the future, with the development of high value-added manufacturing, introduction of the latest technologies into manufacturing, the demand for these specialists will increase even more. Computer science specialists are expected to play an important role in the economic development of the Kurzeme region and our country, as they will be the ones shaping the knowledge-based economy.

The content of the study programme, its organisation and course of implementation, the provision of academic staff and material and technical basis enable implementation of the objective set by the study programme, fulfilment of tasks and achievement of the expected results. The study program includes study courses oriented towards it. Study course descriptions specify the purpose of the study course and the achievable results in accordance with the achievable results of the study program. (Appendix No. 3.6).

The unit of measurement of the amount of work invested by a student at VUAS is a credit point. 40 academic hours of work correspond to one credit point. To compare it to the ECTS system used in

Europe, a factor of 1.5 needs to be applied. In case of VUAS, 40% of the time corresponds to contact hours spent by a student in a lecture-room or computer laboratory in contact with a lecturer, and 60% of the time is independent work with literature, the Internet resources, performing study projects and practical work individually or together with members of a group.

The groups of courses included in the programme correspond to a certain number of credit points:

1. Mandatory part: 78 CP

   of which

   - industry guidelines 30 CP

   - current problems 28 CP

   - cross-sectoral aspects 20 CP

2. Limited choice part: 26 CP
3. Optional courses: 6 CP
4. Bachelor's paper: 10 CP

1. Courses of the mandatory part (A) are divided into:

- industry’s guidelines courses – in higher and discrete mathematics, data structures and basic algorithms, numerical and optimization methods, as well as algorithm theory and modelling fundamentals (object oriented and chaotic process modelling);
- industry's current problems courses – contain key programming and programming techniques’ courses, including object-oriented programming and web programming, analysis and design of information systems, and programming tools and environments.
- cross-sectoral aspects courses – include courses in physics and electronics, the English language, as well as economics, business and sectoral law basics.

2. Limited choice (B) courses include courses in operating systems, database technologies, LAN design and administration, mathematical modelling, and others that provide for advanced specialisation and practice.
3. Optional (C) courses offer the opportunity to learn general-education topics indirectly related to computer science whose knowledge is essential to broaden the students' horizons and facilitate integration into the labour market. An optional course may be any study course delivered by VUAS which is not a mandatory or limited choice course of the study program.
4. The Bachelor's paper is an independently realised project in computer science, which is defended at the meeting of the Final Examination Commission. The Bachelor's paper is a statement of the student's competencies for the Bachelor's degree.

The implementation of the academic bachelor study program "Computer Science" ensures the actuality of the content of the study courses and their relevance to the industry, the needs of the labor market and scientific trends.

The study program has been created and is implemented with the active participation of employers. For example, the study program "Software testing and automation" is implemented in the study program in cooperation with the company "TestDevLab" and the content and lecture materials of the course "Programming on the web (JAVA)" have been developed in cooperation with the company "Accenture". Industry specialists are involved in the study process. Information about the needs of the labor market is gathered from the employer surveys and the feedback of the practice managers.

During the implementation of the ESF project No.: 8.2.2.0/18/A/009 "Strengthen the academic staff of Ventspils University of Applied Sciences in the areas of strategic specialization", internships for academic staff were organized to develop cooperation with industry, and foreign academic staff were also attracted.

The academic staff involved in the implementation of the academic bachelor's study program "Computer Science" participates in scientific conferences, seminars and follows the current trends in the development of the industry and education.

The study program is regularly reviewed - by evaluating the results of the student survey (once a semester), creating study plans for a new semester (once a year), preparing and reviewing a self-evaluation report (once a year), as well as reviewing the reports of the Final Examination Commission at the faculty council meeting (once a year). The evaluation of the program and the necessary changes are reviewed by the Council of Study Programs and the Council of the Faculty.

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

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

The study programme is implemented through various forms of study. These are both lectures and seminars, discussions, workshops, laboratory work, literary analysis, learning projects. Various learning projects, which are developed in separate study courses, play an important role in the implementation of the learning process. The workshops of the courses relating specifically to the use of computer systems (design of computer systems, programming, database and computer network technologies and others) are organised in a computer class. During the classes, the teaching staff can use a computer projector, an interactive board and handouts. Interactive training tools are offered to align the different levels of knowledge in programming, especially for the first-year students.

In most courses training materials (lecture slides, practice assignments, tests, a.o.) are available electronically. VUAS' teaching staff place their courses in the electronic training environment Moodle. This makes it easier for the students to access the slides of the course's lectures, assignments of workshops and other course-related documents and materials. Using the electronic learning environment, the students may submit their independent work and tests, as well as fill in

the tests and later look at their work's assessment and error analysis.

The basic principles and procedure for evaluation of the students' knowledge are determined by the Regulations regarding the State Academic Education Standard (Cabinet of Ministers Regulation No 240 of 13.05.2014) and evaluation takes place in accordance with the laws and regulations in force at VUAS.

The assessment system at VUAS is governed by the Regulation on Procedure for Organization of Examinations and Assessment of Students' Knowledge at Ventspils University of Applied Sciences (approved at the Senate's meeting on 15th January, 2020, Decision No 20-02 as amended by the Senate's Decision No 21-29 of 31.05.2021).

The study programme contains the following basic principles for evaluation of education:

- principle of aggregation of positive achievements;
- principle of compulsory testing;
- principle of openness and clarity of evaluation criteria;
- principle of diversity of evaluation forms;

VUAS assesses quality of students' knowledge according to two criteria:

1. qualitative assessment – examinations are evaluated with a mark in the 10-point system, tests – with "passed" or "failed";
2. quantitative assessment – credit points (CP) that characterise the amount of work assigned for a student in hours (contact hours and independent work).

The credit points are granted if a student passes an examination, scoring no less than 4 points (almost mediocre). In tests, knowledge, skills and know-hows are assessed by "passed" or "failed". The students take the examinations stipulated by the study programme (examination or test) orally, in writing or in the form of practical tasks. The oral examination shall take place following pre-established examination questions that are based on the programmes of the study courses.

There are various forms of the written test: a written test (examination) following pre-established questions or tasks, a test, a.o.

Practical tasks are determined by the lecturer in accordance with the requirements of the study course.

In some study courses, the teaching staff have developed a test-taking system based on the results of interim tests (e.g. 3 passed tests plus the final examination).

The lecturers inform the students regarding the form and requirements of the examination of the relevant study course during the first two lectures of the term.

While ensuring a student-centred approach, the teaching staff take note of the opportunities and cooperation of each student in implementation of significant feedback both during the learning of the study course and evaluation phase of knowledge, skills and competencies. The students are offered consultations, individual interviews, both face-to-face and remotely, thus creating preconditions for the students that reduce the difference in the level of previously acquired knowledge, respect the interests of students, cultural differences, experience as well as language skills (especially for students studying in English), a.o. Mutually respectful cooperation between a student and the teaching staff is aimed at achieving successful results of the study programme.

The principles for the implementation of the study programme and the methods used are identical in implementing the programme in Latvian and English.

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

In the “Computer Science” programme of Bachelor's studies, the internship is not mandatory, but it is offered to the students under the limited choice part of the study program amounting to 8 CP. The internship is organised in accordance with the internship by-law approved at the Council meeting of FoIT of Ventspils University of Applied Sciences on 9th December, 2014 (Decision No 14-10-02), as amended on 10th February, 2021, (Decision No 21-02-03). Annex No 3.7.

The purpose of the practice is:

1. make sure of the student's professional and personal suitability for work in the field of computer science;
2. to give the student the opportunity to independently continue improving the acquired skills in real working conditions of the company or organization.

The student's tasks during the internship are:

1) implement an independent project on a topic specific to the internship company;

2) get to know several and learn practical skills in working with at least one of the IS creation and maintenance tools or programming environments used in the company;

3) get to know the computer network used in the company and the basics of its administration;

4) get to know the databases used in the company and the basics of their administration;

5) regularly document the progress of practice;

6) write a report and prepare a report (and a presentation in PDF format) about the course of the internship and the work done.

Study course learning outcomes :

1. Knowledge

- Knows technologies and methods for completing practice tasks and solving problems.
- Knows documentation and technical standards required for the completion of the internship task.

2. Skills

- Able to plan and organise work, use different methods, technologies, programming tools and environments to complete the internship tasks.
- Be able to find, evaluate and use information creatively to carry out the internship tasks.
- Know how to work on projects.

3. Competences

- Be able to apply the theoretical knowledge and skills acquired at Ventspils University of

Applied Sciences
- Be able to plan and carry out the tasks of the internship, describe and present the results.
- Be able to take responsibility for the quality of the results of the work placement.
- Be able to integrate into the company working environment.

The linking of students' internship tasks and goals with the study results of the study program is specified in the study results mapping (Appendix 3.4) and in the description of the study course "Internship" (Appendix 3.6), which is prepared in the same form as the descriptions of other study courses.

Despite the internship being optional, some students choose the internship. This enables them to become acquainted with a potential workplace during their studies, acquire professional skills and integrate more easily into the labour market in the future. Table 3.6 summarises information about the number of students who have defended the internship, broken down by study year.

Table 3.6.

Number of students having defended the internship from 2017/2018 to the 2021/2022 study year

Year of study	Number of students
2017/2018	12
2018/2019	17
2019/2020	7
2020/2021	7
2021/2022	14

Traditionally, Accenture's Latvian branch and SIA TestDevLab offer internships for the students of the Bachelor’s study programme “Computer Science”. The founders of SIA TestDevLab are two year 2005 graduates of the Bachelor's study programme “Computer Science”. TestDevLab is one of the successful ICT companies in Latvia specialising in software development and testing and already has three foreign offices in Skopje, Tartu, and Vilnius. The students are also looking for internships independently. In recent years, for example, the students had internships at the following companies: SIA “HW & SW Services”, DIGI-INK SIA, SIA Sapiens Software Solutions (Latvia), SIA Routed In, SIA “BirgerMind” and others. The students planning to associate their future with science have the opportunity to do an internship at the Institute of Engineering (IZI) of Ventspils University of Applied Sciences “Ventspils International Centre for Radio Astronomy” (IZI VSRC). VSRC is a science education centre having specialised in implementing high-quality future research services in the fields of space technology and signal processing science.

Companies have been identified that can provide internships for students studying in the English language programme "Computer Science". The Faculty has close cooperation with IT companies "Accenture", "Routed In" , "Emergn", "TestDevLab", "Asya" (all have an office in Ventspils) and "DevLead" (providing remote working opportunities), which have expressed their readiness to provide internships for students in English. It should be noted that Accenture and Emergn have English as their working language, while several companies have business partners or clients abroad, so communication in these companies is both in Latvian and in a foreign language, which is, most often, English.

So far, one student of the study programme has completed an internship in English at "Asya"Ltd.

Having found an internship placement, a student, in order to confirm connection of the tasks included in the student internships with the study results to be achieved in the study programme, provides the director of the study programme with information regarding the expected amount of work and details thereof at the internship placement, by filling in a special form, where information regarding the undertaking, the manager of the internship, the purpose and tasks of the internship, etc. is indicated. After confirmation with the program’s director, the student writes an application to the FoIT’s dean. The internship and manager of internship is approved at the meeting of the Council of the FoIT.

A student during the internship, in addition to performing internship tasks, documents the progress of the internship, and prepares a report on the progress of the internship and the work done. The evaluation of the internship is carried out during defence of the internship, and the internship is evaluated in a 10-point system.

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

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

The academic Bachelor's study programme “Computer Science” complies with the Cabinet Regulation No 240 regarding the State Academic Education Standard of 13.05.2014 that stipulates that the students be provided with the sciences’ theoretical knowledge and research skills, thus reaching the study results specified in the study programme which conform to the skills, competencies and knowledge of the appropriate level of European Qualification that are defined in the Latvian Classification of Education.

Bachelor's paper is a form of training that strengthens the knowledge acquired through theoretical courses by applying it to practical and scientific research. The Bachelor's work is an independently realised project in computer science, which is defended at the Final Examination Commission. The Bachelor's paper is a statement of the student's competence for the Bachelor's degree. The topics of the Bachelor's papers for the reporting period are summarised in Annex 3.9.

In addition to the academic staff elected by VUAS, but also guest lecturers and industry representatives are involved in the management and review of the Bachelor’s papers of students. The students write their Bachelor’s papers in partnership with such companies as TestDevLab, Accenture, Computer Vision, a.o.

The students may select the topics of the Bachelor's paper from the list offered by the Faculty, which includes the topics offered by the academic staff elected by VUAS, guest teaching staff and representatives of the industry; the topics are also defined by the students individually contacting the potential supervisor of the paper so that the topic of the Bachelor's paper complies with the student's preferred research direction and quality criteria for the Bachelor's paper.

During the reporting period, the students have written Bachelor's papers on a variety of topics related to the computer science industry. Each year, the Bachelor's papers of several students are related to the Institute of Engineering “Ventspils International Center for Radio Astronomy” of Ventspils University of Applied Sciences, such as “Correlation of Irbene Radio Telescopes’ Data using KANA Correlator,” “Creation of a Prototype of Ventspils University’s VSRC HPC Monitoring System,” “Processing of Weak Radio Astronomical Objects’ Observations Data - Calibration, Filtering and Analysis of Results” and other topics. Such cooperation enables the students to explore the research directions of the Institute in greater detail and to work in close cooperation with researchers in implementation of various projects and studies. It provides opportunities for the Institute of Engineering “Ventspils International Center for Radio Astronomy” of Ventspils University of Applied Sciences to attract new employees, but the students have an opportunity to acquire unique experience and possibly even a job offer.

Several topics of the students’ Bachelor’s papers are related to automation of the processes of VUAS, for example, “Implementation of the University’s Timetable of Lectures in the Database”, “Development of Automated Lecture Recording System for Interactive Digital Class”, “Establishment of Attack Detection System in VUAS’ Computer Network”, “Development of Study Course Descriptions and Catalogues’ Management System of Ventspils University of Applied Sciences” and other topics.

The graduation papers cover a wide range of topics, from systems’ development to machine learning. The students have written a number of papers related to other industries, such as the medical industry - “Developing a Machine Learning Method-based Recommendation System for People with Muscular Atrophy,” the forest industry - “Mapping the Cover of Tree Crowns Using Remote Sensing Data and Networks of Convolution Neurons,” the meteorology industry - “Predicting Weather through Satellite Image Data Products and Deep Machine Learning,” and other industries providing a great insight into the computer science industry being able to address effectively challenges of various of complexity in other industries.

The Bachelor's paper is defended at the Final Examination Commission. Table 3.7 shows evaluations of the Bachelor's papers from 2017 to 2022.

Table 3.7.

Evaluation of Bachelor's papers of the study programme “Computer Science” by years

	Evaluation in points								
Academic year	**4**	**5**	**6**	**7**	**8**	**9**	**10**		
Academic year	**(almost mediocer)**	**(mediocer)**	**(almost good)**	**(good)**	**(very good)**	**(excellent)**	**(outstanding)**	**Number of graduates**	**Averege mark**
2016./2017.	1	2	1	5	3	1	0	13	6,77
2017./2018.	0	0	3	8	6	1	0	18	7,28
2018./2019.	2	1	8	7	2	4	1	25	6,88
2019./2020.	1	5	1	5	5	3	2	22	7,14
2020./2021.	0	1	4	4	3	3	3	18	7,67
2021./2022.	1	0	4	5	6	7	0	23	7,57

2021./2022 angļu v.	0	0	0	0	0	1	0	1	9
Total	5	9	21	34	25	20	6	120	7,24
% of total number	4,20%	7,50%	17,50%	28,33%	21,82%	16,66%	5,00%		

As seen from Table 3.7., the average mark for the Bachelor's papers combined for all years from 2017 to 2022 is above 7 (good). The number of students with grades of 9 (excellent) and 10 (outstanding) is 21% of the total number of graduates.

Each year the Final Examination Commission advises issuing recommendations for studies in the Master's study programme "Computer Science" at VUAS on State budget resources to several students.

For some students whose bachelor's papers attracted a lot of interest, the Final Examination Commission recommended participating in "*ZIBIT*" - the competition of the IT sector's graduation papers of the Latvian institutions of higher education, in which the top 3 Bachelor's and top 3 Master's papers are awarded. The students of the Bachelor's programme "Computer Science" demonstrated good results when participating in the competition. Thus, student Alvils Stūre won the third place in the Bachelor's papers category in 2019 for his paper "Determination and Classification of Neuronal Activity Peaks using Classic Machine Learning and Deep Learning Algorithms". In 2020 Klāvs Spruģevics won the first place for his paper "3D Reconstruction of Building Models using Lidar data". In 2021, the paper "Development of Digital Infrastructure and Systems for Environmental Monitoring Sensors" by Roberts Ivanovs - graduate of Ventspils University of Applied Sciences was recognized as the winner of the first place.

3.3. Resources and Provision of the Study Programme

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

Assessment of the adequacy of resources and funding for implementation of studies and programs and achievement of study results is detailed in points 2.3.1 to 2.3.3 of Chapter 3 of Part II of this self-assessment report.

Students of the academic bachelor study program "Computer Science" have access to all VUAS computer rooms and laboratories. The computer rooms are equipped with modern computers, interactive whiteboards and other technological devices that help ensure a modern learning process and achieve the results of the study program; all computers have a fast Internet connection.

Before each semester, lecturers are surveyed about the software they need for the implementation

of study courses, and the Informatics and Technical Teaching Aid (ITTA) Unit installs the necessary software in the computer classrooms. The software is mostly free, or it is possible to use educational licenses. Lecturers also use online tools, which have grown considerably in recent years. The use of online tools and other online resources is ensured by a broadband Internet connection (at least 10 Gbps performance), a wireless Internet network, including the EDUROAM network, available at VUAS.

Compliance of resources and facilities with the conditions for the implementation of the study programme and for the achievement of the learning outcomes

The resources and facilities available in the VUAS computer classrooms and laboratories contribute directly and significantly to the achievement of the results of the study programme. The resources needed in each study course are determined by the course objective, the results to be achieved, the methods used and the course content.

For example, study program results SPSR 1.3 (Knows technologies and methods for performing learning tasks or work tasks in the profession), SPSR 2.7. (Able to design, program, test, and analyze information systems), SPSR 2.8. (Able to work with professional software) SPSR 2.10. (Able to participate in project development, implementation and management) are mainly achieved by such study courses: "Theory of Algorithms", "Data Structures and Algorithms", "Numerical Methods", Object Oriented Modeling", "Basics of Computer Science", "Programming", "Object Oriented Programming", "JAVA Programming", "Visual Programming Languages", " Information Systems Analysis and Design ", "Database Technologies", "Web Technologies", "Software testing and automation" (Appendix 3.4 - mapping).

These courses require software for program development, such as C++, Java and Python compilers and development environments (Anaconda, CLion, PyCharm, WebStorm, Android Studio, Java(TM) SE Development Kit, Microsoft Visual Studio Code, Spring Tool Suite, Eclipse, Cypress, Selenium, SonarQube and others). The need for the specific software is determined by the content of the study course and the results to be achieved. In courses dealing with the development, testing and containerisation of information systems, ITTA reserves server resources for the creation of virtual machines for each student, thus providing each student with their own virtual working environment where they can install the software, tools, and libraries they need for their practical work with administrator rights.

Study program results SPSR 2.1 (Able to plan and organize work, use various methods, technologies, software development tools and environments to perform tasks and solve problems) and SPSR 2.2. (Able to find, evaluate and creatively use information to perform learning and professional tasks and solve problems) in addition to the above, helps to achieve the study courses "Physics I", "Physics II", "Electronics", "Operating Systems", "Network Operating Systems", " Computer Systems Hardware and Architecture" and " Local Area Network Design and Administration" (Appendix 3.4 - mapping). For the implementation of these study courses, computer classrooms and laboratories equipped with appropriate equipment are used, which are in buildings C and E of Ventspils University of Applied Sciences, for example, the Physics laboratory (E8).

The achievement of the study results is also ensured by the book collection of the Ventspils University of Applied Sciences library, the possibility to order books from other libraries, as well as the subscribed databases of VUAS library. The literature required for study courses is specified in the description of each study course (Appendix 3.6).

The achievement of the study results in each study course and the entire study program is also

ensured by the e-learning system "Moodle", where all study courses implemented in the study program are available. It helps students to better navigate the course content, to access study materials, to submit study works and to receive feedback.

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

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

VUAS includes the costs with direct impact for the implementation of the study program or attributing them proportionally to the number of the students in the program when analysing the financing needed or financing received for a particular study program. **Income** includes the State budget funding for study process (1630.11 EUR per each state funded study place, corrected by the study program (study costs) coefficient and by the study level coefficient, plus the state budget funding for scholarships and social needs for students 164.34 EUR per each state funded study place), as well as income from tuition fees (calculated separately for each study program). The financing allocated by the Ventspils City Municipality for supporting the study process and for the Ventspils City Municipality IT sector scholarships according to the agreement between the VUAS and the Municipality is included as income, too, calculated proportional to the number of students in the program. **Costs** are allocated as following:

- There is a centralized 26% deduction from income of each faculty from State budget funding and from tuition fees, allocated to finance the common running costs of the VUAS;
- There is a proportional part of total common running costs of the faculty or other common costs of the particular faculty allocated to the costs of the study program proportional to the number of the students in the program.

The 26% deduction from the income of each faculty for the common running costs of the VUAS is used for:

- utility costs – electricity, heating, water and sanitation, waste disposal services;
- maintenance of premises and buildings;
- services for maintenance of IT systems;
- marketing costs;
- representation costs;
- partly remuneration of the administrative staff of the VUAS;
- common tax payments of the institution etc.

Direct costs of the faculty, which are necessary and can be identified as expenses by the particular faculty, are divided among the study programs proportionally to the number of students in these study programs. Expenses which are planned, made and can be identified for a particular study program, are included in the costs of this study program. These expenses include remuneration of the academic staff and general staff of the faculty, social security payments, health insurance, as well as expenses for fixed assets, purchase of inventory, books, learning aid, maintenance of laboratory equipment and computer classes and other faculty expenses.

Both income and costs are calculated per each student, too, separately for every study program (for one calendar year usually), as well as the percentage of each cost group of the total costs of the study program is determined.

To calculate **the break-even point** of the study program, it is possible to use several methods – to increase the number of students in the study program, to increase the state subsidy for each study place or to increase tuition fees for paying students. VUAS is using the first method – to model the number of students necessary to break even. The VUAS is not trying to increase tuition fees in the existing economic situation and taking into account the financial situation of the local population, but is investing resources in marketing efforts to attract more students. We wish to point to the need to increase the government funding for university studies in the future, too.

Academic bachelor study program **“Computer Science”, study program form: Latvian language**

The study program (study costs) coefficient **1.5**; the study level coefficient **1.0**

No.	**Item**	**Actual situation**				**Break-even point**		
		No of students	Amount, EUR	*Percentage distribution*	*Per 1 student (per year)*	Costs (EUR)	Per one student (per year, EUR)	*Number of students in the program*
	2	3	4		5	6	7	8
	INCOME	**100***	**317 729**	***100%***	***3 177,29***		**3 177**	
1.	State funding for studies	100	244 517	*77,0%*	*2445,17*			
2.	State funding for scholarships	100	16 434	*5,2%*	*164,34*			
3.	Tuition fees		3 160	*1,0%*	*31,60*			

4.	Funding from Municipality for studies		43 961	*13,8%*	*439,61*			
5.	Funding from Municipality for scholarships		9 658	*3,0%*	*96,58*			
	COSTS	**100**	**224 713**	***100%***	***2247,13***	**224 713**		***71***
6.	Academic staff remuneration	100	128 118	*57,0%*	*1281,18*			
7.	General staff remuneration	100	3 125	*1,4%*	*31,25*			
8.	Scholarships and social costs	100	26 092	*11,6%*	*260,92*			
9.	Running costs, Utilities, Administration costs (26%)	100	64 396	*28,7%*	*643,96*			
10.	Materials, books, equipment	100	2 983	*1,3%*	*29,83*			
	Financial result:	**100**	**93 016**	***29,3%***	***930,16***			

**Number of students in the program 100 (01.10.2022.)*

There are on average 100 students in the academic bachelor program “Computer Science”, Latvian language form, which is 50.3 % of the total number of students in the Faculty of Information Technology. The same proportion is used to calculate the funding from the Municipality for this program. The same proportion of 50.3 % is used to split the total costs of the faculty to this program.

71 students are needed in this program to reach the break-even point (condition – costs not changing). It is planned to use the positive cash flow of this program to cover the costs of maintenance of study infrastructure (computer classes, software licenses) and study materials, as well as part of the cash flow is used to cover losses from the English language form of this study program and other programs of this study field.

Academic bachelor study program **“Computer Science”, study program form: English language**

The study program (study costs) coefficient **1.5**; the study level coefficient **1.0**

No.	Item	Actual situation				Break-even point		
		No of students	Amount, EUR	*Percentage distribution*	*Per 1 student (per year)*	Costs (EUR)	Per one student (per year, EUR)	*Number of students in the program*
	2	3	4		5	6	7	8
	INCOME	**15***	**47 140**	***100%***	***3 142,66***		**3 143**	
1.	State funding for studies	10	24 452	*51,9%*	*1630,11*			
2.	State funding for scholarships	10	1 643	*3,5%*	*109,56*			
3.	Tuition fees	5	13 050	*27,7%*	*870,00*			
4.	Funding from Municipality for studies		6 555	*13,9%*	*436,99*			
5.	Funding from Municipality for scholarships		1 440	*3,1%*	*96,00*			
	COSTS	**15**	**61 395**	***100%***	***4 092,99***	**61 395**		***20***
6.	Academic staff remuneration	15	47 484	*77,3%*	*3165,60*			
7.	General staff remuneration	15	552	*0,9%*	*36,80*			
8.	Scholarships and social costs	15	3 083	*5,0%*	*205,56*			
9.	Running costs, Utilities, Administration costs (26%)	15	9 750	*15,9%*	*650,03*			

10.	Materials, books, equipment	15	552	*0,9%*	*35,00*			
	Financial result:	**15**	**-14 255**	***-30,2%***	***-950,33***			

**Number of students in the program 15 (01.10.2022.), of them 10 state budget financed, 5 paying tuition fees.*

There are on average 15 students in the academic bachelor program “Computer Science”, study form - in English language, 3 Latvian and 7 Ukrainian citizens in state budget financed places, 5 foreign students paying tuition fees, which is 7.5 % of the total number of students in the Faculty of Information Technology. Tuition fee for students from third countries is set at 2610 EUR per study year in this program. The same proportion is used to calculate the funding from the Municipality for this program. The same proportion of 7.5 % is used to split the total costs of the faculty to this program.

20 students are needed in this program to reach the break-even point (condition – costs not changing). Losses from the English language study form are covered from the positive cash flow of the Latvian language study form of the same study program.

The development of the academic bachelor study program “Computer Science” has been supported financially from the ESF projects during the years 2018 – 2022. The project “Modernization of Ventspils University of Applied Sciences’ STEM teaching programs' ' (No. 8.1.1.0/17/I/007) financed new laboratory equipment, new computer classes and improvement of premises in total for 1.77 million EUR. The projects “Strengthening the Academic Staff of Ventspils University of Applied Sciences in the Fields of Strategic Specialization'' (Project No: 8.2.2.0/18/A/009), “Improving Quality of the Content of Study Programs at Ventspils University of Applied Sciences, Improving Resource Efficiency and Ensuring Better Management” (Project No: 8.2.3.0/18/A/014) and “Next Generation Micro Cities of Europe” (No.UIA03-250) have contributed to the qualifications of the academic staff of the program. As the laboratories and computer classes installed are used by all programs of this study field and by other faculties, too, and the academic staff is teaching in several study programs, it is not possible to separate the exact financial contribution of the projects mentioned to the development of this study program. As investments from the projects mentioned above were used to finance the development of the study infrastructure, instead of the Faculty budget for 2022, there will be a need to use, in the upcoming years, the VUAS own budget to maintain computer classes and acquire new equipment after 2023.

Direct cost calculation is made for each programme. Taking into account the costs directly affecting implementation of the study programme (detailed in Chapter 2.3.1), it is estimated for the study programme “Computer Science” that on average, (including each semester, volume of internships and semester during which the final paper is to be written, as well as two implementing languages), EUR 157 973 are spent on the remuneration of teaching staff; together with the remuneration of the study program’s director, as well as the costs of final examinations (including remuneration of the supervisors, reviewers and members of the Examination Commission) the expenses amount to EUR 162 085. By adding the mandatory State social contributions (EUR 38235.85), we get the expenses of EUR 200 320.85. Considering that the State budget’s resources per one study place in the program (including the coefficient for the sector and level) amount to EUR 2198,66 per one study place, it is calculated that at least 91 students are required in the study program for it to cover its cost price.

3.4. Teaching Staff

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

Implementation of the academic Bachelor's study programme “Computer Science” is carried out by highly qualified academic staff that provides the students with the necessary research skills, theoretical and practical knowledge, skills and competencies (see Table 3.8.).

Table 3.8.

Education of academic staff of the study program “Computer Science” and study courses taught

No.	Name	Surname	Academic position	Scientific degree, qualification	Study courses taught
1.	Sergejs	Hiļķevičs	Professor	Dr. phys.	Basics of computer science Foundations of entrepreneurship
2.	Jānis	Vucāns	Guest professor	Dr. math.	Optimization methods
3.	Gaļina	Hiļķeviča	Assoc. professor	Dr. math.	Mathematical analysis I Mathematical analysis II Mathematical logic Discrete mathematics Differential equations Numerical methods

No.	Name	Surname	Academic position	Scientific degree, qualification	Study courses taught
4.	Raita	Rollande	Assoc. professor	Dr. sc. ing.	Object Oriented Modelling Information systems analysis and design Software development tools and environment
5.	Jānis	Hofmanis	Assoc. professor	Dr.sc.comp.	Parallel programming
6.	Guntars	Dreijers	Assoc. professor	Dr.philol.	English II
7.	Juris	Žagars	Assoc. Guest professor	Dr. habil. phys.	Modelling of chaotic processes
8.	Aleksandrs	Berežnojs	Guest teaching staff	Dr. sc. ing.	Information systems security
9.	Vairis	Caune	Docent	Dr.sc.comp.	Algorithm theory Visual programming languages
10.	Linda	Gulbe	Docent	Ph. D. sc.comp.	Introduction to computer processing of satellite images

No.	Name	Surname	Academic position	Scientific degree, qualification	Study courses taught
11.	Jesus Alberto Cazares	Montes	Docent	Dr. phys.	Mathematical Analysis I Mathematical Analysis II Mathematical Logic Discrete Mathematics Differential Equations Numerical methods Linear Algebra un Analytical Geometry I Linear Algebra un Analytical Geometry II Probability Theory And Mathematical Statistics
12.	Aleksejs	Klokovs	Guest docents	Dr. sc. ing.	Fundamentals of computer aided design
13.	Aigars	Krauze	Guest docent	Dr. sc. ing.	Electronics
14.	Vija	Vagale	Guest docent	Dr. sc. comp.	Database technologies
15.	Estere	Vītola	Lecturer	Mg. paed.	Basics of computer science Programming Object Oriented Programming
16.	Karina	Šķirmante	Lecturer	Mg. sc. comp.	Data structures and algorithms JAVA programming
17.	Jeļena	Mihailova	Lecturer	Mg.math.	Linear Algebra un Analytical Geometry I Linear Algebra un Analytical Geometry II
18.	Ieva	Vizule	Lecturer	MA	English I English II

No.	Name	Surname	Academic position	Scientific degree, qualification	Study courses taught
19.	Sintija	Ozoliņa	Guest Lecturer	Mg. philol.	Fundamentals of the Latvian Language I Fundamentals of the Latvian Language II
20.	Dmitrijs	Smirnovs	Lecturer	Mg. oec.	Basics of economics
21.	Oskars	Rasnačs	Guest Lecturer	Mg.math.	Probability theory and mathematical statistics
22.	Ilva	Cinīte	Guest Lecturer	Mg. phys.	Physics I Physics II
23.	Andris	Vagalis	Guest Lecturer	Mg. sc. comp.	Network operating systems
24.	Mārcis	Naktiņš	Guest Lecturer	Mg. sc. comp.	Computer systems hardware and architecture Operating systems Local area network design and administration
25.	Roksolana	Amarova	Guest Lecturer	Mg. sc. ing.	Electronics
26.	Artūrs	Orbidāns	Guest Lecturer	Mg. sc. ing.	Computer systems hardware and architecture
27.	Kārlis	Immers	Guest Lecturer	Mg. sc. comp.	Web technologies
28.	Andis	Pilāns	Guest Lecturer	MBA	Basics of IT industry rules & regulations & standards
29.	Varis	Vītols	Guest Lecturer	Mg. sc. ing.	Civil Protection

No.	Name	Surname	Academic position	Scientific degree, qualification	Study courses taught
30.	Ivo	Lemšs	Guest Lecturer	Mg. biol.	Sustainable society and green thinking Civil Protection (in English)
31.	Pēteris	Lauriņš	Guest Lecturer	Mg.oec.	Information systems project management
32.	Madara	Freimane	Guest Lecturer	Mg.sc.ing.	Software testing and automation
33.	Raitis	Didrihsons	Guest Lecturer	Mg.oec.	Fundamentals of entrepreneurship
34.	Edgars	Garšneks	Guest Lecturer	Mg.sc.comp.	Numerical methods

The language skills of the teaching staff of the academic Bachelor's study programme “Computer Science” complies with the Cabinet Regulation No 733 of 2009 regarding Knowledge of the State Language and Procedure for Testing Fluency of the State Language for Performance of Professional and Official Duties.

Information on the foreign language skills of the teaching staff is summarised in the “Basic Information on the Teaching Staff Involved in Implementation of the Study Field” (Annex No 2.8) and in the curricula vitae (CVs) of the teaching staff appended in Annex No 2.9.

34 lecturers are involved in the implementation of the study program, 13 of whom are teaching staff elected to Ventspils University of Applied Sciences. Visiting teaching staff include not only those employed in higher education, but also industry professionals, whose involvement in the implementation of the study program allows students to acquire knowledge also from representatives of the labour market. Several study courses are developed in close cooperation with employers, for example, the “Software Testing and Automation” course has been developed and is being implemented in cooperation with SIA “TestDevLab”. The content of study courses has been developed in cooperation with SIA “Accenture”: “Web programming (JAVA)”.

All teaching staff involved in the study process are proficient in English at a sufficient level for the study process. A large number of teaching staff provide their study courses in both Latvian and English. However, there are some teaching staff who are specifically assigned to the implementation of the programme in English. Guest lecturer Mg. philol. Sintija Ozoliņa teaches the study course "Latvian Language I" and "Latvian Language II". Within the framework of the ESF project "Strengthening the academic staff of Ventspils University College in areas of strategic specialisation" (Nr. 8.2.2.0/18/A/009) in 2018 a foreign guest lecturer Dr. phys. Jesus Alberto Cazares Montes, who teaches mathematics courses in the Bachelor's programme "Computer Science" in English was invited. In 2022, J.A.C. Montes was elected as docent for six years.

Each teaching staff is an expert in the field with several years of experience providing by means of his/her knowledge, skills and competencies, a major contribution to implementation of the

Bachelor's study programme “Computer Science” and achievement of the study programme’s results.

The following few examples will reflect the information on how the qualifications of teaching staff help to achieve study results:

- Associate professor, Dr.sc.ing. Raita Rollande holds a PhD degree in Engineering in the Information Technology Industry Systems Analysis, Modeling and Design subfield. R.Rollane passed Information Technology study courses at the State University of New York at Buffalo. Associate professor R. Rollande provides her knowledge in prototyping and developing information systems to students in the study courses "Analysis and design of information systems", "Program development tools and environments", "Object-oriented modeling".
- Docent, Ph. D.sc. comp. Linda Gulbe in 2015, within the framework of the Erasmus+ program, during an internship in Freiburg (Germany), deepened her knowledge on the topic “Preparation of remote sensing data processing solutions”. L. Gulbe is a researcher at the Ventspils International Radio Astronomy Center and conducts research related to the development of remote sensing data processing methods. From 2019, L. Gulbe works at the Institute of Electronics and Computer Sciences as a researcher and programming engineer. Her areas of activity are the development and implementation of algorithms and workflows, processing of high spatial resolution remote sensing data, solutions and applications of convolutional neural networks, machine learning. L. Gulbe works within 5 research projects. In 2020, L. Gulbe defended his doctoral thesis "Automated mapping of tree crowns for forest inventory using joint processing of remote sensing data". L.Gulbe teaches the course "Introduction to satellite image processing" for the students of the academic bachelor's study program "Computer Science", which is closely related to her research interests.
- Lecturer, Mg.sc.comp. Karina Šķirmante has participated in several information system development projects, thus acquiring the understanding of the information system operating cycle, architecture planning, database model creation, testing and good style implementation. Lecturer K. Šķirmante is a researcher at the Ventspils International Radio Astronomy Center and conducts research related to signal processing, using programming technologies, frameworks, libraries and HPC (High Performance Computing) resources. Lecturer K. Šķirmantei has experience in conducting programming trainings or "Bootcamps" on behalf of the Accenture company, training potential employees. Lecturer K. Šķirmante in the study courses she is teaching - "Data structures and basic algorithms" and "Programming on the web (JAVA)" - provides students with practical skills in programming, optimization of algorithms, thus achieving the results of the study program.
- Guest lecturer, Mg.sc.comp. Kārlis Immers has been working as a programmer since 2013 and has accumulated a lot of experience in programming web applications. K. Immers has participated in the development of several SIA TET web applications, and is also currently working on the development of maps and geospatial software solutions in the company SIA "Jāņa Sēta". K. Immers provides his knowledge to students in the course "Web technologies".
- Guest lecturer, MBA Andis Pilāns has been working with information security issues since 2016, performing the duties of cyber security management analyst, incident manager, information security manager, thus managing information security risks, implementing security awareness measures, managing security incidents, developing various security policies on a daily basis, development of information security management goals, risk analysis, research of regulatory acts and other tasks. The qualification of Andis Pilāns, his accumulated experience and knowledge helps to achieve the results of the study program in his study course "Fundamentals of Industry Rights".

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

The policy of training, development and renewal of academic staff of the study direction is implemented by promoting continuous improvement of the teaching staff and it includes: consultations with colleagues, doctoral studies, courses for improving professional skills of the academic staff, participation in scientific research, seminars, conferences.

During the reporting period there were changes in the academic staff related to termination of employment relationships and attraction of new guest lecturers to the study courses. For example,

- the changes have affected implementation of the study course “Algorithm Theory” that is now delivered by PhD. Vairis Caune instead of the guest lecturer Dace Briede;
- as of 2022 the course “Probability Theory and Mathematical Statistics,” is delivered by Oskars Rasnačs, PhD at the University of Latvia, instead of lecturer Jelena Mihailova who reduced her workload at VUAS;
- the courses that for many years were delivered by lecturer Gints Neimanis - the Head of the Informatics and Technical Teaching Aid (ITML) Section of VUAS who terminated his employment relationship with VUAS, are now delivered by guest lecturer Dr. sc. comp. Vija Vagale, guest lecturer Andris Vagalis and guest lecturer Mārcis Naktiņš;
- the course “Basics of Computer-aided Design” is delivered by guest lecturer Dr. sc. ing. Aleksejs Klokovs instead of lecturer Inga Vanaga.

Upon commencing implementation of the study programme “Computer Science” in English, lecturer Dr. phys. Jesus Alberto Cazares Montes was attracted to deliver mathematics courses under the project “Strengthening the Academic Staff of Ventspils University of Applied Sciences in the Fields of Strategic Specialization” (Project No: 8.2.2.0/18/A/009). Guest lecturer Mg. philol. Sintija Ozoliņa teaches the study courses "Latvian Language I" and "Latvian Language II".

Within the framework of the study programme, professionals of the relevant field participate in guest lectures that provide the students with the sector's point of view.

The changes made to the study program ensure acquisition of the necessary research skills, theoretical and practical knowledge, skills and competencies that secure achievement of the study results.

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

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

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

Cooperation among the teaching staff of the study program is facilitated through both formal and informal events organised by VUAS.

The teaching staff of the study programme have been provided with an opportunity to participate in professional improvement and methodological seminars, courses and discussions organised by the Study Unit in cooperation with Lifelong Learning Centre. Several courses for the teaching staff were organised by implementing projects “Strengthening the Academic Staff of Ventspils University of Applied Sciences in the Fields of Strategic Specialization” (Project No: 8.2.2.0/18/A/009) and “Improving Quality of the Content of Study Programs at Ventspils University of Applied Sciences, Improving Resource Efficiency and Ensuring Better Management” (Project No: 8.2.3.0/18/A/014).

Close cooperation among teaching staff takes place when developing and improving the content of the study programme. The teaching staff follow closely the thematic division included in the study course, coordinating among them the thematic areas and the mechanism for achievement and evaluation of study results.

In the process of implementation of the study programme, the teaching staff cooperate closely, for example, when discussing quality of the final papers at the meetings organised by the Faculty, evaluating criteria and possibilities for improvement of quality of the final papers.

When a study course is implemented by two lecturers, mutual cooperation is of paramount importance. Attracting young teaching staff is very important. The teaching staff of the Faculty support the young lecturers, share their experience and assist in preparation of teaching materials.

128 students study in the Latvian language flow in the Bachelor's study programme “Computer Science”, 19 students study in the English (147 students in total). During the study year the study process is ensured by 31 teaching staff members. Ratio of students and lecturers: 147/34 = 4,32. The students have been provided with quality studies and personal approach during the study process.

The calculations do not take into account that students from several study programmes of VUAS participate in some study classes at the same time.

Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	3-1_appendix_D-DS_ENG.pdf	3-1_pielikums_D-DP_LV.pdf
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)	HEC_recognition.pdf	AIP_atzinums.pdf
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period	3-2_appendix_statistics_on_students.pdf	3-2_pielikums_Statistika_par_studejosajiem.pdf
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard	3-3_appendix_Compliance_national_education_standard.pdf	3-3_pielikums_ITB_Atbilstiba-valsts-izglitibas-standartam.pdf
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)		
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	3-4_appendix_Study_Result_Mapping.xlsx	3-4_pielikums_Studiju_Rezultatu_Kartejums.xlsx
The curriculum of the study programme (for each type and form of the implementation of the study programme)	3-5_appendix_ITB_Study_plan.docx.pdf	3-5_pielikums_ITB_studiju_plans.docx.pdf
Descriptions of the study courses/ modules	3-6_Appendix_ITB_study_course_descriptions_precizets.pdf	3-6_Pielikums_ITB_kursu apraksti_LV _precizets.pdf
Description of the organisation of the internship of the students (if applicable)	3-7_appendix_internship-regulations.pdf	3-7_pielikums_Prakses_nolikums_ITB.docx.pdf
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)	3-8_appendix_declaration-compliance-to-law-on-higher-education-institutuions-55-sect.pdf	3-8_pielikums_aplicinajums_atbilstiba-AL-55p-prasibam.pdf

Computer Science (45484)

Study field	*Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science*
ProcedureStudyProgram.Name	*Computer Science*
Education classification code	*45484*
Type of the study programme	*Academic master study programme*
Name of the study programme director	*Vairis*
Surname of the study programme director	*Caune*
E-mail of the study programme director	*vairis.caune@venta.lv*
Title of the study programme director	*Dr.sc.comp.*
Phone of the study programme director	
Goal of the study programme	*The aim of the study program is to prepare specialists in computer science with a broad knowledge in higher mathematics, science and engineering, with particular emphasis on digital signal and image processing, development of software and IT systems, computer vision and machine learning, and to prepare students for independent scientific research work that would enable them to independently perform professionally in promising sectors of the computer science labor market.*
Tasks of the study programme	*The study programme tasks are:* *- to provide students with the conditions and opportunities to acquire skills and competences for their scientific and professional career;* *- to motivate and promote students' continuing education needs, including the motivation to proceed to doctoral programs;* *- to develop students' scientific analysis skills, pedagogical skills, independent problem-solving skills, and encourage their involvement in scientific problem-solving.*

Results of the study programme	*Knowledge:* *Knows computer science guidelines, machine learning fundamentals and project development cycles.* *Skills:* *Is able to apply their knowledge to formulate and solve problems in academic, scientific and professional environment;* *Is able to independently plan and organize their work and further learning;* *Is able to use documentation and technical standards of other sectors;* *Is able to communicate and cooperate with specialists from other sectors in the development, implementation and management of projects.* *Competencies:* *Can discuss complex and systemic aspects of computer science in a reasoned manner with both experts and non-experts;* *Can work effectively both individually and in a group;* *Can perform their work and duties to a high standard while continually looking for and implementing innovations to improve their scientific or professional activities;* *Can demonstrate their knowledge and ethical responsibility for the impact of scientific results or professional activities on the environment and society.*
Final examination upon the completion of the study programme	*Master's thesis*

Study programme forms

Full time studies - 2 years - latvian

Study type and form	*Full time studies*
Duration in full years	*2*
Duration in month	*0*
Language	*latvian*
Amount (CP)	*80*
Admission requirements (in English)	*Bachelor of Science or Engineering in computer science, mathematics, information technology, physics, astronomy, electronics or telecommunications*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Master's degree of Natural Sciences in Computer Science.*
Qualification to be obtained (in english)	*-*

Places of implementation

Place name	City	Address
Ventspils University College	VENTSPILS	INŽENIERU IELA 101, VENTSPILS, LV-3601

Full time studies - 2 years - english

Study type and form	*Full time studies*

Duration in full years	*2*
Duration in month	*0*
Language	*english*
Amount (CP)	*80*
Admission requirements (in English)	*Bachelor of Science or Engineering in computer science, mathematics, information technology, physics, astronomy, electronics or telecommunications. English language level of at least B2 level.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Master's degree of Natural Sciences in Computer Science.*
Qualification to be obtained (in english)	-

Places of implementation

Place name	City	Address
Ventspils University College	VENTSPILS	INŽENIERU IELA 101, VENTSPILS, LV-3601

3.1. Indicators Describing the Study Programme

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

The study programme is also intended to be accredited for implementation in English. The Education Qualification Code of the Republic of Latvia (from 45481 to 45484) is also changed, in accordance with the changes in the Regulations regarding the classification of education of Latvia. No other changes have been made to the parameters of the study program (meaning title, duration, volume, form, objectives and tasks). Taking into account the specificity of the program and the wide demand of specialists, as well as the increasing number of foreign students in the academic Bachelor's study program “Computer Science”, it was decided by the faculty to offer this program for implementation also in English.

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

The title of the study programme “Computer Science” and the degree to be obtained conforms to the content of the study programme, providing students with knowledge not only in practical programming, but also in the subjects of computer sciences relevant to the master's level.

The code of the study programme (45484) complies with the education classification of the Republic of Latvia:

- **45** - Academic education (Master's degree), to be implemented after obtaining a Bachelor's degree or professional Bachelor's degree. Duration of full-time studies lasts between one and two years. Total duration of full-time studies shall be at least five years.
- **45(4)** - Sciences, mathematics and information technologies
- **454(8)** - Computing
- **4548(4)** - Programming

The academic Bachelor's study programme “Computer Science” also corresponds to the group of 484 educational programs, therefore the academic Master's study programme with this code is a logical extension of the Bachelor's studies.

The new education classification in sciences of the Republic of Latvia provides only for three groups of educational programs: “Computer use (482)”, “Computer systems, databases and computer

networks (483)" and "Programming (484)". The latter is the most appropriate, but it is considered to request the additional classification which would be more thematically appropriate to the processing of discrete signals or to the area of machine learning. In accordance with ISCED-F classification code 6013, we will keep the naming "Computer science" as the most appropriate description of study programme compared to narrower naming, such as programming.

The academic Master's study programme "Computer science" corresponds to the study field "Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science" (directly to the part "Computer Science") by its aims, main results to be achieved as well as the contents of the study programme.

The name of the study program and its code are mutually connected, because ISCED-F classification code 6013 corresponds also to "Computer Science". Aims and main tasks of the study programme are derived from general aims and tasks of academic master programmes and the code of the study programme. Enrollment requirements are connected to the contents, aims and achievable results of the study programme - in order to be able to fully learn the contents of the study programme, a Bachelor's degree in Natural science or Engineering is needed.

The aim of the study programme of the academic Master's study programme "Computer Science" is to prepare specialists in computer sciences with broad knowledge in higher mathematics, science and engineering, with particular emphasis on the processing of digital signals and images, the development of software and IT systems, computer vision and machine learning, and to prepare students for independent scientific research work, which would enable independent professional activity in prospective sectors of the computer science labour market. This objective is in alignment with the aim of the study field (Chapter 2.1.1) and its stated aim is in alignment with the strategy of the Ventspils University of Applied Sciences for 2021-2027 (https://irp.cdn-website.com/9945ff8b/files/uploaded/VENTSPILS%20UNIVERSITY%20OF%20APPLIED%20SCIENCE_STRATEGY_2021-2027.pdf).

Main tasks of the study programme:

- provide students with the conditions and opportunities to acquire skills and competences for their scientific and professional career;
- motivate and promote students' continuing education needs, including the motivation to proceed to doctoral programs;
- develop students' scientific analysis skills, pedagogical skills, independent problem-solving skills, and encourage their involvement in scientific problem-solving

Main results to be achieved:

Knowledge:
-Knows computer science guidelines, machine learning fundamentals and project development cycles.

Skills:
-Is able to apply their knowledge to formulate and solve problems in academic, scientific and professional environment;
-Is able to independently plan and organize their work and further learning;
-Is able to use documentation and technical standards of other sectors;
-Is able to communicate and cooperate with specialists from other sectors in the development, implementation and management of projects.

Competencies:
-Can discuss complex and systemic aspects of computer science in a reasoned manner with both

experts and non-experts;
-Can work effectively both individually and in a group;
-Can perform their work and duties to a high standard while continually looking for and implementing innovations to improve their scientific or professional activities;
-Can demonstrate their knowledge and ethical responsibility for the impact of scientific results or professional activities on the environment and society.

The aim, tasks and study results of the academic Master's study program “Computer Science” are defined in accordance with the framework of national classifications conforming to the European qualification framework specified in Cabinet of Ministers Regulation No 322, “Regulations on the Classification of Education of Latvia.” The Master's study program complies with LCI level 7 and its study results are defined in accordance with the descriptions of knowledge, skills and competences corresponding to level 7. The study results to be achieved by the study programme are defined at the level of knowledge, skills and competence.

1. Knowledge

1.1 Able to present not only a comprehensive knowledge of facts, theories and relationships, but also advanced knowledge and understanding of signal and image processing, computer science, higher mathematics, ICT, which provides a basis for research work

1.2 Able to independently apply theory, methods and problem-solving skills to engage in research and perform highly-skilled professional functions in computer sciences in standard and non-standard situations

1.3 Knows documentation and technical standards, as well as the relevant legal basis in the industry

Skills

2.1 Able to independently formulate and critically analyse complex scientific and professional challenges

2.2 Able to justify decisions and carry out additional analysis where necessary

2.3 Able to integrate knowledge from different fields

2.4 Able to contribute to the creation of new knowledge, and development of research and professional methods

2.5 Able to demonstrate understanding and ethical responsibility for the impact of scientific results and professional activities on the environment and society

2.6 Able to explain and discuss complex and systemic aspects of computer sciences in a reasoned manner with both specialists and non-specialists

2.7 Able to work independently, and to direct the development and specialisation of their competences in order to adapt their professional activities to changing labour market conditions

2.8 Able to collaborate with experts from other sectors

2.9 Able to participate in project development, implementation and management

2.10 Able to apply occupational safety, fire safety and environmental protection rules

3. Competencies

3.1 Takes interest in continued self-improvement, building a career, and continuing education in knowledge-based, democratic, multicultural and multilingual society in Europe and in the world

3.2 Able and willing to carry out work tasks individually or in a group

3.3 Able to take responsibility for their own and group performance and analyse it

3.4 Able to perform their work and duties to a high standard, continuously seeking and innovating to improve scientific and professional activity and resources

Admission requirements include a “Bachelor's degree of science and engineering in computer science, mathematics, information technology, physics, astronomy, electronics or telecommunications". According to experience, students with a bachelor's degree in computer science or information technology perform best in studies specifically related to programming, but students with bachelor's degree in other fields of science fields have also successfully completed their studies and thus provided the labour market with a combination of skills of different sectors that are in high demand in the labour market and in research.

The duration of implementation of the study programme is two years and the total amount of the study programme is 80 CP. Study program contact classes are organised on Fridays and Saturdays to allow students to combine their studies with work in industry (deliberately choosing a weekday as one of the days and informing students that it will be mentally and physically difficult to combine full-time face-to-face studies with a full-time job). Currently, the programme is implemented only in Latvian, but it is planned to implement the program also in English, taking into account the increase in the number of potential students, including the increase in the number of foreign students in the academic Bachelor's study program in “Computer Science”.

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

According to the informative report of the Ministry of Economy “On medium - and long-term forecasts of the labour market”, the main labour shortage in the higher education group is expected to be for specialists with education in the fields of engineering, sciences and ICT (STEM) while maintaining an existing structure of higher education supply. According to the estimates of Ministry of Economy, the shortfall between the demand and supply for higher education workforce in science, mathematics and information technology is currently around two thousand and could reach nine thousand by 2040 (see Figure 3.1)

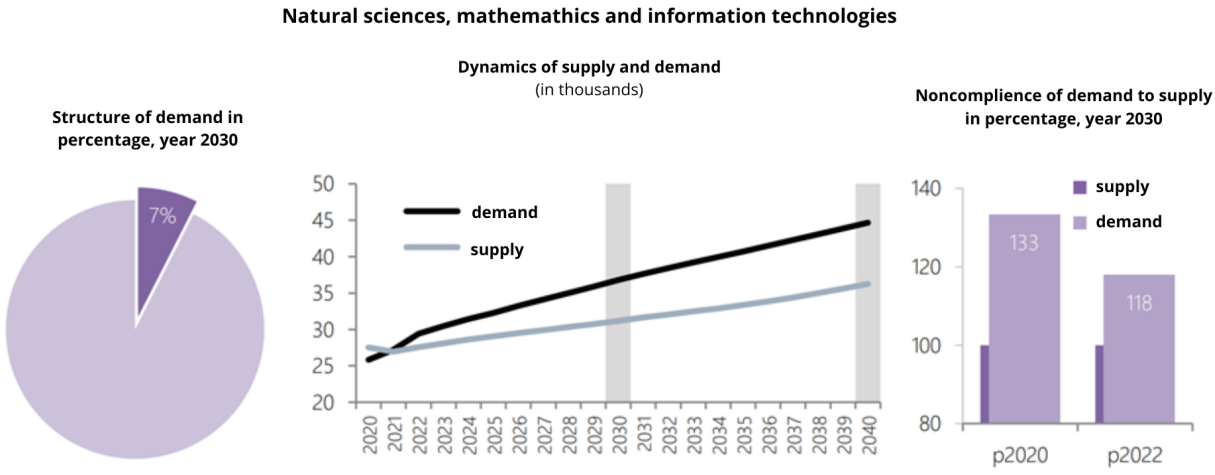

Figure 3.1 **Forecast for exceeding demand of higher education specialists over supply in sciences, mathematics and information technologies for 2020-2040.**

The Ministry of Education and Science's graduate monitoring was used (graduates from 2017 for the 2018, 2019 and 2020 tax years), as well as personal interviews with graduates was used to assess graduate employment.

Of the six graduates in 2017, five are employed in ICT related sectors in Latvia and one has emigrated and is working abroad.

Three students graduated in 2018, all three employed in ICT related industries in Latvia.

Three students graduated in 2019, all three employed in ICT related industries in Latvia.

Three students graduated in 2020, all three are employed in Latvia, one of them works at VUAS, the other two elsewhere in Latvia in ICT related industries.

One student graduated in 2021 and went on to work in the Remote Sensing Department of the Institute of Engineering at VUAS, and is now self-employed in the ICT sector.

Four students graduated in 2022, two of them are working in ICT companies and two in the Institute of Engineering of VUAS.

The results of the personal surveys did not contradict the monitoring of graduates by the Ministry of Education. For the most part, graduates work with non-basic ICT systems. Employers are satisfied with the performance of graduates and would be happy to hire more graduates from this study programme.

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

languages.

Table 3.2 shows the main statistics on students in the study program. For further details see Annex 4.2.

Table 3.2.

Academic year	Number of students enrolled	Number of students	Number of graduates
2016./2017.	11	24	6
2017./2018.	8	19	3
2018./2019.	4	14	3
2019./2020.	2	9	3
2020./2021.	10	16	1
2021./2022.	8	21	4
2022./2023.	1	15	

The number of students enrolled is significantly influenced both by the economic situation of the country in a given year and also by the number of graduates of the academic Bachelor's study programme in “Computer science” of a given year (most of the students enrolled in the study programme are graduates of this programme). The programme director and their work on promoting the study programme is also an important factor. Unfortunately for this programme, the programme's directors have changed several times in recent years for various reasons, which has certainly also affected the fluctuations in the number of students enrolled. As with the total number of students enrolled at the university, both the pandemic in 2020 and the Russian invasion of Ukraine in 2022 should be taken into account here.

It should be noted that many students have dropped out or gone on academic leave, which results in a rather high drop-out rate. However, students in general have been very positive about the changes in their study courses and enrolments are expected to stabilise.

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

3.2. The Content of Studies and Implementation Thereof

3.2.1. Analysis of the content of the study programme. Assessment of the interrelation between the information included in the study courses/ modules, the intended learning outcomes, the set aims and other indicators with the aims of the study course/ module and the aims and intended outcomes of the study programme. Assessment of the

relevance of the content of the study courses/ modules and compliance with the needs of the relevant industry, labour market and with the trends in science on how and whether the content of the study courses/ modules is updated in line with the development trends of the relevant industry, labour market, and science.

Content of the study programme is presented in table 3.3.:

Table 3.3.

Plan of academic masters' study programme "Computer Science" by parts

No	Part of the study programme	Amount of credit points
1.	A, Theoretical courses in the sector	14 CP
2.	A, Courses on current issues	16 CP
3.	B, Part of compulsory option	28CP (out of 34CP available)
4.	C, optional courses	2 CP
5.	Master's thesis	20 CP
	Total:	80 CP

Plan of academic masters' study programme "Computer Science" by parts

The theoretical study courses in the sector mainly provide the study results to be achieved by the study programme corresponding to knowledge and competence:

- Higher mathematics special course - provides the necessary knowledge needed to process medical signals
- Digital image processing - prepares students to work with interpretation and classification methods.
- The basics of remote sensing - provides the basic knowledge you need to work with remote sensing problems
- Probability theory and statistics in computer sciences - provides general mathematical tools for data analysis and rational discussion on statistically correct interpretation of data.

Study courses on current problems, however, focus on the achievement of skills and competences:

- Information systems project management - provides basic skills in dealing with information systems project design, planning and management
- Medical signal processing - provides insight into the practical aspects of signal processing using medical signals as an example
- Software development templates - complements the Information systems project management course with practical knowledge on how to successfully build a system architecture
- Methods of interpretation and classification I and Methods of interpretation and classification II - provide practical experience in dealing with data processing using self-created software

and using pre-existing libraries, as well as help to see the practical side of data analysis and classification.
- Mathematical modelling methods - prepare students to formulate science problems in a computer modelling format to enable realistic analysis of natural processes through simulations.

The offer of compulsory option courses is analysed by identifying the least achieved results of the study programme in other subjects, as well as through discussions with graduates' employers.

This part includes subjects that are deeply related to machine learning, the development and security of information systems, and study courses that promote scientific activity.

Optional courses allow students to broaden their horizons in areas beyond computer sciences.

The master's thesis lasts the entire last semester of studies and directly relates to most of the study programme results, which is to be expected as students have to learn how to independently solve science problems, formulate methodologies, obtain and analyse results, draw conclusions on non-basic topics of science and present their results in front of other experts.

The results to be achieved by the study programme are based on the objectives of the study programme, thus reaching the results to be achieved by the study programme, also linking of study courses with the objectives of the study programme is ensured.

The contents of the study courses are being discussed with specialists from the field as well as enterprises from the corresponding labour market and scientific institutions (multiple such persons are also among our docents, such as Aleksejs Klokovs and Mārtiņš Saulītis). The contents of the study course are updated according to docent initiative every year if needed and in addition, if any indications are received from the council of study programmes, faculty council, final examinantion commission or director of the study programme, the contents are updated for the next semester it is planned to be given to students. In such a manner we provide topicality and accordance to demands of the field, labour market and scientific tendencies. At this moment, machine learning is having a huge developpement leap, therefore it is given a supplementary attention. In addition, cyber-security skills are being improved.

In annex, table 4.3. on the compliance of the study program with the national education standard.

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

Chapter 3.2.6 lists the topics of the master's thesis defended during the reporting period and justifies their relevance. These are on topics in the field of computer science. One of the criteria for evaluating the thesis is the analysis of the results and the ability to analyse the achievements of the current field and formulate their insights on potential improvements. This indicates that the award of the degree is based on the achievements of the field of computer science.

The topics of master's thesis are mostly analysis of different topics of computer science, supplementary literature studies, their own conclusions, which result in experiments and analysis of experiments' results and drawing new conclusions. Part of the initial analysis is the study of state of art (newest peer-reviewed publications), which clearly shows the newest achievements and findings in the field.

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

The study programme is implemented as a full-time face-to-face programme, 30% of the study programme consist of contact hours. The implementation of study courses of the study programme is realised in face-to-face classes and remotely, in accordance with the regulation that the proportion of remote studies does not exceed 50% of the total number of contact hours in the programme. When approving the schedule of classes for each semester, the organisation and implementation of the studies is clearly defined, indicating the planned classroom for the in-person classes or the access link for the remote classes.

The study program is currently only available in Latvian, but it is planned to offer it in English in the future. The lecturers for the English training have the necessary English language skills.

The organisation and implementation of the study programme is carried out using various teaching and learning methods and forms, which include lectures, seminars, discussions, workshops, individual work of students, presentations, preparation and presentation of posters to a commission, etc. Learning knowledge, strengthening skills ,and competences in the study programme include theories, tools, practical examples, lectures, group assignments, interactive discussions and guest lecturers from the industry. The methods used by the teaching staff of the study programme are different, but interactive learning methods prevail, which promote active and informed participation of students in the study process. Practical experience of teaching staff in companies and projects of the ICT sector ensures synergy of theoretical knowledge and practical experience, which fully ensures the achievement of study results and study objectives by using diverse teaching methodologies.

The study program is implemented as a full-time study program, therefore the main methods for implementation of study courses are work in contact hours under the guidance of a lecturer and independent work outside class time. The course work is mainly in lectures and practical classes. Independent work is expected to take the form of work at home, in the laboratory and in the library (both physical and electronic).

Lectures use both traditional form, with the lecturer presenting and explaining the topic, and interactive form, with students participating as active participants. Flipped classroom elements are used in courses where problems have been identified during the programme that students regularly encounter time-consuming issues in completing practical work. This approach allows students to learn the theoretical material at home, while the face-to-face sessions focus on practical problem-

solving based on previously independently learned theory. This approach is used in several study courses, such as Scientific research methodology 2CP and Information system testing and cyber security 2CP.

During practical classes, students solve tasks related to the course of study. The work in the practical classes mostly contributes to the results of the skills and competences sections. Practical classes are an essential part of every compulsory course in this study programme, as well as most optional courses.

Group projects are an essential aspect of preparing students for today's labour market. Working in a team with others helps students understand and improve their professional communication skills and practice reasoned debate and compromise. There is a significant amount of group work, for example, in Information Systems Project Management (4 CP), where the whole course is based on the immediate application of theory in the development of the relevant component of the group project.

Individual work, research, analysis and presentation of scientific achievements are essential for achieving the results of the study programme. As a preparatory phase for the master's thesis, in the penultimate semester of the study programme there is the development of a Research project in computer science (8CP), which involves researching literature, preparing a methodology for the master's thesis and preparing a poster about the thesis, results and conclusions, which is then presented in front of a commission of fellow students and lecturers.

In many subjects, in order to respect the diversity of student contingent and their needs, the initial knowledge and skills of the students are usually identified at the start of study courses, followed by a discussion on how the course will benefit individual students and how subject learning pathways can be optimised. If a student has practised a topic to be looked at in theory, it is not productive to ask them to do it again from the basics. If a student can demonstrate that they have mastered some of the elements required in the course, they may be assessed differently from the course description, subject to agreement between the student, the teaching staff (and, if appropriate, the programme director).

Descriptions of study courses are published in the Moodle section of the relevant study course, and students are informed of more detailed criteria for obtaining study course grades at the beginning of the semester. The principles of student-centred education are taken into account in the implementation of the whole study process. Students can participate in the improvement of the study process directly (personally) by expressing their wishes to the teaching staff of the study course, the director of the study programme, the dean, specialists of the study department or to apply with the assistance of the Student Council, the representatives of which are in the Council of Study Programs, the Faculty Council and the Senate. For administrative matters, students have the opportunity to meet with the programme director and the dean in order to address individual issues. In problematic situations, students are invited to a meeting with the dean of the faculty. Student meetings with the director of the study programme are organised at least once a semester, to discuss and debate current issues. This ensures maximum quality of the study process and prompt response to information provided by students.

The principles of student-centred education can be summarised and are implemented in the study program as follows:

- Teaching staff of study courses take into account and respect the diversity of students and their needs using different ways of delivering the programme, according to students' capabilities;
- mutual respect among the teaching staff and students is promoted in their relations, creating

a positive emotional background and creative cooperation;
- study courses are acquired in the process of cooperation among students and teachers, where different teaching methods and forms of work are applied according to the situation;
- promoting students' independence by offering them learning methods where they can demonstrate their knowledge and skills individually or in groups;
- pedagogical methods, forms of teaching, learning and assessment are regularly evaluated;
- examination work, evaluation criteria and methods, as well as the assessment criteria are made public in advance and are placed in the “Moodle” together with the course description and discussed in class;
- students receive feedback and, if necessary, support from the teaching staff to improve their learning process and students can apply for individual counselling;
- assessment gives students the opportunity to demonstrate the extent to which they have achieved the expected learning results;
- assessment is carried out in accordance with the requirements laid down by the university of higher education, it consistent, fair and applicable to all students;
- The university has a student appeals procedure.

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

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

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

During the reporting period the following master's theses were developed and presented in the study programme:

1. Face feature recognition and tracking in RGBD cameras using machine learning (2017)
2. Simultaneous Localization and Mapping for autonomous mobile robots (2017)
3. Number detection and recognition on player jerseys (2017)
4. 3D modeling of indoor environments using RGB-D camera (2017)

5. Automated pedestrian flow analysis using data from surveillance cameras (2017)
6. Land cover classification using remote sensing data (2017)
7. Effective Diffusion Coefficient in Two-Dimensional Discrete Case (2018)
8. Human flow analysis using Convolutional Neural Networks (2018)
9. Video television quality research in packet networks (2018)
10. Latvian language academic writings abstract analysis automation possibilities for purpose of corpus linguistics (2019)
11. Development of augmented reality mobile application: Virtual information board (2019)
12. Multichannel approaches for EEG processing using Deep Learning (2019)
13. Land cover classification using multisource remote sensing data (2020)
14. Development of an electronic door access systems prototype with multi-factor authentication and analysis of authentication methods (2020)
15. Development of Automated LOFAR Data Processing System and Automated Data Analysis System (2020)
16. Automated building plane detection using LIDAR data processing (2021)
17. Detection and classification of open soil in Sentinel-2 time series (2022)
18. Improvements of weak radio signal processing methodology, using Karhunen–Loève transformation, Singular Spectrum Analysis and machine learning algorithms (2022)
19. Car's CAN bus message reading and data retrieval for real time monitoring and data statistical indicator analysis (2022)
20. Development of an interface for secure data transmission and comparison of the applied cryptographic algorithms (2022)

Most master's thesis topics could be divided into the following categories (current in industry and labour market):

- machine learning (both theoretical development and practical applications);
- computer vision applications;
- remote sensing;
- data processing and analysis solutions.

More than half of the 20 listed master thesis are done as a direct assignment of an enterprise or scientific institution, thus indirectly showing both the topicality in both the field and labour market.

The topics of the final thesis are chosen by the students in consultation with their research supervisors. These topics are usually related to research projects that students have been involved in during their studies, or for students who have started their careers, they relate their topic to current developments in their workplace.

The average evaluation during the reporting period is 7.1 points, with three students obtaining the maximum evaluation of excellent (10 points), see table 3.4. for a more detailed overview.

3.4. tabula

Study programme "Computer Science" master's thesis evaluation by year

	Evaluation in points								
	4	5	6	7	8	9	10		
Academic year	(almost mediocre)	(mediocre)	(almost good)	(good)	(very good)	(excellent)	(outstanding)	Number of graduates	Average mark
2016./2017.	0	0	1	0	2	1	2	6	8,50

2017./2018.	1	0	1	0	1	0	0	3	6,00
2018./2019.	0	0	2	1	0	0	0	3	6,33
2019./2020.	0	1	1	0	1	0	0	3	6,33
2020./2021.	0	0	0	1	0	0	0	1	7,00
2021./2022.	1	0	1	0	1	0	1	4	7,00
Total	2	1	6	2	5	1	3	20	7,10
% of total	10,00%	5,00%	30,00%	10,00%	25,00%	5,00%	15,00%		

3.3. Resources and Provision of the Study Programme

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

In addition to the information provided in Part II, Chapter 3, Sections 2.3.1 to 2.3.3, it is important to mention the recently established Machine Learning and Computer Vision Laboratory, which is essentially a computer class with high performance computers designed to handle large amounts of data. In this laboratory, students use computers both in classes (for example, processing satellite images that covers several hundred megabytes, or teaching a network of neurons that requires graphics processing unit (GPU) with multiple gigabytes of internal memory) and for their final projects, especially if they involve teaching a network of neurons or solving computer vision problems.

There is a wide range of electronic databases available providing access to publications and thus the necessary information on scientific developments and the newest discoveries in the fields.

During the preparation of master’s thesis, students have to familiarize themselves with the latest peer-reviewed publications about the state of the are in the subfield of the problem, therefore, the access to electronic databases is of importance. In study courses, where students need to process satellite images, high performance computers are essential. In study courses where students are learning practical aspects of machine learning, high performance computers are essential. In study course “Computer Aided Design” high performance computers are essential. Technical equipment of VUAS provides such access, thus allowing students to carry out their practical assignments and achieve the achievable results of the study programme by applying their theoretical knowledge also in practice.

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

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

VUAS includes the costs with direct impact for the implementation of the study program or attributing them proportionally to the number of the students in the program when analysing the financing needed or financing received for a particular study program. **Income** includes the State budget funding for study process (1630.11 EUR per each state funded study place, corrected by the study program (study costs) coefficient and by the study level coefficient, plus the state budget funding for scholarships and social needs for students 164.34 EUR per each state funded study place), as well as income from tuition fees (calculated separately for each study program). The financing allocated by the Ventspils City Municipality for supporting the study process and for the Ventspils City Municipality IT sector scholarships according to the agreement between the VUAS and the Municipality is included as income, too, calculated proportional to the number of students in the program. **Costs** are allocated as follows:

- There is a centralized 26% deduction from income of each faculty from State budget funding and from tuition fees, allocated to finance the common running costs of the VUAS;
- There is a proportional part of total common running costs of the faculty or other common costs of the particular faculty allocated to the costs of the study program proportional to the number of the students in the program.

The 26% deduction from the income of each faculty for the common running costs of the VUAS is used for:

- utility costs – electricity, heating, water and sanitation, waste disposal services;
- maintenance of premises and buildings;
- services for maintenance of IT systems;
- marketing costs;
- representation costs;
- partly remuneration of the administrative staff of the VUAS;
- common tax payments of the institution etc.

Direct costs of the faculty, which are necessary and can be identified as expenses by the particular faculty, are divided among the study programs proportionally to the number of students in these study programs. Expenses which are planned, incurred and can be identified for a particular study program, are included in the costs of this study program. These expenses include remuneration of the academic staff and general staff of the faculty, social security payments, insurance costs, as well as expenses for fixed assets, purchase of inventory, books, learning aid, maintenance of laboratory equipment and computer classes and other faculty expenses.

Both income and costs are calculated per each student, too, separately for every study program (for one calendar year usually), as well as the percentage of each cost group of the total costs of the study program is determined.

To calculate **the break-even point** of the study program, it is possible to use several methods – to increase the number of students in the study program, to increase the state subsidy for each study place or to increase tuition fees for paying students. VUAS is using the first method – to model the number of students necessary to break even. The VUAS is not trying to increase tuition fees in the existing economic situation and taking into account the financial situation of the local population, but is investing resources in marketing efforts to attract more students. We wish to point to the need to increase the government funding for university studies in the future, too.

Academic master study program **"Computer Science"**

Director of the program assist. prof. Vairis Caune

The study program (study costs) coefficient **1.5**; the study level coefficient **1.5**

No.	**Item**	**Actual situation**				**Break-even point**		
		No of students	Amount, EUR	*Percentage distribution*	*Per 1 student (per year)*	Costs (EUR)	Per one student (per year, EUR)	*Number of students in the program*
	2	3	4		5	6	7	8
	INCOME	**7***	**31 307**	***100%***	***4 472,45***		**4 472**	
1.	State funding for studies	7	25 674	*82,0%*	*3 667,75*			
2.	State funding for scholarships	7	1 150	*3,7%*	*164,34*			
3.	Tuition fees		645	*2,1%*	*92,14*			
4.	Funding from Municipality for studies		3 146	*10,0%*	*449,48*			
5.	Funding from Municipality for scholarships		691	*2,2%*	*98,74*			
	COSTS	**7**	**51 449**	***100%***	***7 349,80***	**51 449**		***12***

6.	Academic staff remuneration	7	41 318	*80,3%*	*5902,57*			
7.	General staff remuneration	7	239	*0,5%*	*34,14*			
8.	Scholarships and social costs	7	1 842	*3,6%*	*263,08*			
9.	Running costs, Utilities, Administration costs (26%)	7	6 843	*13,3%*	*977,57*			
10.	Materials, books, equipment	7	1 207	*2,3%*	*172,43*			
	Financial result:	**7**	**-20 141**	***-39%***	***-2 877,35***			

**Number of students in the program 7 (01.10.2022.).*

There are on average 7 students in the academic master program “Computer Science”, which is 3.6 % of the total number of students in the Faculty of Information Technology. The same proportion is used to calculate the funding from the Municipality for this program. The same proportion of 3,6% is used to split the total costs of the faculty to this program.

There would be needed 12 students in this program to reach the break-even point (condition – costs not changing). Alternatively, a 50% rise in the state budget funding per study place would be needed. Taking into account that the VUAS will have to increase the costs in the future, the growth of the state budget funding is imminent anyhow. The financial losses of the academic master study program “Computer Science” have been covered from the positive cash flow of other study programs within this study field.

The development of the academic master study program “Computer Science” has been supported financially from the ESF projects during the years 2018 – 2022. The project “Modernization of Ventspils University of Applied Sciences’ STEM teaching programs” (No. 8.1.1.0/17/I/007) financed new laboratory equipment, new computer classes and improvement of premises in total for 1.77 million EUR. The projects “Strengthening the Academic Staff of Ventspils University of Applied Sciences in the Fields of Strategic Specialization” (Project No: 8.2.2.0/18/A/009), “Improving Quality of the Content of Study Programs at Ventspils University of Applied Sciences, Improving Resource Efficiency and Ensuring Better Management” (Project No: 8.2.3.0/18/A/014) and “Next Generation Micro Cities of Europe” (No.UIA03-250) have contributed to the qualifications of the academic staff of the program. As the laboratories and computer classes installed are used by all programs of this study field and by other faculties, too, and the academic staff is teaching in several study programs, it is not possible to separate the exact financial contribution of the projects mentioned to the development of this study program. As investments from the projects mentioned above were used to finance the development of the study infrastructure, instead of the Faculty budget for 2022, there will be a need to use, in the upcoming years, the VUAS own budget to maintain computer

classes and acquire new equipment after 2023.

The sources of funding for the study field as a whole are listed in section 2.3.1. A direct cost calculation is made for each programme. Taking into account the costs directly influential for the implementation of the study program (described in more detail in Chapter 2.3.1), it is estimated that on average (taking into account each semester, the amount of traineeships and the semester in which a final thesis is to be delivered), EUR 29,320 is spent on the remuneration of the teaching staff, together with the remuneration of the director of the study programme, and the costs of final examinations (including the remuneration of thesis supervisors, reviewers and members of the examination commission), costs up to EUR 33,432. Plus the Mandatory State Social Contributions (EUR 7886.61), a cost of EUR 41,318.61 is reached. Taking into account that the State budget funds per one study place in the program (taking into account the sector and level coefficient) are EUR 3297.98 per one study place, it is calculated that the program needs at least 13 students to cover its own costs. The total number of students is around this figure, but additional work is needed to attract students to keep the number above 13.

3.4. Teaching Staff

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

The implementation of the academic master's study programme of "Computer Science" is carried out by highly qualified academic staff, who provide students with the necessary research skills, theoretical and practical knowledge, skills and competences (see table 3.5.).

Table 3.5.

Academic staff of Master's study programme "Computer Science"

No.	Name, Surname	Scientiffic degree, qualification	Academic position	Study courses tought
1.	Sergejs Hiļķevičs	Dr.phys.	Professor	Crisis Management
2.	Una Libkovska	Dr. sc. admin.	Professor	Economic Process Analysis
3.	Gaļina Hiļķeviča	Dr.math.	Associate Professor	Selected Topics of Mathematics
4.	Jānis Hofmanis	Dr.sc.comp.	Associate Professor	Methods of Mathematical Modeling

5.	Raita Rollande	Dr.sc.ing.	Associate Professor	Information Systems Project Management
6.	Ēvalds Urtāns	Ph.D.sc.comp.	Docent	Full-stack Mobile App Developement Introduction in Deep Learning Software Design Patterns
7.	Juris Freimanis	Dr.phys.	Docent	Probability and Statistics in Computer Science
8.	Linda Gulbe	Ph.D.sc.comp.	Docent	Digital Image Processing Methods of Interpretation and Classification I Methods of Interpretation and Classification II Scientific Research Methodology
9.	Vairis Caune	Dr.sc.comp.	Docent	Information Theory and Cryptography Biomedical Signal Processing Parallel Computing Research Project Developement in Computer Science
10.	Juris Roberts Kalniņš	Dr.habil. phys.	Guest professor	Information Theory and Cryptography
11.	Juris Žagars	Dr.habil. phys.	Guest associate professor	Fundamentals of Remote Sensing Satellite Navigation Methods
12.	Aleksejs Klokovs	Dr.sc.ing.	Guest docent	Computer Aided Design
13.	Artūrs Stepčenko	Dr.sc. ing.	Guest docent	Probability and Statistics in Computer Science
14.	Mārtiņš Saulītis	Mg. sc. comp.	Guest lecturer	Information Systems Testing and Cyber Security
15.	Pēteris Lauriņš	Mg.oec.	Guest lecturer	Information Systems Project Management

The high qualification of the teaching staff involved in the implementation of the study programme ensures the achievement of the objectives and study results of the study programme, i.e. it ensures a qualitative synergy of research skills, theoretical knowledge, abilities and competences.

Most of the teaching staff involved in the study program have PhDs. Two exceptions are Mārtiņš Saulītis and Pēteris Lauriņš, who have master's degrees, but their years of experience (in large companies and projects) are an important added value in transferring practical skills and experience to students. Mārtiņš Saulītis has more than 5 years of work experience in various companies, including IBM, as a specialist whose direct responsibilities were and are the tasks that are taught to the student in the course he teaches. Pēteris Lauriņš has more than 5 years of work experience in various companies, including Accenture, as a specialist whose direct responsibilities were and are tasks directly related to the subject he teaches.

The language skills of the teaching staff of the academic master's study program “Computer Science” comply with the Cabinet of Ministers Regulation No. 733 of 2009, “Regulations on the extent of knowledge of the official language and the procedure for examining the proficiency in the official language for the performance of professional and official duties”. Information on the foreign

language skills of the lecturers is summarised in the lecturers' curriculum vitae attached in the annex.

The attachment in the annex contains a statement that the academic staff of the academic study program meets the requirements set out in the third paragraph of Article 55 (1) of the Law on Higher Education

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

Changes in the teaching staff during the reporting period:

- The “Information system testing and cyber security” study course was delivered in 2017 by TestDevLab representatives Ervīns Grīnfelds and Andrejs Frišfelds. Currently this course is taught by Mārtiņš Saulītis. The focus of the subject has changed from pure systems testing to the cyber security aspect. Given the current relevance of cyber security, these changes have continued to make the study program offer relevant;
- The “Parallel computing” study course was taught by Jānis Hofmanis and Vairis Caune in 2017, but it has been completely taken over by Vairis Caune from 2019;
- “Probability theory and statistics in computer sciences” was taught by Gundars Bergmanis-Korāts in 2017 and Artūrs Stepčenko after 2018;
- The "Introduction to machine learning" course was taught by Gundars Bergmanis-Korāts in 2017, Agris Traškovs in 2018-2020, Juris Kļonovs in 2020 and Ēvalds Urtāns in 2021-2022. There has been a high turnover of lecturers for this subject, due to both staff turnover and the fact that the lecturer chosen for the subject was the person who was considered to be the most competent machine learning teacher available at the time. Ēvalds Urtāns has been elected to the ITF as a docent and hopefully this course instructor's position will become more constant;
- The “Medical signal processing” study course was taught by Gundars Bergmanis-Korāts in 2017, but Vairis Caune began teaching in 2019;
- The “Java design templates” study course was taught by Jānis Hofmanis in 2017, but the results to be achieved in this course are now provided by a revised study course called “Software development templates,” currently taught by Ēvalds Urtāns.
- The study program offer has been supplemented from 2020 by the Part B compulsory option course “Computer aided design”, which is taught by Aleksejs Klokovs. Aleksejs Klokovs is a specialist in this field and his professional experience is appreciated by students.
- The study program offer has been supplemented from 2022 by part B compulsory option courses “Crisis management,” which is taught by Sergejs Hiļķevičs and “Analysis of economic processes,” which is taught by Una Libkovska. These courses are set out in Part B to enable students to choose study courses that link economic processes and their analysis with information technologies and may then offer designs or concepts for high value added information systems to solve problems.

In summary, the main changes are related to reduction of the workload of Jānis Hofmanis and Gundars Bergmanis-Korāts in the provision of study courses of this study programme and the attraction of new teachers, ensuring both academic renewal and necessary conditions and compliance with the requirements of regulatory enactments. It is worth mentioning that attracting Ēvalds Urtāns to the implementation of this study programme is a step in the right direction - his

theoretical and practical academic knowledge combined with strong scientific activities is a significant contribution to maintaining the quality of this programme. The changes have introduced bigger proportion of study courses that are thought by professionals that are also working in their respective fields, hence improving the quality of studies.

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

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

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

The most important criteria for the selection of academic staff are scientific and professional competence, which potentially ensures successful cooperation among the teaching staff.

Cooperation between teaching staff in the study programme is promoted through both formal and informal events organised by the VUAS. Teaching staff from different faculties are involved in the implementation of the study process, which provides a variety of experiences and promotes professional development.

The success of the cooperation among the study programme's faculty members can be seen in a number of activities:

- Interdisciplinary cooperation of academic staff – for example, teaching staff of different fields are involved and employed in the study programme, and can share their experience and

discuss topical issues at organised meetings of the Council of Study Programs, Faculty Council meetings, seminars, meetings with employers, etc.

- Collective scientific activities of academic staff – for example, the teaching staff involved in the study programme is developing collective scientific publications which indicate both interdisciplinary cooperation and research and collective activities in related scientific fields. For example, a collective publication by L. Gulbe, G. Korāts and V. Caune.
- Cooperation of lecturers in the development of the study programme content - when developing and improving the study program content, the teaching staff carefully follow the thematic division included in the study course, coordinating among themselves the thematic areas and the evaluation mechanism of study results.
- Collaboration among the teaching and the support staff - for example, the Covid-19 pandemic led to a national state of emergency, which prioritised new models of collaboration and forms of implementation. The cooperation between teaching staff and IT specialists became particularly important for the implementation of the study programme, ensuring complete remote studies. The study process is carried out remotely, mainly through the BBB (BigBlueButton) platform, etc. However, study materials and all information regarding the organisation and procedures of the study process are available on the e-learning platform "Moodle". (This was also done previously, but it was particularly important during the pandemic period and any deviation from that point was identified and rectified.)
- Teacher-student cooperation – for example, the study program involves highly qualified and competent teaching staff who provide students with necessary research skills, theoretical knowledge, abilities and competences. The teaching staff carry out scientific research activities in parallel with the study process, which also involves students, thus ensuring cooperation among lecturers and students. As a result of cooperation, students have the opportunity to present their research thesis at annual scientific conferences of VUAS and other universities. For example, a collective publication by lecturer Ēvalds Urtāns and student Kristofers Volkovs.
- Informal cooperation and communication among teaching staff - various activities are organised at the VUAS' FoIT to promote teacher communication in an informal setting. One example is weekly coffee breaks, during which the lecturers discuss current issues in an informal atmosphere and share their experiences in solving various problems.

In addition, study programme's staff are invited to participate in organised professional development and methodological seminars, courses and discussions. In the process of implementation of the study programme, there is close cooperation among the teaching staff, for example, discussion of the quality of final theses at meetings organised by the faculty, discussing evaluation criteria and ways of improving the quality of final theses. Teaching staff are also involved in peer-to-peer teaching, where pedagogical approaches and teaching methods are discussed afterwards. All the proposed measures are aimed at promoting cooperation among the teaching staff, which would ensure the interconnection of study courses, research topics.

There are currently 15 students in the programme. A total of 15 teaching staff are involved in teaching the study programme. Therefore, the ratio of students to teaching staff within the study programme (at the time of submission of the self-assessment report) is calculated formally as 1:1. However, it should be noted that since the first year student is currently studying on an individual plan and the amount of credit points for optional study courses exceeds the total number of credit points to be earned (accordingly, all teaching staff will never participate in the entire student training process), it would be more illustrative to look at the ratio of the lecturers currently teaching to the number of students. This ratio is currently 1.667:1, or there is one teacher per 1.67 students.

Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	4-1_appendix_D-DS_ENG.pdf	4-1_pielikums_D-DP_LV.pdf
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)	CHE_recognition.pdf	AIP_atzinums.pdf
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period	4-2_appendix_statistics-on-students.pdf	4-2_pielikums_statistika-par-studejosajiem.pdf
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard	4-3_Appendix_Atbilstiba-valsts-izglitibas-standartam-ITM.docx.pdf	4-3_pielikums_Atbilstiba-valsts-izglitibas-standartam-ITM.docx.pdf
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)		
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	4-4_appendix_programe_mapping.xlsx	4-4_pielikums_programmas-kartejums_precizēts.xlsx
The curriculum of the study programme (for each type and form of the implementation of the study programme)	4-5_appendix_study_programme_plan.docx.pdf	4-5_pielikums_ITM_Studiju-programmas-plans.docx.pdf
Descriptions of the study courses/ modules	4_6_Appendix__Kursu apraksti_ENG.pdf	4-6_pielikums_Kursu apraksti_LV.pdf
Description of the organisation of the internship of the students (if applicable)		
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)	4-7_appendix_declaration-compliance-to-law-on-higher-education-institutuions-55-sect.pdf	4-7_pielikums_aplicinajums_atbilstiba-AL-55p-prasibam.pdf

Electronics (47523)

Study field	*Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science*
ProcedureStudyProgram.Name	*Electronics*
Education classification code	*47523*
Type of the study programme	*Professional master study programme*
Name of the study programme director	*Jānis*
Surname of the study programme director	*Šate*
E-mail of the study programme director	*janis.sate@venta.lv*
Title of the study programme director	*Mg.sc.ing.*
Phone of the study programme director	
Goal of the study programme	*To train highly qualified leading electronic engineers who are capable not only of developing complex electronic equipment and systems, but also of planning, organising and supervising the development process of such equipment and systems, and of formulating and researching complex scientific and professional problems independently.*

Tasks of the study programme	*The objectives of the study programme are:* *- to prepare competitive leading electronics engineers for practical work in technology design, development and production;* *- to ensure the achievement of study outcomes (knowledge, skills and competences) in accordance with the knowledge, skills and competences at level 7 of the European Qualifications Framework as defined in the Latvian Classification of Education;* *- to ensure the successful acquisition of professional knowledge, skills and competences in line with the professional standard for a leading electronics engineer;* *- to encourage students to learn independently and creatively, and to evaluate and apply new developments in electronics;* *- to develop students' analytical skills, independent problem-solving skills, and encourage their involvement in practical and scientific problem-solving;* *- to develop students' general skills and competences, promoting the development of communicative and digital skills, analytical and critical thinking, creativity, civic responsibility, the ability to successfully manage oneself and work in a team, to take responsibility for performance, ensuring the growth of a successful personality;* *- to cooperate with other universities, institutions, organisations and employers, attracting highly qualified and professional teaching staff to ensure training that meets modern requirements;* *- to provide a study process with modern teaching laboratory equipment, as well as to give students the opportunity to practice solving real scientific and technical problems by involving them in the work of electronics companies during their internship;* *- to modify the content and presentation methods of the programme in a timely manner in response to changes in the labour market and predict changes in the near and distant future.*
Results of the study programme	*Study programe results:* *- able to design electronic equipment and systems of high complexity;* *- able to manage research and development projects;* *- able to monitor, manage and optimize the production of electronic equipment and systems;* *- able to carry out scientific research;* *- able to carry out the general tasks of pursuing a professional activity;* *- understanding and knowledge in electronics engineering in line with the theoretical orientations of this field and the latest findings.*
Final examination upon the completion of the study programme	*Master's thesis*

Study programme forms

Full time studies - 2 years - latvian

Study type and form	*Full time studies*

Duration in full years	*2*
Duration in month	*0*
Language	*latvian*
Amount (CP)	*80*
Admission requirements (in English)	*Academic Bachelor of Engineering in electronics, telecommunications or related engineering specialty*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Professional Master's degree in Electronics*
Qualification to be obtained (in english)	*Lead Electronics Engineer*

Places of implementation

Place name	City	Address
Ventspils University College	VENTSPILS	INŽENIERU IELA 101, VENTSPILS, LV-3601

Full time studies - 1 years - latvian

Study type and form	*Full time studies*
Duration in full years	*1*
Duration in month	*0*
Language	*latvian*
Amount (CP)	*40*
Admission requirements (in English)	*Professional Bachelor of Engineering in electronics, telecommunications or related engineering specialty*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Professional Master's degree in Electronics*
Qualification to be obtained (in english)	*Lead Electronics Engineer*

Places of implementation

Place name	City	Address
Ventspils University College	VENTSPILS	INŽENIERU IELA 101, VENTSPILS, LV-3601

3.1. Indicators Describing the Study Programme

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

Since the previous accreditation of the study field, a number of changes have been made to the study programme based on the following reasons:

1. Expert recommendations from the previous accreditation of the field of study;
2. New professional standard "Lead Electronics Engineer" PS-143 (approved at the meeting of the Tripartite Cooperation sub-council of Vocational Education and Employment on August 12, 2020, protocol No 6. Professional standards and programs | Valsts izglītības satura centrs (visc.gov.lv) (seen 24.02.2023.)) for master's level;
3. Harmonisation of the study programme content with the professional bachelor study programme "Electronics Engineering".

The following changes were made:

1. An additional option of 1 year 40CP (full-time) has been introduced for the implementation and duration of the study programme;
2. The admission conditions for the study programme have been updated to take account of the addition of an implementation option:
    1. admission to the 80CP programme requires a Bachelor's degree in electronics, telecommunications or a related electrical engineering specialisation;
    2. admission to the 40-CP programme requires a professional bachelor's degree in electronics, telecommunications or a related electrical engineering specialisation.
3. The qualification to be awarded has changed from "Electronics Engineer" to "Lead Electronics Engineer";
4. The content and title of the study course "Devices for transmitting and receiving of radio signals" (4 CP) has been changed to the study course "Satellite communication systems" (4 CP);
5. The study course "Antenna Engineering" (4 CP) is replaced by the study course "Heterogeneous Computing Systems" (4 CP);
6. Course "Data Conversion Methods and Circuits" has been withdrawn from the study programme;
7. The course "Signal Transmission in Optical Systems" (4 CP) has been withdrawn from the study programme;
8. The content, title and scope of the study course "Project and Innovation Management" (2 CP) have been updated and changed to the study course "Project management for electronics engineering" (4 CP);
9. Study course "Teaching methods" (2 CP), replaced by study course "Communication skills" (3 CP);
10. The course "Programming of ARM architecture microcontrollers” (3 CP) has been added to the study programme to give students the possibility to choose between this course and the

course "Introduction to LabVIEW and its applications in electronics" (3 CP);

11. The study courses "Embedded Operating Systems" (3 CP), "Programmable Integrated Circuits" (4 CP) and "Electronics Engineering Research Project" (3 CP) have been added to the study programme.
12. The internship included in the study programme, which is carried out in the amount of 6 CP, has changed its name from "Internship" to "Professional Internship".

The changes in the study programme have been reviewed and approved at the meeting of the Council of Engineering Study Programmes of the FoIT (14.12.2022.), FoIT Council meeting (19.12.2022.), as well as VUAS Senate meeting (20.12.2022.).

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

Graduates of the Professional Master's study programme "Electronics" obtain the Professional Master's degree in Electronics and the professional qualification "Lead Electronics Engineer" in accordance with the professional standard "Lead Electronics Engineer". The professional standard PS-143 was approved by the Tripartite Cooperation sub-council of Vocational Education and Employment on August 12, 2020, protocol No 6. Professional standards and programs | Valsts izglītības satura centrs (visc.gov.lv) (seen 24.02.2023.).

The title of the study programme corresponds to the qualification to be awarded to graduates of the study programme, as well as to the branch of science "Electrical engineering, electronics, information and communication technologies" of the group "Engineering and technology" of the Latvian branch of science "Electrical engineering, electronics, information and communication technologies".

The professional master study program “Electronics engineering” corresponds to the study field “Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science”. The Cabinet of Ministers regulation No. 793 from 11.12.2018. “Regulation Regarding Opening and Accreditation of Study Fields”, Annex 1, defines study fields in higher education in the Republic of Latvia, among them as No. 17 the study field “Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science”, but the regulation does not specify study programs within this study field. One has to analyze other documents therefore. The “UNESCO International Standard CLASSIFICATION OF EDUCATION, Fields of education and training 2013 (ISCED-F 2013) – Detailed field descriptions”

(http://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-fields-of-education-and-training-2013-detailed-field-descriptions-2015-en.pdf, seen 21.02.2023.) includes the studies in planning, designing, developing, maintaining and monitoring electronic equipment, machinery and systems under the ISCED code 0714 “Electronics and automation”,

which is subcode of the code 071 “Engineering and engineering trades”. The Cabinet of Ministers regulation No. 322 (approved 13.06.2017.) “Regulation on the classification of the Latvian education system” (Latvian only) refers to the ISCED-F 2013, and determines the Latvian higher education system code 523 (third, fourth and fifth levels) as corresponding to the ISCED-F code 0714. The VUAS professional master study program “Electronics” has the code 42523. Correspondence of this study program to the ISCED-F study field code 0714 is determined by the large proportion of theoretical and professional field study courses, like embedded systems, telecommunication, microwave and radiofrequency devices, “Satellite communication systems”, “Radiofrequency and microwave devices” in the content of this study program.

Analysis of the interrelation between the name of the study program, code of the study program, the degree, professional qualification to be acquired, the aims, objectives, learning outcomes, and the admission requirements

The professional master study program “Electronics” was designed to educate high qualification electronics engineers (lead engineers) for the production and research sectors of the electronics industry. The tasks, knowledge, skills and competencies of lead electronics engineers are determined by the professional standard PS-143 “Lead Electronics Engineer” (approved by the Tripartite Cooperation sub-council of Vocational Education and Employment on August 12, 2020, protocol No 6. Professional standards and programs | Valsts izglītības satura centrs (visc.gov.lv) (seen 24.02.2023.). The standard PS-143 declares that the professional qualification of the lead electronics engineer should correspond to the fifth level of the professional qualification framework (PQF 5) and to the seventh level of Latvian Qualification Framework (LQF 7). The Cabinet of Ministers regulation No. 322 (approved 13.06.2017.) “Regulation on the classification of the Latvian education system” (Latvian only), Annex 1, determine that the LQF 7 education can be obtained as the second level professional higher education obtaining a professional master degree and a professional qualification of level 5 (PQF 5), and can be implemented after obtaining a professional bachelor degree or the fifth level professional qualification. The code 47 (the first and the second digit of the second classification level) is assigned to this type of master study program by the LQF. The Cabinet of Ministers regulation No 322 determines the length of full time studies at least one year and the total length of full time studies 5 years. Based on this two forms of the study program were designed – one year full time studies with the admission requirement – professional bachelor in engineering (the total length of full time studies 5 years) and the other form – two years with the admission requirement – academic bachelor in engineering, securing the total length of full time studies 5 years, too. The interrelation of the name of the study program “Electronics” to the third - fifth levels “523” (and to the full code of the program 42523) is determined by the Annex 2 of the Cabinet of Ministers regulation No. 322 which lists under this code the study programs corresponding to the code 0714 Electronics and Automation of the ISCED-F 2013. The requirements to the tasks, knowledge, skills and competencies of lead electronics engineers determined by the professional standard PS-143 are directly transformed to the aims, objectives and study results of the master study program “Electronics”, and are described in detail below in this chapter.

The content and delivery of the study programme correspond to code 47523. The first part of the code (47) indicates that the study programme provides second-level professional higher education (level 5 professional qualification and professional master's degree) and follows a bachelor, professional bachelor or level 5 professional qualification. The second part of the code (523) indicates that the content and implementation of the study programme corresponds to the "Electronics and Automation" group of educational programmes in the field of engineering and technology.

Duration of full-time studies 1 year if the student has previously obtained a professional bachelor's degree in electronics, telecommunications or a related electrical engineering specialisation, 2 years

if student has previously obtained an academic bachelor's degree in electronics, telecommunications or a related electrical engineering specialisation (total duration of studies is 5 years).

Aims and objectives of the programme:

The aim, objectives and study outcomes of the Professional Master's study programme "Electronics" are defined in accordance with:

- the national classification framework corresponding to the European Qualifications Framework, as laid down in Cabinet of Ministers' Regulation No 322 "Regulations on the Classification of Latvian Education". The Master's study programme corresponds to LCI level 7, its study outcomes are defined in accordance with the descriptions of knowledge, skills and competences corresponding to level 7;
- the requirements of the professional qualification level 5 professional standard "Lead Electronics Engineer", ensuring that the content of the study programme that corresponds to the professional standard correlates with the aims, objectives and study outcomes defined for the study programme.
- the balance between the general study courses, the theoretical core courses and the information technology courses and the professional specialisation courses provided for in the Cabinet of Ministers' Regulation No 512 "Regulations on the State Standard for Second Level Professional Higher Education".

The **aim** of the the programme is to train highly qualified leading electronic engineers who are capable not only of developing complex electronic equipment and systems, but also of planning, organising and supervising the development process of such equipment and systems, and of formulating and researching complex scientific and professional problems independently.

The aim of the study programme is divided into **strategic** and **specific** objectives.

The **strategic objectives** of the study programme are:

- to achieve the study outcomes specified in the study programme in accordance with the description of knowledge, skills and competences at level 7 of the European Qualifications Framework (EQF) as defined in the Latvian Classification of Education;
- to provide professional studies that meet the needs of the economy and society, are based on the theoretical foundations of the sciences and are applicable in practice;
- to provide training of specialists in in-demand specialties for private economic structures in Latvia and other EU Member States who are competitive on the labour market.

The **specific** objectives of the programme are:

- to train highly qualified leading electronic engineers who are capable not only of developing complex electronic equipment and systems, but also of planning, organising and supervising the development of such equipment and systems, and of formulating and researching complex scientific and professional problems independently.
- to equip young professionals with sufficient knowledge and skills to integrate knowledge from different fields in the electronics sector, creating new processes, technologies and contributing to the development of research, and to carry out successful professional development through a variety of self-learning opportunities.

The **objectives** of the study programme are:

- to prepare competitive leading electronics engineers for practical work in technology design, development and production;

- to ensure the achievement of study outcomes (knowledge, skills and competences) in accordance with the knowledge, skills and competences at level 7 of the European Qualifications Framework as defined in the Latvian Classification of Education;
- to ensure the successful acquisition of professional knowledge, skills and competences in line with the professional standard for a leading electronics engineer;
- to encourage students to learn independently and creatively, and to evaluate and apply new developments in electronics;
- to develop students' analytical skills, independent problem-solving skills, and encourage their involvement in practical and scientific problem-solving;
- to develop students' general skills and competences, promoting the development of communicative and digital skills, analytical and critical thinking, creativity, civic responsibility, the ability to successfully manage oneself and work in a team, to take responsibility for performance, ensuring the growth of a successful personality;
- to cooperate with other universities, institutions, organisations and employers, attracting highly qualified and professional teaching staff to ensure training that meets modern requirements;
- to provide a study process with modern teaching laboratory equipment, as well as to give students the opportunity to practice solving real scientific and technical problems by involving them in the work of electronics companies during their internship;
- modify the content and presentation methods of the programme in a timely manner in response to changes in the labour market and predict changes in the near and distant future.

Study outcomes of the study programme

In addition to the knowledge acquired at the bachelor's study level, students of the professional master's study programme "Electronics" acquire in-depth theoretical knowledge and understanding of the latest developments in their field and professional field, which provides a basis for creative work after graduation in research or working in electronics companies, including working at the interface of different fields.

Upon successful completion of the professional master program “Electronics”, graduates acquire the following academic results:

- ability to design electronic equipment and systems of high complexity;
- ability to manage research and development projects;
- ability to monitor, manage and optimise the production of electronic equipment and systems;
- ability to carry out scientific research;
- ability to carry out the general tasks of pursuing a professional activity;
- understanding and knowledge in electronics engineering in line with the theoretical orientations of this field and the latest findings.

The expected academic results can be broken down into the following knowledge, skills and abilities.”

Knowledge:

- understands and possesses the required knowledge in electronics engineering according to the theoretical guidelines and the latest discoveries;
- understanding and application level knowledge of analogue and digital circuitry, signal processing and its algorithm implementation in embedded systems, field programmable logic circuits (FPGAs) and their application in heterogeneous systems, principles of operation and design of communication systems with an in-depth understanding of satellite communication systems.

- understanding and knowledge of the principles of design management of electronic equipment and systems.
- understanding and knowledge of the conduct of scientific research in electronics and related fields

Skills:

- ability to design electronic equipment and systems according to the requirements of the technical task using modern computer-aided design programmes;
- the ability to prepare and manage presentations and events, persuade others and argue the point of view;
- ability to cooperate, work in a team, plan and organise work independently, debate, present and justify opinions, use professional terminology, observe professional ethics, work professionally in a multicultural society;
- the ability to use information search and retrieval tools, and to carry out research.

Abilities:

- able to develop highly complex electronic equipment and systems;
- able to manage R&D projects;
- able to monitor, manage and optimise manufacturing of electronic equipment and systems;
- able to engage in scientific research;
- able to perform general tasks required to ensure good professional performance;
- able to independently direct and analyse the development and specialisation of own competences.

Admission rules

The study programme with the volume of 80 CP - for matriculation for studies in the professional master's study programme admits citizens of the Republic of Latvia and persons holding a non-citizen passport issued by the Republic of Latvia, as well as persons who have been issued a permanent residence permit, and foreigners, subject to the requirements:

- Academic bachelor's degree in electronics, telecommunications or related electrical engineering

Study programme with the volume of 40 CP - for matriculation for studies in the professional master's study programme, citizens of the Republic of Latvia and persons holding a non-citizen passport issued by the Republic of Latvia, as well as persons who have been issued a permanent residence permit, and foreigners are admitted, subject to the requirements:

- professional bachelor's degree in electronics, telecommunications or a related electrical engineering specialisation

Admission requirements are governed by the VUAS "Admission Rules", which are approved annually by the Senate. From the moment of enrolment until the moment of graduation, after fulfilling all the conditions of the programme, the student shall acquire knowledge, skills and competences in accordance with the aims, objectives and expected results of the study programme, obtaining the Professional Master's Degree in Electronics and the qualification of Lead Electronics Engineer in the organisation.

The result of the entrance procedure is based on the weighted average grade obtained in the Bachelor's studies.

The title of the study programme, the degree to be obtained, the professional qualification, the aim and objectives of the programme are mutually consistent and ensure that the aim of the

programme is achieved.

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

According to the 2020-2022 report of the Ministry of Economics of the Republic of Latvia on medium and long-term forecasts for the labour market, the deficit of workforce with higher education will continue in the engineering sciences sectors at least until 2040. This situation means that it is necessary to maintain and improve the competitiveness of the Latvian economy and to offer higher education programs in engineering sciences. According to the study, “in some higher education thematic groups supply of workforce is expected to decrease due to low level of workforce reproduction: the number of new specialists entering the market is smaller than the number of those leaving the market due to various factors, e.g., retirement. In the coming years, the ageing of the workforce will be most pronounced in such thematic education groups as “engineering sciences, manufacturing, and construction”. “It should be noted that in 2021 more than a half of the total workforce supply with proper education was in the age group above 45 years: in engineering sciences, manufacturing and construction (55%), informative report on medium and long-term forecasts for the labour market.

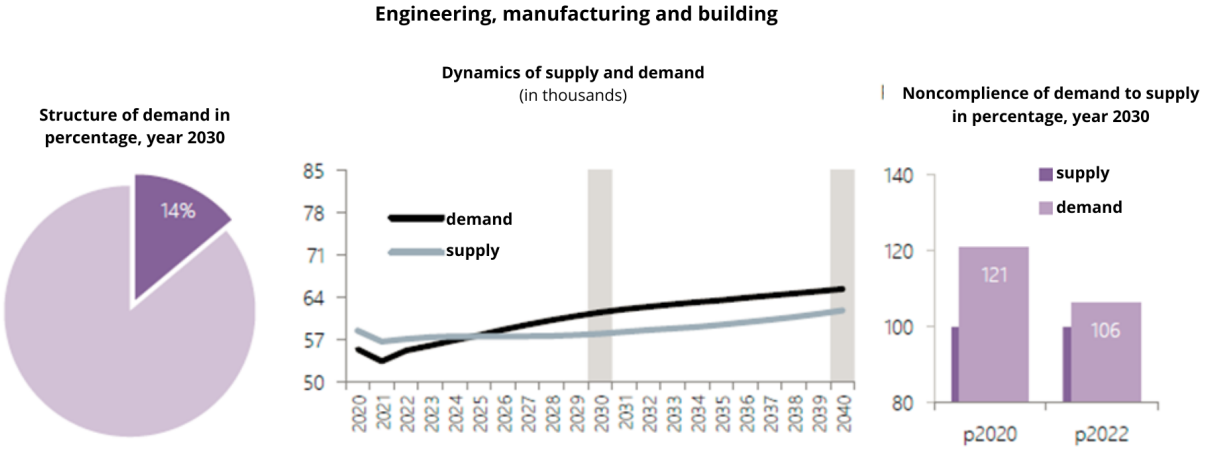

Figure 3.1 **Forecast on the demand for professionals with higher education exceeding the supply in engineering sciences 2020-2040.**

If the current structure of higher education is maintained, it is expected that the highest shortage of labour in the higher education group will affect professionals with backgrounds in the engineering sciences, natural sciences and ICT (STEM). By 2030, this shortage could exceed 9 thousand professionals, in particular in areas like computer sciences, architecture and construction, physical and engineering sciences.

Source: Informative report of the Ministry of Economics of the Republic of Latvia “On medium term and long-term forecasts for the labour market”, published on: 27.08.2020, updated: 21.10.2022

Labor market report | Ministry of Economics (accessed on 17.12.2022)

Agnese Rutkovska, an economist of the Bank of Latvia, highlights the electronics sector as one of the most productive in Latvia, and as one of the most promising sectors whose development will also be supported under the EU industrial strategy: “This (electronics) sector is one of the most productive in Latvia with wages significantly higher than on the average in the economy. Such development should be nurtured and supported, encouraged to grow and become more skillful to facilitate creation of well-paid and knowledge-intensive jobs, as well as good profit prospects for companies and increase of tax collections for the sovereign budget.” “According to the EU industrial strategy and the planned new industrial alliances, it is planned to develop important projects for the benefit of Europe — involving raw materials, microprocessors, telecommunications networks, battery production, etc. This is an ever stronger argument to review the potential of Latvian sectors and to look for answers to questions such as which areas are more promising, if there is anything hindering the growth, and how businesses can be supported.” “Thanks to the rapid growth, the share of electronics and electrical engineering is already approximately one tenth of the added value of the processing industry. These are export-intensive sectors: approximately 90% of the total production volume is exported.”

Fig. 3.2. **Production volume indexes of the processing industry (2000 average = 100%).**

Source: Central Statistical Bureau of Latvia, calculations of the author

https://www.makroekonomika.lv/latvijas-elektronika-piedzivojumi-1-serija-elektronika-jauniba-un-briedums (accessed on 17.12.2022)

Administration of the Latvian Electrical Engineering and Electronics Manufacturing Association LETERA, executive director of the association Inese Cvetkova and president of the association Normunds Bergs have a similar opinion. Both are optimistic regarding development prospects of this sector in 2022, and they expect higher turnover and plan to increase the number of employees. President of LETERA: “This time offers many opportunity to us. It is expected that manufacturing will quickly relocate back to the West. We have to be ready to use it, be flexible and able to learn fast, as well as to forward this information to employees as the changes will take place very quickly (LETERA general meeting of 05.04.2022,

https://www.letera.lv/letera-biedru-sapulce-sis-ir-musu-iespeju-laiks/ [accessed on 17.12.2022]).

1. Cvetkova, the Executive Director of LETERA:

- Shortage of qualified professionals is one of the key obstacles that does not allow to ensure successful operation and development of sectoral companies.

Normunds Bergs, Chairman of the Board of SIA SAF Tehnika, the President of LETERA:

- Wars for educated employees. The problems start early in the education system: potential students are not required to have good knowledge of physics, there is no entry exam, after six months they just drop out. We should start with schools, if there is no foundation in physics, continuing education will not help, re-skilling will not work. Research fellows are required to publish articles, though the industry may not need this at all.
- Juris Binde, the President of SIA LMT: “It is possible to buy IT specialists, but impossible to find electronics engineers (discussion in the Rector’s office of VUAS, 16.11.2022, https://www.venta.lv/ventspils-augstskola-svin-valsts-svetkus-ar-jura-bindes-vieslekciju)

The strategic goals of the study program also derive from the need of the electronics industry to have skilled employees with higher education and engineer qualification (see Section 3.1.2).

If students are taught to think creatively, if they are able to develop new products that can be sold, these students will never have to worry about unemployment. Written feedback of internship tutors and oral surveys confirm that these companies really face a shortage of electronics experts and that everyone is interested in further cooperation. VUAS has signed a cooperation agreement with SIA Ventspils Elektronikas fabrika, Hansa Matrix Group (Annex 2.14). Graduates of the Master's programme "Electronics" work in leading Latvian electronics industry companies AS HansaMatrix, SIA Mikrotik, SIA EUROLCDs, research institutes VUAS VSCR, Electronics and Computer Science Institute (EDI). Graduates of VUAS FoIT Master's programme in Electronics have no problems finding a job abroad - research institute VTT, Finland; University of Tartu (Tartu Observatory), Estonia; University of Manchester, UK, etc.

Analysing the monitoring data provided by the Ministry of Education and Science on the employment of graduates of the Professional Master of Engineering programme (2017-2019) in 2018-2020, we conclude that the employment rate of graduates of the Professional Master of Engineering programme is 92%. Calculation methodology: the number of person-years worked by graduates (2018 - 2020) divided by the number of person-years, if all graduates had been employed for all years, we obtain 23 : 25.

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

When analysing the questionnaires filled in by the students in case of student's exmatriculation, it can be concluded that the students have discontinued their studies in the Professional Master's study programme "Electronics" mainly for personal reasons. Students have changed their place of residence, had financial problems or have chosen to work in a different field, which has led to the interruption of their studies. The questionnaires also indicated an inability to combine studies with work. Additionally, in the period from 2 October 2021 to 1 October 2022, students who have been

exmatriculated have interrupted their studies due to the spread of the Covid-19 virus.

Table 3.3.

Breakdown of the number of students by sources of funding.

Academic year	Number of students at State budget study places	Number of students at paid study places	Total number of students
2017./2018.	14	2	16
2018./2019.	7	3	10
2019./2020.	8	4	12
2020./2021.	7	4	11
2021./2022.	2	4	6
2022./2023.	3	3	6

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

3.2. The Content of Studies and Implementation Thereof

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

Compliance of the study programme content with the national education standard.

Cabinet Regulation No. 512 “Regulations on the national standard for the 2nd level professional higher education” (26 August 2014) establish the mandatory content of professional undergraduate studies (Paragraphs 19 to 30). The content, structure and planning of the professional master’s program were developed in full compliance with the above document.

Content of the program

The programme includes the following groups of courses for both variants of the study programme (40 CP and 80 CP)

	Groups of study courses	40 CP	80 CP
1.	Theoretical and professional courses of the field (at least 5 CP)	8	22
2.	Courses in research, creative work, design work and management studies (at least 3 CP)	6	12
3.	Internship (at least 6 CP or at least 26 CP)	6	26
4.	Diploma project (at least 20 CP)	20	20
	Total:	**40 CP**	**80 CP**

In accordance with Clause 24 of the Regulation of the Cabinet of Ministers of the Republic of Latvia No.512 "Regulations on the State Standard of the Second Level Professional Higher Education", the compulsory content of the study programme also includes study courses that ensure the achievement of professional competence in business (innovations, organisation and establishment of enterprises, management methods, basics of project development and management, record keeping and financial accounting system, knowledge about labour relations regulation, including social dialogue in society, as well as knowledge about other innovations in business or institution management). The 40 CP version of the study programme provides the study course "Project management for electronics engineering" (4 CP), while the 80 CP version of the study programme provides the study courses "Electronics Engineering Project Management" (4 CP), "Electronics Engineering Research Project" (3 CP) and "Communication Skills" (3 CP).

Theoretical and professional courses of the field

The theoretical and professional courses in the field make up 8 CP for the 40 CP study programme and 22 CP for the 80 CP study programme. The content of the professional courses corresponds to the two main areas of electronics: embedded systems programming and telecommunications, microwave and radio-frequency devices.

The core of this group of courses is formed by the courses "Satellite Communication Systems" (4 CP), "Heterogeneous Computing Systems" (4 CP) and "Radio Frequency and Microwave Devices" (4 CP). Students can choose between the courses "Heterogeneous Computing Systems" (4 CP) and "Radio Frequency and Microwave Devices" (4 CP), one of which is dedicated to high-density embedded systems, while the other is dedicated to advanced radio frequency and microwave electronics. This provides the opportunity to specialise in one of these sub-areas of electronic engineering. The course "Satellite Communication Systems" is devoted to the study of telecommunication systems with a strong emphasis on their application to satellite communications. The content of this course is being developed with funding from the European Space Agency

project "Development of university course - Satellite communications systems" (000136022/21/NL/SC LVR1_21). According to the project conditions, the content of the course is based on the needs of stakeholders, companies and organisations. The practical part of the course is to be carried out at the VUAS' Irbene radio telescope complex, using the equipment available there for satellite communications.

In the 80 CP study option, the following additional study courses are provided: 'Automatic Control Systems' (4 CP), 'ARM Architecture Microcontroller Programming' (4 CP), 'Introduction to LabVIEW and its Applications in Electronics' (3 CP) and 'Embedded Operating Systems' (3 CP), the content of which is based on the professional standards 'Electronics Engineer' and 'Lead Electronics Engineer'.

Theoretical and professional courses of the field contribute to the achievement of all the learning outcomes of the study programme, but most importantly to the achievement of the following learning outcomes of the study programme:

1. SPSR1 - able to develop highly complex electronic equipment and systems;
2. SPSR6 - understands and possesses the required knowledge in electronics engineering according to the theoretical guidelines and the latest discoveries

Courses in research, creative work, design work and management studies

The theoretical and professional courses in the field make up 6 CP for the 40 CP study programme and 12 CP for the 80 CP study programme. The aim of these courses is to provide the skills and competences needed for project management and research, as well as the professional competences needed for entrepreneurship. The main focus of these courses is on the competences, knowledge and skills mentioned in the professional standard for a lead electronics engineer, which related to the management of research and development projects ("Electronic engineering project management" (4 CP)), as well as scientific research work ("Scientific research methodology" (2 CP) and "Electronic engineering research project" (3 CP)).

These study courses ensure the achievement of the following learning outcomes of the study programme:

1. SPSR2 - able to manage R&D projects;
2. SPSR4 - able to engage in scientific research;
3. SPSR5 - Able to perform general tasks required to ensure good professional performance.

Internship

The internship is usually carried out in companies or research institutes in the sector. As part of the study programme, internships contribute significantly to the achievement of the following learning outcomes of the study programme:

1. SPSR3 - able to monitor, manage and optimize manufacturing of electronic equipment and systems.

A more in-depth outline of the content and implementation of the internship can be found in subsection 3.2.4.

Development of the diploma project

The development of a diploma project or master's thesis lasts throughout the last semester of studies and directly relates to most of the programme's outcomes, which is natural since students have to learn to independently solve various engineering problems, formulate methodologies, obtain and analyse results, draw conclusions on non-elementary engineering topics and present their results in front of other professionals.

Relevance and updating of study programme content to labour market needs

The definition and implementation of the content of the study programme is carried out through the activities described below, which ensure the involvement of employers' representatives in the definition and implementation of the content of the study programme. As a result, employers are involved both in the evaluation of the study programme results and in the implementation of the

necessary changes, ensuring that the study programme is relevant and up-to-date to the needs of the labour market.

The content and delivery of the study programme is defined in accordance with the professional standard. As the study programme is a professional master's programme, its content is defined and implemented in accordance with the Standard for the Profession of Lead Electronics Engineer (approved on 12 August 2020, Protocol No 6). The content of the study programme is thus designed and implemented in line with current industry trends and labour market needs.

Representatives of industry are represented on the Council of Study Programmes. Five employer representatives have been approved as members of the FoIT Engineering Programme Council (approved at the FoIT Council meeting on 13 May 2020, protocol No.4). This gives employers the opportunity to be involved in decision-making regarding the content and implementation of the study programme, as well as to put forward their own proposals for change.

Representation of companies in the sector on the Master's Thesis Defence Committee. Employers' representatives are involved in the Master's thesis defence as members of the national examination committee. This gives employers the opportunity to assess the relevance of the students prepared within the study programme to the needs of the industry and the labour market. After the Master's thesis defence, discussions are held with employers' representatives to discuss gaps in the results achieved and potential steps to improve the content of the study programme. In this way, feedback from employers on the results of the studies is received on an annual basis.

Representatives of companies in the sector are involved in the study process as teaching staff. In order to ensure closer contact between students and representatives of companies in the sector, several courses are taught by representatives of employers (electronics engineers), where some of the courses taught in this way are partially or fully delivered in the production facilities of the companies concerned. Such practice is implemented for the study courses "Electronics Engineering Project Management (4 CP)", "Satellite Communication Systems (4 CP)" and "Heterogeneous Computing Systems (4 CP)". This gives employers' representatives the opportunity to shape the content of study courses in line with industry trends, as well as to assess the level of preparation of students and provide feedback to study programme management on existing gaps.

Employer surveys are organised. Employer surveys gather the overall opinion of employers, allowing them to identify gaps in the study programme and plan necessary changes.

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

Graduates of the Professional Master's study programme "Electronics" acquire a Professional Master's degree in Electronics and the professional qualification "Lead Electronics Engineer" in accordance with the professional standard "Lead Electronics Engineer". The study programme clearly corresponds to the scientific field "Electrical Engineering, Electronics, Information and Communication Technologies" of the "Engineering and Technology" group of the Latvian science

sector.

The study programme has a close cooperation with the scientific activities carried out at the Ventspils University of Applied Sciences (VUAS) research institute, the Ventspils University of Applied Sciences International Radio Astronomy Centre (VIRAC). Four of the eight faculty members involved in the implementation of the study programme (J. Šate, M. Donerblics, M. Bleiders, A. Orbidnāns) have been elected to academic positions at VIRAC and participate in various research and development projects on a daily basis. This directly contributes to the relevance of the content and the degree to advances and knowledge in electronics and related fields.

The close links between the study programme and the VIRAC contribute to the practice that students' Master's theses are developed in the framework of various research and development projects and defended before the National Examination Committee, which includes representatives of both employers and academic staff.

The following are some examples where students' final work relates to current issues in science:

Academic year 2021./2022.:

- Master thesis "Development of microcontroller programming algorithms for control of He cryostat devices" was developed and defended in the framework of the European Space Agency funded project "Establishing RT-16 S-band uplink and downlink RF to IF chain for TT&C service" (4000131327/20/NL/SC). The master thesis developed a control system for a unique cooling system to be integrated into a satellite communications Earth base station system in accordance with the requirements of the European Space Agency.

Academic year 2020./2021.:

- Master thesis "Development of a portable LOFAR radio telescope high-frequency antenna element stability evaluation device". The thesis was developed exclusively at ASTRON, a Dutch research institute and a long-standing partner of VIRAC. Due to the partnership between ASTRON and VIRAC, students are given the opportunity not only to have an internship at this institute, but also to develop their final theses there. Within the framework of the existing master thesis, a measuring device was developed to identify faults in antenna arrays developed by ASTRON for the practical implementation of innovative radio astronomical observation techniques.

Academic year 2019./2020.:

- Master thesis "Integration of ESTCube-2 nanosatellite functional modules in the side panels" developed and defended. The thesis was developed exclusively at the University of Tartu (more precisely at the Tartu Observatory), a long-standing partner of VIRAC. Within the framework of the existing MSc thesis, specific nanosatellite ESTCUBE-2 subsystems were developed for integration into the side panels of this satellite. It should be underlined that the ESTCUBE-2 nanosatellite is expected to be launched into Earth orbit in the first half of 2023.

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

process.

From a curriculum management perspective, the emphasis is on student-centred study processes and methods. The implementation of the study programme is based on the idea that a student, a future leading electronics engineer, should learn to solve real-life engineering problems from the first semester of studies through project-oriented study courses throughout the programme. At the same time, emphasis is placed on supporting the student to develop his/her knowledge, competences and skills in the areas of technology that interest him/her. The core of the study programme is based on a project-oriented learning approach, while the other courses of study contribute to the implementation of this project-oriented approach, providing the necessary knowledge, skills and competences.

Implementation of a project-oriented teaching method

Project-based learning is at the core of the study programme and is implemented through a series of electronic engineering project-based learning courses:

1. Electronics Engineering Project Management (4 CP);
2. Electronic Engineering Research Project (3 CP).

In the study courses "Electronics Engineering Project Management" and "Electronics Engineering Research Project", the course lecturer mainly plays the role of mentor (providing support) and customer (defining technical requirements)

The aims of the project-based learning method.

This method is used to provide a number of strategic objectives for the successful achievement of the study programme objectives:

1. To provide a day-to-day link between what you learn in theoretical lectures and real-life problems. When students develop individual, group and research projects in parallel with lectures and workshops there is an immediate opportunity to assess the practical application of theoretical knowledge acquired during lectures. This provides students with additional motivation to learn theoretically complex subject matter, as the immediate application of knowledge is visible.
2. To ensure that the knowledge, skills and competences acquired in daily lectures, seminars, tutorials and laboratory work are consolidated and applied to a practical project.
3. To ensure the acquisition of both professional and general knowledge, skills and competences in line with the objectives and outcomes of the study programme.

Evaluating the results of project-based learning.

To assess the contribution of the project-oriented approach, and more specifically the series of electronic engineering project courses, to the objectives of the study programme, the results achieved are evaluated each semester. The results are evaluated during the defence of the students' projects and during post-defence discussions. The final results of the study courses "Project Management in Electronics Engineering" and "Research Project in Electronics Engineering" are not assessed by the faculty member responsible for the course, but by a separate committee, usually composed of the lecturers of the study courses who teach the lectures in parallel with the project development. This provides an immediate assessment of whether students are able to apply the knowledge and skills acquired in their courses to real-world problems. A number of general skills are also assessed in parallel, such as the ability to communicate and discuss, the ability to

present project results, the ability to prepare project documentation, etc. After the project defence, a discussion is held under the guidance of the programme director to assess the achievement of the objectives and discuss steps to improve the programme.

The study programme is implemented as a full-time study programme, so the main methods are contact hours under the guidance of a lecturer and independent work outside class time. Three forms of classes are offered in the course: lectures, practical classes and laboratory work. Independent work is provided in the form of homework, laboratory work and work in the library.

Lectures use both traditional forms, with the lecturer presenting and explaining the topic, and interactive forms, with students participating as active participants. Flipped classroom elements are used in courses where problems have been identified during the programme that students regularly encounter time-consuming problems in completing practical work. This approach allows students to explore theoretical material independently at home, while the face-to-face sessions focus on practical problem-solving based on previously independently learned theory. As a result, the responsible lecturer can provide immediate support in solving practical problems, reducing the time spent on practical work and increasing learning efficiency. Elements of this approach are used in a number of courses, such as, Programming ARM architecture microcontrollers (2 CP) and Embedded operating systems (4 CP).

During **practical classes**, students calculate problems, calculate circuits and their elements, create specific programs or embedded systems. During these classes, discussions and exchanges take place on the most appropriate way to achieve the result. Practical activities are one of the main teaching approaches used in the implementation of the study programme. In addition to the series of electronics engineering courses, the study programme includes a significant number of learning-by-doing courses, using the equipment available in the teaching laboratories. In such courses, theoretical material is not strictly separated from practical work. Instead, the lecturer provides an introduction to the theory at the beginning of the class, which usually does not last more than 30 minutes, and then the students immediately start the practical tasks, which usually consist of performing a specific practical task using the principles of the theory that they have previously learnt. This approach is used in a number of courses, such as, Programmable Integrated Circuits (4 CP), Automatic Control Systems (3 CP), Heterogeneous Computing Systems (4 CP) and "Introduction to LabVIEW and its applications in electronics (3 CP)".

In turn, in several study courses, which require the use of development boards for practical work, students are provided with sets of equipment to take home so that they can perform their practical work outside the Ventspils University of Applied Sciences laboratories. An additional advantage of this approach is that students can complete the practical work at their own pace in their own homes and, if they wish, use the allocated equipment for advanced skills training and individual projects. This practice is implemented in a number of study courses, such as, Programming ARM architecture microcontrollers (2 CP), Embedded operating systems (4 CP), Programmable integrated circuits (4 CP) and Heterogeneous computing systems (4 CP). The distribution of the necessary equipment and technical support in case of problems is provided by the FoIT Engineering Department technicians.

During **laboratory work,** students carry out experiments independently in teaching laboratories, connect circuits required for the course and measure circuit and signal parameters. Experiments usually aim to evaluate and analyse certain theoretical principles in practice. The results are presented in the form of protocols and reports and defended in subsequent classes. Students work both individually and in groups. In situations where the work is done in groups, however, the results usually have to be defended individually by each student. Laboratory work is used as a basic element of the acquisition of practical knowledge, skills and competences in a number of study courses, such as "Satellite Communication Systems" (4 CP) and "Radio Frequency and Microwave

Devices" (4 CP).

During **independent studies**, the student studies the subject independently. Independent work can take place in laboratories, in the library (where there are also free-access computers with internet access). Students of the electronics programme (both bachelor and master) have 24-hour access to a student independent work room, where students organise their own work.

Programme lecturers (more than 90%) and students use the e-learning environment Moodle. Course materials are uploaded to the Moodle platform so that, in addition to lecture and lesson materials, opinions and information can be exchanged between lecturers and students, as well as between students themselves, in a forum mode. 90% of the course materials are available in electronic form (lecture slides, laboratory assignments and descriptions, practical assignments, control works, tests, as well as other course-related documents and materials). Using the e-learning environment, students can submit their completed laboratory work, take tests, do homework and later view the marking and error analysis of their work. Regular efforts are being made to increase the number of courses uploaded to this environment.

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

The aim of the internship is to use the theoretical knowledge and practical skills acquired in the study process to solve specific tasks in a practical environment in order to promote the development and improvement of students' professional knowledge, skills and competences in accordance with the qualification of leading electronics engineer.

The Director of the study programme is responsible for the organisation and control of student internships in accordance with the duties set out in the job description of the "Director of the Study Programme" of the VUAS. In turn, the internships chosen by students are evaluated and approved at the meeting of the Faculty Council.

The organisation of the internship work is determined in accordance with the Regulations "Regulations of the Internship of the Professional Master's Degree Programme "Electronics"" (hereinafter - the Regulations of the Internship), which have been approved at the meeting of the Faculty Council (see Annex 6.8). The internship is implemented in accordance with the approved study plan and its scope is determined in accordance with the Regulation of the Cabinet of Ministers of the Republic of Latvia No. 512 "Regulations on the State Standard of the Second Level Professional Higher Education".

In order to achieve the results planned in the study programme and to ensure the professional competence required for a leading electronics engineer, the programme content includes an internship, which is divided into two parts:

- internship of 20 CP and 6 CP in a study programme of 80 CP;

- internship of 6 CP in a study programme of 40 CP.

Aim and objectives of the internship

The aim and tasks of the internship are defined in the Internship Regulations in accordance with: 1) the duties and tasks of a senior electronics engineer as defined in the professional standard " Lead electronics engineer"; 2) the study programme study outcomes (hereinafter - SPSR) as specified in the "Mapping of study courses to achieve the study outcomes of the study programme" (hereinafter - Mapping of study outcomes, see Annex 6.5). The following internship tasks are defined in the internship regulations:

1. to encourage students to understand the core tasks and responsibilities of the electronics engineer's career;
2. to develop the professional knowledge, skills and competences necessary for the performance of the main tasks and duties of the professional activity, which are developed during the traineeship by performing in depth at least one of the following tasks:
    1. development of highly complex electronic equipment and systems;
    2. R&D project management;
    3. carrying out scientific research.
3. to improve the general knowledge and competences necessary for the performance of the main tasks and duties of their professional activity, including interpersonal, communication, leadership, etc. skills and competences.

The link between the objectives and goals of the student placement and the SPSRs is specified in the Mapping of Study Courses (see Annex 6.5.) and in the description of the internship, which is presented in the same format as all course descriptions.

Internship opportunities.

The internships used by students so far fall into three categories:

1. Internships in companies and organisations in Latvia;
2. Internship at the Ventspils University of Applied Sciences Research Institute Ventspils International Radio Astronomy Centre;
3. Internship in companies and organisations through Erasmus+.

Support provided by the university in finding and choosing a placement for internship.

Given the critical shortage of electronics engineers in Latvia, students have no problem finding an internship. The reality is that the supply of internships exceeds the number of students. Therefore, the support provided by the university is not about finding an internship, but about advising on the most suitable internship for the student's individual goals and abilities. Such support is provided by the programme director in individual discussions with students.

Support for Erasmus+ internships provided by the university.

To facilitate student mobility and contribute to the achievement of the SPSRs, the study programme provides enhanced support for study placements abroad under the Erasmus+ programme. This support is provided through the following activities implemented by the Programme Director:

1. Discussing potential internships abroad with students, individually assessing their goals, abilities, competences and knowledge;
2. Finding an internship based on the contacts built up at VUAS during various international research projects;
3. Informal discussions with the potential internship provider about the tasks to be carried out and deadlines;

4. Support in preparing documents (CV, cover letter, etc.);
5. Providing guidance to help students fully prepare for internship interviews;
6. Advice on finding a place to live.

All formal support and additional student assessment is provided by the staff of the Study Department of Ventspils University of Applied Sciences responsible for external relations.

As a result, every year several second-year students of the electronics study programme do their internships abroad.

Academic year 2021./2022. :

- 1 student completed a 20 CP internship at the ASTRON research institute in the Netherlands, developing measurement equipment used for fault detection in antenna arrays for radio astronomy observations. It should be noted that during the internship the development of a Master's thesis was also started. It should be noted that the internship was extended and as a result, the student's Master's thesis was also completed at ASTRON

Academic year 2019./2020.:

- 1 student completed internship (20 CP) at Tartu Observatory, Estonia, participating in activities related to the development of Estonia's second nanosatellite ESTCUBE-2. It should be noted that the internship was extended and resulted in the student's MSc thesis at Tartu Observatory.

Academic year 2017./2018.:

- 2 students undertook internship (20 CP) at the University of Manchester, UK. During the internship the students developed signal processing algorithms for hardware that processes radio astronomical measurements. The results of the internship were used for both students' MSc theses.

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

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

Students choose their final thesis topics independently, in consultation with their supervisors. These topics are usually related to research projects that students have been involved in during their studies, or for those students who have started their career, they relate their topic to current developments in their workplace.

Most Master's thesis topics can be classified into the following categories (which are relevant to the industry and the labour market):

- development of specific equipment or systems;

- implementation of signal processing algorithms in embedded systems;
- development of experimental measurement benches.

The relevance of the MSc thesis for the labour market is also demonstrated by the fact that most of the thesis topics are chosen by the students in the context of their job responsibilities in their workplaces.

In the last five years (2017-2022), the following Master's theses have been developed and defended in the study programme:

1. Pan-Tilt-Zoom (PTZ) control system development for videocamera (2017/2018);
2. Development of planar technology antenna array for 2.4 GHz ISM band (2017/2018);
3. Research and development of control unit for cooperative driving with miniature car (2017/2018);
4. Automatic measuring system for galvanized PCB interlayer connections (vias) (2018/2019);
5. Development of FPGA firmware of nanosatellite communication subsystem signal processing unit according to CCSDS 131.2-B-1 recommendation standard (2018/2019);
6. LOFAR long baseline calibrator survey process study and automation(2018/2019);
7. Application of Signal Processing Methods in Interferometric Data Reduction (2018/2019)
8. Modernization of camcorder’s lens focus adjustment system with electric motor (2018/2019);
9. 3D building reconstruction and shadow mapping using LIDAR data (2018/2019);
10. Development of universal electrical power supply unit with a wireless and manual control (2019/2020);
11. Integration of the functional blocks in the side panels of the ESTCube-2 nanosatellite (2019/2020);
12. Automatic temperature control cooling system (2019/2020);
13. A high performance digital transceiver design (2020/2021);
14. Development of portable "HBA" tile oscillation checking tool for "LOFAR" radio telescope (2020/2021);
15. Development of control system for liquid crystal display spacer spraying machine using industrial PLC controller(2020/2021);
16. Development of microcontroller programming algorithms for He cryostat equipment control (2021/2022).

As seen from the titles of the Master's theses, most of them are based on the development of equipment or systems. The implementation of development-based projects is directly related to the objectives of the study programme.

The average grade in the reporting period is 8.24, with four students obtaining the maximum grade of excellent (10 points), see Table 3.4 for a more detailed overview.

Table 3.4.

Master’s thesis evaluation by year in the study programme "Electronics"

	Evaluation in points								
	4	5	6	7	8	9	10		
Academic year	(almost mediocre)	(mediocre)	(almost good)	(good)	(very good)	(excellent)	(outstanding)	Number of graduates	Average mark
2016./2017.	0	1	0	0	1	0	1	3	7,67
2017./2018.	0	1	0	0	2	3	0	6	8,00

2018./201.9	0	0	0	0	0	1	0	1	9,00
2019./2020.	0	0	0	0	2	1	0	3	8,33
2020./2021.	0	0	0	0	2	0	1	3	8,67
2021./2022.	0	0	0	0	0	1	0	1	9,00
Total	0	2	0	0	7	6	2	17	8,24
% from total	0,00%	11,76%	0,00%	0,00%	41,18%	35,29%	11,76%		

3.3. Resources and Provision of the Study Programme

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

The study process of the study programme "Electronics" is based on the central resources and facilities described in the Self-Evaluation Report, Part II, Chapter 3, Subsections 2.3.1 - 2.3.3. Information on the programme-specific resources and provision is provided below.

The study process of the study programme "Electronics" is based on the development of individual projects, laboratory work and practical work. To ensure these processes, VUAS FoIT has several modern teaching laboratories, which are regularly updated.

List of laboratories available for the study programme:

1. **Laboratory for electrical measurements (E1).** The laboratory for electrical measurements is equipped with standard electronic measuring equipment and accessories such as power supplies, signal generators, multimeters, oscilloscopes and soldering equipment. The laboratory has 8 workstations, where 2 students can work at the same workstation.
2. **Laboratory for digital electronics (E2).** The laboratory for digital electronics is based on the LUCAS-NUELLE UniTrain systems, which are used for laboratory work in: 1) digital electronics; 2) semiconductor electronics; 3) power supply systems; 4) radio frequency electronic systems. The laboratory has 8 workstations, where 2 students can work at the same workstation. Each workstation is equipped with a LUCAS-NUELLE UniTrain with the additional modules needed for the laboratory work.
3. **Laboratory for Signal Processing (E3).** The laboratory for signal processing is based on the laboratory benches of the virtual instrumentation systems ELVIS and Emona Datex (Experiments in Modern Analogue & Digital Telecommunications) distributed by National Instruments, with one bench per workstation. In order to use the above-mentioned benches, each computer in this laboratory is equipped with LabVIEW software. In addition, each workstation in this laboratory has access to the N210 software-defined radio platform

manufactured by Ettus Research with several daughter boards. Each workstation in this laboratory partially supports the study process related to the programming of embedded systems (more precisely FPGAs) using the Cyclone V GX Starter Kit FPGA prototyping boards manufactured by terasIC. The laboratory has 8 workstations, where 2 students can work at the same workstation.

4. **Laboratory of Optics and Optoelectronics (E6).** This laboratory carries out laboratory work in optics and optoelectronics. The laboratory is equipped with equipment from OptoSci, Newport, Edmund Optics and others. The laboratory has 8 workstations, where 2 students can work at the same workstation.
5. **Laboratory of Physics (E8).** This laboratory is used for physics laboratory work on topics such as mechanics, electricity and magnetism. The laboratory equipment is based on PHYWE equipment. The laboratory has 10 workstations, where 2 students can work at the same workstation.
6. **Laboratory for Mechatronic Systems (D208).** This laboratory teaches the basics of electro-pneumatic systems using Festo equipment. The laboratory has 8 workstations, where 2 students can work at the same workstation.
7. **Prototyping laboratory (D04).** The aim of this laboratory is to provide students with access to professional prototyping equipment for the development of independent projects. The prototyping laboratory includes LPKF equipment for printing plates and Hakko soldering equipment.
8. **Laboratory for Robotics and Sensors (D207).** The aim of this laboratory is to provide students with the opportunity to carry out practical work using Festo PLCs and industrial robotic arm stands. The laboratory has 6 workstations, where 2 students can work at the same workstation.
9. **Amateur Radio Station (E801).** The purpose of this laboratory is to provide equipment for learning wireless communication systems. The amateur radio station provides students with equipment to communicate with: 1) other radio stations; 2) satellites; 3) ships and aircraft. In addition to communications equipment, Rohde & Schwarz and Agilent measuring instruments (spectrum analysers, vector signal generators, vector circuit analysers, oscilloscopes) are available for the development of communications equipment.
10. **Practical workspace (B3).** A multi-purpose space designed to provide students with an environment to carry out practical projects outside class time. The room has 8 workstations based on Treston modular workbenches, where each workstation is equipped with soldering equipment - soldering station, hot air station, soldering extractor, printing plate holders and other tools. A laser cutter/engraver and a MakerBot 3D printer are available in the room.

Maintenance of teaching laboratories and technical support for teaching staff and students

The Head of the Engineering Unit of the FoIT, who has a number of laboratory technicians, is responsible for the maintenance and technical support of the engineering laboratories. The laboratory technicians of the Engineering Department ensure the successful work of the lecturers and students in the laboratories of the VUAS. This includes regular installation, maintenance, inventory and labelling of laboratory equipment, electronic devices and other necessary equipment, diagnostics and minor repairs within the scope of their competence, configuration of computers according to the instructions of lecturers, installation of necessary software on workstation computers, etc.

Updating and replenishing the resources available in the teaching laboratories..

From the financial point of view, the renewal and replenishment of the resources available in the teaching laboratories is carried out from two financial sources: project funding and the Faculty

budget.

The Faculty's budget allocates an average of EUR 7000 annually for the renewal of technical teaching aids and materials. The use of this budget is the responsibility of the Head of the FoIT Engineering Department, while the technical processes are carried out by the FoIT Engineering Department laboratory technicians.

Project funding is regularly attracted for the development of the VUAS infrastructure. The project "Modernisation of Ventspils University of Applied Sciences STEM curricula" within ESF SAM 8.1.1 is of significant importance for the VUAS in 2018-2021. Within this project, approximately 130000 EUR were allocated for the supplementation of equipment necessary for the implementation of electronics-related engineering studies. In addition, the project "Next Generation Micro Cities of Europe" (No.UIA03-250) also included the upgrading of equipment in teaching laboratories, with an investment of around EUR 15 000.

Availability of teaching laboratories.
The VUAS FoIT has a practice of having teaching laboratories freely available to students every day of the week, 24/7. The accessibility is ensured in two ways: students have access to the laboratories either via the laboratory technicians or via the VUAS concierge who is available at any time in the concierge's room. The free accessibility of the laboratories allows for a student-centred learning process in such a way that students can combine their work in the laboratories with other individual activities or needs, such as work or other extra-curricular activities.

Materials for implementing student projects.

As the study process in this programme is largely based on a project-oriented teaching method, students are provided with free components and materials, including the ordering of printing plates. The funding allocated for the provision of materials is determined in proportion to the number of students. Currently, around EUR 3000 per year is allocated for student project materials. The procurement and distribution of materials is the responsibility of the Head of Engineering, but it should be mentioned that in practice this process is carried out by the lab technicians. In addition to the materials needed individually, various materials and components are purchased for stock, such as 3D printer filament, laser cutter plywood and the most popular electronic components.

Compliance of resources and facilities with the conditions for the implementation of the study programme and for the achievement of the learning outcomes

The resources and facilities available in the teaching laboratories contribute directly and significantly to the achievement of the specified programme outcomes. Given that the learning outcomes are based on the requirements of the professional standard "Lead Electronics Engineer", three of the six learning outcomes are focused on specific practical competences:

1. Able to develop highly complex electronic equipment and systems (SPSR1);
2. Able to monitor, manage and optimize manufacturing of electronic equipment and systems (SPSR3);
3. Able to engage in scientific research (SPSR4).

As regards the contribution to SPSR1, students are provided with access to equipment suitable for the development of electronic equipment and systems, as well as with all the necessary materials for the development of the various projects and with technical support provided by the laboratory technicians. The following teaching laboratories contribute directly to the achievement of SPSR1: Laboratory for electrical measurements (E1); Laboratory for Signal Processing (E3); Prototyping laboratory (D04); Practical workspace (B3).

As regards the contribution to the achievement of SPSR4, students are provided with equipment

and support to develop the knowledge, competences and skills required for the various design and research projects. Access to laboratories is provided primarily to provide the necessary baseline facilities for the various projects. The following teaching laboratories contribute directly to the achievement of SPSR4: Laboratory for electrical measurements (E1); Laboratory for Signal Processing (E3); Prototyping laboratory (D04); Practical workspace (B3); Amateur Radio Station (E801). In addition to the material and technical base, the scientific base provided by the Ventspils University of Applied Sciences Engineering Research Institute "Ventspils International Radio Astronomy Centre" (VIRAC), where the available scientific equipment and expertise enable students to engage in various research and development projects, is very important for the achievement of SPSR4.

In terms of contribution to SPSR3, students are provided with equipment that enables them to develop skills in the installation, maintenance and repair of certain electronic equipment and systems. While the same laboratories that contribute to SPSR1 and SPSR4 make a significant contribution to SPSR3, in addition to equipment for the development of electronic equipment and systems, equipment for the development of advanced manufacturing systems is also made available. The following teaching laboratories contribute directly to the achievement of SPSR2: Laboratory for electrical measurements (E1); Laboratory for Signal Processing (E3); Prototyping laboratory (D04); Practical workspace (B3); Amateur Radio Station (E801); Laboratory for Mechatronic Systems (D208); Laboratory for Robotics and Sensors (D207).

It should be emphasised that the resources and facilities available in the teaching laboratories make an important contribution not only to the acquisition of practical competences but also to the development of general knowledge and understanding of electronic engineering. For example, the following laboratories contribute significantly to the achievement of SPSR6 (Understanding and knowledge of electronics engineering at the highest level of achievement in the field): Laboratory for digital electronics (E2); Laboratory for Signal Processing (E3); Laboratory of Optics and Optoelectronics (E6) and Laboratory of Physics (E8). These laboratories provide an opportunity to test the principles covered in the theoretical lectures in a practical way, thus providing an opportunity to acquire and consolidate the knowledge covered in the theoretical lectures in a qualitative way.

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

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

VUAS includes the costs directly impacting the implementation of the study program or attributing them proportionally to the number of the students in the program when analysing the financing needed or financing received for a particular study program. **Income** includes the State budget funding for study process (1630.11 EUR per each state funded study place, corrected by the study program (study costs) coefficient and by the study level coefficient, plus the state budget funding for scholarships and social needs for students 164.34 EUR per each state funded study place), as well as income from tuition fees (calculated separately for each study program). The financing allocated by the Ventspils City Municipality for supporting the study process and for the Ventspils City Municipality IT sector scholarships according to the agreement between the VUAS and the Municipality is included as income, too, calculated proportional to the number of students in the program. **Costs** are allocated as following:

- There is a centralized 26% deduction from income of each faculty from State budget funding and from tuition fees, allocated to finance the common running costs of the VUAS;
- There is a proportional part of total common running costs of the faculty or other common costs of the particular faculty allocated to the costs of the study program proportional to the number of the students in the program.

The 26% deduction from the income of each faculty for the common running costs of the VUAS is used for:

- utility costs – electricity, heating, water and sanitation, waste disposal services;
- maintenance of premises and buildings;
- services for maintenance of IT systems;
- marketing costs;
- representation costs;
- partly remuneration of the administrative staff of the VUAS;
- common tax payments of the institution etc.

Direct costs of the faculty, which are necessary and can be identified as expenses by the particular faculty, are divided among the study programs proportionally to the number of students in these study programs. Expenses which are planned, incurred and can be identified for a particular study program, are included in the costs of this study program. These expenses include remuneration of the academic staff and general staff of the faculty, social security payments, insurance costs, as well as expenses for fixed assets, purchase of inventory, books, learning aid, maintenance of laboratory equipment and computer classes and other faculty expenses.

Both income and costs are calculated per each student, too, separately for every study program (for one calendar year usually), as well as the percentage of each cost group of the total costs of the study program is determined.

To calculate **the break-even point** of the study program, it is possible to use several methods – to increase the number of students in the study program, to increase the state subsidy for each study place or to increase tuition fees for paying students. VUAS is using the first method – to model the number of students necessary to break even. The VUAS is not trying to increase tuition fees in the existing economic situation and taking into account the financial situation of the local population, but is investing resources in marketing efforts to attract more students. We wish to point to the need to increase the government funding for university studies in the future, too.

Professional master study program "**Electronics**"

Director of the program lect. Jānis Šate

The study program (study costs) coefficient **1.7**; the study level coefficient **1.5.**

No.	Item	Actual situation				Break-even point		
		No of students	Amount, EUR	*Percentage distribution*	*Per 1 student (per year)*	Costs (EUR)	Per one student (per year, EUR)	*Number of students in the program*
	2	3	4		5	6	7	8
	INCOME	**3***	**15 063**	***100%***	***5 021,11***		**5 021**	
1.	State funding for studies	3	12 470	*82,8%*	*4 156,78*			
2.	State funding for scholarships	3	493	*3,3%*	*164,34*			
3.	Tuition fees		501	*3,3%*	*167,00*			
4.	Funding from Municipality for studies		1 311	*8,7%*	*436,99*			
5.	Funding from Municipality for scholarships		288	*1,9%*	*98,74*			
	COSTS	**3**	**36 536**	***100%***	***12 178,52***	**36 536**		***7***
6.	Academic staff remuneration	3	29 282	*80,1%*	*9760,67*			
7.	General staff remuneration	3	100	*0,3%*	*33,33*			
8.	Scholarships and social costs	3	781	*2,1%*	*260,34*			
9.	Running costs, Utilities, Administration costs (26%)	3	3 373	*9,2%*	*1 124,18*			

10.	Materials, books, equipment, laboratories' infrastructure	3	3 000	*8,2%*	*1000,00*			
	Financial result:	**3**	**-21 472**	***-58,8%***	***-7 157,41***			

**Number of students in the program 3 (01.10.2022.).*

There are on average 3 students in the professional master program "Electronics", which is 1.5 % of the total number of students in the Faculty of Information Technology. The same proportion is used to calculate the funding from the Municipality for this program. The same proportion of 1.5 % is used to split the total costs of the faculty to this program.

There would be needed 7 students in this program to reach the break-even point (condition – costs not changing). Alternatively, the rise in the state budget funding per study place would be needed at least 50%. Taking into account that the VUAS will have to increase the costs in the future, the growth of the state budget funding is imminent anyhow. The specifics of this program is characterized by a higher need in expenses for materials, equipment, laboratory maintenance, which determines a relatively higher proportion of these costs compared to the other programs of the study field. The financial losses of the professional master study program "Electronics'' have been covered from the positive cash flow of other study programs within this study field. It is possible that the losses may decrease after implementing the one year version of the professional master study program "Electronics'' after accreditation, because the costs of the second study year will decrease.

The development of the professional study program "Electronics" has been supported financially from the ESF projects during the years 2018 – 2022. The project "Modernization of Ventspils University of Applied Sciences' STEM teaching programs" (No. 8.1.1.0/17/I/007) financed new laboratory equipment, new computer classes and improvement of premises in total for 1.77 million EUR, and 130.000 EUR for the laboratories in electronics subjects in particular. The projects "Strengthening the Academic Staff of Ventspils University of Applied Sciences in the Fields of Strategic Specialization" (Project No: 8.2.2.0/18/A/009), "Improving Quality of the Content of Study Programs at Ventspils University of Applied Sciences, Improving Resource Efficiency and Ensuring Better Management" (Project No: 8.2.3.0/18/A/014) and "Next Generation Micro Cities of Europe" (No.UIA03-250) have contributed to the qualifications of the academic staff of the program. As laboratories and computer classes installed are used by all programs of this study field and by other faculties, too, and the academic staff is teaching in several study programs, it is difficult to separate exact financial contribution of the projects mentioned to the development of this study program. The project "Next Generation Micro Cities of Europe" provided 15.000 EUR financing for development of electronics laboratories of the VUAS. The ESA project "Development of university course - Satellite communications systems" (000136022/21/NL/SC LVR1_21) in the study course "Satellite communications" was launched in 2022, and will contribute to the development of the content of study courses in radiofrequency field of the professional master study program "Electronics". As investments from the projects mentioned before are finished now, there will be a need to increase spending from the VUAS own budget to maintain laboratories and computer classes after 2023.

For each programme, a direct cost calculation is made. Taking into account the direct costs of implementing the study programme (described in more detail in Section 2.3.1), it is estimated that

for this study programme the average cost (taking into account each semester, the amount of internships and the semester in which the final thesis is to be developed) is EUR 19581for the salaries of the teaching staff, together with the salary of the study programme director and the costs of final examinations (including the salaries of supervisors, reviewers, and members of the examination committee), the cost amounts to EUR 23693. Adding the compulsory State social contributions (EUR 5589.18), the costs amount to EUR 29282.18. Considering that the State budget funds per study place in the programme (taking into account the field and level coefficient) are EUR 3737.71 per study place, it is calculated that the programme needs at least 8 students to cover its own costs.

3.4. Teaching Staff

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

The Professional Master's study programme "Electronics" is implemented by highly qualified academic staff with significant practical experience in engineering and natural sciences in both the private and academic sectors, which ensures that students acquire the necessary research skills, theoretical and practical knowledge, skills and competences (see Table 3.5). The core teaching staff consists of a group of 6 electronics engineers, complemented by 2 high-level faculty members from other fields, to ensure quality teaching of generic skills in addition to sector-specific skills.

Table 3.5.

Academic staff of the professional master’s study programme "Electronics"

No.	Name	Surname	Academic position	Scientific degree, qualification	Study courses taught
1	Guntars	Dreijers	Assoc. professor	Dr. philol.	Communication skills
2	Linda	Gulbe	Docent	Dr. sc. comp.	Scientific research methodology
3	Matīss	Maltisovs	***Docent	Ph. D., Electronics engineer	*Electronics engineering project management

4	Jānis	Šate	Lecturer	Mg.sc.ing., Electronics engineer	Heterogeneous computing systems Automatic control systems Electronics Engineering Research Project Programmable integrated circuits *Electronics engineering project management **Satellite communication systems
5	Artūrs	Orbidāns	Guest Lecturer	Mg.sc.ing., Electronics engineer	Embedded operating systems
6	Gints	Dreifogels	Guest Lecturer	Mg.sc.ing., Electronics engineer	Programming of ARM architecture microcontrollers
7	Mārcis	Donerblics	Guest Lecturer	Mg.sc.ing., Electronics engineer	*Electronics engineering project management **Satellite communication systems
8	Mārcis	Bleiders	Guest Lecturer	Mg.sc.ing., Electronics engineer	Radio-frequency and microwave equipment **Satellite communication systems

The language skills of the lecturers of the Professional Master's study programme "Electronic" comply with the Cabinet of Ministers Regulation of 2009 No 733 "Regulations on the Scope of Knowledge of the State Language and the Procedure for Testing Proficiency in the State Language for Professional and Official Duties". Information on the foreign language skills of the lecturers is summarised in the lecturers' curricula vitae (CV) attached as Annex.

The qualifications of the teaching staff are in accordance with Article 39 of the Law on Higher Education Institutions regarding the academic staff of professional study programmes. There are 8 teaching staff involved in the implementation of the study programme, 4 of whom are docents elected by Ventspils University of Applied Sciences.

3 of them have a PhD degree, 3 of them (M. Bleiders, J. Šate and M. Donerblics) are studying for a PhD degree, while 6 of them have a qualification of electronics engineer in addition to their academic degree.

*The study course "Electronics Engineering Project Management" (4 CP) is taught by three lecturers (M. Maltisovs, M. Donerblics and J. Šate) in order to ensure the successful achievement of the study course and, consequently, study programme objectives, taking into account the versatility of this study course. The main role of Mr Maltisov in the implementation of this course of study is to ensure the link with the needs of the industry, given his more than 5 years of experience in development projects in companies in the industry. M. Donerblics and J.Šate have experience in the management and implementation of European Space Agency (ESA) research and development projects, during which they have gained experience in both the preparation and project management of project proposals and the development of electronic equipment and systems using guidelines defined in industry standards. Currently, M. Donerblics is leading the ESA project "Establishing RT-16 S-band uplink and downlink RF to IF chain for TT&C service" (4000131327/20/NL/SC) and J. Šate is leading the ESA project "IP core for on-board blob detection and cropping in SSSB missions" (4000138644/22/NL/SC/rp).

**The study course "Satellite Communication Systems" (4 CP) is also taught by three faculty

members (M. Bleiders, M. Donerblics and J. Šate) simultaneously to ensure successful achievement of the objectives of the study course and the study programme, taking into account the interdisciplinary content of this study. M. Bleiders has a background in microwave and radio frequency development, M. Donerblics has significant experience in the implementation of satellite Earth base stations, and J. Šate has experience in signal processing, in particular digital processing and theory of communication signals.

***Docent Matīss Maltisovs, PhD, has more than 5 years of private sector experience in electronic equipment and systems manufacturing and development companies. Currently, M. Maltisovs is an electronics engineer at Lightspace Technologies Ltd, where his main responsibilities are related to the development of printed circuit boards for the company's augmented reality products. M. Maltisovs experience contributes significantly to the implementation of the study course "Electronics Engineering Project Management", as well as to the connection of the content of the entire study programme with the needs of companies in the sector.

The relevance of the qualifications of the teaching staff to the study programme's outcomes and objectives.

There are 6 members of the teaching staff involved in the implementation of the study programme (PhD Matīss Maltisovs, Mg. sc. ing. Jānis Šate, Mg. sc. ing. Mārcis Donerblics, Mg. sc. ing. Gints Dreifogels, Mg. sc. ing. Artūrs Orbidāns and Mg. sc. ing. Mārcis Bleiders with a professional qualification of an electronics engineer, whose qualifications and professional activities are directly related to developing electronic equipment and systems and participating in research and development projects. The qualifications of these lecturers are therefore directly relevant to the following learning outcomes:

1. SPSR1 - able to develop highly complex electronic equipment and systems;
2. SPSR6 - understands and possesses the required knowledge in electronics engineering according to the theoretical guidelines and the latest discoveries.

The assistant professor involved in the implementation of the study programme, Matīss Maltisovs, PhD, has more than 5 years of experience in the private sector in electronic equipment and systems manufacturing and development companies. This experience contributes significantly to the achievement of the following learning outcomes of the study programme:

1. SPSR3 - able to monitor, manage and optimize manufacturing of electronic equipment and systems.

Teaching staff involved in the implementation of the study programme Mg. sc. ing. M. Donerblics and Mg. sc. ing. J. Šate have experience in the management and implementation of European Space Agency (ESA) research and development projects, during which they have gained experience both in the preparation and management of project appendices and in the development of electronic equipment and systems using the guidelines defined in industry standards. Currently, M. Donerblic is leading the ESA project "Establishing RT-16 S-band uplink and downlink RF to IF chain for TT&C service" (4000131327/20/NL/SC) and J. Šate is leading the ESA project "IP core for on-board blob detection and cropping in SSSB missions" (4000138644/22/NL/SC/rp). This experience contributes significantly to the achievement of the following study outcomes of the study programme:

1. SPSR2 - able to manage R&D projects.

In the implementation of the study programme there are 2 teaching staff (Dr. philol. Guntars Dreijers and Dr. sc. comp. Linda Gulbe), whose qualification and professional activity is not directly related to the field of electronic engineering guidelines and duties of an electronic engineer, but these teaching staff ensure the achievement of study programme study results related to the general tasks of ensuring professional activity, as well as the acquisition of the ability to carry out scientific research work:

1. SPSR4 - able to engage in scientific research;
2. SPSR5 - able to perform general tasks required to ensure good professional performance.

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

During the reporting period, a number of highly qualified faculty members have joined the teaching staff, whose qualifications and experience have a positive impact on the quality of the study programme and ensure generational change.

For the implementation of the study programme, an assistant professor Ph. D., Matīss Maltisovs, who is a graduate of the Faculty of Electronics and Telecommunications of Riga Technical University and an electronics engineer at SIA Lightspace Technologies. By attracting a lecturer with a scientific degree and experience in the companies in the field to replace a lecturer with an academic master's degree without experience in the companies in the field, a significant contribution was made to the improvement of the quality of the relevant study courses.

For the implementation of the study programme a lecturer Mg.Sc. Ing. Jānis Šate and guest lecturer Mg.sc. Ing. Mārcis Donerblics. Both lecturers have experience in the management and implementation of European Space Agency (ESA) research and development projects, during which they have gained experience in the preparation and project management of project appendices and in the development of electronic equipment and systems using guidelines defined in industry standards. Currently, M. Donerblic is leading the ESA project "Establishing RT-16 S-band uplink and downlink RF to IF chain for TT&C service" (4000131327/20/NL/SC) and J. Šate is leading the ESA project "IP core for on-board blob detection and cropping in SSSB missions" (4000138644/22/NL/SC/rp). This experience makes an important contribution to the provision of electronics engineering related R&D competences to students.

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

Not applicible.

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

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

The most important criteria for selecting academic staff are scientific and professional competence, which potentially ensures successful collaboration between academics.

Cooperation between the study programme staff is promoted through both formal and informal activities organised by the VUAS. Teaching staff from different faculties are involved in the implementation of the study process, which provides a variety of experiences and promotes professional development.

The success of the cooperation between the study programme's teaching staff can be seen in a number of activities:

- **Interdisciplinary cooperation between academic staff** – for example, faculty members from different study fields are involved and employed in the study programme and can share their experience and discuss topical issues at organised meetings of the Council of Study Programmes, Faculty Council meetings, seminars, meetings with employers, etc.
- **Joint research activities by academic staff**, for example, faculty members involved in a study programme produce joint scientific publications, which indicate both interdisciplinary collaboration and research and joint activities in related scientific fields. For example, the joint presentations of lecturer Jānis Šate and guest lecturer Gints Dreifogels at a conference, the involvement of guest lecturer Mārcis Bleiders and guest lecturer Artūrs Orbidāns in joint scientific publications.
- **Cooperation between teaching staff in the development of study programme content**, by developing and improving the content of the study programme, lecturers carefully follow the thematic division included in the study course, mutually coordinating the thematic areas and the assessment mechanism of the study results. As an example, activities within the project "Next Generation Micro Cities of Europe" (No.UIA03-250), during which guest lecturers A. Orbidāns and G. Dreifogels modernised their courses by introducing student-centred methods, as well as shared their experience with other VUAS FoIT lecturers during several seminars. In addition, J. Šate, M. Bleiders and M. Donerblics are developing the materials for the course "Satellite communications systems" in cooperation with the European Space Agency within the project "Development of university course - Satellite

communications systems" (000136022/21/NL/SC LVR1_21).

- **Informal cooperation among teaching staff.** Various activities are organised at the VUAS FoIT to promote communication among the teaching staff in an informal atmosphere. One example is the weekly coffee breaks, during which lecturers discuss current issues in an informal atmosphere, as well as share their experiences in solving various problems.

Currently, 8 lecturers with different workloads are involved in the implementation of the study programme, while 6 students are currently enrolled in the study programme. So the ratio of students to lecturers: 6/8=0,75. Students are provided with quality studies and the possibility of individual approach during the study process.

The calculations do not take into account that students from several study programmes of Ventspils University of Applied Sciences participate in some study courses concurrently.

Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	6-1_appendix_D-DS_ENG.pdf	6-1_pielikums_D-DP_LV.pdf
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)		
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period	6-2_appendix_statistics-on-students.pdf	6-2_pielikums_statistika_studejosie_IZM.pdf
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard	6-3_appendix_Compliance_national_education_standart.pdf	6-3_pielikums_Atbilstiba-valsts-standartam.pdf
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)	6-4_appendix_compliance-with-profession-standard.pdf	6-4_pielikums_Atbilstiba-profesijas-standartam_EIM.pdf
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	6-5_appendix_study-programme-mapping.xlsx	6-5_pielikums_studiju-programmas-kartejums.xlsx
The curriculum of the study programme (for each type and form of the implementation of the study programme)	6-6_appendix_IZM_Study_programme_plan.docx.pdf	6-6_pielikums_Studiju-programmas-plans_IZM.docx.pdf
Descriptions of the study courses/ modules	6-7_Appendix_Study_course_descriptions.pdf	6-7_Pielikums_kursu apraksti.pdf
Description of the organisation of the internship of the students (if applicable)	6-8_appendix_internship-regulations.pdf	6-8_pielikums_Prakses_nolikums_2022_IZM.pdf
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)		

Programming Specialist (41484)

Study field	*Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science*
ProcedureStudyProgram.Name	*Programming Specialist*
Education classification code	*41484*
Type of the study programme	*First level professional higher education study programme*
Name of the study programme director	*Estere*
Surname of the study programme director	*Vītola*
E-mail of the study programme director	*esterev@venta.lv*
Title of the study programme director	*Mg.pead.*
Phone of the study programme director	
Goal of the study programme	*The study programme goal is to prepare programming specialists for professional activity in accordance with the level standards of higher professional education and profession, providing the necessary knowledge, skills, and competences required for the programming profession and enabling successful integration into the labour market and independent adaptation to the changing labour market requirements, as well as to motivate students for professional development and further education in higher education study programmes or through non-formal education.*
Tasks of the study programme	*The study programme objectives are:* *- To provide students with the conditions and opportunities to acquire first-level professional higher education relevant to the labour market requirements, in accordance with the professional standard for programmers* *- To provide the study process with qualified teaching staff in line with modern requirements.* *- To organise the study process in such a way that the student can acquire both theoretical knowledge and practical skills in the chosen specialty.* *- To organise the internship in such a way that the student can consolidate the knowledge acquired in the study courses.* *- To ensure that the content of the study programme and the study process are in line with changes in the labour market.* *- To motivate students to work in their chosen profession.* *- To facilitate students' self-learning needs and their involvement in continuing professional development.* *- To encourage students to engage in practical and scientific problem-solving, to motivate them to improve their qualifications.*

Results of the study programme	*The study programe target results are:* *- Awareness, knowledge and ability to evaluate program requirements* *- Able to prepare a software design* *- Able to write software code according to programming guidelines, analyze the sources of software errors, debug the software* *- Able to perform software testing* *- Able to cooperate during software development and delivery processes in cross-functional teams* *- Able to organize and plan the work alone and in a team, to communicate in the professional environment; able to individually work in the profession, improve knowledge and competencies*
Final examination upon the completion of the study programme	*Qualification work*

Study programme forms

Full time studies - 2 years - latvian

Study type and form	*Full time studies*
Duration in full years	*2*
Duration in month	*0*
Language	*latvian*
Amount (CP)	*80*
Admission requirements (in English)	*Secondary education.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	-
Qualification to be obtained (in english)	*Programmer*

Places of implementation

Place name	City	Address
Ventspils University College	VENTSPILS	INŽENIERU IELA 101, VENTSPILS, LV-3601

3.1. Indicators Describing the Study Programme

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

In 2018, changes were made to the first-level professional higher education study programme "Programming Specialist" of FoIT study field "Information Technology, Computer Engineering, Electronics, Telecommunications, Computer Management and Computer Science", by adding a second language - English. The changes were made on the basis of the study development aims of the Strategy of the Ventspils University of Applied Sciences for the period from 2016 to 2020 (approved on 09.11.2016, Senate Decision No.16-93) "Increase the number of enrolled students and reduce student attrition", 2. "Increase the number of full-time foreign students at VUAS" and 3.e. "Implementation of study programmes in foreign languages".

At the same time, English was added as the second language for the bachelor's degree programme "Computer Science" in the same FoIT study field. The interest of students in English programmes was not so high that two study programmes in English could be implemented in one study field at the same time. So far, the study programme "Programming Specialist" has been implemented only in Latvian, and by the decision of the IT Faculty Council No 22-15-07 of December 19, 2022 - the study programme "Programming Specialist" will be implemented only in Latvian without the second language - English.

No other changes have been made to the parameters of the study programme (in terms of its title, duration, scope, form, aim, objectives).

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

Analysis and evaluation of the relevance of the study programme to the study field and analysis of the programme title, code, professional qualification

The first-level professional higher education study programme "Programming Specialist" corresponds to the study field “Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science”.

The Cabinet of Ministers regulation No. 793 from 11.12.2018. “Regulation Regarding Opening and Accreditation of Study Fields” (hereinafter MK Regulations No. 793), Annex 1, defines study fields in

higher education in the Republic of Latvia, among them as No. 17 the study field “Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science”, but the regulation does not specify study programs within this study field. Therefore, the compliance of the study program with the field of study is substantiated based on Cabinet of Ministers regulations No. 322 (approved 13.06.2017) " Regulation on the classification of the Latvian education system " (hereinafter MK Regulations No. 322) and the international education classification standard "UNESCO International Standard CLASSIFICATION OF EDUCATION, Fields of education and training 2013 (ISCED-F 2013) - Detailed field descriptions" (hereinafter ISCED-F 2013) (available at: http://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-fields-of-education-and-training-2013-detailed-field-descriptions-2015-en.pdf , [accessed 23.02.2023.]).

Graduates of the study programme acquire the professional qualification "Programmer" in accordance with the Programmer's professional standard (approved 08.06.2022.), corresponding to the fourth professional qualification level (PQL No.4) (corresponding to the fifth level of the Latvian Qualifications Framework (LQF No.5)) (available Only in Latvian at: https://registri.visc.gov.lv/profizglitiba/dokumenti/standarti/2017/PS-221.pdf [accessed: 23/02/2023]). Occupational qualification code 251205 (programmer). The title of the study programme “Programming specialist” corresponds to the acquired qualification "Programmer".

The content and implementation of the study programme “Programming specialists” correspond to the educational qualification code 41484, which is determined by the MK Regulations No. 322. The first part of the code (41) indicates that the study programme provides first-level professional higher education (fourth-level professional qualification) and is to be followed by secondary general education or vocational secondary education, and the duration of fulltime studies is two years.

The second part of the code (484) indicates that the content and implementation of the study programme correspond to the thematic group 'Natural sciences, mathematics and information technology', the thematic field 'Computer science', the thematic group 'Programming'.

Based on ISCED-F 2013, the study program "Programming specialist" belongs to the educational broad field **06 Information and Communication Technologies**, which corresponds to the field of study, and the educational detailed field **0613 Software and applications development and analysis**.

Study programme aims and objectives

The strategic objectives of the study programme are defined by regulations of Cabinet of Ministers No 141 (March 20, 2001) "Regulations on the State Standard for First-Level Professional Higher Education”.

Strategic objectives of the study programme:

- to prepare a student for work in a specific profession, promoting the improvement of him or her as a mentally and physically developed, free, responsible and creative personality;
- to promote the acquisition of knowledge and skills (also skills for independent learning), that ensures the obtaining of the fourth level professional qualification and promotes competitiveness in changeable socio-economic conditions;
- to create motivation for continuing education and provide an opportunity to prepare for obtaining the second level professional higher education and the fifth level professional

qualification

Based on the strategic objectives, the study programme has specific objectives.

Objectives of the study programme:

- to prepare programming specialists for professional activity in accordance with the level standards of higher professional education and profession, providing the necessary knowledge, skills, and competences required for the programming profession and enabling successful integration into the labour market and independent adaptation to the changing labour market requirements
- to motivate students for professional development and further education in higher education study programmes or through non-formal education.

Tasks of the study programme:

- To provide students with the conditions and opportunities to acquire first-level professional higher education relevant to the labour market requirements, in accordance with the professional standard for programmers
- To provide the study process with qualified teaching staff in line with modern requirements.
- To organise the study process in such a way that the student can acquire both theoretical knowledge and practical skills in the chosen specialty.
- To organise the internship in such a way that the student can consolidate the knowledge acquired in the study courses.
- To ensure that the content of the study programme and the study process are in line with changes in the labour market.
- Motivate students to work in their chosen profession.
- To facilitate students' self-learning needs and their involvement in continuing professional development.
- To encourage students to engage in practical and scientific problem-solving, to motivate them to improve their qualifications.

Study programme results

The expected result is to prepare programming specialists whose theoretical knowledge and practical skills allow them to start a career in the profession, to independently and systematically improve their knowledge and skills to adjust to working in changing labour market circumstances, as well as to continue their studies in bachelor's level study programs.

As a result of successful completion of the first level professional higher education study programme "Programming Specialist". As a result, the graduate achieves the following academic results:

1. Awareness, knowledge and ability to evaluate program requirements:
    1. Able to study software requirements and their compliance with architectural and operational principles alone or in a team
    2. Able to establish the functional and non-functional software requirements and their reasonability
    3. Able to validate, detail and prototype software requirements

4. Able to process change requests and problem reports

2. Able to prepare a software design:
    1. Able to study the description of software design and assess software requirements
    2. Able to decompose the design to a lower level by creating descriptions of data and processes
    3. Able to analyze various technical solutions and select the most appropriate one
    4. Able to develop a conceptual and physical model of data according to the defined requirements
    5. Able to develop and describe software algorithms, taking into account software requirements
    6. Able to design software interfaces taking into account software requirements
    7. Able to document software design
3. Able to write software code according to programming guidelines, analyze the sources of software errors, debug the software:
    1. Able to develop a software code in a programming language
    2. Able to process software data by analyzing sources of data according to their technical and logical structure
    3. Able to optimize the performance of software code according to acquired measurements and software requirements
    4. Able to document the software code according to the guidelines
    5. Able to use software code management systems
    6. Able to prepare the programming environment
    7. Able to debug the software code, identify and eliminate the causes of errors
4. Able to perform software testing:
    1. Able to develop software tests by selecting the most suitable development methods and data to pass the tests
    2. Able to perform software tests and record information on incidents/problems
    3. Able to analyze the results of software testing, and analyze any deficiencies found
    4. Able to reproduce errors found by users
    5. Able to cooperate with specialists to develop testing documentation

5. Able to cooperate during software development and delivery processes in cross-functional teams:

    1. Ability to manage development workflows alone or in a team by prioritizing tasks and using task management platforms
    2. Able to develop and manage software deliveries alone or in a team according to the schedule of resource deliveries
    3. Able to integrate deliveries/deliverables into testing and operating environments alone or in a team
    4. Able to cooperate in cross-functional teams
    5. Able to facilitate timely delivery of quality software
    6. Able to participate in software maintenance processes

6.Able to organize and plan the work alone and in a team, to communicate in the professional environment; able to individually work in the profession, improve knowledge and competencies:

    1. Able to speak and write in the official language according to literary language norms and to use professional terminology to perform professional duties
    2. Able to speak, write and to use professional terminology in two foreign languages to perform professional duties
    3. Able to rely on mathematical and natural sciences competencies to perform professional duties

4. Able to ensure compliance with occupational safety, electrical safety, fire safety, environmental and civil protection requirements
5. Able to ensure that safe information and communication technologies are used
6. Able to ensure that civil, social, and employment norms and the labor law are complied with
7. Able to understand and apply IT standards
8. Able to act according to green and sustainable development principles by providing support in understanding these issues
9. Able to act according to business principles and engage in professional activities according to the selected business model
10. Able to learn and develop independently

Admission rules

Citizens of the Republic of Latvia (RL) and persons with a RL non-citizen passport, as well as persons who have been issued permanent residence permits, are eligible to study in the first-level professional higher education study programme "Programming Specialist". Foreigners can study in the programme in accordance with Section No.83 and No. 85 of the Law on Higher Education Institutions of the Republic of Latvia.

The programme is open to applicants with secondary general education or vocational secondary education (qualification level 3 in accordance with Section 5 (3) of the Vocational Education Law of the Republic of Latvia). At the time of admission to the study programme, the applicants' total score is made up of four parts:

1. the overall score of the centralised examination of mathematics (60%)
2. the overall score of the centralised examination in a foreign language or the result of the foreign language examination of an international testing institution (in accordance with Cabinet of Ministers Regulation No 543 "Regulations on the replacement of the centralised examination in a foreign language in a general secondary education programme by an examination in a foreign language by an international testing institution") (20%),
3. the overall score of the centralised examination in Latvian (10%),
4. the average of the scores of all centralised examinations (10%).

The admission procedure is defined by the Admission Rules of VUAS, , while the admission requirements for the study programme "Programming specialist" are based on the knowledge acquired during secondary education, which is necessary in the study process.

For the admission rules, 60% of the total score is the score of the centralised examination in mathematics. The implementation of the study programme "Programming Specialist" is based on the professional qualification "Programmer", which includes design, development, testing, implementation of software, and most of these activities require analytical and algorithmic thinking, which is acquired at the basic level in mathematical orientation courses at the general secondary education or vocational secondary education stage.

For the admission rules, 20% of the total score is the score of a centralised examination in a foreign language or the result of a foreign language test by an international testing institute. The study courses cover the latest technologies in software development and current technology documentation is mostly available in a foreign language, so applicants need to have an adequate level of foreign language skills to be able to successfully study the course materials.

In the admission rules, 10% of the total score is the score of the centralised Latvian language examination. The study implementation language is Latvian and classes in the study courses are organised in Latvian, therefore, in order to effectively learn topics, the applicant must have a basic

level of Latvian.

In the admission rules, 10% of the total score is an average score of all centralised examinations, on the basis of Part No. 4, Paragraph No. 10 of the Cabinet of Ministers Regulation No. 846 (10.10.2006) "Regulations Regarding the Requirements, Criteria and Procedures for Admission to Study Programmes".

The admission rules are updated every academic year.

“Admission Rules and Matriculation Procedure at Ventspils University of Applied Sciences for the Academic Year 2023/2024” is available online in Latvian:

https://irp.cdn-website.com/f6b5d556/files/uploaded/22-55_Uznemsanas%20_noteikumi_2023_2024_LV.pdf [accessed: 17.12.2022.].

Duration and scope of the study programme

The duration of the first-level professional higher education study programme "Programming Specialist" is 2 study years or 4 study semesters, with a total of 80 CP or 120 ECTS. The scope of the main parts and courses of the first-level professional study programme corresponds to the structure described in the Cabinet of Ministers Regulation No. 141 "Regulations regarding the State Standard for First Level Professional Higher Education":

1. The scope of the programme is from 80 to 120 credit points. The scope of the the first-level professional higher education study programme "Programming Specialist" is 80 credit points (CP)
2. The total number of study courses - total amount - has to be not less than 56 credit points but not exceeding 75% of the total amount of the programme. The total number of study courses in the first-level professional higher education study programme “Programming Specialist” is 56 CP.
3. The general education study courses have to be not less than 20 credit points. The total number of general education courses in the first-level professional higher education study programme “Programming Specialist” is 20 CP. The general education courses cover the humanities; social sciences; natural sciences, technical sciences and information technology.
4. The sector study courses have to be not less than 36 credit points. The sector study courses in the first-level professional higher education study programme “Programming Specialist” is 36 CP. This section includes compulsory courses; study courses for a particular profession, optional study courses.
5. The amount of internship has to be not less than 16 credit points. The internship for the first-level professional higher education study programme “Programming Specialist” is 16 CP.
6. Qualification work has to be not less than 8 credit points. The qualification work of the first-level professional higher education study programme “Programming Specialist” is 8 CP.

Evaluation of effectiveness

Graduates of the first-level professional higher education study programme “Programming Specialist” obtain the qualification "Programmer", which corresponds to qualification level No. 4. The need for such a study programme is justified by the labour market forecasts of the Ministry of Economics of the Republic of Latvia, which state that in the medium term (2020-2030) the Information and Communication Services sector will need approx. 13,000 IT specialists. In the long term (2031-2040), the number of specialists in the Communication and Information Services sector may exceed 12,000. It should be noted that it was outlined that Programming will be one of the TOP 15 education subject areas in terms of labour shortages/shortages by 2030 based on the above-mentioned labour market forecasts of the Ministry of Economy. Programmers, application

developers and analysts will be the sixth occupational set with the highest shortage in 2030, so the demand for ICT specialists, in particular programmers, is and will be there for a long time (see Figure 3.1.) based on the above-mentioned labour market forecasts of the Ministry of Economy. (Labour market projections of the Ministry of Economy available here: *https://prognozes.em.gov.lv/en/correspondence-demand-supply*).

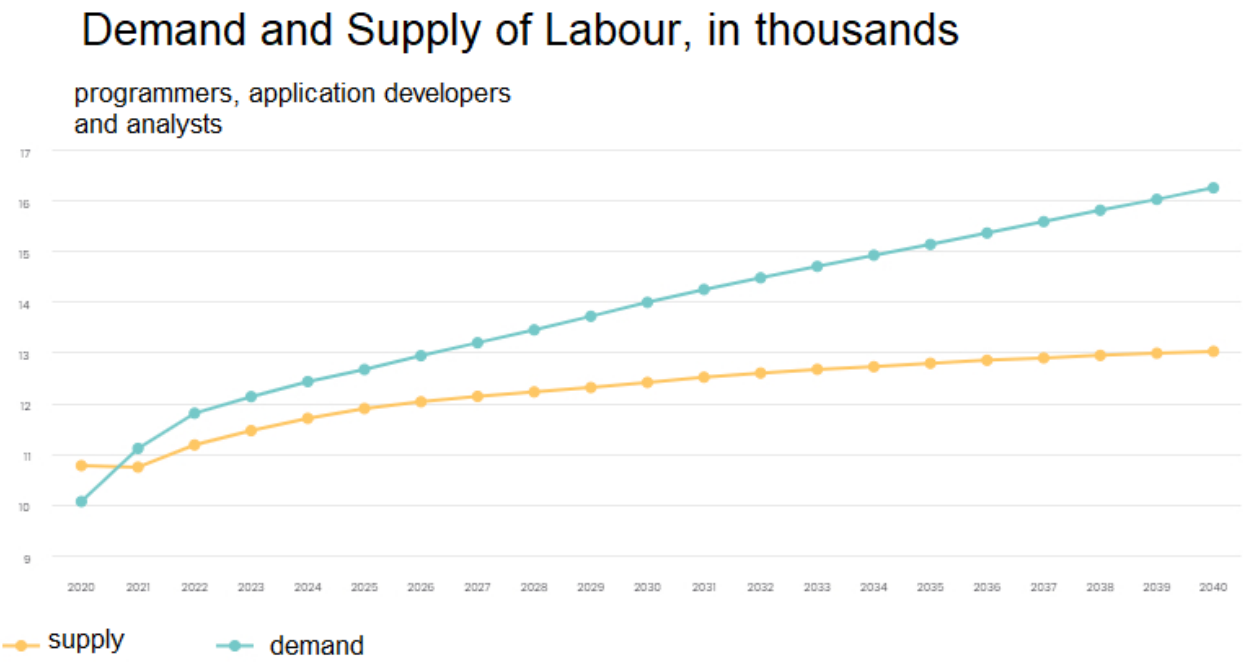

Fig. 3.1.. **Labour market situation and forecasts (2020-2040) of the Ministry of Economy - for the occupational group of programmers, application developers and analysts (in thousands).**

In the Ministry of Economy report is information of the current and future shortage of programmers. A quote from the Ministry of Economy's information report on medium- and long-term labour market projections - "...In higher skilled occupations, both labour demand and supply will continue to grow in the medium and long term, so that overall demand and supply will remain in balance. At the same time, labour shortages could become more pronounced in some higher-skilled occupations. The most significant labour shortages in the medium term are likely to arise in ICT occupations (senior database and network specialists, **programmers/application developers** and analysts, information technology operations and user support specialists, telecommunications and radio equipment specialists)...". Available: https://www.em.gov.lv/lv/media/14720/download?attachment [accessed 19/12/2022].

Taking into account the demand for programming specialists, the usefulness of the first-level professional higher education study programme "Programming Specialist" implemented at Ventspils University of Applied Sciences is very high.

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

Economic justification

This paper presents a general economic assessment of the value that a trained software professional brings to the economy. The assessment uses the following data and calculations:

Table 3.2.

Parameter	Value	Justification	Reference
Active professional years of the specialist	40 years	In these calculations we assume that students aged 20-25 will work in the ICT sector until retirement age, for example, 65.	The State Social Insurance Agency. Retirement pension. Available at: https://ej.uz/vsaa-vecuma-pensija [accessed: 15/12/2022]
Number of months worked per year	11 months	Taking into account the legislation of the Republic of Latvia on employee leave, it is assumed that the software programmer will work 11 months per year.	Labour Law, Chapter No. 35. Available (Only in Latvian) at: https://likumi.lv/ta/id/26019-darba-likums [accessed: 15/12/2022]
Hours worked per month	140 h	It is assumed that there are 140 productive hours out of 160 working hours in each month.	
Average sales rate of specialist work	35.00 eur/h	The work of the programmer is of high added value and will be calculated on the basis of a sales rate of €35.00/h programmer, taking into account information available at the end of 2022 from the electronic procurement system for information systems software development, enhancement and maintenance services. The largest part of a specialist's selling rate is made up of the specialist's out-of-pocket costs - salary, taxes, provisions for administrative time, training, etc. The sales rate assumption does not take into account what the sales rate might be for current professionals in 5, 10 or 20 years' time. The value of a professional is calculated as of today, excluding future cash value. In 20 years' time, it is possible that the rates for young professionals will be €70 per hour.	A procurement of the software upgrade, development and maintenance services for existing information systems of Electronic Procurement System - from €34 to €84/hour Available (Only in Latvian) at: https://ej.uz/eis-gov [accessed 15/12/2022]

Average specialist salary rate	20.54 eur/h	Calculations are based on information from the State Revenue Service on average hourly rates in 2022 and from CV.lv job ads at the end of 2022. The hourly rate assumption does not take into account what the hourly rate might be for current professionals in 5, 10 or 20 years' time. The value of a professional is calculated as of today, excluding future cash value. In 20 years' time, it is possible that the rates for young professionals will be €70 per hour.	State Revenue Service. Information on average hourly tariff rates for the period February to October 2022. Available(Only in Latvian) at:https://ej.uz/eis-gov [accessed 18/12/2022] IT specialist jobs on CV.lv - hourly rates range from €15 - €43/h. Available at: https://ej.uz/cv-it[accessed 15/12/2022]
Average rate of VAT	21%	Given that the work of a trained software engineer is sold as a service, VAT must be charged. This calculation will be based on a rate of 21% over the lifetime of the active professional years.	State Revenue Service. VAT rates. Available at:https://ej.uz/vid-pvn-likmes [accessed 15/12/2022]
Labour tax burden on average salary in Latvia in 2021	40.5%	The calculation is based on the average tax burden in Latvia, assuming that the trained software engineer lives in Latvia and pays all taxes, thus contributing money to the Latvian state budget in the form of taxes.	Organization for Economic Co-operation and Development (OECD). Report “Taxing Wages: Key findings for Latvia 2021”. Available at:https://www.oecd.org/tax/tax-policy/taxing-wages-latvia.pdf [accessed 15/12/2022]

Total number of hours in a professional's life = 40 x 11 x 140 = 61600 h. We can look at two scenarios:

1. the trained programmer is an employee, live and work in Latvia, and get paid for his or her work, knowledge, skills and competence throughout his or her working life

61600 h x 20.54 eur/h = 1265264 eur. Given the current tax burden in Latvia, the programmer pays contributions to the state budget (overall)

1 265 264 x 40.5% = 512431.92 eur.

1. the work of the trained programmer is sold as a service, on which VAT is paid to the national budget. At the current VAT rate, the State budget would be paid

61600 h x 35.00 eur/h x 21% = 452760 eur.

Taking into account the calculations, it can be seen that each trained programming specialist contributes a lot to the Latvian economy, including the graduates of the first level professional higher education study programme "Programming Specialist" implemented at Ventspils University of Applied Sciences, thus proving the high economic usefulness of this programme.

Analysis of graduate employability

Taking into account that the first level professional higher education study programme "Programming Specialist" is implemented at Ventspils University of Applied Sciences from the 2017/2018 academic year, the first graduate of the study programme was in the 2018/2019 academic year. In total, 18 persons graduated the study programme (see Figure 3.3).

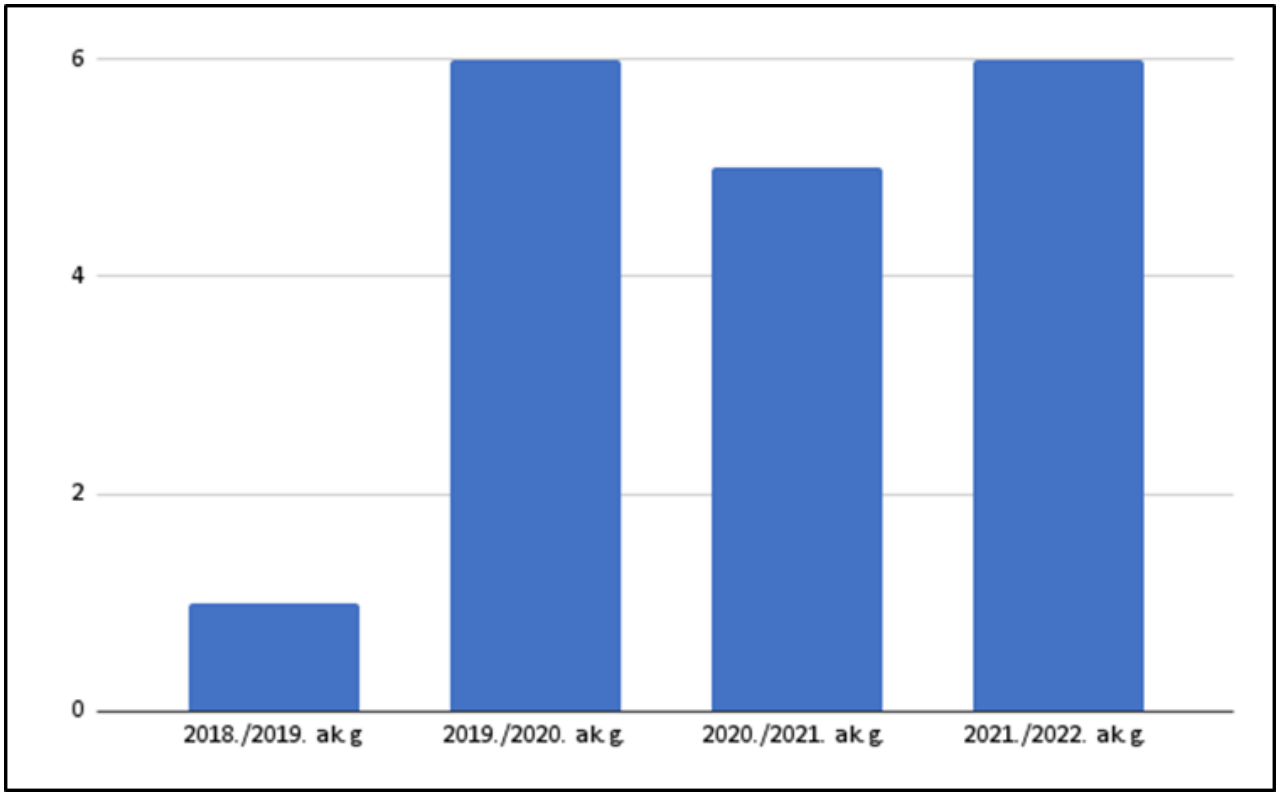

Fig.3.3. **Number of graduates of the first-level professional higher education study programme "Programming Specialist" during the programme implementation period**

In December 2022, 83.33% of graduates of the first-level professional higher education study programme "Programming Specialist" had their job responsibilities related to information technologies - development and testing. Data of the job duties (IT-related and non IT-related) of all graduates are presented in Table 3.4 (December 2022).

Table 3.4.

Year of graduation	IT-related job responsibilities	Non-IT job responsibilities	Distribution of students working related to IT
2018./2019. ac.y.	1	0	100.00%
2019./2020. ac.y.	4	2	66.67%
2020./2021. ac.y	5	0	100.00%
2021./2022. ac.y	5	1	83.33%
Total over the period	15	3	**83.33%**

Graduates of the study programme who have IT-related job responsibilities work in such companies/institutes as Ltd. TestDevLab, Accenture Latvian branch, Ltd. Dartfsh, Ventspils University of Applied Sciences of Engineering Institute "Ventspils International Radio Astronomy Centre" (VUAS EI VIRAC), Ltd. Tieto Latvia, JSC Development Finance Institution Altum, Ltd. ITP Baltic, Ltd. eazyBI. The number of graduates, taking into account their place of work as of December 2022, is shown in Table 3.5.

Table 3.5.

Graduates workplaces (IT-related jobs)

Company/Institute	Number of working graduates	Distribution of graduates with IT-related job responsibilities
Ltd. eazyBI	1	6.67%
Ltd. ITP Baltic	1	6.67%
JSC Development Finance Institution Altum	1	6.67%
Accenture Latvia	7	46.67%
Ltd. TestDevLab	2	13.33%
Ltd. Dartfsh	1	6.67%
VUAS EI VIRAC	1	6.67%
Ltd. Tieto Latvia	1	6.67%
Total	15	100.00%

7 out of 15 graduates with IT-related job responsibilities work in Accenture Latvia, two graduates - in SIA TestDevLab, and others graduates of the first level professional education study programme "Programming Specialist" work in individual companies/institutes.

It should be noted that 14 out of 15 graduates, whose job responsibilities are related to software development, testing and implementation, are working in the same company or institute where they did their internship during their studies, thus once again demonstrating the great importance of internships in the professional study programme, as well as the student's knowledge, skills and abilities, which are valued in the continuation of the employment relationship after the completion of the internship.

Two of the 2019/2020 graduates enrolled in the academic bachelor study programme "Computer Science" implemented by Ventspils University of Applied Sciences to continue their education in the second level study programme. In December 2022, only one of the graduates is continuing his studies, while the other graduate has discontinued his studies due to personal reasons.

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

Enrolments in the first-level professional higher education programme "Programming Specialist" are on an upward trend. The programme was launched in the 2017/2018 academic year and 13 students were enrolled in that year. The number of students enrolled in the 2022/2023 academic year is already 37. The dynamics of the number of students enrollment is shown in Figure 3.6.

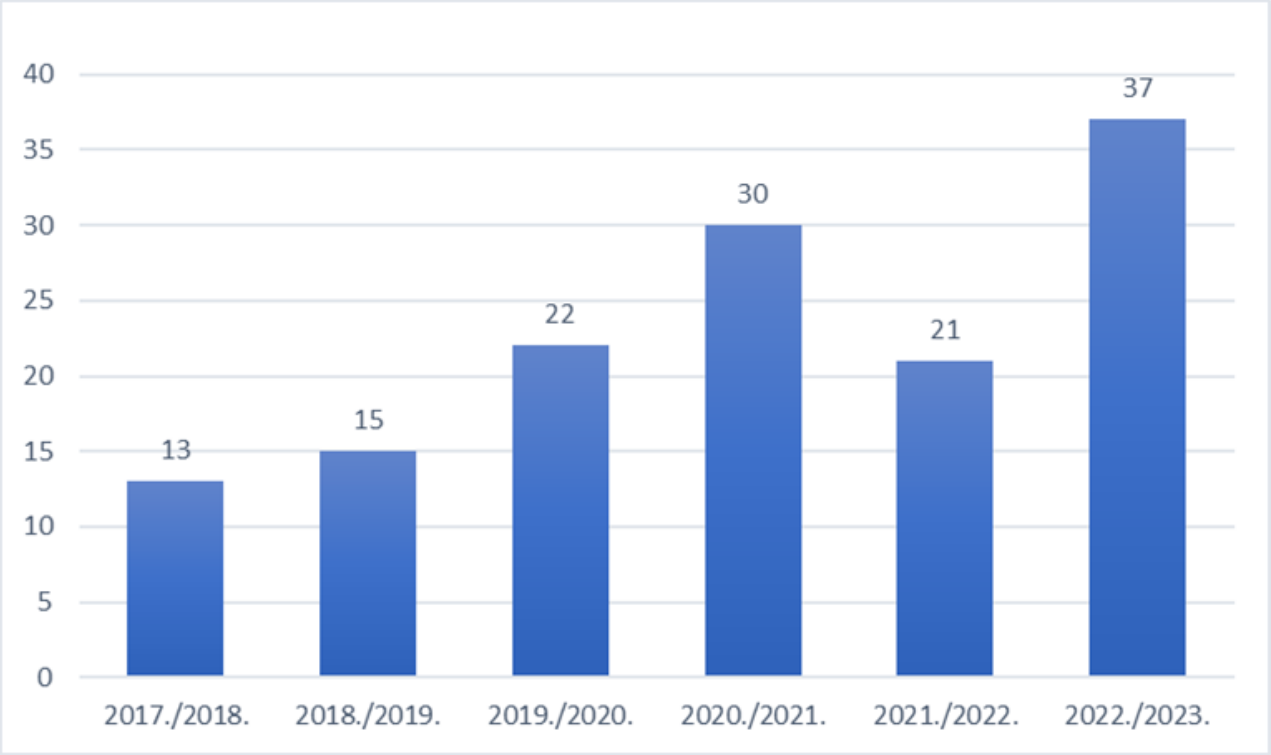

Fig.3.6. **Dynamics of the number of students enrollment in the study programme "Programming Specialist".**

The dynamics of the number of students in the study programme by study years and study courses can be seen in Figure 3.7.

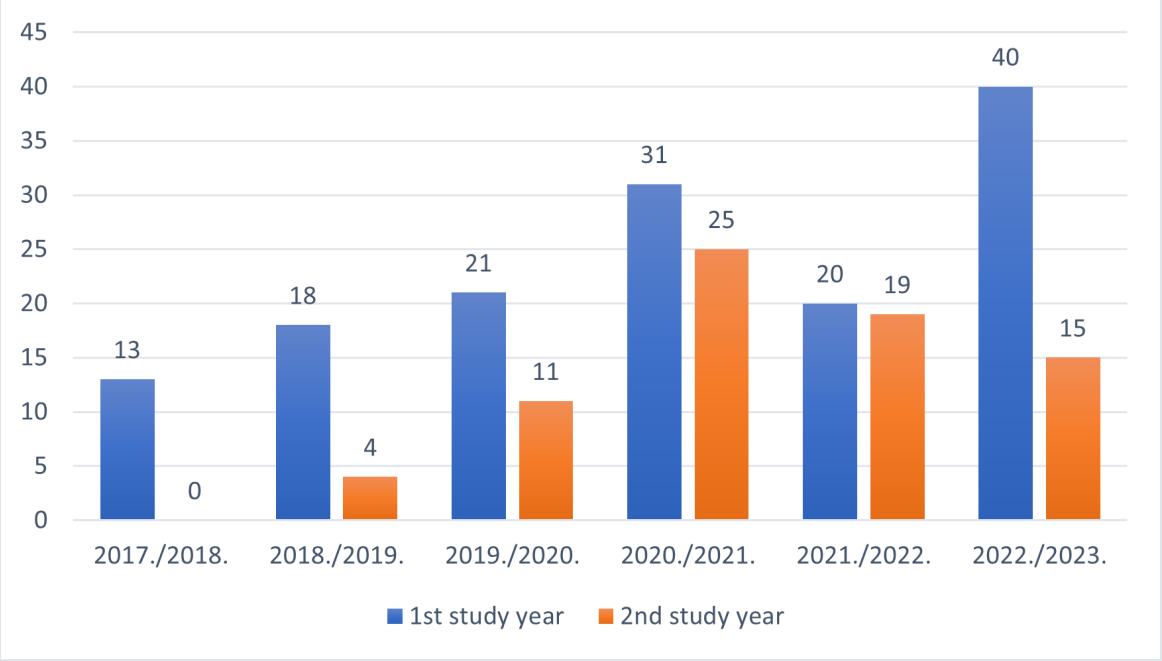

Fig.3.7. **Dynamics of the number of students in the study programme "Programming Specialist".**

The majority of students (86%-100% depending on the year of study) study with state budget funding. The distribution of students in the study programme by funding source (state budget places, private funding) is shown in Figure 3.8.

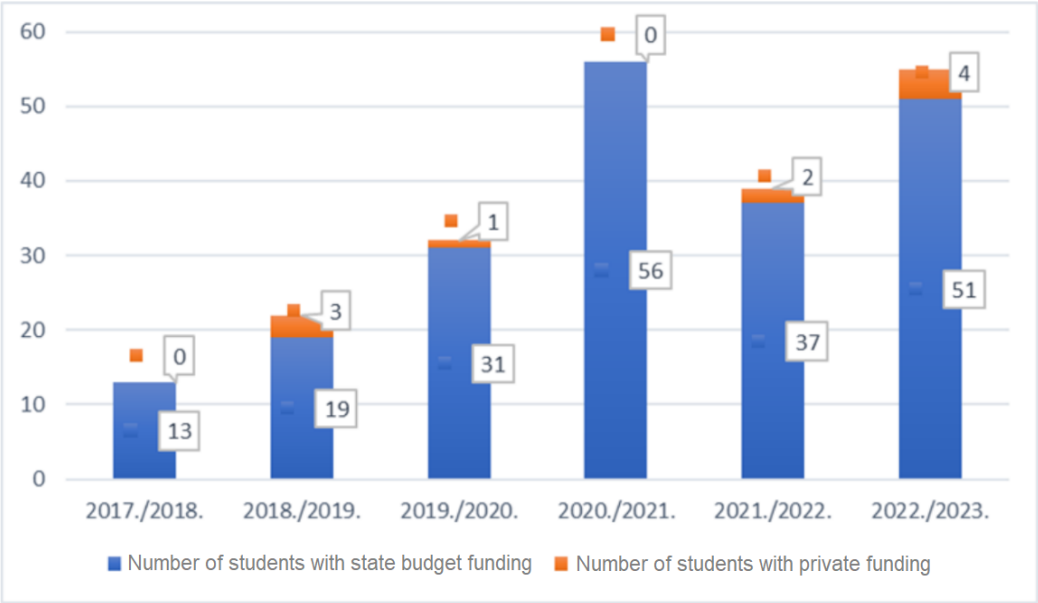

*Fig.3.8.***The distribution of students in the study programme by funding source**

There are also drop-out situations in the study programme. The first graduation was in 2017/2018, when only one student graduated (out of 13 students which enrolled in the 1st year). Some of these students had taken a study break, but most of them were exmatriculated. The number of students drop-out by year is shown in Figure 3.9.

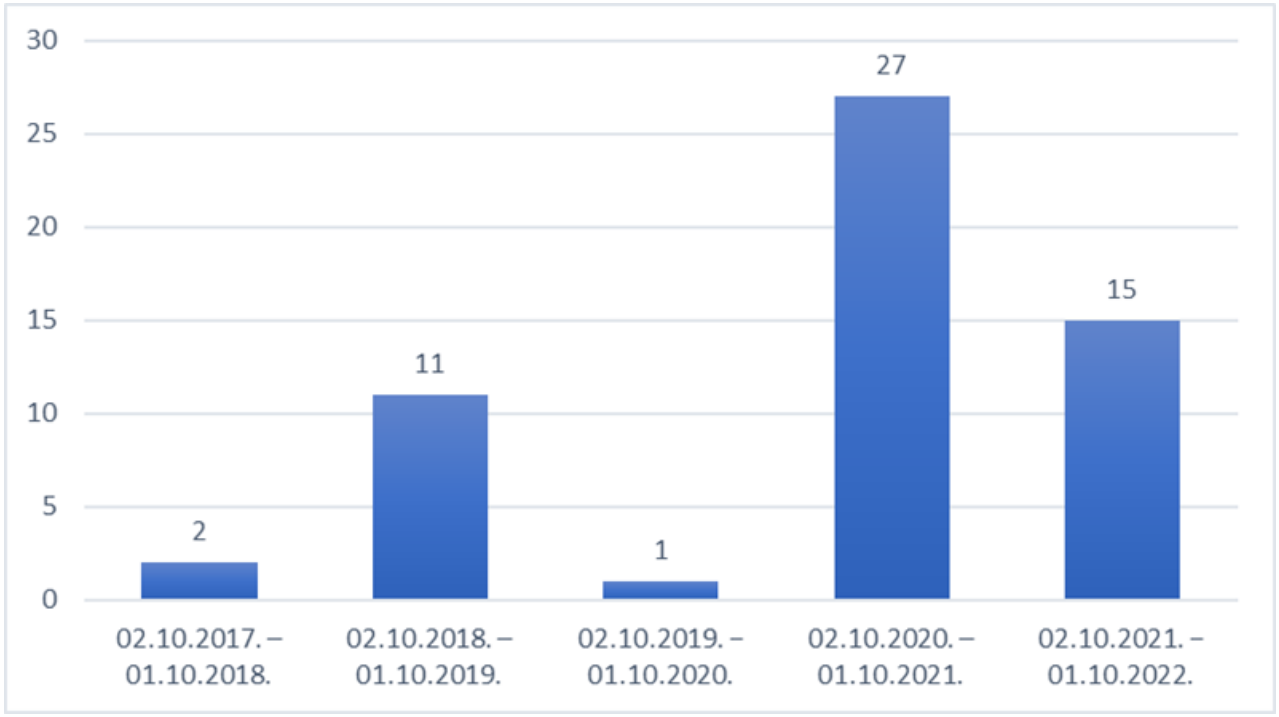

Fig.3.9. **Number of students dropped out of "Programming Specialist" study programme**

Analysing the questionnaires of students' responses related to cases of student's exmatriculation, it can be concluded that students have left their studies mainly for personal reasons - they have changed their place of residence, financial problems have arisen. It is relatively common for students to experience difficulties in combining studies with work, especially in the second year of study, when students have to take important courses in their specialisation, as well as undertake an internship and prepare a qualification work. There is a particularly high drop-out rate between 2

October 2020 and 1 October 2022. This is a time when a large number of students have dropped out due to the spread of the Covid-19 virus, as they face unprecedented financial and emotional challenges during this period.

To motivate and support students, in their 1st year they are already informed about the challenges they will face in their 2nd year (two internships and a qualification work should be defended to successfully complete their studies). As the programme is only four semesters long (of which only three semesters are lectures), there is little scope for changes in the course planning. Courses are taken in sequence, based on previously completed courses. Therefore, students have to do all the work, including finding internships and choosing a topic for their qualification work. In order to avoid additional emotional stress, the programme director and the faculty administration try to support and assist students in finding the most suitable internship place. It has been observed that students sometimes experience difficulties in communicating and "presenting" themselves to potential employers. It is therefore suggested that the courses "Aspects of Communication and Professional Ethics", "IT Project Management" and "English" include various activities (practical work, presentations, etc.) that would enhance students' communication and presentation skills, highlighting those qualities, skills and competences that could be attractive to employers.

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

3.2. The Content of Studies and Implementation Thereof

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

Content of the study programme

The content of the study programme "Programming Specialist" complies with the state education standard. Cabinet Regulation No 141 "Regulations on the State Standard for First Level Professional Higher Education" (20 March 2001) (hereinafter - Cabinet Regulation No 141) defines the compulsory content of first level professional higher education programmes (Paragraphs 4-8 of the Regulation). The content, structure and layout of the study programme "Programming Specialist" has been designed in compliance with all the requirements of this document. The content of the study courses is developed in compliance with the above-mentioned Cabinet of Ministers Regulation

No 141, the professional standard for programmers (08.06.2022), as well as industry and labour market trends.

Table 3.10.

Compliance of the content of the study programme "Programming Specialist" with the Cabinet of Ministers Regulation No 141

	The scope of the programme shall be from 80 to 120 credit points.	80 CP
1.	The total number of study courses - total amount - not less than 56 credit points but not exceeding 75% of the total amount of the programme	56 CP
	The general education training courses - not less than 20 credit points.	20 CP
	The sectoral study courses - not less than 36 credit points;	36 CP
2.	The amount of internship - not less than 16 credit points;	16 CP
3.	Qualification work - not less than 8 credit points but not exceeding 10% of the total amount of the programme	8 CP

The total length of the study programme "Programming Specialist" is 80 credit points. The total amount of study courses is 56 credit points. The content of the courses consists of General study courses and Sectoral study courses. More than 30 % of the study courses are practical. The types of independent work and the ways of verifying their performance shall be specified in the course descriptions of the study programme.

The choice of courses in the programme, as well as the content of the courses and internships, is designed to meet the basic requirements of the professional qualification of a programmer and the specific requirements needed to perform the duties and main tasks of a programmer, as defined by the professional standards for programmers.

General education study courses. The study programme "Programming Specialist'' comprises general education courses with a total of 20 credit points. These include study courses to develop the skills, knowledge and competences needed to fulfil the core tasks and responsibilities of a professional activity, as well as to develop professional competencies for entrepreneurship. These courses use competency training and practical teaching methods. The study course "*Entrepreneurship and Economics*" (2 CP) helps to develop competences in the organisation and establishment of enterprises, management methods, record-keeping and financial accounting systems. The study course "*IT Project Managemen*t'' (2 CP) helps to build the core competencies of project development and management. The study course "*Aspects of Communication and Professional Ethics*" (1 CP) helps to build competences in social dialogue in society. Whereas the study course "*Basics of IT Industry Rules & Regulations & Standards*" (2 CP) helps to build competences in the laws and regulations governing employment relations. The study programme includes 4 study courses of 7 credit points for the development of professional competences in entrepreneurship. The general education section also includes a mathematics course for programmers, English and Spanish courses for programmers, as well as courses in civil protection, community sustainability and green thinking.

Sectoral study courses. The study programme "Programming Specialist" comprises sectoral study courses equivalent to 36 credit points. The sectoral study courses include compulsory study courses, study courses for a particular profession and optional study courses and provide specific

knowledge and skills in programming.

Internship. The internship is organised for 16 credit points in companies in the sector or in companies where software development and testing activities are carried out, in accordance with the internship regulations. In cases where the student is gainfully employed in parallel with successful studies, the internship is compatible with work in companies with a relevant profile. The internship is carried out in accordance with a tripartite traineeship agreement between the university, the intern and the employer providing the internship. The aims and objectives of the internship include familiarisation with the management structure and operating principles of the internship organisation. Representatives of the organisations with which the internship agreement has been concluded participate in the definition of the aims and objectives of the student's internship, as well as in the evaluation of the internship. At the end of the placement, the placement supervisor writes a review of the student's placement work and gives his/her assessment. This evaluation shall constitute 30% of the student's placement grade. The internship is divided into two parts of four and twelve credits respectively. This enables the student to undertake the placement in two companies in order to diversify the student's experience and strengthen the student's understanding of the profession.

Qualification work. At the final stage of the study programme, students develop a qualification work. The elaboration of the qualification work in the amount of eight credits strengthens the knowledge, skills and competences acquired in the study courses, applying them in the development of the practical work and in the preparation of the theoretical description of the development process. The qualification work includes the defence of the qualification work at a meeting of the National Final Examination Board. The National Final Examination Board is composed of a chairperson and at least four members. The head of the Board and at least half of its members shall be representatives of professional organisations or employers in the sector. The qualification paper is the student's evidence of competence for the qualification and is assessed on a 10-grade scale.

The study programme is implemented in accordance with the study programme plan (available in Annex 7.6).

Relevance and updating of study programme content to labour market needs

The development, implementation and updating of the study programme content is carried out in accordance with the labour market and development trends in the sector, involving industry professionals and representatives of employers who provide competent advice and their vision of the current needs and development trends in the sector.

Employers are involved in both the assessment of study programme results and the implementation of necessary changes, course delivery, assessment of student learning outcomes through participation in committees

The content of the study programme is designed and implemented in accordance with the professional standards.

The study programme "Programming Specialist" is a professional education programme, its content is defined and implemented in accordance with the Programmer's Occupational Standard (approved on 8 June 2022, Protocol No 3). Thus, the content of the study programme is developed and implemented in accordance with current industry trends and labour market needs.

Representatives of companies in the sector are represented in the Computer Science Study Programme Board of the Faculty of Information Technology. 5 employer representatives have been approved as members of the Council of the Computer Science Programme (approved at

the FoIT Council meeting on 8 March 2022, protocol No 4). This gives employers the opportunity to be involved in decision-making regarding the content and implementation of the study programme, as well as to put forward their own proposals for changes to the study programmes.

Industry is represented on the National Examinations Board. The head of the Board and at least half of its members are representatives of professional organisations or employers in the sector. This gives employers the opportunity to assess the relevance of the students trained under the study programme to the needs of the sector and the labour market, as well as to get to know their potential employees. Employers are also invited to participate in the pre-defence sessions of the qualification theses and to assist the student in the qualification process with their questions and advice.

After the defence of the qualification work, discussions are held with the members of the State Final Examination Board, during which shortcomings in the achieved results are identified and proposals are made to improve the content of the study programme, the development of the qualification work and the assessment process. In this way, feedback is received annually from employers on the results achieved.

Representatives of companies in the sector are involved in the design and implementation of study courses. In order to ensure closer interaction between students and industry, a number of study courses have been developed in cooperation with the industry, and industry is involved in the implementation of the courses. The following sectoral courses are included: 'Development Operations Tools' (2 CP), 'Software Testing and Automation' (2 CP) and 'Software development templates' (2 CP), 'Full-stack mobile app development' (2 CP), 'Security of Information Systems' (2 CP), 'Design Patterns' (2 CP), as well as a number of general education courses. This gives employers' representatives the opportunity to shape the content of study courses in line with current industry trends, as well as to assess the level of students' preparation and provide feedback to the study programme management.

Employer surveys are organised. The Employer Survey collects employers' views on the knowledge, skills and competences of students (interns) and graduates. This allows both the strengths and weaknesses of the study programme to be identified, and, if necessary, the content of the study programme or individual courses to be concluded and, if necessary, modified.

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

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

process.

The form of education of the first-level professional higher education study programme "Programming Specialist" is full-time studies. It is implemented as a full-time study programme over a two-year period. In order to provide students with a transparent framework for the implementation of the study course, for each study course the aim of the study course is defined, along with the content of the study course, the calendar plan, the achievable results within the framework of the study course, the evaluation of the results of the study course and the criteria, as well as the organisation of the individual independent work of the student. At the beginning of each study course, students are presented with this information and it is also placed on the page of the respective study course in the e-learning platform "Moodle" of Ventspils University of Applied Sciences.

The acquisition of knowledge, skills, attitudes and competences in study courses involves several methods, including active work in the classroom, involving the acquisition of theoretical knowledge and the transfer of this knowledge into practical work, carried out individually or in groups. Lectures and seminars, as well as individual and group practical work, are mostly face-to-face, but in some cases online, using digital platforms and online tools for programming and other assignments. The study courses provide the necessary theoretical knowledge, with a strong emphasis on its application in practical work, through independent analysis of information, writing programmes and other coursework.

An essential role in the acquisition of each study course is played by the student's independent work, which includes: regular study of the course material using lecture materials, study literature, internet resources, etc.; development of independent practical work; development of homework; preparation for tests, etc. The ratio of lectures, practical work and laboratory work is determined by the lecturer of the study course, taking into account that at least 30 % of the study course volume has to be realised practically.

To bring students closer to the industry and to learn about current industry trends, several courses are run by representatives of companies in the sector. Students have the opportunity to attend guest lectures by experts in the field or in their professional field.

The programme's teaching staff and students use the e-learning environment "Moodle" and the online conference programme "BigBlueButton". All course materials are available on the Moodle platform. The above-mentioned digital technologies are also used for the exchange of views and information between lecturers and students, as well as among students themselves.

In the study process, various methods of assessing knowledge, skills, attitudes and competences are used both during the study course and at the end of it: test work, homework, test, project, study work, presentation demonstration, study test, examination. Academic integrity and ethical principles are important considerations in the course of study and in the assessment of achievement.

In the process of managing the development of qualification works, as well as in the process of its assessment, not only the academic staff of the VUAS is involved, but also experts and specialists in the field of professional activity, thus strengthening the professionalism of students in accordance with the industry and the needs of the economy.

The basic principles and procedures for the assessment of students' knowledge are determined by the Regulations on the State Standard of Academic Education (Regulation of the Cabinet of

Ministers of the Republic of Latvia No.240 of 13.05.2014) and are carried out in accordance with the laws and regulations in force at Ventspils University of Applied Sciences.

The assessment system at Ventspils University of Applied Sciences is regulated by the "Regulations on the Procedure for Organising Examinations and Assessing Students' Knowledge at Ventspils University of Applied Sciences" (approved at the meeting of the VUAS Senate on 15 January 2020, Decision No 20-02. Decision No. 21-29 of the Senate of 31.05.2021).

The learning process is student-centred, respecting students' different levels of prior knowledge and experience in programming. This study programme is chosen by people who have just graduated from high school, by people who already have a higher education in another field, by people who graduated many years ago, by people who work, by people who have their own family, so it is very important to respect this diversity and, as far as possible, to create appropriate learning paths and lecture plans.

Lecturers respect the capabilities of each student and the importance of cooperation in the feedback process, both during the course and during the assessment of knowledge, skills and competences. In all courses, assessment criteria and methods, as well as marking criteria, are communicated in the first lectures and assessment is consistent and fair. Assessment provides students with the opportunity to demonstrate the extent to which they have achieved the expected learning outcomes. Students receive feedback which, if necessary, provides guidance on the learning process. Students are offered tutorials, individual discussions, both face-to-face and with the possibility of distance consultation, thus creating conditions for learners which reduce the gap in the level of prior knowledge, respect learners' interests, cultural differences, experiences.

Mutually respectful cooperation between student and lecturer is aimed at the successful achievement of study programme results.

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

In order to ensure the strengthening of knowledge, skills and competences in the programming profession, the first level professional higher education study programme "Programming Specialist" provides for an internship of 16 credit points in accordance with the Cabinet of Ministers Regulation No 141 "Regulations on the State Standard for First Level Professional Higher Education" (20 March 2001), which provides for a minimum internship of 16 credit points.

The internship is divided into two parts: four credits in semester 3 and twelve credits in semester 4.

The study programme director is responsible for the organisation and control of the in internship in accordance with the duties set out in the VUAS "Study Programme Director" job description. In turn, the internships chosen by students are evaluated and approved at the meeting of the Faculty Council. The organisation of internship work is specified in the internship regulations of the first level professional higher education study programme "Programming Specialist" (hereinafter - the

Internship Regulations, see Annex 7.8).

Aim and objectives of the internship

The aim and objectives of the internship are defined in the Internship Regulations in accordance with: 1) the Programmer Professional Standard; 2) the Study Programme Study Results (hereinafter - SPSR) specified in the "Mapping of Study Courses to Achieve the Study Programme Study Results" (hereinafter - the Study Results Mapping, see Annex 7.5). The following internship tasks are defined in the internship regulations.

The aim of the internship is to:

- to verify the student's professional and personal suitability to work in the field of programming;
- to give the student the opportunity to independently continue the professional development of the acquired skills and competences in a real working environment of a company/organisation.

The student's tasks during the internship are:

- independently carry out a software development task or participate in a software development project;
- develop professional skills and competences by carrying out tasks in the framework of a software development project;
- become familiar with software development methods used in the enterprise;
- familiarise themselves with the software development environments used in the enterprise;
- document regularly the progress of the traineeship;
- develop documentation of the internship.

Internship expected results

Knowledge:

- Knowledge of technologies and methods for practice tasks and problem solving.
- Knowledge of documentation and technical standards required for the completion of the practice task.

Skills:

- Is able to apply the technologies learned in practice.
- Is able to identify the functional and non-functional requirements of a programme and their validity.
- Is able to analyse different technical solutions and select the most appropriate one.
- Is able to understand requirements specification and system design, participate in software implementation and testing.
- Is able to select and analyse theoretical and practical solutions described in literature sources, specifications and documentation

Competences:

- Is able to present, discuss and explain results in a reasoned manner
- Is able to take responsibility for the quality of the results of the work placement.
- Is able integrate into the company working environment.

The link between the objectives and goals of the students' internship and the SPSRs is indicated in the Learning Outcomes Mapping (see Annex 7.5) and in the internship description, which is prepared in the same form as the course descriptions.

Internship possibilities

Students have internships according to the acquired qualification in companies of the industry or in companies where activities related to software development are carried out, such as Ltd. TestDevLab, Accenture Latvia, Ltd. Dartfish, Ventspils University of Applied Sciences Engineering Institute "Ventspils International Radio Astronomy Centre" (VUAS EI VIRAC), Ltd.Tieto Latvia, JSC “Development Finance Institution Altum”, Ltd. ITP Baltic, Ltd.eazyBI.

It should be noted that 14 out of 19 graduates continue their working career in the same company or daughter company where they had their internship during their studies. This shows the importance of internship in the professional study programme, as well as the knowledge, skills and competences acquired in the study programme, which are valued by employers when continuing employment relations after the completion of internship.

Choosing a internship

The placement is chosen by the student. After finding the internship placement, the student provides the study programme director with information on the expected workload and its specifics at the internship placement by filling in a specific form. The student's internship placement and the internship supervisor are approved at the meeting of the Faculty Council.

After the approval of the internship placement by the FoIT Council meeting, a tripartite contract is concluded between the VUAS, the student and the internship company. The student placement is supervised by a suitably qualified specialist from the placement site (company or organisation)

Internship progress and defence

During the internship, in addition to completing the internship tasks, the student is required to document the internship and prepare an internship report on the internship and the work done. The internship is evaluated by a committee composed of the teaching staff involved in the implementation of study programmes of the Faculty of Information Technology, as well as representatives of the field or area of professional activity. The evaluation of the internship consists of the evaluation of the internship supervisor (30%) and the evaluation of the committee (70%). The internship is evaluated in a 10-grade system.

Support provided by the university in finding and choosing a internship

Despite the labour market demand for programming professionals and the large number of companies active in programming, students sometimes find it difficult to find internships. There are companies that are keen to attract new employees rather than interns who require company resources to be dedicated to the placement without a guarantee that the student will continue with the company. The university supports the student in finding an internship if this is necessary. The programme director or the faculty administration individually addresses representatives from companies with which there have been various types of cooperation in the past. With the support of the university, students are provided with an internship appropriate to the qualification to be obtained.

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

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

At the final stage of the study programme, students work on a qualification thesis. The topic of the qualification paper is chosen by the students independently. In order to ensure that the topic chosen by the student corresponds to the study programme and the qualification to be obtained, the student consults the lecturers of the relevant study courses or specialists in the field of professional activity. Often, qualification thesis topics are related to projects that students have been involved in during their studies or students have started their working career and relate the qualification thesis topic to current developments in their workplace.

During the reporting period (academic years 2018/2019, 2019/2020, 2020/2021 and 2021/2022), 19 qualification theses were developed and 18 successfully defended.

Table 3.11.

Topics of Qualification work

Academic year of defence	Qualification work topic	Grade
2018./2019. AY	The Development of an Android-based Wireless LED Matrix Control System	6
2019./2020. AY	Development of web system with continuous integration in Amazon cloud	8
	Hand gesture and symbol recognition using computer vision and machine learning	8
	Rubik's cube solver app	6
	Development of an event-driven web-based system using cloud solutions	8
	Interactive Novation Launchpad interface development for digital classroom	9
	Ventspils tourist train audio guide	5
2020./2021. AY	Development of a prototype of a semantic search algorithm and a visualization module for botanical terms	7
	Development of Android application for collecting data of COVID-19 cases	8
	Application system's development for use of VIRAC's infrastructures	9
	Application development for specialist remote consultations using production servers load balancing	8
	Development of digital camera time-lapse photography slider control system	9

2021./2022. AY	Development of a time planner tool	6
	Development of work environment risk assessment record application	5
	Design and development of a terminology platform system using Spring Framework and React JS technologies	7
	POS system prototype development (not successfully defended)	3
	Development of a web application intended for meal planning	8
	Development of Mobile App Prototype With Google Flutter and Dart for Gathering and Analysing Statistics on Emotion Regulation Skills	8
	Time management web application	7

The average grades of the qualification work in each academic year are shown in Table 3.12, while the statistics showing the number of students who obtained the grades in each academic year are shown in graph 3.13.

Table 3.12.

Average grades of qualification work

Academic Year	Number of qualification works	Average grade
2018./2019. AY	1	6.00
2019./2020. AY	6	7.33
2020./2021. AY	5	8.20
2021./2022. AY	7	6.29
Total	19	6.95

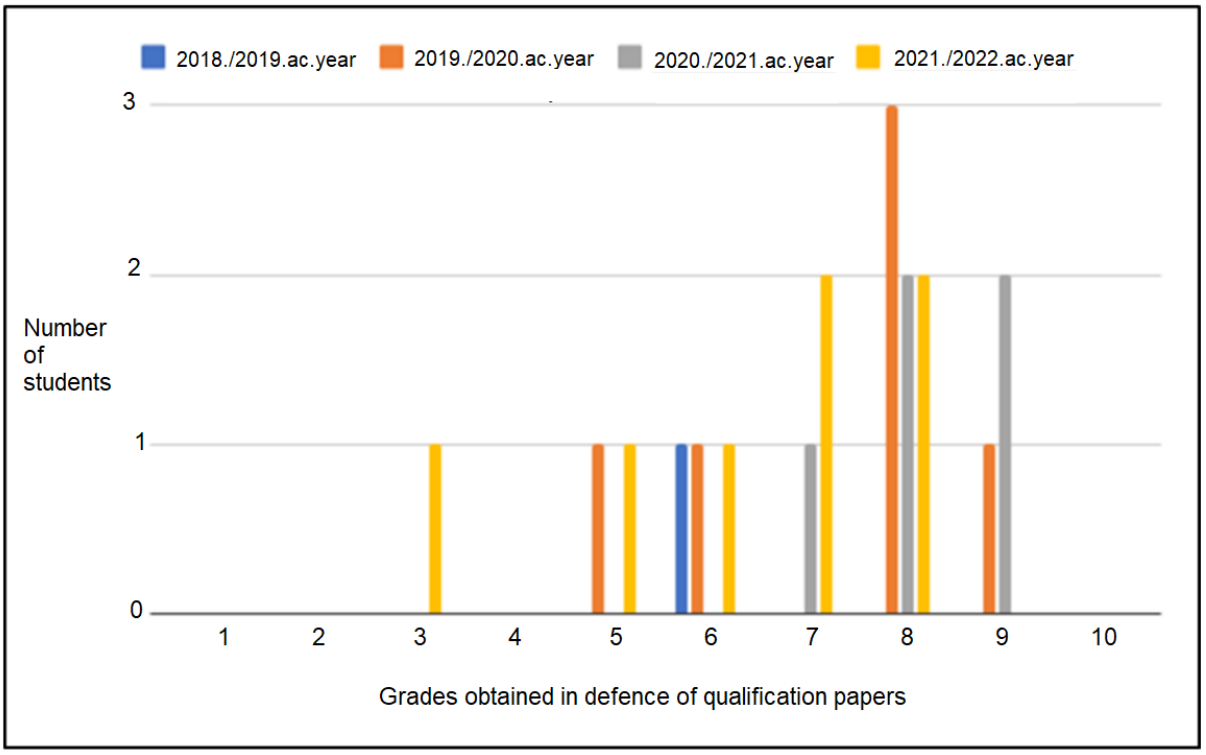

Fig. 3.13. **Statistics on assessments of qualification papers in the period from 2018/2019 to 2021/2022**

The topics of the qualification papers are chosen on the basis of relevance to the sector. The qualification papers use up-to-date technologies, libraries and frameworks, e.g. Spring or Node.js are often used for backend development, and React.JS and Angular.JS libraries are used for frontend development. Several qualification projects have developed mobile apps as front-ends using the current Google Flutter framework and Android technologies, and several qualification projects have used containerisation and cloud solutions, thus also thinking about the implementation and maintenance of the developed software solution in a production environment. Several qualification projects have included microcontroller programming, combined with the development of a mobile app as a dashboard, thus including both low-level and high-level programming.

3.3. Resources and Provision of the Study Programme

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

The assessment of the adequacy of resources and provision for the implementation of the study and programme and the achievement of the learning outcomes is presented in detail in Part II,

paragraphs 2.3.1 - 2.3.3 of this self-evaluation report.

The main "work tool" of the students of the study programme "Programming specialist" is a computer equipped with the necessary software - compilers and program development environments and a fast Internet connection.

Students of the study programme "Programming Specialist" have access to all VUAS computer rooms and laboratories. The computer rooms are equipped with modern computers, interactive whiteboards and other technological devices that help ensure a modern learning process and achieve the results of the study program, and all computers have a fast Internet connection.

Before the current semester, lecturers are asked about the software they need for the implementation of study courses, and the Informatics and Technical Teaching Aid (ITTA) Unit installs the necessary software in the computer classrooms. The software is mostly free, or it is possible to use educational licenses. Lecturers also use online tools, which have grown considerably in recent years.The use of online tools and other online resources is ensured by a broadband Internet connection (at least 10 Gbps performance), a wireless Internet network, including the EDUROAM network, available at VUAS.

Compliance of resources and facilities with the conditions for the implementation of the study programme and for the achievement of the learning outcomes

The resources and facilities available in the VUAS computer classrooms and laboratories contribute directly and significantly to the achievement of the results of the study programme. Since the results of the study program are based on the requirements specified in the professional standard "Programmer", five of the six learning outcomes are focused on specific practical competences:

- Awareness, knowledge and ability to evaluate program requirements (SPSR 1)
- Able to prepare a software design (SPSR 2)
- Able to write software code according to programming guidelines, analyze the sources of software errors, debug the software(SPSR 3)
- Able to perform software testing (SPSR 4)
- Able to cooperate during software development and delivery processes in cross-functional teams (SPSR 5)

Study program results SPSR 1, SPSR 2, SPSR 3 are mainly achieved by such study courses as "Mathematics for programmers", “Databases I”, “Databases II”, “Data Structures and Algorithms”, “Full-Stack Mobile App Development”, “Design Patterns”, “Fundamentals of JAVA Programming”, “JAVA Programming”, “Embedded Systems”, “Software Engineering I”, “Software Engineering II”, “WEB Application Programming” and others (Appendix 7.5. – mapping).

Depending on the programming languages used, these courses require software for program development, such as Java and Python compilers and development environments (Anaconda, CLion, PyCharm, WebStorm, Android Studio, Java(TM) SE Development Kit, Microsoft Visual Studio Code, Spring Tool Suite, Eclipse and others).

Study program results SPR 4 and SPR 5 are mainly achieved by such study courses as “IT Project Management”, “Software Engineering I”, “Software Engineering II”, “Software Testing and Automation”, “Development Operations Tools” and others (Appendix 7.5. – mapping).

Also in these study courses, the necessary software for program development and testing (in addition to the above), such as Cypress, Selenium, SonarQube and others, is provided, considering the content of the specific study course and the achievable study results.

In courses dealing with the development, testing and containerisation of information systems, ITTA reserves server resources for the creation of virtual machines for each student, thus providing each student with their own virtual working environment where they can install the software, tools, and libraries they need for their practical work with administrator rights.

Additional resources other than those mentioned above are not required to achieve the study program result SPR 6.

Achieving the study results in each study course and the entire study program as a whole is also ensured by the e-learning system "Moodle", where all study courses implemented in the study program are available. It helps students better navigate the course content, access study materials, submit study papers and receive feedback.

Achieving study results is also ensured by the book collection of the Ventspils University of Applied Sciences library, the possibility to order books from other libraries, as well as the subscribed databases of the VUAS library. The literature required for study courses is specified in the description of each study course (Appendix 7.7.).

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

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

VUAS is including the costs directly influential for the implementation of the study program or attributing them proportionally to the number of the students in the program when analysing the financing needed or financing received for particular study program. **Income** includes the State budget funding for study process (1630.11 EUR per each state funded study place, corrected by the study program (study costs) coefficient and by the study level coefficient, plus the state budget funding for scholarships and social needs for students 164.34 EUR per each state funded study place), as well as income from tuition fees (calculated separately for each study program). The financing allocated by the Ventspils City Municipality for supporting the study process and for the Ventspils City Municipality IT sector scholarships according to the agreement between the VUAS and the Municipality is included as income, too, calculated proportional to the number of students in the program. **Costs** are allocated as following:

- There is a centralized 26% deduction from income of each faculty from State budget funding and from tuition fees, allocated to finance the common running costs of the VUAS;
- There is a proportional part of total common running costs of the faculty or other

common costs of the particular faculty allocated to the costs of the study program proportionally to the number of the students in the program.

The 26% deduction from the income of each faculty for the common running costs of the VUAS is used for:

- utility costs – electricity, heating, water and sanitation, waste disposal services;
- maintenance of premises and buildings;
- services for maintenance of IT systems;
- marketing costs;
- representation costs;
- partly remuneration of the administrative staff of the VUAS;
- common tax payments of the institution etc.

Direct costs of the faculty, which are necessary and can be identified as expenses by the particular faculty, are divided among the study programs proportionally to the number of students in these study programs. Expenses which are planned, made and can be identified for a particular study program, are included in the costs of this study program. These expenses include remuneration of the academic staff and general staff of the faculty, social security payments, health insurance, as well as expenses for fixed assets, purchase of inventory, books, learning aid, maintenance of laboratory equipment and computer classes and other faculty expenses.

Both income and costs are calculated per each student, too, separately for every study program (for one calendar year usually), as well as percentage of each cost group of the total costs of the study program is determined.

To calculate **the brake-even point** of the study program, several methods can be used – to increase the number of students in the study program, to increase the state subsidy for each study place or to increase tuition fees for paying students. VUAS is using the first method – to model the number of students necessary to break even. The VUAS is not trying to increase tuition fees in the existing economic situation and taking into account the financial situation of local population, but is investing resources in marketing efforts to attract more students. We wish to point to the need to increase the government funding for university studies in the future, too.

First level higher education professional study program “Programming Specialist”

Director of the program lect. Estere Vītola

The study program (study costs) coefficient **1.5**; the study level coefficient **1.0**

No.	**Item**	**Actual situation**				**Brake-even point**		
		Students	Amount, EUR	*Percentage distribution*	*Per 1 student (per year)*	Costs (EUR)	Per one student (per year, EUR)	*Number of students in the program*
	2	3	4		5	6	7	8
	INCOME	**51***	**161 654**	***100%***	***3 169,68***		**3 170**	

1.	State funding for studies	51	124 703	*77,1%*	*2 445,17*			
2.	State funding for scholarships	51	8 381	*5,2%*	*164,34*			
3.	Tuition fees		1 280	*0,8%*	*25,10*			
4.	Funding from Municipality for studies		22 374	*13,8%*	*438,70*			
5.	Funding from Municipality for scholarships		4 915	*3,0%*	*96,38*			
	COSTS	**51**	**96 444**	***100%***	***1891,06***	**96 444**		***30***
6.	Academic staff remuneration	51	44 475	*46,1%*	*872,06*			
7.	General staff remuneration	51	1 702	*1,8%*	*33,37*			
8.	Scholarships and social costs	51	13 297	*13,8%*	*260,72*			
9.	Running costs, Utilities, Administration costs (26%)	51	32 756	*34,0%*	*642,27*			
10.	Materials, books, equipment	51	4 215	*4,4%*	*82,65*			
	Financial result:	**51**	**65 210**	***40,3%***	***1278,62***			

Number of students in the program 51 (01.10.2022)

There are in average 51 students in the first level higher education study program “Programming Specialist”, which is 25.6 % of the total number of students in the Faculty of Information Technology. The same proportion is used to calculate the funding from the Municipality for this program. The same proportion of 25,6 % is used to split the total costs of the faculty to this program. The study program has a high positive cash flow result of 40,3 %, but partially this is because part of the study courses are implemented together with other study programs which

decreases the academic staff remuneration costs for this particular study program.

Thirty students are needed in this program to reach the brake-even point (condition – costs not changed). It is planned to use the positive cash flow of this program to cover the costs of maintenance of study infrastructure (computer classes, software licenses) and study materials, as well as part of the cash flow is used to cover losses from the other programs of this study field.

The development of the first level higher education professional study program “Programming Specialist” has been supported financially from the ESF projects during the years 2018 – 2022. The project “Modernization of Ventspils University of Applied Sciences’ STEM teaching programs” (No. 8.1.1.0/17/I/007) financed new computer classes and improvement of premises in total for 1.77 million EUR. The projects “Strengthening the Academic Staff of Ventspils University of Applied Sciences in the Fields of Strategic Specialization” (Project No: 8.2.2.0/18/A/009), “Improving Quality of the Content of Study Programs at Ventspils University of Applied Sciences, Improving Resource Efficiency and Ensuring Better Management” (Project No: 8.2.3.0/18/A/014) and “Next Generation Micro Cities of Europe” (No.UIA03-250) have contributed to the qualifications of the academic staff of the program. As the laboratories and computer classes installed are used by all programs of this study field and by other faculties, too, and the academic staff is teaching in several study programs, it is not possible to separate the exact financial contribution of the projects mentioned to the development of this study program. As investments from the projects mentioned before are finished now, there will be a need to increase spending from the VUAS own budget to maintain computer classes after 2023.

The sources of funding for the field of study as a whole are listed in section 2.3.1. Taking into account the direct costs for the implementation of the study programme "Programming Specialist" (described in more detail in chapter 2.3.1), it is calculated that on average (taking into account each semester, the amount of internships and the semester in which the final thesis is to be produced) the costs spent on the salaries of the teaching staff are EUR 31874, together with the salaries of the study programme director and the costs of final examinations (including the salaries of supervisors, reviewers, and members of the examination board) amount to EUR 35 986. Adding the compulsory National Social Security contributions (€8489.10), the cost is €44475.10. Taking into account that the State budget allocation per study place in the programme (taking into account the sector and level coefficient) is EUR 2198,66 per study place, it is calculated that the study programme "Programming Specialist" requires at least 20 students to cover the programme's costs.

3.4. Teaching Staff

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

The first level professional education study programme "Programming Specialist" is implemented

by highly qualified academic staff with significant practical experience in information technologies in both the private and academic sectors. Qualified academic staff provides the necessary theoretical and practical knowledge, skills and competences. The academic staff as of the accreditation time is described in Table 3.14.

Table 3.14.

Teaching staff of the study programme "Programming Specialist"

No.	Name, Surname	Scientific degree, qualification	Academic position	Study courses taught
1.	Jeļena Mihailova	Mg.math.	Professor	Mathematics for programmers
2.	Estere Vītola	Mg.paed.	Professor	Mathematics for programmers
3.	Baiba Egle	Mg. philol.	Guest professor	English
4.	Rafael Martín Calvo	Dr.sc.comp.	Professor	Fundamentals of Spanish for programmers
5.	Guntars Dreijers	Dr. philol.	Associate Professor	Communication and professional ethics
6.	Viesturs Zeps	Dr. oec.	Guest docent	Economics and business
7.	Andis Pilāns	MBA	Guest professor	IT legal fundamentals and standards Information systems security
8.	Uldis Kuplis	Mg.oec.	Guest professor	IT project management
9.	Ivo Lemšs	Mg. biol.	Guest professor	Civil protection Sustainability and green thinking
10.	Karina Šķirmante	Mg.sc. comp.	Professor	Data structures and algorithms Software engineering I Software Engineering II JAVA Programming Fundamentals of Programming in JAVA
11.	Mārtiņš Saulītis	Mg. sc. comp.	Guest professor	Databases I Databases II
12.	Ēvalds Urtāns	Ph.D. sc.comp.	Docent	Full-stack mobile app development Templates for software development
13.	Raita Rollande	Dr.sc. ing.	Associated Professor	Software engineering I
14.	Kārlis Immers	Mg.sc.comp.	Guest lecturer	Web app development
15.	Katrīna Zvaigzne	Mg.sc. comp.	Guest lecturer	Tools for delivering software solutions
16.	Madara Zvaigzne	Mg.sc.ing.	Guest lecturer	Software testing and automation
17.	Gints Dreifogels	Mg.sc.ing.	Guest lecturer	Embedded applications

18.	Edgars Palacis	Mg.sc. ing.	Guest lecturer	Software architectural design
19.	Gints Neimanis	Mg.oec.	Guest lecturer	Internet and computer network technologies Administration of Linux systems
20.	Vairis Caune	Dr.sc.comp.	Docent	Parallel programming

The language skills of the the teaching staff of the first-level professional higher education study programme "Programming Specialist" comply with the Cabinet of Ministers Regulation of 2009 No. 733 "Regulations on the Scope of Knowledge of the State Language and the Procedure for Testing Proficiency in the State Language for Professional and Official Duties". Information on the foreign language skills of the lecturers is summarised in the lecturers' curricula vitae (CV) is attached as Annex 2.9.

The qualifications of the teaching staff are in accordance with Section No 39 of the Law on Higher Education Institutions regarding the academic staff of professional study programmes. There are 20 teaching staff involved in the implementation of the study programme, 8 of whom are lecturers elected by Ventspils University of Applied Sciences. The involvement of guest lecturers in the implementation of the study programme allows students to gain knowledge not only from lecturers of Ventspils University of Applied Sciences, but also from professionals of the labour market. Several study courses are developed in close cooperation with employers, for example, in cooperation with SIA "TestDevLab" the course "Software Testing and Automation" has been developed and is being implemented. In cooperation with Accenture, the content of the study courses "JAVA Programming" and "Development Operations Tools" has been developed. In cooperation with the specialist of "VISMA" Ltd. the content of the course "Software Architecture Design" has been developed.

6 of the teaching staff have doctoral degrees, 1 lecturer (K. Šķirmante) is studying for a doctoral degree, and the rest of the teaching staff have master's degrees.

Each lecturer is an expert in his/her field, and he/she has several years of experience and with his/her knowledge, skills and competences, they make a significant contribution to the implementation of the first level professional education study programme "Programming Specialist" and to the achievement of the study programme results. The following examples will illustrate how the qualifications of the teaching staff contribute to the achievement of the learning outcomes (without covering all the learning outcomes of the study programme, but focusing on the learning outcomes of the sectoral courses):

- Associate Professor, Dr.sc.ing. Raita Rollande has a PhD in Engineering in the IT Systems Analysis, Modelling and Design field, and she has studied at the State University of New York at Buffalo. Associate Professor Rollande provides her expertise in prototyping and development of information systems to students in the course "Software Engineering I", in which students work on the architecture of an information system, analysing different technical solutions and selecting the most appropriate one, creating a conceptual and physical model of the data, documenting the prototype, thus enabling the achievement of the study programme outcomes SPSR 1.1. “Able to study software requirements and their compliance with architectural and operational principles alone or in a team”, SPSR 1.2. ”Able

to establish the functional and non-functional software requirements and their reasonability", SPSR 1.3. "Able to validate, detail and prototype software requirements", SPSR 2.2. "Able to analyze various technical solutions and select the most appropriate one" SPSR 2.4. "Able to develop a conceptual and physical model of data according to the defined requirements", SPSR 2.5. "Able to develop and describe software algorithms, taking into account software requirements", SPSR 2.7. "Able to document software design" and others.

- Docent, Ph.D. sc.comp. Ēvalds Urtāns has a PhD in electrical engineering, electronics, information and communication technologies and is currently working on various projects, such as developing artificial intelligence models for voice biometrics, researching deep machine learning and using HPC resources. Docent Ē. Urtāns is familiar with various technological solutions and provides his knowledge and skills in the study courses "Full-Stack Mobile App Development" and "Design Patterns", which help to achieve the results of the study programme SPSR 2.3. "Able to analyze various technical solutions and select the most appropriate one", SPSR 3.1. "Able to develop a software code in a programming language", SPSR 3.5. "Able to use software code management systems", SPSR 3.6."Able to prepare the programming environment" and others.
- Guest lecturer, Mg.sc. comp. Katrina Zvaigzne has been an Accenture Developer since 2015 and works daily on implementing DevOps methodologies in projects of various scales and timeframes, such as continuous delivery and deployment, developing isolated, independent, repeatable container configurations, as well as managing the operations team and interns. In her course "Development Operations Tools", the guest lecturer provides practical skills in the application of DevOps methodologies, thus achieving the programme outcomes SPSR 5.2. "Able to develop and manage software deliveries alone or in a team according to the schedule of resource deliveries", SPSR 5.3. "Able to integrate deliveries/deliverables into testing and operating environments alone or in a team", SPSR 5.6. "Able to participate in software maintenance processes" and others.
- Guest lecturer, Mg.sc.ing. Madara Freimane is an information systems tester from 2018. She works daily on exploratory, functional, availability, performance and Rest API testing, as well as improves and adapts testing processes in projects, manages and prioritises the testing process, thus contributing with her practical experience in testing in her taught study course "Software Testing and Automation" to the achievement of the study programme outcomes SPSR 4.1. "Able to develop software tests by selecting the most suitable development methods and data to pass the tests", SPSR 4.2. "Able to perform software tests and record information on incidents/problems", SPSR 4.3. "Able to analyze the results of software testing, and analyze any deficiencies found", SPSR 4.4. "Able to reproduce errors found by users", SPSR 4.5. "Able to cooperate with specialists to develop testing documentation" and others.
- Guest lecturer, Mg.sc.comp. Kārlis Immers has been working as a programmer since 2013 and has gained a lot of experience in web application programming. He has participated in the development of several web applications for TET Ltd. and is currently working on the development of maps and geospatial software solutions for Jāņa Sēta Ltd. The course "WEB Application Programming" taught by the guest lecturer K.Immers achieves the study programme outcomes SPSR 2.3. "Able to analyze various technical solutions and select the most appropriate one", SPSR 2.4 "Able to develop a conceptual and physical model of data according to the defined requirements", SPSR 3.1. "Able to develop a software code in a programming language", SPSR 3.6. "Able to prepare the programming environment", SPSR 3.7. "Able to debug the software code, identify and eliminate the causes of errors" and others.
- Lecturer, Mg.sc.comp. Karina Šķirmante has participated in several information system development projects, thus understanding the information system life cycle, architectural

design, database model development, testing and implementation best practices. Lecturer K. Šķirmante is a researcher at the Ventspils International Radio Astronomy Centre and conducts research in signal processing using programming technologies, frameworks, libraries and HPC (High Performance Computing) resources. Lecturer K. Šķirmante has experience in conducting programming training or "Bootcamps" on behalf of Accenture, training potential employees. In her courses "Data Structures and Algorithms", "Software Engineering I", "Software Engineering II", "JAVA Programming", "Fundamentals of JAVA Programming", lecturer K. Šķirmante provides students with practical skills in programming, algorithm optimization, software engineering, thus achieving the study programme outcomes SPSR 2.2. “Able to decompose the design to a lower level by creating descriptions of data and processes”, SPSR 2.3. “Able to analyze various technical solutions and select the most appropriate one”, SPSR 2.4 “Able to develop a conceptual and physical model of data according to the defined requirements”, SPSR 2.5. “Able to develop and describe software algorithms, taking into account software requirements”, SPSR “Able to design software interfaces taking into account software requirements”, SPRS 3.1. “Able to develop a software code in a programming language”, SPSR 3.3. Able to optimize the performance of software code according to acquired measurements and software requirements”, SPSR 3.5. ”Able to use software code management systems” and others.

- Guest lecturer, MBA Andis Pilāns has been working on information security issues since 2016, performing the duties of cyber security management analyst, incident manager, information security administrator, thus performing daily information security risk management, implementation of security awareness measures, security incident management, development of various security policies, development of information security management objectives, conducting risk analysis, research of regulatory enactments and other tasks. Taking into account his experience and knowledge, the guest lecturer, in his taught study courses "Basics of IT Industry Rules & Regulations & Standards" and "Security of Information Systems", achieves the study programme outcomes SPSR 6.5 “Able to ensure that safe information and communication technologies are used”, SPSR 6.6. “Able to ensure that civil, social, and employment norms and the labor law are complied with”, SPSR 6.7. “Able to understand and apply IT standards” and others.
- Guest lecturer, Mg.oec. Uldis Kuplis has "VMEDU Certified SCRUM Agile Product Owner / Scrum Master" and "CompTIA CTT++ Trainer" certificates, thus proving himself as a competent IT project manager. Guest lecturer U. Kuplis teaches the course "IT Project Management", where students learn project risk management and project organisational structure, as well as software development workload assessment, planning Agile SCRUM sprints, planning a simple IT project and documenting it. The ”IT Project Management” course contributes to the achievement of the programme outcomes SPSR 5.4. “Able to cooperate in cross-functional teams”, SPSR 5.5.”Able to facilitate timely delivery of quality software” and others.

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

During the reporting period, the following changes of teaching staff in the implementation of the first-level professional education study programme "Programming Specialist" have taken place:

- "English", the change from Associate Professor Dr. paed. V. Balama to guest lecturer, Mg.

philol. B. Egle. The change was made by Associate Professor Dr. paed. V. Balama due to heavy workload. Guest lecturer B. Egle has a professional Master's degree in Translation of Applied Texts, thus providing her experience to students on how to correctly use professional terminology in English for work duties, as well as additionally providing students with an understanding of translating texts of different complexity into English on IT, programming and business topics (see lecturer's CV, Annex 2.9). To gain an insight into programming, Baiba Egle has studied the basics of the Python programming language. The quality of the course delivery has remained unchanged, thus not changing the overall quality of the study programme.

- "Security of Information Systems" and "Basics of IT Industry Rules & Regulations & Standards", the change from guest lecturer MBA S. Meijere to guest lecturer MBA A. Pilāns. The change took place because guest lecturer S. Meijere could no longer combine her base workload with teaching. Guest lecturer A. Pilāns has been working with information security issues for more than 6 years, performing the duties of a cyber security management analyst, incident manager, information security administrator, thus performing daily information security risk management, implementation of security awareness measures, security incident management, development of various security policies, development of information security management objectives, conducting risk analysis, research of regulatory enactments and other tasks (see lecturer CV, Annex 2.9). The quality of the course has improved as the experience of A. Pilāns in several projects provides students with a more practical orientation on system security issues. The guest lecturer shares his experience in information systems security in his lectures, and as the study programme is a professional study programme, the guest lecturer's extensive practical experience improves the overall quality of the study programme.
- "Databases I" and "Databases II", the change of guest lecturer Mg.oec. G.Neimanis to guest lecturer Mg. sc. comp. M.Saulītis. Guest lecturer G. Neimanis has reduced his workload at Ventspils University of Applied Sciences and has agreed to teach only the Optional study courses "Internet and Computer Network" and "Linux System Administration". Guest lecturer M. Saulitis has extensive experience in IT projects as a technical manager (see lecturer's CV, Annex 2.9) and is able to transfer his knowledge to students in both courses, which are related to database layer design, prototyping and development, data filtering, etc. The quality of the course delivery has remained unchanged, thus not changing the overall quality of the study programme.
- "Design Patterns", the change from guest lecturer Mg.sc.comp. J. Kļonovs to docent Ē.Urtāns. J. Kļonovs terminated his employment relations with Ventspils University of Applied Sciences, therefore at the moment of accreditation the study course is taught by docent Ē. Urtāns. Ē. Urtāns' experience in various projects gives students a more practical approach to using software development templates (see lecturer's CV, Annex 2.9). The quality of the course has improved, as the lecturer Ē. Urtāns has a PhD in electrical engineering, electronics, information and communication technologies, thus improving the quality of the course content, taking into account his experience not only in practice, but also in science. The overall quality of the study programme has improved.
- "WEB Application Programming", the change from guest lecturer Mg.sc. comp. A. Traškovs to guest lecturer Mg.sc.comp. K. Immers. Guest lecturer A. Traškovs terminated his employment relations with Ventspils University of Applied Sciences in 2018, therefore guest lecturer K. Immers was chosen as the lecturer of the mentioned course. Guest lecturer K. Immers has good practical programming skills and he is familiar with modern web technologies that are used in the industry. Guest lecturer K. Immers has been involved in several large-scale web application developments (see lecturer's CV, Annex 2.9). The quality of the course delivery has remained unchanged, thus not changing the overall quality of the study programme.

- "Software Testing and Automation" - the course is taught by TestDevLab Ltd and guest lecturers are testing specialists from the company. The lecturer of the course may be changed every academic year at the discretion of SIA "TestDevLab", ensuring high involvement of testing specialist/specialists in the implementation of the course. The quality of the course delivery has remained unchanged, thus not changing the overall quality of the study programme.

Taking into account that the professional standard for programmers was changed in 2022 (the fourth professional qualification level (PQL No 4), which corresponds to the fifth level of the Latvian Qualifications Framework (LQF No5)) (available at: https://registri.visc.gov.lv/profizglitiba/dokumenti/standarti/2017/PS-221.pdf [accessed: 23/02/2023]), new study courses have been prepared and included in the implementation of the study programme.

The new courses that are based on new professional standard for programmers (2022):

- "Civil Protection" and "Sustainable Society and Green Thinking", implemented by guest lecturer, Mg. biol. I. Lemšs. The guest lecturer is an environmental protection specialist and is Deputy Director of the State Environmental Service Kurzeme Regional Environmental Administration. The guest lecturer has been teaching these courses at Ventspils University of Applied Sciences in other study programmes for several years (see lecturer's CV, Annex 2.9).
- "Spanish Language Fundamentals for Programmers", implemented by Dr. philol. R.M. Calvo. The lecturer is a native Spanish speaker and has extensive teaching experience - he has been teaching Spanish-related courses since 2010 (see lecturer's CV, Annex 2.9).

Based on the demand for full-stack developers in the job market, a new course has been prepared. The new course explores the concepts of full-stack development in combination with mobile app development. According to CV.lv (as of 16/12/2022), there is a need for more than 300 IT specialists whose job responsibilities include full-stack development concepts and technologies (available at: https://www.cv.lv/en/search?limit=20&offset=0&categories%5B0%5D=INFORMATION_TECHNOLOGY&keywords%5B0%5D=full%20stack&fuzzy=true&suitableForRefugees=false&isHourlySalary=false&isRemoteWork=false&isQuickApply=false [accessed 16/12/22]). The teaching of the new study course "*Full-Stack Mobile App Development*" has been entrusted to docent, Ph.D. sc.comp. Ē. Urtāns, who is also the course author and who has experience in implementing projects involving full-package development concepts and technologies (see lecturer's CV, Annex 2.9). The quality of the study programme has improved, as students are provided with practical skills in currently actual and modern technologies - full package information systems development and mobile applications development.

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

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

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

The most important criteria for the selection of academic staff are scientific and professional competence, which potentially ensures successful collaboration among the teaching staff.

Cooperation between the study programme teaching staff is promoted through both formal and informal activities organised by the VUAS. Lecturers from different faculties are involved in the implementation of the study process, which provides a variety of experiences and promotes professional development.

The successful cooperation of the study programme's teaching staff can be demonstrated by a number of measures that have been implemented:

- **Interdisciplinary cooperation of academic staff -** for example, faculty members from different fields are involved and employed in the study programme and can share their experience and discuss topical issues at organised meetings of the Council of Study Programmes, Faculty Council meetings, seminars, meetings with employers, etc.
- **Cooperation of teaching staff in the development of the study programme content** - when developing and improving the study programme content, teaching staff carefully follow the thematic division included in the study course, mutually coordinating the thematic areas and the mechanism of evaluation of study results. For example, activities within the project "Next Generation Micro Cities of Europe" (No.UIA03-250), during which guest lecturer G. Dreifogels, lecturers K. Skirmante and E. Vītola modernised their courses by introducing student-centred methods, as well as shared their experience with other VUAS FoIT lecturers during several seminars.
- **Informal cooperation between teaching staff.** Various activities are organised at VUAS FoIT to foster informal communication among teaching staff. One example is the weekly coffee breaks, during which the teaching staff discuss current issues in an informal atmosphere, as well as share their experiences in solving various problems.
- **Cooperation between teaching staff in the implementation of specific study courses,** for example,
    - Lecturer J. Mihailova and lecturer E. Vītola are participating in the implementation of

the study course "Mathematics for Programmers". Lecturer J. Mihailova provides students with theoretical knowledge of higher mathematics, while E. Vitola teaches students how to implement mathematical algorithms and formulas discussed in the theoretical classes in practice using the Python programming language. The two lecturers have been working together successfully for several years and together they have successfully managed to show students how to solve mathematical problems of different complexity by programming.

- associate professor R.Rollande and lecturer K.Šķirmante are participating in the implementation of the study course "Software Engineering I". The aim of the course is to provide students with theoretical insight into information system development and practical skills in information system project development by developing the system. To accomplish the goal, students in a small team (2-3 students) develop a prototype of the project and implement it in practice using the Agile Software Development method and Spring framework technologies. Asoc.prof. R.Rollande provides information on prototyping and designing an information system, for example, by implementing requirements engineering and documentation. The students, together with Asoc. prof. R.Rollande develop the prototype of the problem environment and documentation, but under the guidance of K.Šķirmantes, students develop (program and test) the prototype in practice, using the actual and modern technologies, such as Spring framework, RestFul API, MySQL and others.

At the time of submission of the Self-assessment Report, the first level professional education study programme "Programming Specialist" is implemented by 20 faculty members and it has 40 students in the 1st year and 15 students in the 2nd year, thus the ratio of students to faculty members is 2.75 students to one faculty member. The calculations do not take into account that students from several study programmes of Ventspils University of Applied Sciences participate in the study courses implemented in the "Programming Specialist" programme.

Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	7-1_appendix_diploma_diploma-supplement_example.pdf	7-1_pielikums_diploma_diploma-pielikuma-paraugs.pdf
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)		
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period	7-2_appendix_statistics-on-students.pdf	7-2_pielikums_Studejoso_statistika.pdf
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard	7-3_appendix_complience-to-state-educational-standard.pdf	7-3_pielikums_Atbilstiba-valsts-izglitibas-standartam.pdf
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)	7-4_appendix_complience-with-professional-standard.pdf	7-4_pielikums_Atbilstiba-profesijas-standartam.pdf
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	7-5_appendix_mapping_LV-EN.xlsx	7-5_pielikums_kartejums_LV-EN.xlsx
The curriculum of the study programme (for each type and form of the implementation of the study programme)	7-6_appendix_study_programme_plan.docx.pdf	7-6_pielikums_Studiju_programmas_plans_PS.docx.pdf
Descriptions of the study courses/ modules	7-7_Appendix_course_descriptions.pdf	7-7_Pielikums_kursu apraksti.pdf
Description of the organisation of the internship of the students (if applicable)	7-8_appendix_internship_regulations.pdf	7-8_pielikums_Prakses_nolikums_PS_ar-pielikumiem.pdf
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)		

Electronics Engineering (42523)

Study field	*Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science*
ProcedureStudyProgram.Name	*Electronics Engineering*
Education classification code	*42523*
Type of the study programme	*Professional bachelor study programme*
Name of the study programme director	*Jānis*
Surname of the study programme director	*Šate*
E-mail of the study programme director	*janis.sate@venta.lv*
Title of the study programme director	*Mg.sc.ing.*
Phone of the study programme director	
Goal of the study programme	*The aim of the study programme is to prepare specialists in engineering sciences with a professional bachelor's degree and qualification of electronics engineer, whose theoretical knowledge and research skills allow to continue studies in engineering master's level study programmes and higher level professional study programmes in electronics for obtaining level 5 professional qualification, as well as to independently and systematically improve their knowledge and skills to adapt to professional activities in changing labour market conditions. To develop and defend a 12 credit point bachelor's thesis in electronics.*
Tasks of the study programme	*The objectives of the study programme are:* *- to provide the knowledge, competences and skills appropriate to the bachelor's level, the qualification of electronics engineer and international standards;* *- to encourage students to learn independently and creatively, and to evaluate and apply new developments in electronics;* *- develop students' analytical skills, independent problem-solving skills, and encourage their involvement in practical and scientific problem-solving;* *- ensure the practical application of acquired knowledge and skills by analysing different situations of concern, case examples and tackling practical challenges;* *- create motivation and contribute to meeting students' continuing education needs, including motivation to continue education in both professional and academic masters' study programmes* *to ensure that the study process is supported by qualified teaching staff and training that meets modern requirements;* *- to provide a student-centred study process with modern teaching laboratory equipment, as well as to give students the opportunity to practice solving real scientific and technical problems by involving them in the work of electronics companies during their internship;* *- modify the content and presentation methods of the programme in a timely manner in response to changes in the labour market and correctly predict changes in the near and distant future.*

Results of the study programme	*Study programme results:* *- ability to develop electronic equipment and systems;* *- ability to participate in research and development projects;* *- ability to define a manufacturing process and to manufacture electronic equipment and systems;* *- ability to perform and manage the installation, maintenance and repair of electronic equipment and systems;* *- ability to carry out the general tasks of pursuing a professional activity;* *- understanding and knowledge of electronics engineering at the state-of-the-art of the field.*
Final examination upon the completion of the study programme	*Bachelor's thesis*

Study programme forms

Full time studies - 4 years - latvian

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

Places of implementation

Place name	City	Address
Ventspils University College	VENTSPILS	INŽENIERU IELA 101, VENTSPILS, LV-3601

3.1. Indicators Describing the Study Programme

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

The Professional Bachelor's study programme "Electronics Engineering" was established as a follow-up to the major modifications in the Academic Bachelor's study programme "Electronics". The modifications were implemented in 2018 (licence number: 04049-25).

In 2018, the following modifications were introduced, taking into account employers' needs and suggestions, students' recommendations, the recommendations of the previous Study Field Evaluation Committee and industry trends:

- the study programme is transformed from an academic bachelor's programme to a professional bachelor's programme;
- the title of the study programme was changed from "Electronics" to "Electronics Engineering";
- The title of the study programme was changed from "Electronics" to "Electronics Engineering";
- the duration of the study programme was changed from 3 years to 4 years;
- the study programme volume was changed only from 120 CP (180 ECTS) to 160 CP (240 ECTS).
- The degree and qualification to be obtained in the study programme were changed from "Bachelor of Engineering degree in Electronics" to "Professional Bachelor of Engineering degree in Electronics and qualification of Electronics Engineer (Professional qualification level 5, European Qualifications Framework (EQF) and Latvian Qualifications Framework (LQF) level 6)".
- Following the recommendations of the previous accreditation commission, a compulsory internship of 20 CP (30 ECTS) has been introduced.
- A new series of project-oriented, practical training courses:
    - Electronics Engineering Project I 2 CP (3 ECTS);
    - Electronics Engineering Project II 2 CP (3 ECTS);
    - Electronics Engineering Project III 2 CP (3 ECTS);
    - Electronics Engineering Group Project I 2 CP (3 ECTS);
    - Electronics Engineering Group Project II 2 CP (3 ECTS);
    - Electronics Engineering Research Project 2 CP (3 ECTS).
- a list of new courses were introduced, taking into account employers' needs, students' suggestions and industry trends:
    - Programming Basics for Microcontrollers I (2CP, 3 ECTS);
    - Fundamentals of Programmable Integrated Circuits (2 CP, 3 ECTS);
    - Introduction to Industrial Automation (2 CP, 3 ECTS);
    - Programming of ARM Architecture Microcontrollers (3 CP, 4.5 ECTS);
    - Embedded Operating Systems (4CP, 6 ECTS);
    - Automatic Control System Design (3 CP, 4.5 ECTS);

    - Programmable Logic Controller Programming (4 CP, 6 ECTS);
    - Systematization Principles of Industrial Engineering(4 CP, 6 ECTS);
    - Manipulators and Control Systems of Industrial Robots (4 CP, 6 ECTS);
    - Object Oriented Programming II (4CP, 6 ECTS);
- Modifications were introduced to the content and organization of several study courses:
    - For the study course "Mathematical Analysis II", the number of credit points has been reduced from 4 (6 ECTS) to 2 (3 ECTS) in order to balance the number of mathematical knowledge and professional skills-based study courses in the 1st year of study.
    - A new course "Introduction to Electrodynamics and Antenna Theory" (4 CP, 6 ECTS) was introduced, combining two existing courses "Electromagnetic Fields and Waves" (2 CP, 3 ECTS) and "Antenna Theory" (2 CP, 3 ECTS). As a result, the implementation of the study programme was facilitated and the fragmentation of the courses was reduced.
    - A new course "Digital Electronics" (4 CP, 6 ECTS) was introduced, combining two existing courses "Fundamentals of Digital Circuitry" (2 CP, 3 ECTS) and "Digital Electronics and Computer Architecture" (2 CP, 3 ECTS). As a result, the implementation of the study programme was facilitated and the fragmentation of the courses was reduced.
    - The title of the course "Programming" has been modified to "Programming in C", in order to better reflect the content of the course.
    - The title of the course "Microcontrollers and Embedded Systems" has been modified to "Programming Basics for Microcontrollers I" in order to better reflect the content of the course.
    - The title of the course "Computer Aided Design" has been changed to "PCB (Printed Circuit Board) Design" in order to make the title of the course more indicative of its content.
    - A new course "Data Transmission Technology and Devices" (4 CP, 6 ECTS) was introduced, combining two existing courses "Wireless Technologies" (2 CP, 3 ECTS) and "Sound and Image Transmission Technologies" (2 CP, 3 ECTS). As a result, the process of implementing the study programme was facilitated and the fragmentation of courses was reduced.
    - The course "Optics and Optoelectronics" has been reduced from 3 (4.5 ECTS) to 2 CP (3 ECTS) to balance the physics-based and professional skills-based courses in the 2nd year of study.
    - The number of CPs allocated for the development of the Bachelor's thesis has been increased from 10 (16 ECTS) to 12 (18 ECTS), taking into account students' feedback that too limited time is allocated for the development of a high-quality Bachelor's thesis.

Since the license was granted, no other changes (in terms of title, language, duration, scope, form, objectives, tasks) have been made to the study program.

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

the study programme (including different options of the study programme implementation) and evaluation of its usefulness.

The professional bachelor study program "Electronics engineering" corresponds to the study field "Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science". The Cabinet of Ministers regulation No. 793 from 11.12.2018. "Regulation Regarding Opening and Accreditation of Study Fields", Annex 1, defines study fields in higher education in the Republic of Latvia, among them as No. 17 the study field "Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science", but the regulation does not specify study programs within this study field. Therefore one has to analyze other documents. The "UNESCO International Standard CLASSIFICATION OF EDUCATION, Fields of education and training 2013 (ISCED-F 2013) – Detailed field descriptions"

(http://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-fields-of-education-and-training-2013-detailed-field-descriptions-2015-en.pdf, seen 21.02.2023.) defines the study program "Electronics Engineering" under the code 0714 "Electronics and automation", which is subcode of the code 071 "Engineering and engineering trades". The Cabinet of Ministers regulation No. 322 (approved 13.06.2017.) "Regulation on the classification of the Latvian education system" (Latvian only) refers to the ISCED-F 2013, and determines the Latvian higher education system code 523 (third, fourth and fifth levels) as corresponding to the ISCED-F code 0714. The VUAS professional bachelor study program "Electronics Engineering" has the code 42523. Correspondence of this study program to the ISCED-F study field code 0714 is determined by the large proportion of study courses in analogous electronics, digital electronics, microcontrollers, signal theory and electronics engineering projects in the content of this study program.

Analysis of the interrelation between the name of the study program, code of the study program, the degree, professional qualification to be acquired, the aims, objectives, learning outcomes, and the admission requirements

The professional bachelor study program "Electronics Engineering" was designed to educate electronics engineers for the production, services and research sectors of the electronics industry. The tasks, knowledge, skills and competencies of electronics engineers are determined by the professional standard PS-141 "Electronics Engineer" (approved by the Tripartite Cooperation sub-council of Vocational Education and Employment on August 12, 2020, protocol No 6. Professional standards and programs | Valsts izglītības satura centrs (visc.gov.lv) (seen 24.02.2023.). The standard PS-141 declares that the professional qualification of the electronics engineer should correspond to the fifth level of the professional qualification framework (PQF 5), which equals to the sixth level of Latvian Qualification Framework (LQF 6). The Cabinet of Ministers regulation No. 322 (approved 13.06.2017.) "Regulation on the classification of the Latvian education system" (Latvian only), Annex 1, determines that the LQF 6 education is the second level professional higher education (professional qualification of level 5 (PQF 5) and professional bachelor degree, and the length of studies should be 4 years) which can be obtained after graduating from secondary education determined as the admission requirement for this study program. This type of the study program is assigned the code 42 by the LQF (the first and the second digit of the second classification level). The interrelation of the name of the study program "Electronics Engineering" to the third - fifth levels "523" (and the full code of the program 42523) is determined by the Annex 2 of the Cabinet of Ministers regulation No. 322 "Regulation on the classification of the Latvian

education system" which determines the correspondence of the study program "Electronics Engineering" to the code 0714 Electronics and Automation of the ISCED-F 2013. The requirements to the tasks, knowledge, skills and competencies of electronics engineers determined by the professional standard PS-141 are directly transformed to the aims, objectives and study results of the study program described below in this chapter.

The graduates of the professional undergraduate program "Electronics Engineering" acquire a professional bachelor's degree in electronics and the professional qualification "Electronics Engineer", according to the professional standard "Electronics Engineer". The name of the study program clearly describes the qualification obtained by the graduates of this program, and clearly indicates that the program is a part of the "Electrical Engineering, Electronics, Information and Communication Technologies" area of the Latvian "Engineering Sciences and Technologies" scientific area.

Code 42523 applies to the content and implementation of the study program. The first part of the code (42) means that the program offers 2nd level professional higher education (5th level professional qualification and a professional bachelor's degree), and can be implemented after general or vocational secondary education. Duration of full-time studies is four years. The second part of the code (523) means that the content and implementation of the program is a part of the group of engineering sciences and technologies education programs "Electronics and Automation".

Purposes and objectives of the program:

The aim, objectives and study results of the professional undergraduate program "Electronics Engineering" are defined according to:

- the national classification framework in line with the European qualification framework set out in Cabinet of Ministers Regulation No. 322 "Regulations on the Classification of Education of Latvia". The master's program offers education at LCI Level 6, and its academic results are defined according to the description of knowledge, skills and competences required at Level 6;
- requirements of the 5th professional qualification level for the professional standard "Electronics Engineering"; making sure that the content of the study program that is in line with the professional standard correlates with the aim, objectives and study results of the program;
- the balance among the general education courses, basic sectorial (professional sectors) theoretical courses, information technology courses and specialised sectorial (professional sectors) professional courses set out in Cabinet of Ministers Regulation No. 512 "Regulations on the national standard for the 2nd level professional higher education".

The **aim** of the study programme is to prepare specialists in engineering sciences with a professional bachelor's degree and qualification of electronics engineer, whose theoretical knowledge and research skills allow to continue studies in engineering master's level study programmes and higher level professional study programmes in electronics for obtaining level 5 professional qualification, as well as to independently and systematically improve their knowledge and skills to adapt to professional activities in changing labour market conditions. To develop and defend a 12 credit point bachelor's thesis in electronics.

The aim of the study programme is divided into **strategic** and **specific** objectives.

Strategic objectives of the program are:

- offer professional studies that satisfy the requirements of economics and social needs and

are based on the theoretical basis of sectoral sciences and can be used in practice;
- ensure that electronic engineers who can compete in the labour market are prepared in this highly sought after profession for private economic entities in Latvia and EU Member States.

The specific objectives of the program is to prepare highly-skilled and competitive electronics engineers:

- who have acquired fundamental knowledge in the following areas: physics, higher mathematics, modern electronics, and information technologies, and who are able to operate advanced electronics, know how to design, operate and repair it, and who are knowledgeable about advanced information and computer technologies and are able to creatively use them it performing professional duties;
- who are able to independently study electronics and automation systems, equipment and devices, computer equipment and peripherals, as well as technological aspects of processes; and who are able to perform installation and assembly, service and repair works;
- who are able to study technological aspects of products and processes, and provide consultations;
- who are able to ensure installation of new software;
- who are able to compete in the labour market on the basis of their education and methodological knowledge, as well as skills and expertise, and quickly respond to changes in it;
- who can continue education in master’s programs or by self-study.

The objectives of the study programme are:

- to provide the knowledge, competences and skills appropriate to the bachelor's level, the qualification of electronics engineer and international standards;
- to encourage students to learn independently and creatively, and to evaluate and apply new developments in electronics;
- develop students' analytical skills, independent problem-solving skills, and encourage their involvement in practical and scientific problem-solving;
- ensure the practical application of acquired knowledge and skills by analysing different situations of concern, case examples and tackling practical challenges;
- create motivation and contribute to meeting students' continuing education needs, including motivation to continue education in both professional and academic masters’ study programmes
- to ensure that the study process is supported by qualified teaching staff and training that meets modern requirements;
- to provide a student-centred study process with modern teaching laboratory equipment, as well as to give students the opportunity to practice solving real scientific and technical problems by involving them in the work of electronics companies during their internship;
- modify the content and presentation methods of the programme in a timely manner in response to changes in the labour market and correctly predict changes in the near and distant future.

The requirements of the program are:

- complete general courses worth 20 credit points that ensures good understanding of theoretical and specialised professional courses;
- complete courses that are related to electronics engineering, automation and communications worth 100 credit points that ensures the required competences, i.e., an electronics engineer should be able to develop electronics, communications and automation systems and devices; if any technical problems occur, the electronic engineer should be able

to determine the cause of failure, its place, technical element, should substantiate the possibility of repairs and their economic feasibility, as well as to replace the damaged components (non-functional) and restore the operational capacity of electronic devices;
- complete elective courses worth 7 credit points;
- improve professional skills and expertise: an internship worth no less than 20 credit points;
- pass the state exam at the end of the program that includes preparing a design and its defence: 12 credit points.

Expected academic results of the study program

The expected result is to prepare engineering sciences specialists with a professional undergraduate degree and the qualification of an electronics engineer, whose theoretical knowledge and research skills allow to continue studies in engineering sciences master's programs and higher level professional programs in electronics to receive the 5th level professional qualification, as well as to independently and systematically improve their knowledge and skills to adjust to working in changing labour market circumstances.

Upon successful completion of the professional undergraduate program "Electronics Engineering", graduates acquire the following academic results:

- ability to develop electronic equipment and systems;
- ability to participate in research and development projects;
- ability to define a manufacturing process and to manufacture electronic equipment and systems;
- ability to perform and manage the installation, maintenance and repair of electronic equipment and systems;
- ability to carry out the general tasks of pursuing a professional activity;
- understanding and knowledge of electronics engineering at the state-of-the-art of the field.

The expected academic results can be broken down into the following knowledge, skills and abilities.

Upon successful completion of the professional undergraduate program "Electronics Engineering", graduates acquire the below knowledge, skills and abilities.

Knowledge:

- knowledge of operational principles of electronic components and devices and their use in designing and developing electronic equipment;
- knowledge of stages of preparing electronics documentation;
- knowledge of the most common causes of failure of electronics devices and their rectification principles;
- knowledge of ISO, IEC, LVS, and other standards in electronics;
- improvement of theoretical knowledge and awareness of the latest achievements in the sector and professional area that after completion of studies provide a foundation for creative work in electronics companies, incl. in cross-sectorial companies.

Skills and abilities:

- able to design, model, test, analyse and prototype electronics equipment and systems;
- able to prepare key accuracy and optimization calculations for electronic devices;
- able to work with ready-made software to control electronic devices, process signals, as well as to create and simulate electronic diagrams;
- able to study technological aspects of products and processes, and to provide consultations;
- able to use electronics and electrical engineering measuring tools;

- able to independently establish causes of damage to electronics devices, and rectify them;
- able to prepare lists of main assemblies of electronic devices and their frequently replaceable parts, and make their orders;
- able to speak and write in at least two languages in familiar and unfamiliar contexts;
- able to independently improve his/her qualification (master studies, top-up courses, self-study) to adjust to working in changing labour market circumstances;
- able to cooperate with specialists with a different specialisation;
- able to teach, encourage, guide, and control subordinates;
- able to apply occupational safety, fire safety and environmental protection rules;
- able to participate in project development, implementation and management.

Specific skills and abilities:

- able to install, perform diagnostics of electronic equipment, maintain and troubleshoot, as well as repair electronic equipment: these skills are learnt during courses that are a part of the “Specialised professional sectorial courses” of the program, strengthened during the practical part of these courses by preparing and developing laboratory projects, and further improved during internships in electronics companies;
- able to independently identify control samples and technological processes to ensure operational efficiency and safety of electronic, radio-navigation and automatic systems, and devices;
- able to organise and manage the maintenance and repairs of operational electronics, radio-navigation and automatics systems, and devices;
- able to independently install computer equipment, perform its technical maintenance, preventive servicing, repairs, and upgrading, and ensure that the software of new systems is installed;
- able to design electronic diagrams and printing plates according to the requirements of the technical order with advanced automated computer design software: learnt during specialised undergraduate courses “Computer design of printing plates” and “Manufacturing technologies for electronic devices and design of printing plates”;
- able to engage in business communication and read professional publications in the English language: learnt during courses “English for engineers I” and “English for engineers II”;
- able to work independently and in a team, and to take responsibility for the performance of the team: learnt during internships in sectorial companies, as well as courses “Electronics engineering group project I” and “Electronics engineering group project II”;
- able to use information search and selection tools, and office software: learnt during all courses, when reports on laboratory and course projects are prepared, as well as during the internship and in preparing the diploma project;
- able to prepare presentation materials and events and moderate them, persuade others and substantiate his/her opinion: learnt in defending laboratory and course projects, during internships;
- able to independently guide professional development and specialisation, and analyse these processes: learnt during all courses, independent study.

Attitudes:

- able to demonstrate awareness and ethical responsibility for the impact of scientific results and professional activities on the environment and the society.

When electronics engineers have received a professional qualification and a diploma, they can work as installers, service technicians, and technologists of electronic equipment, heads of structural units, project managers in companies that provide services by installing, servicing or repairing

electronic devices, or that use such devices during the manufacturing process. The graduates can also establish companies, or continue with their master's studies. As the electronics industry and information and telecommunications services sectors develop in Latvia, there is ever greater demand for electronics professionals in the labour market. In the future, as production with high added value is developed, and the most advanced technologies are introduced in manufacturing processes, demand for such professionals will increase even more. As new electronics and telecommunications companies are established also in Ventspils, it is expected the electronics professionals will play an important role in the economic development of Kurzeme region and the entire country, as they will become the founders of advanced industrial production.

Admission requirements

The Professional Bachelor's study programme "Electronics Engineering" admits applicants who have general secondary education or secondary vocational education (qualification level 3) in accordance with the VUAS Admission Rules ("Admission Rules and Matriculation Procedure at Ventspils University of Applied Sciences for the Academic Year 2023/2024" available online in Latvian: https://irp.cdn-website.com/f6b5d556/files/uploaded/22-55_Uznemsanas%20_noteikumi_2023_2024_LV.pdf [visited: 17.12.2022.]

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

According to the 2020-2022 report of the Ministry of Economics of the Republic of Latvia on medium and long-term forecasts for the labour market, the deficit of workforce with higher education will continue in the engineering sciences sectors at least until 2040. This situation means that it is necessary to maintain and improve the competitiveness of the Latvian economy and to offer higher education programs in engineering sciences. According to the study, "in some higher education thematic groups supply of workforce is expected to decrease due to low level of workforce reproduction: the number of new specialists entering the market is smaller than the number of those leaving the market due to various factors, e.g., retirement. In the coming years, the ageing of the workforce will be most pronounced in such thematic education groups as [..] "engineering sciences, manufacturing, and construction [..]". "It should be noted that in 2021 more than a half of the total workforce supply with proper education was in the age group above 45 years: in [..] engineering sciences, manufacturing and construction (55%), informative report on medium and long-term foreca

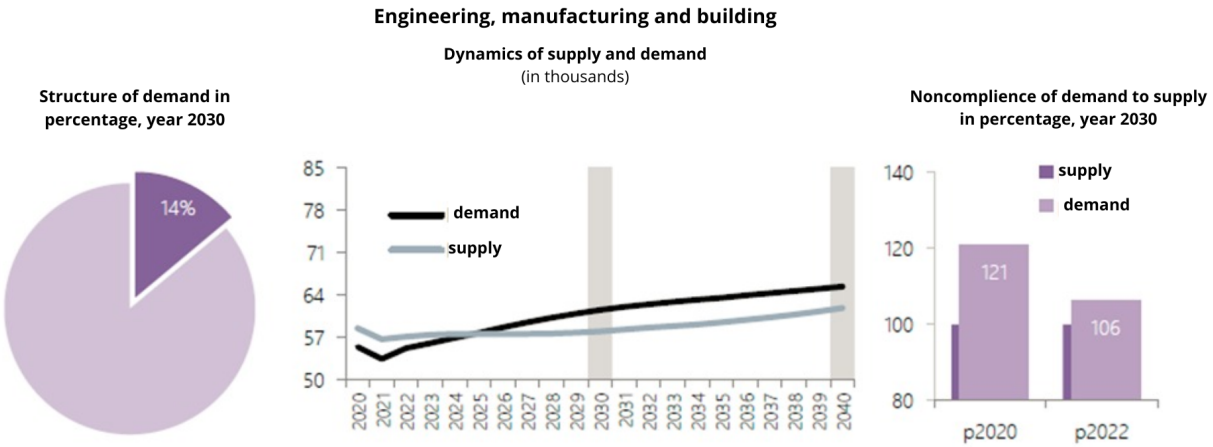

Figure 3.1 **Forecast on the demand for professionals with higher education exceeding the supply in engineering sciences 2020-2040.**

If the current structure of higher education is maintained, it is expected that the highest shortage of labour in the higher education group will affect professionals with background in the engineering sciences, natural sciences and ICT (STEM). By 2030, this shortage could exceed 9 thousand professionals, in particular in areas like computer sciences, architecture and construction, physical and engineering sciences.

Source: Informative report of the Ministry of Economics of the Republic of Latvia "On medium term and long-term forecasts for the labor market", published on: 27.08.2020, updated: 21.10.2022 Labor market report | Ministry of Economics (accessed on 17.12.2022)

Agnese Rutkovska, an economist of the Bank of Latvia, highlights the electronics sector as one of the most productive in Latvia, and as one of the most promising sectors whose development will also be supported under the EU industrial strategy: "This (electronics) sector is one of the most productive in Latvia with wages significantly higher than on the average in the economy. Such development should be nurtured and supported, encouraged to grow and become more skillful to facilitate creation of well-paid and knowledge-intensive jobs, as well as good profit prospects for companies and increase of tax collections for the state budget." "According to the EU industrial strategy and the planned new industrial alliances, it is planned to develop important projects for the benefit of Europe — involving raw materials, microprocessors, telecommunications networks, battery production, etc. This is an ever stronger argument to review the potential of Latvian sectors and to look for answers to questions such as which areas are more promising, if there is anything hindering the growth, and how businesses can be supported." "Thanks to the rapid growth, the share of electronics and electrical engineering is already approximately one tenth of the added value of the processing industry. These are export-intensive sectors: approximately 90% of the total production volume is exported."

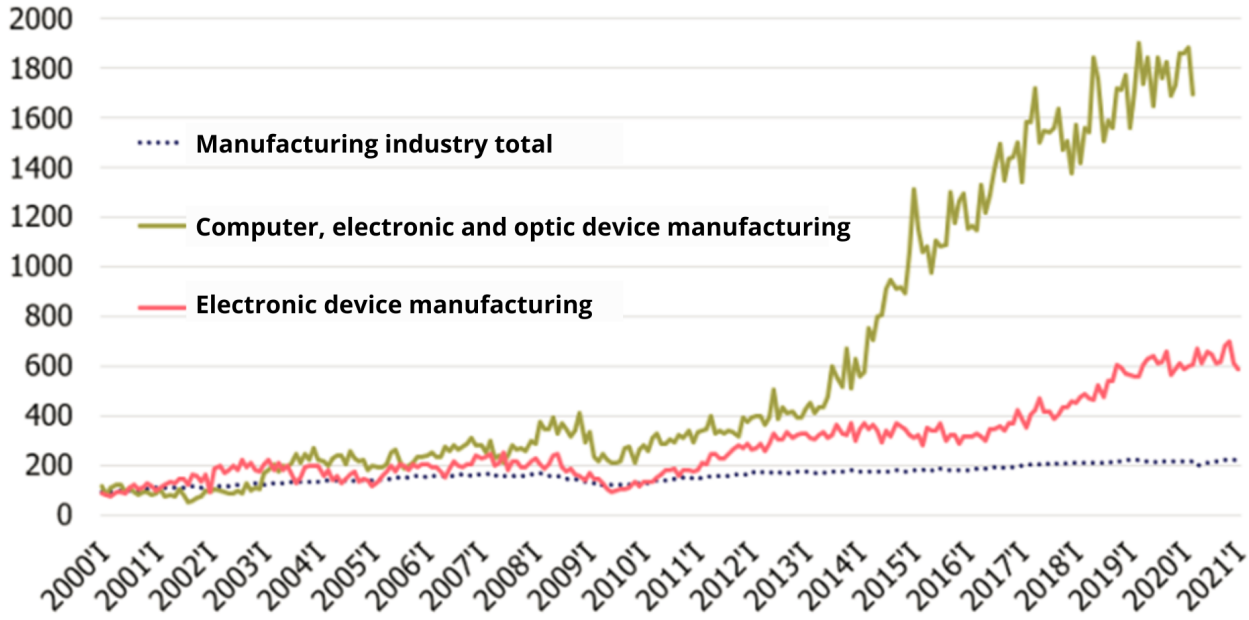

Fig. 3.2. **Production volume indexes of the processing industry (2000 average = 100%).**

Source: Central Statistical Bureau of Latvia, calculations of the author

https://www.makroekonomika.lv/latvijas-elektronika-piedzivojumi-1-serija-elektronika-jauniba-un-briedums (accessed on 17.12.2022)

Administration of the Latvian Electrical Engineering and Electronics Manufacturing Association LETERA, executive director of the association Inese Cvetkova and president of the association Normunds Bergs have a similar opinion. Both are optimistic regarding development prospects of this sector in 2022, and they expect higher turnover and plan to increase the number of employees. President of LETERA: "This time offers many opportunities to us. It is expected that manufacturing will quickly relocate back to the West. We have to be ready to use it, be flexible and able to learn fast, as well as to forward this information to employees as the changes will take place very quickly (LETERA general meeting of 05.04.2022, https://www.letera.lv/letera-biedru-sapulce-sis-ir-musu-iespeju-laiks/ [accessed on 17.12.2022]).

Cvetkova, I. the Executive Director of LETERA:

- Shortage of qualified professionals is one of the key obstacles that does not allow to ensure successful operation and development of sectoral companies.

Normunds Bergs, Chairman of the Board of SIA SAF Tehnika, the President of LETERA:

- Wars for educated employees. The problems start early in the education system: potential students are not required to have good knowledge of physics, there is no entry exam, after six months they just drop out. We should start with schools, if there is no foundation in physics, continuing education will not help, re-skilling will not work. Research fellows are required to publish articles, though the industry may not need this at all.
- Juris Binde, the President of SIA LMT: "It is possible to buy IT specialists, but impossible to find electronics engineers (discussion in the Rector's office of VUAS, 16.11.2022, https://www.venta.lv/ventspils-augstskola-svin-valsts-svetkus-ar-jura-bindes-vieslekciju)

The strategic goals of the study program also derive from the need of the electronics industry to

have skilled employees with higher education and engineer qualification (see Section 3.1.2).

If students are taught to think creatively, if they are able to develop new products that can be sold, these students will never have to worry about unemployment. Written feedback of internship tutors and oral surveys confirm that these companies really face a shortage of electronics experts and that everyone is interested in further cooperation. VUAS has signed a cooperation agreement with SIA Ventspils Elektronikas fabrika, Hansa Matrix Group (Annex 2.14). Graduates of the bachelors program “Electronics” work in the leading electronics companies of Latvia: AS HansaMatrix, SIA Mikrotik, SIA EUROLCDs, research institutes VeA IZI VSRC, Electronic and Computer Sciences Institute (EDI), SIA Aspired, SIA Azeron, etc.

According to Ministry of Education and Science data on employment of graduates of VUAS FoIT bachelor’s program “Electronics”, the employment rate is 92%, i.e., according to MES and SRS data, in 2017-2019 the graduates of the “Electronics” program worked 23 of the 25 person-per-years possible (25, if all graduates had worked full time for three years). Calculation method: calculate the sum of years worked by the graduates of VUAS FoIT IZB (EIB) undergraduate program in 2018 to 2020 (according to SRS data) and divide the total by the maximum possible number (if all graduates had worked all these years) eventually arriving at employment in percent.

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

The dynamics of the number of students from 2016 to 2022 can be seen in Table 3.1, including students for both fee and State budget resources, where the label IZB indicates students who had entered into study contracts for studies in the academic bachelor's study program “Electronics” before it was transformed into the professional bachelor's study program “Electronics Engineering.” The first students in the study professional bachelor's study program “Electronics Engineering” were enrolled in the 2018./2019 academic year.

Table 3.3.

Breakdown of the number of students by sources of funding.

Academic year	Number of students at state budget study places	Number of students at paid study places	Total number of students
2016./2017.	30 IZB	15 IZB	45 IZB
2017./2018.	28 IZB	10 IZB	38 IZB
2018./2019.	9 (+27 IZB)	0 (+ 9 IZB)	9 (+ 36 IZB)
2019./2020.	18 (+8 IZB)	0(+10 IZB)	18 (+18 IZB)
2020./2021.	28 (+2 IZB)	1 (+10 IZB)	29 (+12 IZB)
2021./2022.	26(+1 IZB)	0 (+9 IZB)	26 (+10 IZB)
2022./2023.	24	2	26

Table 3.4.

The dynamics of the number of students enrolled.

Academic year	Number of students enrolled
2016./2017.	10 IZB
2017./2018.	9 IZB
2018./2019.	9
2019./2020.	12
2020./2021.	12
2021./2022.	4
2022./2023.	10

Table 3.5.

The dynamics of the number of students by academic year and study year.

Academic year	Year 1	Year 2	Year 3	Year 4
2016./2017.	12 IZB	18 IZB	15 IZB	0
2017./2018.	10 IZB	13 IZB	15 IZB	0
2018./2019.	9 (+1 IZB)	0 (+19 IZB)	0 (+16 IZB)	0
2019./2020.	12	6 (+2 IZB)	0 (+16 IZB)	0
2020./2021.	12	12	5 (+12 IZB)	0
2021./2022.	5	6	10(+6 IZB)	5
2022./2023.	11	2	5	8

Table 3.6.

Graduation rate dynamics.

Academic year	Number of graduates
2015./2016.	10 IZB
2016./2017.	6 IZB
2017./2018.	2 IZB
2018./2019.	3 IZB
2019./2020.	0 (+3 IZB)
2020./2021.	0 (+2 IZB)
2021./2022.	5

Table 3.7.

Student drop-out.

Time period	Number of students dropped-out
02.10.2015. – 01.10.2016.	22 IZB
02.10.2016. – 01.10.2017.	16 IZB

02.10.2017. – 01.10.2018.	15IZB
02.10.2018. – 01.10.2019.	3 (+16 IZB)
02.10.2019. – 01.10.2020.	5 (+2 IZB)
02.10.2020. – 01.10.2021.	10 (+1 IZB)
02.10.2021. – 01.10.2022.	4 (+6 IZB)

By analysing questionnaires completed by students in case of student exmatriculation, students have stopped studying in the professional undergraduate program "Electronics Engineering," mostly for personal reasons. Students have changed their place of residence, have financial problems or have chosen to work in a different field, which has led to the interruption of their studies. The questionnaires also indicated an inability to combine studies with work. Additionally, between October 2, 2021 and October 1, 2022, exmatriculated students suspended their studies due to the spread of the COVID-19 virus.

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

3.2. The Content of Studies and Implementation Thereof

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

Compliance of program content with the national education standard

Cabinet Regulation No. 512 "Regulations on the national standard for the 2nd level professional higher education" (26 August 2014) establish the mandatory content of professional undergraduate studies (Paragraphs 7 to 15). The content, structure and planning of the professional bachelor's program were developed in full compliance with the above document.

Content of the program

The program consists of the below groups of study courses:

1.	General education study courses (at least 20 CP)	20 CP
2.	Field (professional field) theoretical core courses and information tehnology courses (at least 36 CP)	39 CP
3.	Professional specialisation courses in the field (area of professional activity) (at least 60 CP)	62 CP
4.	Optional part courses (at least 6 CP)	7 CP
5.	Internship (at least 20 CP)	20 CP
6.	Diploma project (at least 12 CP)	12 CP
	Total	**160 CP**

General education study courses of the professional undergraduate program include courses to teach professional business competences and management (innovation, business organization and establishment, management methods, business economics, basic project development and management, financial accounting system), as well as environmental protection competences.

Field (professional field) theoretical core courses and information technology courses (39 CP) provide knowledge required in any subject of engineering sciences: mathematics, physics, programming, as well as basic theory required for electronics engineering.

Professional specialisation courses in the field (area of professional activity) (61 CP) ensure teaching of specific knowledge and skills in analogue and digital economy, as well as allow to gain understanding of application of general principles of electronics in specific electronic automation and communication devices. These courses include practical tasks, laboratory projects and at least 3 study projects during which the students acquire skills and ability to use their knowledge in performing practical tasks in general electronics applications.

Optional part courses (7 CP) allow students to expand their knowledge in various areas beyond electronics, as well as engage in in-depth study of electronics engineering and computer sciences subjects of interest in them.

Internship (20 CP). The internship (20 CP) takes place in private sectorial companies or scientific institutes according to the internship regulation. If in addition to studies the student is employed as a salaried employee, the internship may be combined with working in a company that operates in the respective sector. The internship may also take place in foreign companies during the ERASMUS program.

The **diploma project** is a form of learning that solidifies the knowledge acquired during theoretical courses by using this knowledge in carrying out practical tasks and engaging in scientific research.

The content of the program is developed according to the program plan (see Annex 5.6).

Ability of program content to meet the needs of the labour market and its updating

The content of the program is developed and implemented by including the below activities that allows to involve representatives of employers in developing and implementing the study program. As a result, employers are involved both in the assessment of program results and introduction of the required changes to ensure that the program meets the needs of the labour market and is updated.

Content of the program and implementation of it takes place according to the

professional standard. As the program is a professional undergraduate program, its content is developed and implemented according to the professional standard for electronic engineers (approved on 12 August 2020, Minutes No. 6). Thus, the content of the program is developed and implemented by taking into consideration the most recent sectoral trends and labour market needs.

Representatives of sectoral companies are active in the council of the study programme. Five representatives of employers are approved for participation in the council of FoIT Engineering Sciences study program (approved on 13 May 2020 FoIT Council meeting, Minutes No. 4). Thus, employers have an opportunity to participate in decision-making on the content and implementation of the program, as well as offer their proposals for changes.

Representatives of sectoral companies are invited to the commission for defence of undergraduate student papers. Representatives of employers participate in the defence of undergraduate papers acting as members of the state examination commission. Thus, employers have an opportunity to assess to what extent students taught in the study program meet the needs of the sector and the labour market. After the defence of bachelor papers, there is a discussion with representatives of employers during which deficiencies in the results and potential action that may be taken to improve the content of the program are discussed. Thus, every year we receive feedback from employers on the academic results of studies.

Representatives of sectoral companies are involved in the teaching process as teaching staff. To ensure closer communication between students and representatives of sectoral companies, several study courses are taught by representatives of employers (electronic engineers), and some of the study courses offered are fully or partially taught on the manufacturing premises of the respective companies. This approach is used for the following study courses: “Basic industrial automation (2 CP)”, “Standards and technical norms (2 CP)”, and “Programming programmable logic controllers (4 CP)”. Thus, representatives of employers have an opportunity to develop study courses depending on the latest developments in the sector, as well as to assess the level of knowledge and skills of students and provide feedback to the administration of the program on existing deficiencies.

Employer surveys are carried out. During employer surveys, the opinions of employers are collected to identify program deficiencies and plan the required changes.

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

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

student-centred principles are taken into account in the implementation of the study process.

From a study programme management perspective, emphasis is placed on student-centric study processes and methods. The implementation of the study programme is based on the idea that a student, a future electronics engineer, should learn to solve real-life problems in engineering from the first semester of studies through a series of project-oriented courses throughout the programme. At the same time, emphasis is placed on the student being given the support to improve his or her knowledge, competences and skills in the technological directions of interest to him or her. The core of the curriculum is based on a project-oriented learning approach, while the other courses contribute to the implementation of this project-oriented approach, providing the necessary knowledge, skills and competences.

Implementation of a project-oriented teaching method

Project-based learning is at the core of the study programme and is implemented through a series of electronic engineering project-based learning courses:

1. Electronics engineering project I (3 KP);
2. Electronics engineering project II (3 KP);
3. Electronics engineering project III (3 KP);
4. Electronics engineering group project I (3 KP);
5. Electronics engineering group project II (3 KP);
6. Electronics engineering research project (3 KP).

As a result, in the first three semesters students develop individual study projects, in semesters 4 and 5 they develop projects in groups, and in semester 6 they develop an individual project with a research component. Project-based learning is not provided in the 4th year of study, as the 5th semester is devoted to the internship, while in the 6th semester students develop an independent project within the framework of the bachelor's thesis (12 CP).

Within the series of electronic engineering project courses, the course lecturer mainly plays the role of mentor (providing support) and customer (defining the technical requirements). At the beginning of each semester, students propose their project topic, which is evaluated and approved by the course tutor. The main purpose of the approval process is to assess the relevance and complexity of the topic by evaluating whether it is practically possible to implement the student's idea within a given time frame. After the topic has been approved, students start their project, which, according to the conditions of the course, is the development of an electronic device or system, from an idea to a working prototype, according to the technical instructions of the course tutor.

The aims of the project-based learning method.

This method is used to provide a number of strategic objectives for the successful achievement of the study programme objectives:

1. To provide a day-to-day link between what students learn in theoretical lectures, and real-life problems. When students develop individual, group and research projects in parallel with lectures and workshops there is an immediate opportunity to assess the practical application of theoretical knowledge acquired during lectures. This provides students with additional motivation to learn theoretically complex subject matter, as the immediate application of knowledge is visible.
2. To ensure that the knowledge, skills and competences acquired in daily lectures, seminars,

tutorials and laboratory work are consolidated and applied to a practical project.
3. To ensure the acquisition of both professional and general knowledge, skills and competences in line with the objectives and outcomes of the study programme.

Evaluating the results of project-based learning.

To assess the contribution of the project-oriented approach, and more specifically the series of electronic engineering project courses, to the objectives of the study programme, the results achieved are evaluated each semester. The results are evaluated during the defence of the students' projects and during post-defence discussions. The final outcome of a series of electronics engineering project courses is not assessed by the faculty member responsible for the course, but by a separate committee, usually made up of lecturers from courses that are taught in parallel with the project. This provides an immediate assessment of whether students are able to apply the knowledge and skills acquired in the relevant courses to real-world problems. In parallel, a number of general skills are assessed, such as the ability to communicate and discuss, the ability to present project results, the ability to prepare project documentation, etc. After the project defence, a discussion is held under the guidance of the study programme director to assess the achievement of the objectives and discuss steps to improve the study programme.

The study programme is implemented as a full-time study programme, so the main methods are contact hours under the guidance of a lecturer and independent work outside class time. Three forms of classes are offered in the course: lectures, practical classes and laboratory work. Independent work is provided in the form of homework, laboratory work and work in the library.

Lectures use both traditional forms, with the lecturer presenting and explaining the topic, and interactive forms, with students participating as active participants. Flipped classroom elements are used in courses where problems have been identified during the programme that students regularly encounter time-consuming problems in completing practical work. This approach allows students to explore theoretical material independently at home, while the face-to-face sessions focus on practical problem-solving based on previously independently learned theory. As a result, the responsible lecturer can provide immediate support in solving practical problems, reducing the time spent on practical work and increasing learning efficiency. Elements of this approach are used in a number of courses, such as, Programming basics for microcontrollers I (2 CP), Programming basics for microcontrollers II (2 CP), Programming of ARM architecture microcontrollers (2 CP) and Embedded operating systems (4 CP).

During **practical classes**, students calculate problems, calculate circuits and their elements, create specific programs or embedded systems. During these classes, discussions and exchanges take place on the most appropriate way to achieve the result. Practical activities are one of the main teaching approaches used in the implementation of the study programme. In addition to the series of electronics engineering courses, the study programme includes a significant number of learning-by-doing courses, using the equipment available in the teaching laboratories. In such courses, theoretical material is not strictly separated from practical work. Instead, the lecturer provides an introduction to the theory at the beginning of the class, which usually does not last more than 30 minutes, and then the students immediately start the practical tasks, which usually consist of performing a specific practical task using the principles of the theory that they have previously learnt. This approach is used in a number of courses, such as, Logic and Programming with Arduino platform (2 CP), Programming in C I (2 CP), Programming in C II (2CP), Fundamentals of programmable logic circuits (2 KP), Data transmission technology and devices (4 CP), Digital signal processors (3 KP), Programmable integrated circuits (4 CP) and Automatic control system design (3 KP).

In turn, in several study courses, which require the use of development boards for practical work,

students are provided with sets of equipment to take home so that they can perform their practical work outside the Ventspils University of Applied Sciences laboratories. An additional advantage of this approach is that students can complete the practical work at their own pace in their own homes and, if they wish, use the allocated equipment for advanced skills training and individual projects. This practice is implemented in a number of study courses, such as, Logic and Programming with Arduino platform (2 CP), Programming basics for microcontrollers I (2 CP), Programming basics for microcontrollers II (2 CP), Fundamentals of programmable logic circuits (2 KP), Programming of ARM architecture microcontrollers (2 CP), Embedded operating systems (4 CP) and Programmable integrated circuits (4 CP). The distribution of the necessary equipment and technical support in case of problems is provided by the FoIT Engineering Department technicians.

During **laboratory work,** students carry out experiments independently in teaching laboratories, connect circuits required for the course and measure circuit and signal parameters. Experiments usually aim to evaluate and analyse certain theoretical principles in practice. The results are presented in the form of protocols and reports and defended in subsequent classes. Students work both individually and in groups. In situations where the work is done in groups, however, the results usually have to be defended individually by each student. Laboratory work is used as a basic element of the acquisition of practical knowledge, skills and competences in a number of study courses, such as, Mechanics(3 CP), Electricity and magnetism (4 CP), Introduction to electrodynamics and antenna theory (4 CP), Digital electronics (4 CP), Analog devices (4 CP), Semiconductor electronics (3 CP), Circuit theory I (3 CP), Circuit theory II (3 CP) and Power supply systems for electronic equipment(2 CP).

In courses related to physics and electronics, classes are held in state-of-the-art labs. Each laboratory has 8 workstations, allowing 16 students to work at the same time (two students per workstation). In the physics laboratory, practical works are designed so that students learn the skills of experimental techniques, working with a wide variety of measuring instruments - analogue, digital, obtaining data both manually and by computer, processing and analysing data with different programs. In the electronics laboratory, students can use virtual measuring instruments in addition to real ones, working with equipment from world-renowned companies Lucas - Nülle and National Instruments. For courses related to the use of computer systems (programming, computer network technologies, standards and technical norms), practical sessions are organised in computer labs where the appropriate software for the course is installed.

During **independent studies**, the student studies the subject independently. Independent work can take place in laboratories, in the library (where there are also free-access computers with internet access). Students of the electronics programme (both bachelor and master) have 24-hour access to a student independent work room, where students organise their own work.

Programme lecturers (more than 90%) and students use the e-learning environment Moodle. Course materials are uploaded to the Moodle platform so that, in addition to lecture and lesson materials, opinions and information can be exchanged between lecturers and students, as well as between students themselves, in a forum mode. 90% of the course materials are available in electronic form (lecture slides, laboratory assignments and descriptions, practical assignments, control works, tests, as well as other course-related documents and materials). Using the e-learning environment, students can submit their completed laboratory work, take tests, do homework and later view the marking and error analysis of their work. Regular efforts are being made to increase the number of courses uploaded to this environment.

3.2.4. If the study programme envisages an internship, describe the internship

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

The aim of the internship is to use the theoretical knowledge and practical skills acquired in the study process to solve specific tasks in a practical environment in order to promote the development and improvement of students' professional knowledge, skills and competences in accordance with the qualification of electronics engineer.

In the 7th semester of the study programme "Electronics Engineering" an internship of 20 CP is foreseen in accordance with the study plan and the Regulation of the Cabinet of Ministers of the Republic of Latvia No.512 "Regulations on the State Standard of Second Level Professional Higher Education", which stipulates a minimum internship of 20 CP.

The Director of the study programme is responsible for the organisation and control of student internships in accordance with the duties set out in the job description of the "Director of the Study Programme" of the VUAS. In turn, the internships chosen by students are evaluated and approved at the meeting of the Faculty Council. The organisation of internship work is specified in the Internship Regulations of the Professional Bachelor's Study Programme "Electronics Engineering" (hereinafter - the Internship Regulations, see Annex 5.8).

Aim and objectives of the internship

The aim and objectives of the internship are defined in the Internship Regulations in accordance with: 1) the duties and tasks of an electronics engineer as defined in the professional standard "Electronics Engineer"; 2) the study programme study outcomes (hereinafter - SPSR) as specified in the "Mapping of Study Courses to Achieve the Study Outcomes of the Study Programme" (hereinafter - Mapping of Study Courses, see Annex 5.5). The following internship tasks are defined in the internship regulations:

1. to encourage students to understand the core tasks and responsibilities of the electronics engineer's career;
2. to develop the professional knowledge, skills and competences necessary for the performance of the main tasks and duties of the professional activity, which are developed during the internship by performing in depth at least one of the following tasks:
    1. development of electronic equipment and systems;
    2. participation in research and development projects related to the development of electronic equipment or systems;
    3. determination of technological processes for the manufacture of electronic equipment and systems;
    4. manufacturing of electronic equipment and systems;
    5. installing, maintaining and managing repairs to electronic equipment and systems.
3. to improve the general knowledge and competences necessary for the performance of the main tasks and duties of their professional activity, including interpersonal, communication, leadership, etc. skills and competences.

The link between the objectives and goals of the student placement and the SPSRs is specified in

the Mapping of Study Courses (see Annex 5.5.) and in the description of the internship, which is presented in the same format as all course descriptions.

Internship opportunities.

The internships used by students so far fall into three categories:

1. Internships in companies and organisations in Latvia;
2. Internship at the Ventspils University of Applied Sciences Research Institute Ventspils International Radio Astronomy Centre;
3. Internships in companies and organisations through Erasmus+.

Support provided by the university in finding and choosing a placement for internship.

Given the critical shortage of electronics engineers in Latvia, students have no problem finding an internship. The reality is that the supply of internships exceeds the number of students. Therefore, the support provided by the university is not about finding an internship, but about advising on the most suitable internship for the student's individual goals and abilities. Such support is provided by the programme director in individual discussions with students.

Support for Erasmus+ internships provided by the university.

To facilitate student mobility and contribute to the achievement of the SPSRs, the study programme provides enhanced support for study placements abroad under the Erasmus+ programme. This support is provided through the following activities implemented by the Programme Director:

1. Discussing potential internships abroad with students, individually assessing their goals, abilities, competences and knowledge;
2. Finding an internship based on the contacts built up at VUAS during various international research projects;
3. Informal discussions with the potential internship provider about the tasks to be carried out and deadlines;
4. Support in preparing documents (CV, cover letter, etc.);
5. Providing guidance to help students fully prepare for internship interviews;
6. Advice on finding a place to live.

All formal support and additional student assessment is provided by the staff of the Study Department of Ventspils University of Applied Sciences responsible for external relations.

As a result, every year several 4th year students of the study programme "Electronics Engineering" do internships abroad.

Academic year 2022/2023.:

- 3 students participate in an internship at Tartu Observatory, Estonia, participating in activities related to the development of Estonia's second nanosatellite, ESTCUBE-2;
- 1 student is in internship at the European Space Agency's European Space Operations Centre (ESA ESOC), Germany. During this placement, the student performs tasks related to the implementation of the OPS-SAT nanosatellite mission and process control while the satellite is in Earth orbit.

Academic year 2021/2022.:

- 1 student was in internship at ASTRON, the Netherlands, participating in the development of new antenna arrays, their calorimetry and test software, as well as the actual test execution and results compilation;

- 1 student was in internship at Branstrom Sweden AB, where the student was involved in specific development projects related to marine electronics.

Academic year 2018/2019.:

- 1 student was in internship at Tartu Observatory, Estonia, developing the communication subsystem of Estonia's second nanosatellite, ESTCUBE-2. It should be mentioned that the student continued the work started in the internship as part of his bachelor thesis.

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

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

Students choose their final thesis topics independently, in consultation with their supervisors. These topics are usually related to research projects that students have been involved in during their studies, or for those students who have started their career, they relate their topic to current developments in their workplace.

In the last six years (2016-2022), the following bachelor theses have been developed and defended in the study programme:

1. Development of electrical power subsystem for CubeSat type nanosatellite (2017);
2. Low current measurement device to optimize embedded systems firmware (2017);
3. High altitude balloon communication subsystem design (2017);
4. Design of flight control and communication systems for a quadrotor aircraft using microcontroller with embedded Bluetooth Low Energy transceiver (2017);
5. Development of individually addressable LED controller (2017);
6. Development of power supply subsystem for Irbe-4 high-altitude balloon (2018);
7. Development of three-channel pulse-width modulation regulator (2018);
8. Development of an asynchronous electro motor RPM controller (2019);
9. Development of Tranceiver Communication Subsystem for High Altitude Balloon(2019);
10. Development of nanosatellite “ESTCube – 2” communication subsystem engineering model (2019);
11. Development of a modularly expandable interactive RGB LED panel prototype (2020);
12. Development of prototype for electronic drive control unit for oil reservoir gate valves(2020);
13. Development of experimental equipment for the electrical signals interference (2020);
14. Development of antenna positioning control system (2021);
15. Automated aquarium monitoring and control system with remote control capabilities (2021);
16. Passive radar implementation, using USRP (Universal Software Radio Peripheral) software-defined radio (2022);
17. Portable ground station for satellite communications (2022);
18. Automatical gate entry system (2022);

19. Modernizing pool monitoring and dosing system using Wi-Fi (2022);
20. Development of a smart shower (2022).

The first students enrolled in the Electronics Engineering programme in 2018 and defended their bachelor theses in 2022. Accordingly, the list of final thesis topics from 2017 to 2021 for the final theses of the study programme "Electronics".

As can be seen from the titles of the bachelor theses, most of them are based on the development of equipment or systems. The implementation of development-based projects is directly related to the objectives of the study programme and the qualification of an electronics engineer.

The average score during the reporting period is 7.76, with two students obtaining the maximum score of excellent (10 points), see Table 3.8 for a more detailed overview.

Table 3.8.

Bachelor thesis marks by year in the study programmes "Electronic Engineering" and "Electronics"

Academic year	Evaluation in points							Number of graduates	Average mark
	4	5	6	7	8	9	10		
	(almost mediocer)	(mediocer)	(almost good)	(good)	(very good)	(excellent)	(outstanding)		
2016./2017.	0	0	1	0	3	1	1	6	8,17
2017./2018.	0	0	0	0	2	0	0	2	8,00
2018./2019	0	0	0	0	1	2	0	3	8,67
2019./2020.	1	1	0	0	0	0	1	3	6,33
2020./2021.	0	1	0	1	0	0	0	2	6,00
2021./2022.	0	0	0	1	2	2	0	5	8,20
Total	1	2	1	2	8	5	2	21	7,76
% from total	4,76%	9,52%	4,76%	9,52%	38,10%	23,81%	9,52%		

3.3. Resources and Provision of the Study Programme

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

The study process of the study programme "Electronics Engineering" is based on the central resources and facilities described in the Self-Evaluation Report, Part II, Chapter 3, Subsections 2.3.1 - 2.3.3. Information on the programme-specific resources and provision is provided below.

The study process of the study programme "Electronics Engineering" is based on the development of individual projects, laboratory work and practical work. To ensure these processes, VUAS FoIT has several modern teaching laboratories, which are regularly updated.

List of laboratories available for the study programme:

1. **Laboratory for electrical measurements (E1).** The laboratory for electrical measurements is equipped with standard electronic measuring equipment and accessories such as power supplies, signal generators, multimeters, oscilloscopes and soldering equipment. The laboratory has 8 workstations, where 2 students can work at the same workstation.
2. **Laboratory for digital electronics (E2).** The laboratory for digital electronics is based on the LUCAS-NUELLE UniTrain systems, which are used for laboratory work in: 1) digital electronics; 2) semiconductor electronics; 3) power supply systems; 4) radio frequency electronic systems. The laboratory has 8 workstations, where 2 students can work at the same workstation. Each workstation is equipped with a LUCAS-NUELLE UniTrain with the additional modules needed for the laboratory work.
3. **Laboratory for Signal Processing (E3).** The laboratory for signal processing is based on the laboratory benches of the virtual instrumentation systems ELVIS and Emona Datex (Experiments in Modern Analogue & Digital Telecommunications) distributed by National Instruments, with one bench per workstation. In order to use the above-mentioned benches, each computer in this laboratory is equipped with LabVIEW software. In addition, each workstation in this laboratory has access to the N210 software-defined radio platform manufactured by Ettus Research with several daughter boards. Each workstation in this laboratory partially supports the study process related to the programming of embedded systems (more precisely FPGAs) using the Cyclone V GX Starter Kit FPGA prototyping boards manufactured by terasIC. The laboratory has 8 workstations, where 2 students can work at the same workstation.
4. **Laboratory of Optics and Optoelectronics (E6).** This laboratory carries out laboratory work in optics and optoelectronics. The laboratory is equipped with equipment from OptoSci, Newport, Edmund Optics and others. The laboratory has 8 workstations, where 2 students can work at the same workstation.
5. **Laboratory of Physics (E8).** This laboratory is used for physics laboratory work on topics such as mechanics, electricity and magnetism. The laboratory equipment is based on PHYWE equipment. The laboratory has 10 workstations, where 2 students can work at the same workstation.
6. **Laboratory for Mechatronic Systems (D208).** This laboratory teaches the basics of electro-pneumatic systems using Festo equipment. The laboratory has 8 workstations, where 2 students can work at the same workstation.
7. **Prototyping laboratory (D04).** The aim of this laboratory is to provide students with access to professional prototyping equipment for the development of independent projects. The prototyping laboratory includes LPKF equipment for printing plates and Hakko soldering equipment.
8. **Laboratory for Robotics and Sensors (D207).** The aim of this laboratory is to provide students with the opportunity to carry out practical work using Festo PLCs and industrial robotic arm stands. The laboratory has 6 workstations, where 2 students can work at the same workstation.
9. **Amateur Radio Station (E801).** The purpose of this laboratory is to provide equipment for learning wireless communication systems. The amateur radio station provides students with equipment to communicate with: 1) other radio stations; 2) satellites; 3) ships and aircraft. In addition to communications equipment, Rohde & Schwarz and Agilent measuring instruments

(spectrum analysers, vector signal generators, vector circuit analysers, oscilloscopes) are available for the development of communications equipment.

10. **Practical workspace (B3).** A multi-purpose space designed to provide students with an environment to carry out practical projects outside class time. The room has 8 workstations based on Treston modular workbenches, where each workstation is equipped with soldering equipment - soldering station, hot air station, soldering extractor, printing plate holders and other tools. A laser cutter/engraver and a MakerBot 3D printer are available in the room.

Maintenance of teaching laboratories and technical support for teaching staff and students

The Head of the Engineering Unit of the FoIT, who has a number of laboratory technicians, is responsible for the maintenance and technical support of the engineering laboratories. The laboratory technicians of the Engineering Department ensure the successful work of the lecturers and students in the laboratories of the VUAS. This includes regular installation, maintenance, inventory and labelling of laboratory equipment, electronic devices and other necessary equipment, diagnostics and minor repairs within the scope of their competence, configuration of computers according to the instructions of lecturers, installation of necessary software on workstation computers, etc.

Updating and replenishing the resources available in the teaching laboratories.

From the financial point of view, the renewal and replenishment of the resources available in the teaching laboratories is carried out from two financial sources: project funding and the Faculty budget.

The Faculty's budget allocates an average of EUR 7000 annually for the renewal of technical teaching aids and materials. The use of this budget is the responsibility of the Head of the FoIT Engineering Department, while the technical processes are carried out by the FoIT Engineering Department laboratory technicians.

Project funding is regularly attracted for the development of the VUAS infrastructure. The project "Modernisation of Ventspils University of Applied Sciences STEM curricula" within ESF SAM 8.1.1 is of significant importance for the VUAS in 2018-2021. Within this project, approximately 130000 EUR were allocated for the supplementation of equipment necessary for the implementation of electronics-related engineering studies. In addition, the project "Next Generation Micro Cities of Europe" (No.UIA03-250) also included the upgrading of equipment in teaching laboratories, with an investment of around EUR 15 000.

Availability of teaching laboratories.

The VUAS FoIT has a practice of having teaching laboratories freely available to students every day of the week, 24/7. The accessibility is ensured in two ways: students have access to the laboratories either via the laboratory technicians or via the VUAS concierge who is available at any time in the concierge's room. The free accessibility of the laboratories allows for a student-centred learning process in such a way that students can combine their work in the laboratories with other individual activities or needs, such as work or other extra-curricular activities.

Materials for implementing student projects.

As the study process in this programme is largely based on a project-oriented teaching method, students are provided with free components and materials, including the ordering of printing plates. The funding allocated for the provision of materials is determined in proportion to the number of students. Currently, around EUR 3000 per year is allocated for student project materials. The procurement and distribution of materials is the responsibility of the Head of Engineering, but it

should be mentioned that in practice this process is carried out by the lab technicians. In addition to the materials needed individually, various materials and components are purchased for stock, such as 3D printer filament, laser cutter plywood and the most popular electronic components.

Compliance of resources and facilities with the conditions for the implementation of the study programme and for the achievement of the learning outcomes

The resources and facilities available in the teaching laboratories contribute directly and significantly to the achievement of the specified programme outcomes. Given that the learning outcomes are based on the requirements of the professional standard "Electronics Engineer", three of the six learning outcomes are focused on specific practical competences:

1. Able to develop electronic equipment and systems(SPSR1);
2. Able to participate in R&D projects (SPSR2);
3. Able to establish the technological manufacturing process and to manufacture electronic equipment and systems (SPSR3).

As regards the contribution to SPSR1, students are provided with access to equipment suitable for the development of electronic equipment and systems, as well as with all the necessary materials for the development of the various projects and with technical support provided by the laboratory technicians. The following teaching laboratories contribute directly to the achievement of SPSR1: Laboratory for electrical measurements (E1); Laboratory for Signal Processing (E3); Prototyping laboratory (D04); Practical workspace (B3).

As regards the contribution to the achievement of SPSR2, students are provided with equipment and support to develop the knowledge, competences and skills required for the various design and research projects. Access to laboratories is provided primarily to provide the necessary baseline facilities for the various projects. The following teaching laboratories contribute directly to the achievement of SPSR2: Laboratory for electrical measurements (E1); Laboratory for Signal Processing (E3); Prototyping laboratory (D04); Practical workspace (B3); Amateur Radio Station (E801). In addition to the material and technical base, the scientific base provided by the Ventspils University of Applied Sciences Engineering Research Institute "Ventspils International Radio Astronomy Centre" (VIRAC), where the available scientific equipment and expertise enable students to engage in various research and development projects, is very important for the achievement of SPSR2.

In terms of contribution to SPSR3, students are provided with equipment that enables them to develop skills in the installation, maintenance and repair of certain electronic equipment and systems. While the same laboratories that contribute to SPSR1 and SPSR2 make a significant contribution to SPSR3, in addition to equipment for the development of electronic equipment and systems, equipment for the development of advanced manufacturing systems is also made available. The following teaching laboratories contribute directly to the achievement of SPSR2: Laboratory for electrical measurements (E1); Laboratory for Signal Processing (E3); Prototyping laboratory (D04); Practical workspace (B3); Amateur Radio Station (E801); Laboratory for Mechatronic Systems (D208); Laboratory for Robotics and Sensors (D207).

It should be emphasised that the resources and facilities available in the teaching laboratories make an important contribution not only to the acquisition of practical competences but also to the development of general knowledge and understanding of electronic engineering. For example, the following laboratories contribute significantly to the achievement of SPSR6 (Understanding and knowledge of electronics engineering at the highest level of achievement in the field): Laboratory for digital electronics (E2); Laboratory for Signal Processing (E3); Laboratory of Optics and Optoelectronics (E6) and Laboratory of Physics (E8). These laboratories provide an opportunity to

test the principles covered in the theoretical lectures in a practical way, thus providing an opportunity to acquire and consolidate the knowledge covered in the theoretical lectures in a qualitative way.

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

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

VUAS includes the costs directly influential for the implementation of the study program or attributing them proportionally to the number of the students in the program when analysing the financing needed or financing received for a particular study program. **Income** includes the State budget funding for study process (1630.11 EUR per each state funded study place, corrected by the study program (study costs) coefficient and by the study level coefficient, plus the state budget funding for scholarships and social needs for students 164.34 EUR per each state funded study place), as well as income from tuition fees (calculated separately for each study program). The financing allocated by the Ventspils City Municipality for supporting the study process and for the Ventspils City Municipality IT sector scholarships according to the agreement between the VUAS and the Municipality is included as income, too, calculated proportional to the number of students in the program. **Costs** are allocated as following:

- There is a centralized 26% deduction from income of each faculty from State budget funding and from tuition fees, allocated to finance the common running costs of the VUAS;
- There is a proportional part of total common running costs of the faculty or other common costs of the particular faculty allocated to the costs of the study program proportional to the number of the students in the program.

The 26% deduction from the income of each faculty for the common running costs of the VUAS is used for:

- utility costs – electricity, heating, water and sanitation, waste disposal services;
- maintenance of premises and buildings;
- services for maintenance of IT systems;
- marketing costs;
- representation costs;
- partly remuneration of the administrative staff of the VUAS;
- common tax payments of the institution etc.

Direct costs of the faculty, which are necessary and can be identified as expenses by the particular faculty, are divided among the study programs proportionally to the number of students in these study programs. Expenses which are planned, made and can be identified for a particular study program, are included in the costs of this study program. These expenses include remuneration of the academic staff and general staff of the faculty, social security payments, health insurance, as well as expenses for fixed assets, purchase of inventory, books, learning aid, maintenance of laboratory equipment and computer classes and other faculty expenses.

Both income and costs are calculated per each student, too, separately for every study program (for one calendar year usually), as well as percentage of each cost group of the total costs of the study program is determined.

To calculate **the break-even point** of the study program, it is possible to use several methods – to increase the number of the students in the study program, to increase the state subsidy for each study place or to increase tuition fees for paying students. VUAS is using the first method – to model the number of students necessary to break even. The VUAS is not trying to increase tuition fees in the existing economic situation and taking into account the financial situation of local population, but is investing resources in marketing efforts to attract more students. We wish to point to the need to increase the government funding for university studies in the future, too.

Professional bachelor study program “Electronics Engineering”

Director of the program lect. Jānis Šate

The study program (study costs) coefficient **1.7**; the study level coefficient **1.0**

No.	**Item**	**Actual situation**				**Brake-even point**		
		Students	Amount, EUR	*Percentage distribution*	*Per 1 student (per year)*	Costs (EUR)	Per one student (per year, EUR)	*Number of students in the program*
	2	3	4		5	6	7	8
	INCOME	**25***	**93 350**	***100%***	***3 693,98***		**3 694**	
1.	State funding for studies	25	69 280	*75,0%*	*2 771,19*			
2.	State funding for scholarships	25	4 109	*4,4%*	*164,34*			
3.	Tuition fees		5 530	*6,0%*	*221,20*			
4.	Funding from Municipality for studies		11 012	*11,9%*	*440,49*			

5.	Funding from Municipality for scholarships		2 419	*2,6%*	*96,77*			
	COSTS	**25**	**107 992**	***100%***	***4 319,69***	**107 992**		***29***
6.	Academic staff remuneration	25	71 577	*66,3%*	*2 863,08*			
7.	General staff remuneration	25	838	*0,8%*	*33,52*			
8.	Scholarships and social costs	25	6 528	*6,0%*	*261,11*			
9.	Running costs, Utilities, Administration costs (26%)	25	19 451	*18,0%*	*778,02*			
10.	Materials, books, equipment	25	9 599	*8,9%*	*383,96*			
	Financial result:	**25**	**-15 643**	***-17%***	***-625,71***			

**Number of students in the program 25 (01.10.2022.).*

There are on average 25 students in the professional bachelor program “Electronics Engineering”, which is 12.6% of the total number of students in the Faculty of Information Technology. The same proportion is used to calculate the funding from the Municipality for this program. The same proportion of 12.6 % is used to split the total costs of the faculty to this program.

There would be needed 29 students in this program to reach the break-even point (condition – costs not changed). Alternatively, the rise in the state budget funding per study place would be needed 38% (an increase from 1630,11 EUR to 1954,16 EUR) with a constant number of students. Taking into account that the VUAS will have to increase the costs in the future, the growth of the state budget funding is imminent anyhow. The specifics of this program is a higher need in expenses for materials, equipment, laboratory maintenance, which determines a relatively higher proportion of these costs compared to the other programs of the study field. The financial losses of the professional bachelor study program “Electronics Engineering” have been covered from the positive cash flow of other study programs within this study field.

The development of the professional bachelor study program “Electronics Engineering” has been supported financially from the ESF projects during the years 2018 – 2022. The project “Modernization of Ventspils University of Applied Sciences’ STEM teaching programs” (No. 8.1.1.0/17/I/007) financed new laboratory equipment, new computer classes and improvement of

premises in total for 1.77 million EUR, and 130.000 EUR for the laboratories in electronics subjects in particular. The projects “Strengthening the Academic Staff of Ventspils University of Applied Sciences in the Fields of Strategic Specialization” (Project No: 8.2.2.0/18/A/009), “Improving Quality of the Content of Study Programs at Ventspils University of Applied Sciences, Improving Resource Efficiency and Ensuring Better Management” (Project No: 8.2.3.0/18/A/014) and “Next Generation Micro Cities of Europe” (No.UIA03-250) have contributed to the qualifications of the academic staff of the program. As laboratories and computer classes installed are used by all programs of this study field and by other faculties, too, and the academic staff is teaching in several study programs, it is difficult to separate the exact financial contribution of the projects mentioned above to the development of this study program. The project “Next Generation Micro Cities of Europe” provided 15.000 EUR financing for development of electronics laboratories of the VUAS. The ESA project "Development of university course - Satellite communications systems" (000136022/21/NL/SC LVR1_21) in the study course "Satellite communications" was launched in 2022, and will contribute to the development of the content of study courses in radiofrequency field of the professional bachelor study program “Electronics Engineering”, too. As investments from the projects mentioned above are finished now, there will be need to increase spending from the VUAS own budget to maintain laboratories and computer classes after 2023.

For each programme, a direct cost calculation is made. Taking into account the direct costs of implementing the study programme (described in more detail in Section 2.3.1), it is estimated that for this study programme the average cost (taking into account each semester, the amount of internships and the semester in which the final thesis is to be developed) is EUR 53787 for the salaries of the teaching staff, together with the salary of the study programme director and the costs of final examinations (including the salaries of supervisors, reviewers, and members of the examination committee), the cost amounts to EUR 57899. Adding the compulsory State social contributions (EUR 13658.37), the costs amount to EUR 71577.37. Considering that the State budget funds per study place in the programme (taking into account the field and level coefficient) are EUR 2491.8 per study place, it is calculated that the programme needs at least 29 students to cover its own costs.

3.4. Teaching Staff

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

The implementation of the Professional Bachelor's degree programme "Electronics Engineering" is carried out by highly qualified academic staff with significant practical experience in engineering and natural sciences in both the private and academic sectors, which ensures that students acquire the necessary research skills, theoretical and practical knowledge, skills and competences (see Table 3.9).

Table 3.9.

Academic staff of the professional bachelor's study programme "Electronics Engineering"

No.	Name	Surname	Academic year	Scientific degree,qualification	Study courses tought
1	Gaļina	Hiļķeviča	Assoc. professor	Dr.math.	Mathematical analysis I Mathematical analysis II
2	Guntars	Dreijers	Assoc. professor	Dr. philol.	Aspects of communication and professional ethics
3	Aigars	Krauze	Docent	Dr.sc.ing.	Semiconductor electronics Analog devices
4	Māris	Ēlerts	Docent	Dr. phys.	Digital electronics
5	Jānis	Trokšs	Docent	Dr. phys.	Power supply systems for electronic equipment
6	Artūrs	Vrubļevskis	Docent	Ph. D.	Mechanics Electricity and magnetism Circuit Theory I Circuit Theory II Introduction to electrodynamics and antenna theory

7	Matīss	Maltisovs	*Docent	Ph. D., Electronics engineer	PCB (Printed circuit board) design Electronics engineering project I Electronics engineering project II Electronics engineering project III Data transmission technology and devices Electronics Engineering Group Project I Logic and programming (Arduino platform)
8	Vairis	Caune	Docent	Dr.sc.comp.	Algorithm theory
9	Estere	Vītola	Lecturer	Mag. paed.	Object Oriented Programming I
10	Jānis	Šate	Lecturer	Mg.sc.ing., Electronics engineer	Automatic control systems design Electronics Engineering Research Project Fundamentals of programmable integrated circuits Programmable integrated circuits Signal theory and signal processing

11	Artūrs	Orbidāns	Guest lecturer	Mg.sc.ing., Electronics engineer	Electronics engineering project I Electronics engineering project II Electronics engineering project III Electronics Engineering Group Project I Embedded operating systems Programming in C I Programming in C II
12	Jeļena	Mihailova	Lecturer	Mg. math.	Linear Algebra un Analytical Geometry I Linear Algebra un Analytical Geometry II
13	Karina	Šķirmante	Lecturer	Mg.sc.comp.	Object Oriented Programming II
14	Ieva	Vizule	Lecturer	Mg. philol.	English I
15	Juris	Prikulis	Guest lecturer	Dr. phys.	Digital signal processors
16	Gints	Dreifogels	Guest lecturer	Mg.sc.ing., Electronics engineer	Programming of ARM architecture microcontrollers Electronics engineering group project II Embedded operating systems Introduction to electrodynamics and antenna theory Programming basics for microcoltrollers I Programming basics for microcoltrollers II

17	Mārcis	Donerblics	vGuest lecturer	Mg.sc.ing., Electronics engineer	Semiconductor electronics Analog devices LabView fundamentals
18	Dainis	Backāns	**guest lecturer	Mg.sc.ing., Electronics engineer	Introduction to industrial automation Programmable logic controllers Principles of industrial engineering systematisation Industrial robot manipulation and control systems
19	Ilva	Cinīte	Guest lecturer	Mg. phys.	Optics and optoelectronics
20	Roksolana	Amarova	Guest lecturer	Mg.sc.ing., Electronics engineer	Power supply systems for electronic equipment
21	Edgars	Garšneks	Guest lecturer	Mg.sc.comp.	Numerical methods
22	Varis	Vītols	Guest lecturer	Mg.sc.ing.	Civil Protection
23	Viesturs	Zeps	Guest lecturer	Dr. oec.	Entrepreneurship and economics
24	Ivo	Lemšs	Guest lecturer	Mg. biol.	Sustainable society and green thinking
25	Mārtiņš	Zimka	Guest lecturer	***B.s.c.ing.	Standards and technical norms

The language skills of the teaching staff of the professional bachelor's study programme "Electronics Engineering" comply with the Cabinet of Ministers Regulation of 2009 No 733 "Regulations on the Scope of Knowledge of the State Language and the Procedure for Testing Proficiency in the State Language for Professional and Official Duties". Information on the foreign language skills of the lecturers is summarised in the lecturers' curricula vitae (CV) attached as Annex.

The qualifications of the teaching staff are in accordance with Article 39 of the Law on Higher

Education Institutions regarding the academic staff of professional study programmes. There are 25 teaching staff involved in the implementation of the study programme, 13 of whom are docents elected by Ventspils University of Applied Sciences. The high number of guest lecturers is due to the fact that teaching staff from other higher education institutions and enterprises are attracted in order to provide all the necessary competences for the achievement of the study programme results, as well as to facilitate cooperation with other higher education institutions and industry enterprises.

10 faculty members have PhD degrees, 3 faculty members (K. Šķirmante, J. Šate and M. Donerblics) are studying for PhD degrees, while 7 faculty members have electronics engineer qualifications in addition to their academic degrees.

Several of the lecturers involved in the study programme are also involved in companies in the sector alongside their teaching work. This helps to link the content and implementation of the study programme with the industry and its current developments.

*Docent Matīss Maltisovs, PhD, has more than 5 years of private sector experience in electronic equipment and systems manufacturing and development companies. Currently, M. Maltisovs is an electronics engineer at Lightspace Technologies Ltd, where his main responsibilities are related to the development of printed circuit boards for the company's augmented reality products. M. Maltisovs' experience in the industry is directly related to the implementation of the course "PCB (Printed Circuit Board) design", while his experience in various technology development projects contributes significantly to the implementation of the series of electronics engineering project courses.

**Guest lecturer Mg. sc. ing. Dainis Backāns has more than 5 years of experience in the private sector at the liquid crystal display manufacturing company EUROLCDS Ltd, where he is currently Equipment Engineer. His experience and current job responsibilities are directly related to the content of his courses "Introduction to Industrial Automation" and "Programmable logic controller programming".

***Guest lecturer B.s.c. ing. Mārtiņš Zimkus has more than 5 years of experience in the electronic equipment and systems industry at HansaMatrix Ventspils Ltd, where he is currently Senior New Product Introduction Engineer. The content of the course "Standards and Technical Norms" taught by Mr Zimka is directly related to his professional responsibilities at HansaMatrix Ventspils Ltd. Mr Zimka is qualified as a guest lecturer under Article 39 of the Law on Higher Education.

The relevance of the qualifications of the teaching staff to the study programme's outcomes and objectives.

There are 5 members(PhD Matīss Maltisovs, Mg. sc. ing. Jānis Šate, Mg. sc. ing. Mārcis Donerblics, Mg. sc. ing. Gints Dreifogels and Mg. sc. ing. Roskolana Amarova) of the teaching staff involved in the implementation of the study programme with a professional qualification of electronics engineer, whose qualifications and professional activities are directly related to the development of electronic equipment and systems, as well as participation in research and development projects. The qualifications of these teachers are thus directly relevant to the following study programme outcomes:

1. SPSR1- able to develop electronic equipment and systems;
2. SPSR2 - able to participate in R&D projects.

There are 3 members of the teaching staff (Assist. prof. Dr. sc. ing. Aigars Krauze, Assist. prof. Dr. phys. Jānis Trokšs and Assist. prof. Dr. phys. Māris Ēlerts) with doctoral degrees, who have many years of experience in teaching courses related to electronics engineering fundamentals, as well as

in scientific work.Thus, the qualifications of these teaching staff directly correspond to the following study programme outcomes::

1. SPSR2 - able to participate in R&D projects;
2. SPSR6-understanding and knowledge of electronics engineering according to the highest level of performance in the industry.

There are 5 members of the teaching staff (Assoc. prof. Dr. math. Gaļina Hiļķeviča,Ph. D. Artūrs Vrubļevskis, Mg. math. Jeļena Mihailova, Dr. phys. Juris Prikulis, Mg. phys. Ilva Cinīte), whose qualifications are based on academic and scientific degrees in mathematics and physics. The qualifications of these teaching staff provide the theoretical basis for engineering studies and directly correspond to the following study programme outcomes:

1. SPSR6-understanding and knowledge of electronics engineering according to the highest level of performance in the industry.

There are 4 members of the teaching staff (Dr. sc. comp. Vairis Caune,Mg. sc. comp. Karina Šķirmante, Mg. paed. Estere Vītola, Mg. sc. comp. Edgars Garšneks), whose qualifications and professional activities are related to computer science and information technology. Given that information technology is an inseparable component of the professional activities of electronics engineers, such qualified teaching staff contribute to the achievement of all study outcomes of the study programme, but the most significant contribution is made to the following study outcomes of the study programme:

1. SPSR1- spēja veikt elektronisko iekārtu un sistēmu izstrādi;
2. SPSR5 - Spēja veikt profesionālās darbības nodrošināšanas vispārējo uzdevumu izpildi.

There are two members of the teaching staff (Mg.sc.ing. Dainis Backāns and B.s.c. ing. Mārtiņš Zimka) involved in the implementation of the study programme, whose professional activity and primary work is carried out in the industry's manufacturing companies. The qualifications of these teachers are therefore directly relevant to the following study programme outcomes:

1. SPSR3 - able to develop electronic equipment and systems;
2. SPSR4 - able to perform and manage installation, maintenance and repairs of electronic equipment and systems.

There are 5 members of the teaching staff (Dr. philol. Guntars Dreijers, Mg. philol Ieva Vizule, Mg. sc. ing. Varis Vītols, Dr. oec. Viesturs Zeps, Mg. biol. Ivo Lemšs), whose qualifications and professional activities are not related to the principles of electronic engineering and the duties of an electronic engineer, but these members of the teaching staff ensure the achievement of the study results of the study programme related to the general tasks of professional activity:

1. SPSR5 - able to perform general tasks required to ensure good professional performance.

In-depth background information on the qualifications and professional activities of the members of the teaching staff involved in the implementation of the study programme is summarised in the curriculum vitae (CV) of the members of the teaching staff, which are attached in the Annex.

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

During the reporting period, a number of highly qualified faculty members have joined the teaching

staff, whose qualifications and experience have a positive impact on the quality of the study programme and ensure generational change.

For the implementation of the study courses "Mechanics", "Electricity and Magnetism", "Circuit Theory I", "Circuit Theory II" and "Introduction to Electrodynamics and Antenna Theory" - docent Ph. D., Artūrs Vrubļevskis, a graduate of the Massachusetts Institute of Technology and a senior researcher at the Engineering Institute "Ventspils International Radio Astronomy Centre" (VSCR). Vrublevskis' education and experience gained at the Massachusetts Institute of Technology and in his daily work at IZI VSRC allow him to ensure that the content of his courses is at the cutting edge of the field. As a result, the introduced changes contribute positively to the quality of studies.

For the implementation of the study courses ""PCB (Printed Circuit Board) design", "Electronics engineering project I", "Electronics engineering project II", "Electronics engineering project III", "Data transmission technology and devices", "Electronics engineering group project I", "Logic and programming (Arduino platform)" - docent Ph. D., Matīss Maltisovs, a graduate of the Faculty of Electronics and Telecommunications of Riga Technical University, as well as an electronics engineer at SIA Lightspace Technologies. By attracting a teaching staff member with a scientific degree and experience in the field of industry to replace a teaching staff member with an academic master's degree without experience in the industry, a significant contribution was made to the improvement of the quality of the relevant study courses.

For the implementation of the study courses "Introduction to industrial automation" and "Programmable logic controller programming" - Mg. sc. ing. Dainis Backāns, who is an equipment engineer at EUROLCDS Ltd. These courses were not implemented before the arrival of D. Backāns, as they were introduced in the study programme after the significant changes in 2018. As a result, it is difficult to assess the impact on the quality of the study programme. However, it is positive that Mr Backāns represents the company EUROLCDS Ltd, which contributes to the students' connection with the company.

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

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

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

The most important criteria for selecting academic staff are scientific and professional competence, which potentially ensures successful collaboration between academics.

Cooperation between the study programme staff is promoted through both formal and informal activities organised by the VUAS. Teaching staff from different faculties are involved in the implementation of the study process, which provides a variety of experiences and promotes professional development.

The success of the cooperation between the study programme's teaching staff can be seen in a number of activities:

- **Interdisciplinary cooperation between academic staff** – for example, faculty members from different study fields are involved and employed in the study programme and can share their experience and discuss topical issues at organised meetings of the Council of Study Programmes, Faculty Council meetings, seminars, meetings with employers, etc.
- **Joint research activities by academic staff**, for example, faculty members involved in a study programme produce joint scientific publications, which indicate both interdisciplinary collaboration and research and joint activities in related scientific fields. For example, the joint presentations of lecturer Jānis Šate and guest lecturer Gints Dreifogels at a conference, the involvement of lecturer Karina Šķirmante and guest lecturer Artūrs Orbidāns in joint scientific publications.
- **Cooperation between teaching staff in the development of study programme content**, by developing and improving the content of the study programme, lecturers carefully follow the thematic division included in the study course, mutually coordinating the thematic areas and the assessment mechanism of the study results. As an example, activities within the project "Next Generation Micro Cities of Europe" (No.UIA03-250), during which docent A. Vrubļevskis, lecturer K. Šķirmante, guest lecturers A. Orbidāns and G. Dreifogels modernised their courses by introducing student-centred methods, as well as shared their experience with other VUAS FoIT lecturers during several seminars.
- **Informal cooperation among teaching staff.** Various activities are organised at the VUAS FoIT to promote communication among the teaching staff in an informal atmosphere. One example is the weekly coffee breaks, during which lecturers discuss current issues in an informal atmosphere, as well as share their experiences in solving various problems.

Currently, 25 lecturers are involved in the implementation of the study programme with various workloads, while 30 students are currently enrolled in the study programme. Thus, the ratio of students to lecturers is 30/25=1.2. Students are provided with high-quality studies and the opportunity for an individual approach during the study process.

The calculations do not take into account that students from several study programmes of Ventspils University of Applied Sciences participate in some study courses concurrently.

Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	5-1_appendix_D-DS_example.pdf	5-1_pielikums_D-DP_paraugs.pdf
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)		
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		
Statistics on the students in the reporting period	5-2_appendix_statistics-on-students.pdf	5-2_pielikums_Statistika_studejosie_IZB.pdf
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard	5-3_appendix_Compliance_national_education_standart.pdf	5-3_pielikums_Atbilstiba-valsts-standartam_EIB.pdf
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)	5-4_appendix_Compliance-profession-standard.pdf	5-4_pielikums_Atbilstiba-profesijas-standartam.pdf
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	5-5_appendix_study-programme-mapping.xlsx	5-5_pielikums_Studiju_Rezultātu_Kartējums.xlsx
The curriculum of the study programme (for each type and form of the implementation of the study programme)	5-6_appendix_Study_programme_plan_EIB.docx.pdf	5-6_pielikums_Studiju-programmas-plans_EIB.docx.pdf
Descriptions of the study courses/ modules	5-7_Appendix_Kursu apraksti.pdf	5-7_Pielikums_Kursu apraksti.pdf
Description of the organisation of the internship of the students (if applicable)	5-8_appendix_internship-regulations.pdf	5-8_pielikums_Prakses_nolikums_2022_EIB.pdf
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)		

Smart Technologies and Mechatronics (42523)

Study field	*Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management, and Computer Science*
ProcedureStudyProgram.Name	*Smart Technologies and Mechatronics*
Education classification code	*42523*
Type of the study programme	*Professional bachelor study programme*
Name of the study programme director	*Uldis*
Surname of the study programme director	*Žaimis*
E-mail of the study programme director	*uldis.zaimis@liepu.lv*
Title of the study programme director	*Mg.sc.ing.*
Phone of the study programme director	
Goal of the study programme	*The goals of the professional higher education study program "Smart Technologies and Mechatronics" are:* *• to promote the growth of specialists in the sectors of the national economy in which modern electromechanical equipment is managed with integrated application of* *electronics and computer equipment • to promote the development of computer control in the region and the country;* *• to provide conditions for obtaining high-quality and competitive higher professional education in computer control by preparing specialists who are able to carry out academic and applied research in computer control science (branch of science - 2.2. Electrical engineering, electronics, information and communication technologies);* *• to give bachelors of the study program "Smart Technologiesand Mechatronics" the opportunity to obtain a master's degree in engineering, mechatronics, adaptronics, transport, etc., continuing their ducation. areas, as well as the relevant professional competencies;* *• to promote the development of a creative, responsible and motivated personality for lifelong learning.*

Tasks of the study programme	*The tasks of the study program “Smart Technologies and Mechatronics” are:* *• to create conditions and opportunities for students to obtain professional education in mechatronics.* *Mode ofachievement:* *- to provide the intellectual and material resources necessary for the implementation of the bachelor's program in accordance with the program standard;* *- to promote independent studies by providing the necessary resources and control of the necessary study work;* *- to involve students in research work, developing research skills.* *• to provide a scientifically based understanding of modern automatic control, data transmission, remote control systems, their development and development trends.* *Mode of achievement:* *- to create conditions and environment for acquiring knowledge about the development of computer control disciplines, their interrelationships and interactions and possibilities of practical application;* *- to ensure the continuous improvement of the program.*
Results of the study programme	*1. Is able to demonstrate a comprehensive and specialised knowledge and understanding of the facts, theories, patterns and technologies elevant to the professional field of mechatronics.* *2. Is able to perform practical tasks in the mechatronics profession in an analytical manner, to demonstrate skills that enable creative solutions to professional problems, to discuss and to reasonably debate practical issues and solutions in the profession with colleagues, clients and management, and to learn further with an appropriate degree of independence, developing their competences.* *3. Is able to evaluate and to improve own and others' performance, to work collaboratively with others, to plan and to organise work in order to carry out specific tasks in the profession, and to carry out or supervise work activities that are subject to unpredictable change.* *4. Is able to formulate, to describe and to analyse practical problems in the mechatronics profession, to select the necessary information and to use it to solve clearly defined problems.* *5. Is able to participate in the development of the mechatronics profession, to demonstrate an understanding of the place of the mechatronics profession in the wider social context.*
Final examination upon the completion of the study programme	*Bachelor's degree*

Study programme forms

Full time studies - 4 years - latvian

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

Language	*latvian*
Amount (CP)	*160*
Admission requirements (in English)	*Secondary education.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Professional bachelor's degree in mechatronics*
Qualification to be obtained (in english)	*Mechatronics Engineer*

Places of implementation

Place name	City	Address
Ventspils University College	VENTSPILS	INŽENIERU IELA 101, VENTSPILS, LV-3601

Full time studies - 4 years - english

Study type and form	*Full time studies*
Duration in full years	*4*
Duration in month	*0*
Language	*english*
Amount (CP)	*160*
Admission requirements (in English)	*Secondary education and a level of English of at least B2.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Professional bachelor's degree in mechatronics*
Qualification to be obtained (in english)	*Mechatronics Engineer*

Places of implementation

Place name	City	Address
Ventspils University College	VENTSPILS	INŽENIERU IELA 101, VENTSPILS, LV-3601

3.1. Indicators Describing the Study Programme

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

Accreditation of the professional bachelor study programme "Smart Technologies and Mechatronics" is carried out for the first time.

In the licensing process in 2021, the commission made a request to increase the number of credits in the study course "Manufacturing technologies" to 6 CP - done, to introduce the study course "Hydraulics and pneumatics" in the amount of 2 CP - done, to remove the Latvian language from the planning for the English language group - done, and to supplement material support with 2 CNC machine tools within 5 years. One will be purchased in late 2022/2023. at the beginning of the year, the second - within two years.

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

At the Liepaja University, science programmes are implemented at the Faculty of Science and Engineering (FSE) - the newest of the 4 training units. The following study programmes are implemented at the DIF:

- *Professional bachelor study programme “Information Technology”*
- *Professional bachelor study programme “Smart Technologies and Mechatronics” Academic bachelor study programme “Computer Sciences”*
- *Professional master study programme “Information Technology” Doctoral study programme “E-Study Technologies and Management”*
- *Professional bachelor study programme “Environmental Innovation Technologies” Professional master study programme “Ecotechnologies”*

Faculty's goals:

- to provide a supportive and creative environment for quality, innovation-driven higher professional and/or academic education in natural sciences and engineering;
- to ensure the stabilisation of the Faculty's scientific potential and the achievement of quantitative and qualitative indicators in line with the University's criteria, systematically promoting the development of academic staff;

- to strengthen the study fields under the supervision of the Faculty, ensuring the quality of study programmes, increasing the number of students and offering new study programmes in international and national demand;
- to strengthen the public visibility of the Faculty's activities and results through targeted planning and implementation of a system of marketing activities.

Professional Bachelor study programme "Smart Technologies and Mechatronics" is a joint programme of the Liepaja University (LiepU) and Ventspils University of Applied Sciences (VUAS); according to the SAM project "Reduction of fragmentation of study programmes at Liepaja University" (No. 8.2.1.0/18/I/002), it has been developed and will be implemented in cooperation between the two higher education institutions. The lead organisation is the Liepaja University.

LiepU study programme "Smart Technologies and Mechatronics" will be implemented at the Faculty of Science and Engineering (FSE) in study direction "Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management and Computer Science" (Latvian only), replacing the current programme "Mechatronics". This choice is determined by:

- rapid development of techniques, technologies and materials - not only in manufacturing, but also in household and domestic appliances, which are controlled and operated using programmable electronics; new generation smart materials are widely used; optimisation methods and programmable electronics are applied in the development of mechatronic devices;
- changes in the production organisation - in many cases the conveyor has been abandoned, programmable machine tools are used, work groups are formed for project implementation, the share of individual orders has increased (e.g. in LSEZ companies "Trelleborg Wheel Systems Liepaja Ltd. (SIA)", "Silkeborg Spaantagning Baltics Ltd. (SIA)", etc.).

At Ventspils University of Applied Sciences the study programme "Smart Technologies and Mechatronics" will be implemented at the Faculty of Information Technologies (FoIT). The Faculty implements the first- level higher education study programme "Programming Specialist", two bachelor study programmes "Computer Science", "Electronics Engineering" and two master study programmes "Computer Science" and "Electronics". The FoIT has extensive and modern new laboratories, and its work-oriented study programmes ensure the training of qualified professionals.

Ventspils University of Applied Sciences is active in attracting international students. The international market offers bachelor's and master's degrees in Computer Science and Electronics.

The developed study programme "Smart Technologies and Mechatronics" will offer students competitive studies of national and international importance for the development of the region, will implement nationally and internationally recognised research related to the studies and will contribute to the sustainable development of society.

The program corresponds to the study direction "Information technology, computer engineering, electronics, telecommunications, computer management and computer science" - it is determined by the high proportion of exact sciences (mathematics, physics, informatics, programming, construction, robotics, etc.) in the total range of courses and the operation, development and the essence of service – it is based on mechanics, electronics and programming. Accordingly, the name of the program "Smart technologies and mechatronics", the goals, tasks, achievable results and admission requirements of the program are defined.

The goals, tasks and planned study results of the study program "Smart technologies and mechatronics" are determined by the professional standard PS-210 “Mechatronics Engineer” (approved by the Tripartite Cooperation sub-council of Vocational Education and Employment on February 9, 2022, protocol No 1. Professional standards and programs | Valsts izglītības satura

centrs (visc.gov.lv) (seen 24.02.2023.)

Objectives of the study program

The goals of the professional higher education study program "Smart technologies and mechatronics" are:

- promote the growth of specialists in sectors of the national economy, in which management of modern electromechanical equipment is carried out with the integrated application of electronics and computer engineering;
- promote the development of the field of computer management in the region and the country;
- to provide conditions for obtaining high-quality and competitive higher professional education in computer management by preparing specialists who are able to carry out academic and applied research in the science of computer management (field of sciences - 2.2. Electrical engineering, electronics, information and communication technologies);
- to give the opportunity to the bachelors of the "Smart technologies and mechatronics" study program, while continuing their education, to obtain a master's qualification in engineering, mechatronics, adapttronics, transport, etc. areas, as well as corresponding professional competences;
- promote the development of a creative, responsible and lifelong learning-motivated personality.

Analysis of the interrelation between the name of the study program, code of the study program, the degree, professional qualification to be acquired, the aims, objectives, learning outcomes, and the admission requirements

The joint professional bachelor study program “Smart Technologies and Mechatronics” was designed to promote the growth of specialists in the sectors of national economy in which modern electromechanical equipment is managed with integrated application of electronics and computer equipment as well as to prepare specialists who are able to carry out academic and applied research in computer control science (branch of science field - 2.2. Electrical engineering, electronics, information and communication technologies). The tasks, knowledge, skills and competencies of mechatronics engineers are determined by the professional standard PS-210 “Mechatronics Engineer” (approved by the Tripartite Cooperation sub-council of Vocational Education and Employment on February 9, 2022, protocol No 1. Professional standards and programs | Valsts izglītības satura centrs (visc.gov.lv) (seen 24.02.2023.). The standard PS-210 declares that the professional qualification of the mechatronics engineer should correspond to the fifth level of the professional qualification framework (PQF 5), and it can be obtained in the education program corresponding to the sixth level of Latvian Qualification Framework (LQF 6). The Cabinet of Ministers regulation No. 322 (approved 13.06.2017.) “Regulation on the classification of the Latvian education system” (Latvian only), Annex 1, determines that the LQF 6 education is the second level professional higher education (professional qualification of level 5 (PQF 5) and professional bachelor degree, and the length of studies should be 4 years). One may enter such education program after graduating from the secondary education, thus the secondary education is determined as the admission requirement for the second level professional higher education study program. The code 42 is assigned to this type of the study program by the LQF (the first and the second digit of the second classification level). The interrelation of the name of the study program “Smart Technologies and Mechatronics” to the third - fifth levels of the study program code “523” (and to the full code of the program 42523) is determined by the Annex 2 of the Cabinet of Ministers regulation No. 322 “Regulation on the classification of the Latvian education system” which determines the correspondence of the study programs listed by the ISCED-F 2013 under the

code 0714 Electronics and Automation as corresponding to the LQF code “523”. The conformity of the study program “Smart Technologies and Mechatronics” to the ISCED-F code 0714 subsectors “control engineering”, “robotics”, “electronics engineering” is justified by the high proportion of electronics and computer control (informatics, programming, design, robotics) study courses among the courses of this study program. Essence of the design, servicing and operating of mechatronics devices – mechanics, electronics, and programming constitute the base of mechatronics. The requirements to the tasks, knowledge, skills and competencies of mechatronics engineers determined by the professional standard PS-210 are incorporated directly into the aims, objectives and study results of the study program described below in this chapter. The conformity of the study program “Smart Technologies and Mechatronics” to the professional standard is reflected in the Annex 8.4.

Tasks of the study program

The tasks of the "Smart Technologies and Mechatronics" study program are:

- create conditions and opportunities for students to obtain professional education in mechatronics.
- to provide the intellectual and material resources necessary for the execution of the bachelor's program according to the program standard;
- promote independent studies by providing the necessary resources and the necessary study work control;
- involve students in research work, developing research work skills;
- to provide a scientifically based understanding of modern automatic control, data transmission, remote control systems, their development and development trends.
- create conditions and an environment for acquiring knowledge about the development ofcomputer management disciplines, their interrelation and interaction, and the possibilities of practical application;
- ensure continuous improvement of the program.

Achievable study results of the study program

A professional bachelor's degree and fifth-level qualification is awarded to a learner who, as a mechatronics engineer, develops technological process automation algorithms; manages the design of computer control systems; performs equipment operation monitoring and their assembly tasks; uses special knowledge and skills to solve various practical technical problems or tasks; designs and develops possible automation options; advises on the efficiency of the automation process, on the latest achievements in the field of computer control technology, and the possibilities of their implementation.

A mechatronics engineer works in companies that control electromechanical equipment with the integrated application of electronics and computer equipment.

Upon completion of studies, the student obtains a diploma of professional higher education. Degree Pursuing: Professional Bachelor degree in Mechatronics.

Obtainable qualification: Mechatronics engineer (professional code - 2512 04).

Upon successful completion of the professional undergraduate program “Smart Technologies and Mechatronics”, graduates acquire the following academic results:

- Is able to demonstrate a comprehensive and specialised knowledge and understanding of the facts, theories, patterns and technologies relevant to the professional field of mechatronics;
- Is able to perform practical tasks in the mechatronics profession in an analytical manner, to demonstrate skills that enable creative solutions to professional problems, to discuss and to

reasonably debate practical issues and solutions in the profession with colleagues, clients and management, and to learn further with an appropriate degree of independence, developing their competences.
- Is able to evaluate and to improve own and others' performance, to work collaboratively with others, to plan and to organise work in order to carry out specific tasks in the profession, and to carry out or supervise work activities that are subject to unpredictable change
- Is able to formulate, to describe and to analyse practical problems in the mechatronics profession, to select the necessary information and to use it to solve clearly defined problems.
- Is able to participate in the development of the
- mechatronics profession, to demonstrate an understanding of the place of the mechatronics profession in the wider social context.

The expected academic results can be broken down into the following knowledge, skills and abilities.

Knowledge:

- knows the stages of development of constructors' documentation;
- knows how to execute assembly and detail working drawings;
- able to perform the main accuracy and optimization calculations of mechanical, electronic and computer engineering equipment;
- knows the causes of the most frequent failures of mechanics, electrical equipment, electronics and computer equipment and the principles of their prevention.

Skills:

- able to design mechatronic equipment;
- able to lead a joint working group of mechanics, electricians, electronics and computer specialists for the design of mechatronic systems;
- able to monitor the operation of mechatronic equipment; able to perform tasks of assembling mechatronic equipment.
- able to demonstrate the basic and specialized knowledge characteristic of engineering and mechatronics and a critical understanding of this knowledge, including presenting part of the knowledge in the highest achievements of engineering and mechatronics;
- using the acquired theoretical foundations and skills of mechatronics,
- is able to perform professional, innovative or research activities;
- able to make decisions and solve problems in engineering and mechatronics;
- is able to independently structure his learning, direct his and his subordinates' further education and professional development;
- able to take responsibility and initiative when working individually, in a team or managing the work of others, to make decisions and find creative solutions in changing or uncertain circumstances.

Competence:

- understands the mutual interaction of mechanics, electromechanics, electronics and computer engineering equipment;
- knows how to predict the failure-free operation of mechanics, electrical equipment, electronics and computer equipment;
- knows how to find the causes of mechanical equipment damage and eliminate them;
- knows how to work with ready-made programs intended for the control of mechatronic equipment;

- able to organize both group work and work in a group;
- able to cooperate with representatives of other professional specializations;
- nows how to apply occupational safety, fire safety and environmental protection regulations; understands ISO, EC and other national standards in the field of mechatronics.

Admission conditions

Students are admitted to the program electronically through a competitive process, based on the results of the centralized high school exams. This process is regulated by the annual admission rules for full-time and part-time studies approved by the LiepU Senate (in 2019 - "LiepU admission requirements and criteria for higher level study programs in the 2019/2020 academic year", LiepU order of the LiepU Senate of October 29, 2018 at the meeting, protocol No. 4). The number of budget and paid student places to be admitted is approved by the Senate of LiepU every year.

The basic admission criteria will be the same for all new LiepU study programs in the "Information Technologies and Natural Sciences" field of study:

- successful grades of the secondary education certificate year in all subjects with an average grade not lower than 6 points (if the average grade is lower than 6 points, there is a possibility to take a test - discussions);
- CE in Latvian language, mathematics, English language;
- entrance exam.

Selection criteria

Competition criteria for persons who have obtained secondary education since 2004: Mandatory requirements:

- CE (Centralized examinations) in Mathematics;
- CE in a foreign language or STIP in a foreign language.

Additional requirements:

- FG (Final grade) or VE/I in algebra (mathematics);
- or FG or VE/I in Physics;
- or FG or VE/I in natural sciences;
- or FG or VE/I in informatics / programming.

Competition criteria for persons who obtained secondary education before 2004 (not including), as well as persons who obtained secondary education abroad or persons with special needs.

Mandatory requirements:

- FG or CE in Mathematics;
- FG or CE in a foreign language or STIP in a foreign language.

Additional requirements:

- FG or SE (State exam)/T (Test) in algebra (math);
- or FG or SE/T in physics;
- or FG or SE/T in natural sciences;
- or FG or SE/T in informatics/programming.

Advantages

- 1–3rd place winners of the Latvian national or regional student scientific conference in the Natural Sciences, Engineering and Technology Science section no more than 3 years before admission;

- 1-3. place winners in the Latvian state Olympiads in physics, mathematics, informatics no more than 3 years before admission;
- in addition, 2 points are obtained by those who have obtained vocational secondary education with the qualification of mechatronic systems technician.

Persons who have won prize-winning places in Latvian national subject Olympiads, Latvian national/regional student scientific conferences, Latvian or international sports competitions (achievements no older than 3 years), according to the conditions of admission to study programs, can obtain the following additional points:

- for 1st place or 1st rank - 4 points;
- or 2nd place or 2nd rank - 3 points;
- for 3rd place or 3rd grade - 2 points;

Bonus points can only be earned for one benefit. These extra points do not add up. Test - discussions (oral test for applicants with an average grade below 7 points):

- reason for choosing a profession;
- setting and justification of study goals;
- assessment of cooperation and leadership experience;
- research activities and projects;
- communication skills.

Evaluation criteria for the entrance exam (for all applicants):

- the ability to orientate and reflect on current events in the industry and related developments in society;
- professional motivation;
- the ability to express one's opinion in writing and orally, justifying one's opinion.

Prospective students receive information about opportunities to study in Liepāja's "Smart Technologies and Mechatronics" study program at informational events organized by the university at Liepāja University (for example, "Open Day", "Hands in Hand with a Student", "Shadow Day"), in the city of Liepāja and elsewhere in the country, Liepāja Homes page[2], as well as communicating with students and graduates of the program both privately and on social networks.

The admission of reflective students is regulated by the "Regulations of admission and matriculation procedure at Ventspils University of Applied Sciences", which is determined for each academic year by the decision of the VeA Senate. Admission rules have been developed in accordance with the Law on Universities and 10.10.2006. MK regulations no. 846 "Rules on requirements, criteria and procedures for admission to study programs".

The right to study at Ventspils University of Applied Sciences is available to citizens of the Republic of Latvia and persons with non-citizen passports of the Republic of Latvia, as well as persons who have been issued permanent residence permits. Admission of foreign applicants is organized in accordance with the rules approved by the VeA Senate "Terms of admission and the matriculation process for Ventspils University of Applied Sciences foreign candidates for studies in English-taught study programs".

The foreigner shall attach to the application a document issued by the international testing institution within the last five years, which certifies that the foreigner's proficiency in the language of the relevant study program is at least B2 level, if no other clause of Article 846 of the Code of Civil Procedure applies. The adequacy of the level of knowledge of the English language is evaluated when the applicant completes a language test that meets the requirements of the MK regulations.

As a result of the cooperation, the strengths of both universities are rationally used - LiepU contributes to the development of the programme, implementation of the core courses (general education, most theoretical and professional specialisation courses, elective study courses, internship and state examination - a total of 144 CP), while VeA's cooperation is based on highly developed training management and technical support in the field of electronics. Ventspils University of Applied Sciences will offer 16 (i.e. 10% of 160) credit points of courses related to electronics and electromagnetism.

Studies will be organised in the form of dual studies.

After successfully passing the examinations and defending the bachelor's thesis, the graduates will receive a diploma of the university where the student is matriculated (LiepU or VUAS).

Study languages - Latvian, English, the content of the program is identical in both languages.

Documents regulating the development and implementation of the study program

In the development of the new study program "Smart Technologies", the following have been observed:

- Guidelines of the SAM project "Reducing fragmentation of study programs in LiepU" (No. 8.2.1.0/18/I/002);
- Professional standard "Engineer in mechatronics" (PS0097).

Professional qualification and degree

After the studies, students obtain a professional bachelor's degree in mechatronics and a level 5 qualification *Engineer in mechatronics*, which entitles graduates to start their own job or work in a company. The study programme "Smart Technologies and Mechatronics" provides graduates with professional competence and its development, and, in line with the Lisbon Strategy, provides graduates with opportunities to compete successfully in the labour market. It's provided by:

- the degree to be awarded and a single European Diploma Supplement ("*Diploma Supplement*"*),* which is comparable to related study programmes at other EU universities; alignment of the adopted credit system with the ECTS system;
- compliance of the programme content with the requirements of the study programme of the second level of professional higher education, which are set out for the Common European Area of Education and are also set out in Latvia by the Regulation of the Cabinet of Ministers of the Republic of Latvia No. 512 ("Regulations on the Standard for the Second Level of Professional Higher Education");
- the adequacy of the study programme's scientific research facilities to meet modern requirements;
- teaching staff involved in the implementation of study processes with the appropriate competences for sustainable education.

Graduates of the study programme may continue their education by studying in academic or professional master's study programmes at the Liepaja University, as well as at other Latvian and foreign higher education institutions.

The goals, objectives and study results of the study programme "Smart Technologies and Mechatronics " are not duplicated with other study programmes of LiepU.

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

graduates' employment.

According to the information available to the Association of Mechanical Engineering and Metalworking Manufacturing Companies (http://www.masoc.lv/masoc/), there is currently a shortage of specialists in Latvia who are able to develop new products, design and maintain automated production lines, operate CNC *(Computer Numerical Control)* machines at a professional level, and perform set-up, maintenance and repairs. One of the priorities of the Latvian economy is to develop exports of manufacturing companies and to increase labour productivity. This can be done by introducing new competitive products and automating production. Mechatronics engineers are the professionals most directly involved in making this happen.

The LiepU programme "Smart Technologies and Mechatronics" is the basis for the Master's programme in Mechatronics and Adaptronics.

Relevance of the study programme to the needs of the economy and the labour marketDuring the preparation of the licensing materials, an employers' survey on the need for a study programme in "Smart Technologies" was carried out. 4 companies *(Trelleborg Wheel Systems Liepaja Ltd., Silkeborg Spaantagning Baltic Ltd., AE Partner, INPASS Ltd.)*, whose activities are largely related to the development of new products, would like to hire mechatronics engineers today. Six respondents (Liepaja Special Economic Zone companies) admitted that their companies will need mechatronics engineers in the next 3 years; they plan the development of their companies, expect the economic situation to improve and production to increase; each company plans to hire 1 - 5 mechatronics engineers in this period. Employers point out that a mechatronics engineer needs to know and be able to identify faults in CNC equipment and fix them promptly, as equipment idle time is very costly. Employers point out that the new specialist must continuously acquire new knowledge and be able to speak English or German in order to be able to communicate freely with CNC machine manufacturers, to inform them of machine faults, to receive advice from foreign specialists and, on this basis, to repair machine faults themselves. In this way, technicians continuously improve their professional level for the maintenance and repair of a specific CNC machine. The other key aspect that a mechatronics engineer needs to know is how to work with CAD *(Computer Aided Design)* programmes, perform design functions and develop new products. The third aspect: basic knowledge of manufacturing technology, CAM programmes, CNC machine control systems - *Heidenheim, Fanuc, Siemens*.

Profession Mechatronics Engineer is included in the list of professions where a significant labour shortage is forecast and where foreigners may be invited to work in the Republic of Latvia[1] - Cabinet of Ministers Regulation No. 108, Riga, 20 February 2018 (i.e. No. 11 26. §) "Specialities (professions) in which a significant labour shortage is forecast and in which foreigners may be invited to work in the Republic of Latvia".

Almost all graduates of the last six years work in the field of mechatronics in accordance with their professional qualification obtained at LiepU. All graduates are offered a job, but a small minority turn them down (family circumstances, insufficient pay, working conditions not in line with the job description of a mechatronics engineer). In summer/autumn of both 2018 and 2019, the director of the current Mechatronics study programme was contacted by employers in Kurzeme (2018, 2019) and Vidzeme (2019) regions to recommend their institutions as workplaces for graduates - however, all graduates were already working or had already agreed to take a job at another institution. This shows that there is a high demand for specialists and that graduates will be provided with jobs.

[1]https://likumi.lv/ta/id/297537-specialitates-profesijas-kuras-prognoze-butisku-darbaspeka-trukumu-un-kuras-darba-latvijas-republika-var-uzaicinat-arzemniekus (only in Latvian)

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

In the spring of 2022, 11 students are enrolled in the professional bachelor's study programme "Smart Technologies and Mechatronics " of LiepU, 11 of them in Latvian and 0 in English. The number of students is made up of 12 students enrolled in the first year and 4 students from the previous study programme "Mechatronics" who continued their studies in the second year of the programme "Smart Technologies and Mechatronics ". There are no students in higher courses or graduates yet. The dynamics of the number of students is shown in the table below.

VUAS plans to enroll students starting academic year 2023/2024.

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

Professional Bachelor's study programme "Smart Technologies and Mechatronics" is a joint programme of the Liepaja University (LiepU) and Ventspils University of Applied Sciences (VUAS); according to the SAM project "Reduction of fragmentation of study programmes at LiepU" (No. 8.2.1.0/18/I/002), it has been developed and will be implemented in cooperation between the two higher education institutions. The lead organisation is the Liepaja University.

LiepU study programme "Smart Technologies and Mechatronics" is implemented at the Faculty of Science and Engineering (FSE) in the study field "Information Technology, Computer Hardware, Electronics, Telecommunications, Computer Management and Computer Science", replacing the current programme "Mechatronics". This choice is determined by:

- rapid development of techniques, technologies and materials - not only in manufacturing, but also in household and domestic appliances, which are controlled and operated using programmable electronics; new generation smart materials are widely used; optimisation methods and programmable electronics are applied in the development of mechatronic devices;
- changes in the production organisation - in many cases the conveyor has been abandoned, programmable machine tools are used, work groups are formed for project implementation, the share of individual orders has increased (e.g. in LSEZ companies "Trelleborg Wheel Systems Liepaja Ltd. (SIA)", "Silkeborg Spaantagning Baltics Ltd. (SIA)", etc.).

The study programme "Smart Technologies and Mechatronics" is implemented at the Faculty of Information Technologies (FoiT) of Ventspils University of Applied Sciences. The Faculty implements the first-level higher education study programme "Programming Specialist", three bachelor study programmes "Computer Science", "Electronics Engineering" and "Ship Navigation Electronics" and

two master study programmes "Computer Science" and "Electronics". The study field "Information Technology, Computer Engineering, Electronics, Telecommunications, Computer Management and Computer Science" is accredited for a maximum period of six years. The FOIT has extensive and modern new laboratories, and its work-oriented study programmes ensure the training of qualified professionals.

Ventspils University of Applied Sciences is active in attracting international students. The international market offers bachelor's and master's degrees in Computer Science and Electronics.

The developed study programme "Smart Technologies and Mechatronics" will offer students competitive studies of national and international importance, necessary for the development of the region, will implement nationally and internationally recognised research related to the studies and will contribute to the sustainable development of society. The programme corresponds to the study field "Information Technology, Computer Engineering, Electronics, Telecommunications, Computer Management and Computer Science" - this is determined by the high proportion of exact sciences (mathematics, physics, informatics, programming, design, robotics, etc.) in the total range of courses and the very nature of the operation, development and maintenance of mechatronic devices - based on mechanics, electronics and programming.

Justification for the choice of partner university.

The choice of the partner university is based on the strengths of each higher education institution - LiepU's contribution is the development of the programme, implementation of the core courses (general, most of the theoretical and professional specialisation courses, elective courses, internship and national examination - 144 CP in total), while the cooperation with Ventspils University of Applied Sciences is based on highly developed training management and technical support in the field of electronic engineering. Ventspils University College offers courses with an amount of 16 CP related to electronics and electromagnetism (i.e, (16 out of 160) credit points, which are implemented in modern laboratories with student-centred methods. Ventspils University of Applied Sciences is unique in the region due to its Engineering Institute "Ventspils International Radio Astronomy Centre", which is active in research and development projects in the field of electronic engineering. As a result, the transfer of knowledge, competences and skills from research and development projects to students is implemented, as the staff involved in research and development projects are involved in the implementation of the study programme as teaching staff. Taking into account the equipment, laboratories and competence available at the Ventspils University of Applied Sciences for electronic engineering studies, as well as the close links of the University of Liepaja with the enterprises of the Liepaja Special Economic Zone and the existing study base, resources are established for the implementation of a joint study programme at a level that could not be provided by these higher education institutions separately.

Studies are organised in the form of dual studies.

After successfully passing the examinations and defending the bachelor's thesis, the graduates will receive a diploma of the university where the student is matriculated (LiepU or VUAS).

3.2. The Content of Studies and Implementation Thereof

3.2.1. Analysis of the content of the study programme. Assessment of the interrelation between the information included in the study courses/ modules, the intended learning

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

The Professional Bachelor's study programme "Smart Technologies and Mechatronics" is a conceptually new quality study programme for engineering education. The content of the study programme is developed in accordance with the requirements of the regulatory enactments Izglītības likums, Augstskolu likums, LR MK 2017. gada 13. jūnija noteikumi Nr. 322 “Noteikumi par Latvijas izglītības klasifikāciju”, LR MK 2014. gada 26. augusta noteikumi Nr. 512 “Noteikumi par otrā līmeņa profesionālās augstākās izglītības valsts standartu”,). The goal, objectives and learning outcomes of the study programme in terms of knowledge, skills and competences have been developed in accordance with the European Qualifications Framework[1] (EQF) and the Latvian Qualifications Framework[2] (LCI) Level 5 and in accordance with the *professional standard* "*Mechatronics Engineer*" *(2002*)[3].

At the University of Liepāja, the study program "Smart technologies and mechatronics" is implemented at the Faculty of Science and Engineering s (FSE) within the study direction "Information technology, computer engineering, electronics, telecommunications" in cooperation with the Institute of Science and Innovative Technologies (ISIT) and other LiepU institutions in a unified system, thus using the competence of LiepU in the fields of mechanics and IT.

The study program "Smart technologies and mechatronics" at Ventspils University of Applied Sciences is implemented using the basis of the study direction "Information technology, computer engineering, electronics, telecommunications, computer control and computer science" at Ventspils University of Applied Sciences. This direction is accredited until 2023.

Study programs at Ventspils University of Applied Sciences have been created with the active participation of employers, and all FOIT graduates have the opportunity to find a job in their specialty. According to the "Dynamic University" research, the survey of local industry companies shows that in the next 7 years, the demand for information technology specialists (including electronics) in Ventspils will increase by more than 500%, which makes up more than 700 specialists in total.

According to the Education and career portal prakse.lv, which conducts a survey of Latvian companies, the Ventspils University of Applied Sciences bachelor's study program "Computer Science" has been rated as the sixth most recommended IT study program in the list of educational institutions and studies recommended by employers in 2016, and the bachelor's study program "Electronics" as the fifth most recommended electronics engineering degree program.

The implementation of the study programme is based on a student-centred approach and the development of positive pedagogical relationships, involving students in the evaluation of the study process, providing feedback and improving the study programmes, while encouraging them to be independent and responsible in achieving the results of the study process. Graduates of the programme can continue their education in Master's degree programmes in education in Latvia and Europe.

Reduced fragmentation of programmes and sharing of resources are ensured by the joint delivery of theoretical courses in general education. Courses are also offered for continuing education.

The programme of study comprises 160 CP (240 ECTS) and their distribution is in accordance with the regulatory enactments:

- General study courses (20 CP),
- Theoretical courses (38 CP),
- Professional specialisation study courses (58 CP),
- Elective study courses (6 CP), Internship (26 CP),
- State examination (12 CP).

The professional bachelor's study program "Smart technologies and mechatronics" (42523) is implemented in Latvian and English languages; the program description and layout are identical in both languages.

The central axis of the study programme "Smart Technologies and Mechatronics" in the study process are theoretical and professional specialisation study courses in the field of engineering sciences, which cover solutions and problems of design, installation and operation of automatic equipment, provide knowledge and skills to operate automatic equipment used in machining, assembly, packaging and other technological processes, installing, setting up and organising work with them, these activities also involve mechanical, electronic, computer and information technology approaches. The study programme is implemented in accordance with the continuity of study modules, study courses and internships, they are mutually coherent and consistent in the context of the knowledge, skills and competences to be achieved.

During the course of studies, eight modules or thematic groups are planned:

- Module I/Thematic Group - General Education Courses with Entrepreneurship Module (Semesters 1 to 8),
- Module II/Thematic Group - Mathematics (Semesters 1 to 8),
- Module III/Thematic Group - Mechanics and Design (Semesters 1 to 8),
- Module IV/Thematic Group - Electronics (Semesters 1 to 3),
- Module V/Thematic Group - Information Technology (Semesters 1 to 8),
- Module VI/Thematic Group - Electrical Engineering (Semesters 4 to 6),
- Module VII/Thematic Group - Innovation and Smart Technology Module (Semesters 6 to 8), as well as Final Thesis Module/Group (Semester 7 to 8, final internship (Internship III with an opportunity to go to the ERASMUS exchange programme abroad and development and defense of Bachelor's thesis).

General courses with an Entrepreneurship module

The general education courses (20 CP) are designed to develop students into intelligent, communicative, managerial and entrepreneurial individuals. The module starts with an introduction to the study environment and infrastructure, and provides the skills and competences required to manage technical processes. The following courses are included:

- Introduction to Studies,
- Research and Technology (2 CP)
- Industry legislation (2 CP)
- Office software (2 CP)
- Technical English (2 CP)
- Business Administration (2 CP)
- Project Management (2 CP)
- Human Resources Management (2 CP)
- Business Communication (2 CP)
- Total Quality Management (2 CP)

- Production organisation and management (2 CP)

Mathematics

The Mathematics module (10 CP) includes the mathematical disciplines required for a mechatronics engineer, see the relevant course/module description for a more detailed breakdown.

Mechanics and engineering

The module provides students with the knowledge and skills to develop and design mechanical parts of devices, provides an understanding of manufacturing technologies and enables practical application of theoretical knowledge in the development of coursework.

Electronics

The electronics module is fully implemented at Ventspils University of Applied Sciences. The module includes the study courses "Fundamentals of Electronics", "Electronics", "Electricity and Magnetism", as well as 3 practical electronics courses "Electronics Engineering Project I, II, III".

Information technology

Programming and information technologies are an essential part of the study programme "Smart Technologies and Mechatronics". This module includes the following courses:

- Databases (2 CP)
- Internet of Things (4 CP)
- Robot Control (4 CP)
- Artificial Intelligence (2 CP)
- Simulation and Mathematical Modelling (2 CP)
- Software Engineering (2 CP)
- Cloud Computing Project (2 CP)

Electrical Engineering

The electrical engineering module includes the courses "Electrical Engineering and Electrical Drives" and "Sensors". The module covers DC and AC (single and three-phase) electrical engineering, electric drives, powertrain engineering, and sensor technologies and applications.

Environmental engineering module

This module offers students the opportunity to specialise in technologies related to environmental engineering. The module is an elective option, replacing some of the courses marked with (*) in the programme plan. The module includes the following courses:

- Fundamentals of Environmental Engineering
- Environmental Engineering I
- Environmental Engineering II
- Materials and Recycling
- Environmental Technology III
- Environmental Technology IV
- Circular Economy

Innovation and Smart Technologies module

The Innovation and Smart Technologies module focuses on innovation in mechatronics, providing insights into the development, ideation and implementation of smart devices. Study courses:

- Innovation management (2 CP)

- Smart Technology Project I, II (4 CPs in total)

The study programme "Smart Technologies and Mechatronics" is offered full-time (4 years). The studies are planned in the form of a dual time plan, part of the time is spent in lectures and practical work classes at the Liepaja University, and part - working part-time in a workplace related to the subject of study. The programme is offered in two languages - Latvian and English. See Annex 8.6. for the programme outline and Annex 8.7. for module descriptions.

Programme compliance with the national standard for upper secondary vocational education

Liepaja University Faculty of Natural Sciences and Engineering bachelor study programme "Smart Technologies and Mechatronics" is established in accordance with Cabinet of Ministers Regulation No. 512 "Regulations on the State Standard of the Second Level Professional Higher Education" (issued on 26.08.2014)[4].

The compulsory content of the Bachelor's programme provides a set of knowledge, skills and competences necessary for the exercise of professional activities, in line with the understanding of the profession of mechatronics engineer in the European Union. The programme volume consists of 160 CP, its content and structure are in line with the requirements set out in the above-mentioned regulations (see 3.1. and Annex 8.3.).

3.1. Table

Structure of the study programme "Smart Technologies and Mechatronics" in accordance with the national standard for second-level professional higher education (OLPAI)

1.	Comperhensive courses (at least 20 CP)	**20 CP**
2.	Theoretical industry basic courses (at least 38 CP)	**38 CP**
3.	Industries professional specialization courses (at least 58 CP)	**58 CP**
4.	Elective part (at least 6 CP)	**6 CP**
5.	Internship (at least 26 CP)	**26 CP**
6.	Study work (at least 6 CP)	**6 CP**
7.	State tests (at least 12 CP)	**12 CP**
	Total	**160 KP**

Relevance of the programme to the professional standard

The study programme "Smart Technologies and Mechatronics" has been developed on the basis of the requirements specified in the professional standard "Mechatronics Engineer" (profession code 2144 38), the requirements of the professional standard of the Republic of Latvia (Cabinet of Ministers Regulation No. 461 "Regulations on the Professional Classification, Basic Tasks and

Qualification Requirements Corresponding to the Profession and the Procedure for Using and Updating the Professional Classifier", Riga, 18 May 2010 (i.e. No. 25 33§). The relevance of the

programme is shown in the table in the Annex.

[1] Descriptions of the levels of the European Qualifications Framework (only in Latvian)
http://www.nki-latvija.lv/content/files/EKI-limenu-apraksti_1.pdf

[2] Descriptions of knowledge, skills and competences corresponding to the Latvian Qualifications Framework (LQF) levels. (only in Latvian)
http://www.nki-latvija.lv/content/files/LKI%20limenu%20aprakstu%20tabula%202017.pdf

[3] Professional standard for "Mechatronics engineer". Approved by the Order of the Ministry of Education and Science of 10 July 2002
Nr. 405. (Only in Latvian)
http://dif2.liepu.lv/wp-content/uploads/2018/05/mehatronikas_inzenieris_standarts.pdf

[4] http://likumi.lv/doc.php?id=268761 (only in Latvian)

Ability of program content to meet the needs of the labour market and its updating

The content of the program is developed and implemented by including the below activities that allows to involve representatives of employers in developing and implementing the study program. As a result, employers are involved both in the assessment of program results and introduction of the required changes to ensure that the program meets the needs of the labour market and is updated.

Content of the program and implementation of it takes place according to the professional standard. As the program is a professional undergraduate program, its content is developed and implemented according to the professional standard for mechatronics engineers (approved on 9 February 2022, Minutes No. 1. Thus, the content of the program is developed and implemented by taking into consideration the most recent sectoral trends and labour market needs.

Representatives of sectoral companies are active in the council of the study programme. Five representatives of employers are approved for participation in the council of FoIT Engineering Sciences study program (approved on 13 May 2020 FoIT Council meeting, Minutes No. 4). Thus, employers have an opportunity to participate in decision-making on the content and implementation of the program, as well as offer their proposals for changes.

Representatives of sectoral companies are invited to the commission for defence of undergraduate student papers. Representatives of employers participate in the defence of undergraduate papers acting as members of the state examination commission. Thus, employers have an opportunity to assess to what extent students taught in the study program meet the needs of the sector and the labour market. After the defence of bachelor papers, there is a discussion with representatives of employers during which deficiencies in the results and potential action that may be taken to improve the content of the program are discussed. Thus, every year we receive feedback from employers on the academic results of studies.

Employer surveys are carried out. During employer surveys, the opinions of employers are collected to identify program deficiencies and plan the required changes.

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

study programme on research and other education levels (if applicable).

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

The delivery mechanism of the study programme ensures the achievement of learning outcomes, incorporating the principles of student-centred learning. The student workload is equivalent to 40 academic hours of work per credit point. 1 CP includes contact hours (16) and students' independent work (24). Therefore, two forms of study are integrated in the process of learning the course content: classroom work and independent work.

Education is measured by the sum of positive achievements (pass marks). A pass mark is required for all content covered in the programme. In accordance with the goals, objectives and results set in the study programme and study courses, the basic requirements for the assessment of the acquired education have been established, which are based on the following principles: openness of assessment; obligatory nature of assessment; possibility of revision of assessment; variety of forms of examination (see *Regulations on examinations of study courses/modules*).[1] The basic principles of assessment of the study programme can be described in more detail as follows:

- the principle of aggregation of positive achievements - education is assessed by aggregating positive achievements;
- the principle of compulsory assessment - a pass mark is required for the mandatory content of the core parts of the programmes;
- the principle of openness and clarity of requirements: a set of core requirements for the assessment of learning is defined in line with the aims and objectives of the programmes and the goals and objectives of the courses;
- the principle of variety of assessment methods - different types of assessment are used to assess the learning of the study programme;
- the principle of relevance - the assessment provides opportunities to demonstrate analytical and creative abilities, knowledge, skills and competences in tasks and situations appropriate to all levels of learning.

The content of the examinations shall be in accordance with the content of the course programmes and the skills and knowledge requirements set out in the Occupational Standard. The main forms of assessment for the completion of the study programme is examination and test. In the examination and in the test, the mastery of the course content is assessed on a 10-point scale.

The content of the study programme is organised around course requirements and internship assignments. At the end of the studies, the student develops and defends a bachelor thesis. The conditions for organising student internships and the support provided to students are defined and

integrated into the study programme content.

Study form: Full-time, 4 years.

Study methods**:** lectures, seminars, discussion, individual, pair and group work, practical work, laboratory work, projects, independent work.

The expected results of the study process in the form of abilities, skills and competences are defined in the description of each study course, specifying the content and scope of independent work, the work to be submitted and participation in the study process. The student is expected to be responsible for his/her studies, to complete his/her independent work, to complete the tasks of the internship and to keep up to the work schedule.

The choice, content and scope of study courses, as well as the content of internship, shall be appropriate to the qualification of mechatronics engineer to be obtained, in accordance with the requirements of the professional standard for mechatronics engineers. The study content is structured in a sequence of study courses, internships, which ensure the gradual acquisition of competences. The content of studies is oriented towards the integration of theoretical and practical experience, studies are related to research, scientific and practical urgency.

The assessment of learning outcomes is determined by the assessment criteria and forms of examination specified in the study courses. The final examinations of the courses focus on the integration of theory into practice. The evaluation of the study process takes the form of assessment and evaluation. It aims to contribute to the development of competences and attitudes of future professionals. The evaluation is focused on the dynamics of knowledge, skills and competences acquired during the study process. This is done through seminars, coursework, group work, discussions, students' independent work and internships. The assessment of study results is carried out at the end of study courses and its form is determined by the assessment criteria and examination forms specified in the study courses. Depending on the specifics of the course of study, examinations are organised individually or in groups, and may take the form of a written test or colloquium, or the presentation and defence of a topic studied in depth during the course of study. In the study programme, assessment is mostly implemented according to the cumulative principle. Cumulative principle assessment promotes students' responsible attitude towards the study process and encourages students to acquire knowledge systematically and systematically, to complete independent work assignments on time, and to participate in lectures, seminars and practical work. Self-reflection is an important form of assessment of the competences acquired during the study process.

Multimedia technologies, study materials for successful learning of the course content, as well as tests and other types of examinations available in the e-learning environment are used in the study process. The e-learning environment provides the opportunity to individualise the study process according to the needs and interests of each student.

Credit is awarded for each course of study taken if a grade of at least 4 (almost satisfactory) on a 10-point scale is obtained.

At the end of the study programme, the final state examination is taken - the defence of the bachelor's thesis, which is also evaluated on a 10-point scale. The National Final Examination Board shall be composed of a chairperson and at least four members. The head of the Commission and at least half of its members are professional employers or representatives of the sector.

A diploma of higher education attesting the level of professional qualification as a Mechatronics Engineer is awarded to a student who has completed the programme and passed the bachelor's examination with a mark of not less than 4 - "almost satisfactory". The content of the Bachelor's

Programme provides a set of knowledge, skills and competences in accordance with the Latvian Framework of Education Level 6 and Level 5. Latvian professional qualification level.

The implementation of the study programme is based on a student-centred approach and the development of positive pedagogical relationships, involving students in the evaluation of the study process, providing feedback and improving study programmes, while encouraging them to be independent and responsible in achieving the results of the study process. The nature of student-centred teaching and learning: takes into account and respects the diversity of the student contingent and their needs; takes into account and uses different ways of delivering programmes; uses a variety of pedagogical methods as appropriate to the circumstances; encourages the learner to strive for independence; promotes mutual respect between learner and teacher; has appropriate procedures for dealing with student complaints. However, the student-centred approach to the study process does not reduce the demands on students to acquire the knowledge, skills and competences of a specialist - Engineer.

When designing the study programmes and courses, special attention is paid to the meaningful formulation of learning outcomes, thereby promoting students' understanding of and ownership over their own learning, self-assessment and performance evaluation. Methods, forms of examination and evaluation criteria appropriate to the aim of study and the planned study results will be used in the study process.

In the study process of study programmes of the study direction "Information Technology, Computer Engineering, Electrical Engineering, Telecommunications, Computer Management and Computer Science", including the programme "Smart Technologies and Mechatronics", the following dimensions are taken into account to ensure the unity of theory and practice, to create a supportive and inclusive study environment and to ensure the quality of the learning process:

- cognitive (knowledge, theory);
- pedagogical (didactic-pedagogical technologies, organisation of the study process); social (interpersonal and pedagogical relations);
- innovative (transformation of knowledge and skills acquired in practice); research (integration of research).

Taking into account that currently the number of students studying in the study program implemented in English is currently 0, active cooperation with LiepU's Department of Foreign Relations is underway to increase the interest of potential foreign students in the study program "Intelligent technologies and mechatronics".

[1]https://www.liepu.lv/uploads/dokumenti/studentiem/Noteikumi%20par%20studiju%20kursa_modula%20parbaudijumiem_speka%20no%2001.09.2022.pdf - Latvian only

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

In the study programme "Smart Technologies and Mechatronics" internships are planned in accordance with the Liepaja University regulations on internships.[1] Internships are implemented in accordance with the internship agreement. The University concludes the internship agreement with the employer. The traineeship agreement shall include the goals and objectives of the traineeship, the planning of the traineeship, the evaluation of the traineeship, and the duties and responsibilities of the parties. The goal of the traineeship is achieved on the basis of the knowledge, skills, competences and previous work experience acquired. The rules of the internship (see Annex) have been drawn up, setting out the tasks and procedures for the internship. An example of agreement for the student placement is also attached.

The implementation of the content of the study programme "Smart Technologies and Mechatronics" respects the continuity of study courses and internships. The content of the study courses offered in the programme is oriented towards the continuous and mutually integrated acquisition of knowledge and skills in order to develop students' professional competence in various fields of engineering. The implementation of internship tasks promotes students' independence, responsibility and demonstrates their ability to apply previously acquired knowledge in a professional environment. The strategy of internship planning includes attraction of practitioners - entrepreneurs are involved in providing internships, especially employees of companies operating in the Liepaja Special Economic Zone. Before and after the placement, the suitability of the placement site for the placement is assessed.

As the program is new, students have not yet reached year 4 and graduation. During the studies, studies relevant to the industry have been realized, such as related to the development of CNC tools, the development of artificial intelligence-based prostheses for medical applications, the development of an intelligent fruit dryer, etc.

The internship is carried out in the amount of 26 CP (three internships) - Internship I (4th Semester), Internship II (6th Semester), Internship III (7th Semester), by the end of which the student has already mastered most of the theoretical study courses (see Appendix 8 for an overview of the internship planning). Placements should be chosen according to the knowledge acquired during the semester of study and this is indicated in the placement induction material. This covers all the areas in which the young professional could work after graduation. During their studies, students have the opportunity to assess their abilities and professional suitability for specific fields of work. This reduces the risk that a young professional, when starting to work independently, will find that the chosen field does not match his or her professional interests and psychological aptitude. Student surveys and discussions during internship conferences confirm that most students have already made their choice of career field during their studies, and that this choice is largely influenced by their internship experience.

The induction briefing (held one month before the start of the internship) provides students with information on the aim and objectives of the internship and the expected outcomes. Each student receives an induction material in printed or electronic form. These are presented to the traineeship advisor before the traineeship contract is signed, and only then is the traineeship agreement signed with the head of the institution. If necessary, the student is supported in securing a placement through agreements with cooperation partners: Silkeborg Spaantagning Baltic Ltd., Trelleborg Wheel Systems Liepaja Ltd., Jensen Metal Ltd., InPass Ltd., etc.

During the internship, students observe the professional activities of the internship advisors, find out about the organisation of work in the institution, plan, conduct, analyse classes under the guidance of the internship advisor, develop lesson plans, evaluation and progress reports, as well as collect data for scientific research for their theses and bachelor theses. The progress of the traineeship is recorded in a traineeship folder. During their internship, students must comply with

the Code of Ethics for Professional Practice and all relevant laws and regulations.

During the internship, the internship supervisor (LiepU teacher) communicates with both students and internship advisors to check the progress of the internship and, if necessary, provide advisory support to the student or internship advisor. Both students and placement advisors give their opinion and recommendations on the content of the placements and the knowledge and skills acquired during the theoretical studies. Traineeship advisers are invited to participate at the end of traineeship conferences.

Internship will be provided mainly in the enterprises of the Liepaja Special Economic Zone (LSEZ), where majority are daughter companies of foreign businesses, leading and medium level employees are foreigners or local employees with very good English language skills. It is possible to do internship in enterprises in Ventspils, too - EuroLCD’s, Hansa Matrix etc., which have broad cooperation with foreign partners, and where English is widely used, too. There is ERASMUS internship planned abroad in the 4th grade. There will be no problems for foreign students to do internship.

At the final internship conference, students present what they have done during their internship, share their impressions and new skills. The final evaluation of the placement is based on a cumulative evaluation, which includes the evaluation of the public defence of the placement, the evaluation of the placement folder and the description and evaluation of the student's work by the placement advisor of the institution.

[1]https://liepu.lv/uploads/%C4%80SD/ERASMUS%20dokumenti/Regulations%20on%20internship%20in%20Liepaja%20University.pdf (Only in Latvian)

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

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

The final theses of the VUAS students in the professional bachelor's study programme "Smart Technologies and Mechatronics" have not yet been defended.

3.3. Resources and Provision of the Study Programme

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

respective examples.

Liepaja University study programme "Smart Technologies and Mechatronics" is implemented at the Faculty of Science and Engineering (FSE) within the study direction "Information Technology, Computer Engineering, Electronics, Telecommunications" in cooperation with the Institute of Natural Sciences and Innovative Technologies (DITI) and other Liepaja University institutions in a unified system (see Table 3.2.).

Table 3.2.

Departments involved in the implementation of the study programme "Smart Technologies and Mechatronics" within the study field "Information Technology, Computer Engineering, Electronics, Telecommunications"

Units involved in the implementation of study programmes	**Tasks in the implementation of study programmes**
Faculty of Science and Engineering (DIF)	Provides a supportive and creative environment for quality, innovation-driven higher professional and/or academic education in science and engineering. Ensures the stabilisation of the Faculty's scientific potential and the achievement of quantitative and qualitative indicators in accordance with the University's criteria, systematically promoting the development of academic staff. Strengthens the study fields under the supervision of the Faculty, ensuring the quality of study programmes, increasing the number of students, offering new study programmes in international and national demand.
Faculty of Humanities and Arts (HMZF) Faculty of Pedagogy and Social Work (PSDF) Faculty of Management and Social Sciences (VSZF)	The study process is ensured in cooperation with the Kurzeme Institute of Humanities (KHI), the Institute of Educational Sciences (IZI), the Institute of Management Sciences (VZI), whose aim is to promote the integration of diverse research, study and innovative activities into the study process.

Natural Sciences and Innovative Technologies Institute (DITI	DITI and its research centres (Nanomaterials Laboratory, Environmental Research Laboratory, Nature Embassy, Centre for Circular Economy) ensure the integration of research findings into the implementation of the study programme.
Board of Studies	It monitors the study programmes and the field of study, and examines and approves self-evaluation reports.

To strengthen the study base, LiepU envisages research and entrepreneurship cooperation with Liepaja University Science and Innovation Park, as well as cooperation with Kurzeme Business Incubator and Science and Innovation Park for the implementation of scientific research activities.

The study programme "Smart Technologies and Mechatronics" at Ventspils University of Applied Sciences will be implemented on the basis of the existing study direction "Information Technology, Computer Engineering, Electronics, Telecommunications, Computer Management and Computer Science" at Ventspils University of Applied Sciences. This direction is accredited until 2023.

The study programmes at Ventspils University of Applied Sciences have been developed with the active participation of employers and all FOIT graduates have the opportunity to find a job in their field of specialisation. According to the Dynamic University study, a survey of local companies in the sector shows that the demand for information technology specialists (including electronics) in Ventspils will grow by more than 500% over the next 7 years, totalling more than 700 specialists.

According to the education and career portal prakse.lv, which conducts a survey of Latvian companies, Ventspils University of Applied Sciences's Bachelor Study Programme "Computer Science" has been ranked as the sixth most recommended IT study programme in the list of the most recommended educational institutions and studies by employers in 2016, and the bachelor study programme "Electronics" as the fifth most recommended study programme for electronics engineers.

In recent years, many one-to-one discussions have been held with the heads of the leading companies in the sector, in which they listen to company's wishes. For example, VUAS management and the directors of electronics bachelor and master programmes have established close contacts with the Latvian Electrical Engineering and Electronics Industry Association (LETERA) and its board member and chairman of the board of Ventspils Elektronikas Fabrika (VEF) Ltd. - Ilmārs Osmanis. I. Osmanis, as the Chairman of the Ventspils Technology Development Council, has actively participated in all stages of the development of the Bachelor's and Master's study programmes "Electronics"; on his initiative, the courses and their content in the current programme were adjusted and adapted to the real needs of manufacturers. Since the academic year of 2013/2014 I.Osmanis is also every year the chairman of the State Examination Board of the Professional Master's study programme "Electronics".

The companies Transas Baltic Ltd., Hansa Electronics Ltd., Reids Ltd. have expressed interest in graduates of engineering studies at Ventspils University of Applied Sciences. Clients of these companies include the Latvian Navy, Latvian Border Guard, Riga Transport Fleet, Latvian Shipping, Latvian and Lithuanian fishing companies and other shipping companies in Latvia and abroad.

The material, technical and methodological provision of the study programmes corresponds to the aims and objectives of the study programme. LiepU faculties have six computer classes, which are provided with the necessary software and internet connection. The faculties have video/data

projectors, interactive whiteboards and graphic projectors, which are intensively used both in computer classrooms and other auditoriums for the demonstration of lecture and seminar materials, methodology rooms with visual and methodological materials, e-learning environment Moodle. In order to improve the quality of studies and ensure students' independent studies, lecturers receive methodological support in the preparation and placement of study materials in the Moodle environment. Students can communicate with the faculty via email, Skype, Moodle or MS Teams.

LiepU uses information systems to ensure the study process:

- Library information system “Alice";
- E-learning environment Moodle;
- Latvian higher education information system – LAIS.

Students of the Liepaja University are provided access to the study process accounting information system of Latvian higher education institutions (hereinafter - the LAIS) during the study admission process. The information system is available on the World Wide Web at www.lais.lv.

LiepU Library is the support for LiepU students and teaching staff in the study process and research. The aim of the library’s activities is to ensure studies and scientific activities with printed works, electronic and other information resources, as well as to be a centre for culture promoting national and regional cultural values. A collection is made and services are provided in the Library by implementing a goal of activities.

The completion of the library’s collection takes place in accordance with the necessities of study programmes, in cooperation with the teaching staff and students. In accordance with LiepU QAS procedure “A-10-II Completion of the Library’s collection”, the teaching staff shall fill out the “Request for the completion of the fund to the Department of Completion and Processing of LiepU Library”. The library's collection comprises about 65 500 information resources (92% of books, 8% serial editions and other units of the collection). 75% of the entire collection is open display on shelves, so the teaching staff and students have chance to choose the most appropriate editions by themselves. If there are no necessary information resources at the Library’s disposal, there are offered services for Interlibrary subscription (ILS) and International Interlibrary subscription (IILS). Successful cooperation has been established with the document delivery service SUBITO, National Library of Latvia, etc. Latvian and foreign libraries.

The library is open to users for 55 hours in a week (working days from 9:00 to 18:00 or 19:00, on Saturdays till 16:00). A visit to the library in 2019 (without pandemic restrictions): on average of 150 users per day. At users’ disposal is the Subscription (handing out and receiving information resources), Copying (copying, printing, scanning and binding of works), Group discussion room (at the request of users), as well as 96 independent workplaces for studies and research in the Reading room and Library’s lobby, 16 computerized workplaces with the internet connection in the Reading room of Electronic Resources. Within the library’s working hours users can use the self-service machine *(Self-Check)* to receive or transfer books which is located in the Subscription. Outside the library’s working hours books can be handed over to the *Book-drop box* which is located in LiepU lobby. Throughout the Library is available the free wireless internet. Since 2011, the RFID security system has been used for identifying and protecting information resources of the library.

Since 1992 library’s activities have been automatized. In the Libraries’ information system ALISE are automatized librarian processes such as the processing of bibliographic data, assembling, registration of readers, handing out/receiving information units, ordering/booking, remote access to WebPack, mobile WebPAC, etc. The electronic catalogue of LiepU Library (Only in Latvian) (https://alise.liepu.lv/Alise/en/home.aspx) and the joint catalogue of Higher education

institutions and special libraries (https://alise.liepu.lv/Alise/en/federatedsearch.aspx) are available remotely, both on computers and mobile devices. The electronic catalogue of the library provides a unified search for bibliographic information on both the collection and the local databases created. The remote access allows the user to connect from any place to the section “My Library” and follow the handing out of books, delivery deadlines, requesting an extension of the deadline, and booking or queuing the required literature.

At teaching staff and students disposal are such online databases subscribed by LiepU, such as “Letonika”, “EBSCO eBooks Academic Collection”, “EBSCO Academic Complete”, “Cambridge Journals Online”, as well as financially supported databases by MSC (Ministry of Science and Education): “ScienceDirect”, “Scopus” and “Web of Science”. Everyone has also the opportunity to use free-access databases made by the Library: Academic Staff publications database, Doctoral theses database and Final work database. The Library ensures training, inquiries and consultations in matters relating to the use of information resources and the use of services.

Ventspils University of Applied Sciences has prepared and regularly updates course descriptions in Latvian and English for all courses of study, as well as programme mapping to achieve the programme objectives. Based on the course descriptions, lecturers inform students about the requirements for the course grade during the first two classes of the semester.

Teaching materials prepared by the university lecturers - presentation slides, assignments, tests, control works, descriptions of laboratory works or assignments, other teaching materials are placed in VUAS electronic working environment Moodle**.** Students can upload their independent work or laboratory reports in this environment.

The VUAS library is regularly supplemented with teaching literature specified by the university lecturers.

For the academic year of 2017/2018, there are 5 computer rooms with 30-32 computers each, and one computer room with 24 workstations adapted to the engineering research work streams - mathematical modelling and CAD/CAM training. All classrooms are equipped with computers and projectors. The total number of computers in the University network is around 300. All the University's computers are connected to a single network. In addition, wireless internet is available in the University and in the dormitories.

The library of Ventspils University of Applied Sciences has a collection of ~26,000 volumes of books and ~750 audiovisual materials (CD, DVD, CD-ROM, audio and videocassettes) in mathematics, physics, computer science, electronics, management, economics, law, philosophy, psychology, linguistics, translation studies, literary studies, etc.). For the Computer Science and Electronics programmes (both Bachelor and Master programmes), there are 1402 printed books and 515 diploma papers available. Subscriptions to printed publications are used to support the study programme: Energy and the World; Latvian Journal of Physics and Tehnical Sciences.

All the library's titles are recorded in a single electronic catalogue, and reader service is automated. The system called ALISE automates all areas of the library's activities, including the possibility to publish the library's catalogues on the Internet, as well as to access other libraries' catalogues via network. To ensure the full potential of studies, the library's holdings are systematically updated with the latest world-renowned and authoritative academic and scientific literature, as well as periodicals. Appropriate educational, scientific and reference literature in Latvian is also purchased. The library's acquisitions are adjusted by the library advisory board, in which the university's lecturers actively participate, using the latest publishers' advertising catalogues and internet possibilities. The FOIT budget allocates around EUR 1,000 each year to replenish the textbooks needed for the field of study. The following databases are available free of charge to users of the

VUAS computer network:

- EBSCO;
- Britannica Online Academic Edition;
- RUBRICON;
- NAIS;
- Latvian National Digital Library;
- LETA;
- Letonika reference and translation system;
- Lursoft - newspaper library; data bases of companies; lv.
- Peridoika.lv

Within the project "Establishment of a unified core network of national importance for the support of scientific activities in Latvia", access to the Science Direct and Scopus and Web of knowledge databases has been provided. Since April 2014, students, researchers and academics can use the IEEE Electronics Engineering Database for free at the RTU Ventspils branch library.

Services offered by the Ventspils University of Applied Sciences Library:

- Subscribed databases; CD-ROM databases;
- 8 computers with internet connection;
- Group and individual information literacy sessions; Use of the e-book reader in the library;
- Booking expenses, extending the book handling in deadline;
- A quiet reading room equipped with the necessary equipment for private lessons (audio and video equipment and a computer with internet access);
- Copying, computer printing; Kurzeme virtual catalogue;
- Night subscriptions, holiday and outgoing day subscription;
- Periodicals (newspapers, magazines, etc.);
- Interlibrary loan- Reference, consultation;
- Thematic lectures (events).

The library has 100 seats.

Material and technical base *Liepaja University*

LiepU material and technical base is available for both students and University teachers. Since the study programme is interdisciplinary, it is necessary to use the material and technical support of all faculties for the study programmes implemented at LiepU:

- 320 computers (80 of which are less than 3 years old);
- video projectors - 23;
- interactive whiteboards - 7;
- copiers - 6;
- photo cameras, video cameras - 18 (11 photo cameras, 7 video cameras).

Students have access to a free wireless network in each of the study blocks (36 wireless access points in total). A workstation virtualisation solution has been implemented and three computer classes are equipped with workstation clients (63 workstations in total). Students have their own virtual computer, which is not connected to their workplace. This solution ensures the mobility and security of the study process. Modern network hardware has been installed to virtualise the computer network and a CAMPUS computer network connection has been established between all study blocks. A cooperation agreement has been signed with Microsoft for the lease of MS Office and MS Windows software licences, which can be used by lecturers both in the implementation of the teaching process and in the production of teaching materials. Within this cooperation

agreement, both LiepU lecturers and students have access to MS Office 365, 1Tb file archive in the cloud, etc. at no extra charge.

On 2019, the Faculty has installed a Raspberry Pi microcomputer classroom (12+1 workstations), purchased 15 Arduino microcontroller and sensor kits, a WAGO professional PLC controller and sensor kit, RPi cameras, data transmission modules, displays, mock-up boards, self-driving robots and other equipment for Internet of Things (IoT), Robot Control, PLC controller programming courses.

Equipment of the Institute of Natural Sciences and Innovative Technologies (DITI)

The Institute has the following equipment: Foaming equipment:

- High vacuum chamber
- possibility to heat the tray up to 600°C
- control of the thickness and speed of application

three different steamers:

- magnetron - electron flow with 6 material slots resistive steamer
- vaporiser for organic substances
- the possibility to process the sample in a vacuum chamber with a laser possibility to work with different masks
- manufacturer - Angström, Canada

CVD - chemical vapour deposition:

- for the production of graphene by gas deposition
- for the production of graphene by gas deposition possibility to heat the sample up to 1700°C
- the ability to dose gases precisely(H2 - hydrogen, CH4 - methane, Ar - argon - an inert gas)

Pulsed laser:

- energy per pulse - 100 mJ (millijoules)
- wavelength 680 to 1064 µm (micrometres)

Electron microscope:

- increase up to 30,000 times

Solar collector:

- maximum heat output 1 kW

Solar photovoltaic generator:

- 6 panels,
- voltage of each is 36 V
- power 2 kW
- frequency stabiliser (230 V, 50 Hz)

Bioreactors:

- volume 2.5 m3
- temperature automatically controlled,
- range (10°C - 70°C)
- automatically controlled pH control
- 2 peristaltic pumps for acid, alkali

- mixing system with automatic control
- methane content and gas volume monitoring system with data storage function

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

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

There are no students matriculated in the Ventspils University of Applied Sciences in the professional bachelor study program “Smart Technologies and Mechatronics” in the year 2022. VUAS is providing training according to the cooperation agreement to the students matriculated in this program in the partner university – Liepaja University (LiepU). The Liepaja University is paying for its students based on the State budget funding for study process 1630.11 EUR per each study place for 40 credit points (CP) per year, corrected by the study program (study costs) coefficient 1,7. The amount of payment is calculated proportional to the number of students involved in training in the VUAS study courses and to the number of credit points they take in these study courses. VUAS received a payment of 5530 EUR for training of 10 LiepU students in the courses covering 6 CP in 2022.

Costs are allocated taking into account the centralized 26% deduction from income of each faculty from State budget funding and from tuition fees, allocated to finance the common running costs of the VUAS. The 26% deduction to finance the common running costs of the VUAS is used for:

- utility costs – electricity, heating, water and sanitation, waste disposal services;
- maintenance of premises and buildings;
- services for maintenance of IT systems;
- marketing costs;
- representation costs;
- partly remuneration of the administrative staff of the VUAS;
- common tax payments of the institution etc.

Direct costs of the faculty, which are necessary and can be identified as expenses by the particular faculty, are divided among the study programs proportionally to the number of students in these study programs. Expenses which are planned, made and can be identified for a particular study program, are included in the costs of this study program. The students of the professional bachelor study program “Smart Technologies and Mechatronics” are participating in the lectures together with the students of the professional bachelor program “Electronics Engineering”, therefore no additional remuneration costs of academic or general personnel at the current number of 10 LiepU

students are incurred. There are only direct costs 100 EUR for each student for purchase of electronic components and materials for the study courses “Electronics Engineering Project”. The payment from the LiepU is reducing the negative cash flow of the VUAS professional bachelor program “Electronics Engineering”.

Professional bachelor study program “Smart Technologies and Mechatronics”

Director of the program Uldis Žaimis (LiepU)

The study program (study costs) coefficient **1.7**; the study level coefficient **1.0**

No.	**Item**	**Actual situation**			
		Students	Amount, EUR	*Percentage distribution*	*Per 1 student (per year)*
	2	3	4		5
	INCOME	**10***	**5 530**	***100%***	***5 530***
1.	State funding for studies	0	0		
2.	State funding for scholarships	0	0		
3.	Tuition fees	10	5 530	*100%*	*553*
4.	Funding from Municipality for studies		0		
5.	Funding from Municipality for scholarships		0		
	COSTS	**10**	**2 438**	***100%***	***243,78***
6.	Academic staff remuneration				
7.	General staff remuneration				
8.	Scholarships and social costs				
9.	Running costs, Utilities, Administration costs (26%)		1 438	*59,0%*	*143,78*
10.	Materials, books, equipment		1 000	*41,0%*	*100,00*
	Financial result:		**3 092**	***56%***	***309,22***

**Number of students in the program; none in the VUAS, 10 in LiepU (01.10.2022.).*

There are no students matriculated in the VUAS in the professional bachelor study program “Smart

Technologies and Mechatronics”, therefore the break-even point was not calculated.

The funding of studies from the state budget is allocated each calendar year in accordance with the Cabinet of Ministers' Regulation No 994 of 12.12.2006. "Procedures for financing higher education institutions and colleges from state budget funds" and the agreement between the Ministry of Education and Science and the Liepaja University on the training of a certain number of specialists. The calculation of the projected costs of the professional bachelor study programme "Smart technologies and Mechatronics" for full-time study for the period 2021-2022 is based on the base costs for 2021 (EUR 1,630.11 per one study place) and the coefficient of the thematic area of education "Engineering science" established by the Ministry of Education and Science: 1.7, as well as the cost coefficient for professional bachelor-level study programmes: 1.0 The cost per study place in 2022 is EUR 2 771.19.

The approved tuition fee for full-time study for the first year of the academic year 2022/2023 is EUR 2,220 (in English - EUR 2,700) and it is fixed for the whole study period, the total tuition fee for 4 years is EUR 8,880 (in English - EUR 10,800). Minimum number of students per course for full-time study: 12 students.

Since 2012, in the budget of Liepaja University of Applied Sciences there has been established a budget for the development and implementation of study programmes. The budget is planned and used for organising students' learning processes outside the university, for upgrading the material and technical base of the programmes (including laboratories), for recruiting qualified staff, etc.

A faculty science budget has been established to support the research (creative) activities of academic staff. The budget is planned and used for conference fees, travel expenses, organisation of scientific and methodological seminars, development of international cooperation, attraction of guest speakers, etc.

Liepaja City Municipality funding is available for attracting academic staff to ensure the quality of studies.

The use of DIF funding is regularly reviewed at meetings of the Faculty Council and the teaching staff, and at meetings of the Senate Budget and Development Committee.

LiepU has established quality management system procedures that support the study process - personnel management, financial management, IT, library and economic resources management, document management, project management, information circulation and public information management, as well as scientific and research management processes. For example, A-2-1 "Basic Budget Planning", A-2-2 "Basic Budget Execution and Control".

3.4. Teaching Staff

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

The teaching staff involved in the implementation of the Professional Bachelor's study programme " Smart Technologies and Mechatronics" complies with Article 39 of the Law on Higher Education Institutions and the Regulations of the Cabinet of Ministers; the language skills of the teachers involved comply with the Cabinet of Ministers Regulation of 2009 No 733 "Regulations on the Scope of Knowledge of the State Language and the Procedure for Testing Proficiency in the State Language for Professional and Official Duties". Information on the foreign language skills of the teaching staff is summarized in the curricula vitae of the teaching staff attached in Annex 2.9.

University teachers are professionals in their field, who have demonstrated their expertise in research and the use of e-environments in the study process, as well as participating in international projects and developing teaching tools and materials. The study programme also involves professionals in their specialities with practical work experience in their field - mainly in courses related to engineering, design, materials science.

The staff involved in the implementation of the study programme are listed in Annex 2.8., indicating the academic degree and/or professional qualification of the staff member, the position held, the study courses implemented.

The teaching staff involved in the implementation of the study programme are listed in Annex 2.8, indicating the academic degree and/or professional qualification of the teaching staff member, the position held, the study courses implemented.

There are 15 elected faculty members (63%) and 9 non-elected faculty members (37%) involved in the implementation of the study programme. Of the 15 elected faculty members, 4 are professors (27%) and 5 are associate professors (33%, all with PhDs in various fields).

There are 4 faculty members involved in the implementation of the study programme at VUAS - 1 with a PhD degree (25%) and 3 with a Master's degree (75%), of whom 2 are lecturers (50%) and 2 assistant professors (50%), 2 elected (50%) and 2 non-elected (50%).

Annex 2.8 contains a list of all the teaching staff who are to be involved in the implementation of the study programme, as well as the creative and scientific biographies of all the teaching staff (see Annex 2.9). The list of scientific publications of teaching staff in peer-reviewed journals, published teaching aids, research projects and artistic achievements describing the professional competence of the academic staff involved in the field of study in the provision of the taught study courses is attached in Annexes 2.12 and 2.13.

Since all faculties of LiepU are involved in the implementation of the study programme, the areas of scientific research are also broad, e.g., Humanities, Mathematics, Technologies, Natural Sciences, as well as Social Sciences. Scientific researches in highly ranked databases Web of Science and SCOPUS have been published both by LiepU researchers and academic staff, e.g., A. Jansone, Š. Guseinovs, J. Kaupužs, V. Frišfelds, D. Kūma, U. Žaimis, etc.

The development of engineering, as well as the involvement of teaching staff and students in research, is ensured by the LiepU Institute of Natural Sciences and Innovative Technologies (DITI). Its main research areas are:

- Renewable energy - solar, wind, wave;
- Nanostructured materials;
- Electrical energy storage;
- e-studies;
- Circular economy.

Publications of the Institute's employees, at the same time LiepU DIF lecturers, confirming their scientific activity are presented in the attached CVs.

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

Due to the short duration of the programme, there have been no major changes in the composition of the teaching staff. The only adjustment was the vaccination requirement during the Covid-19 pandemic, when some teachers had to be replaced by others with equivalent training and experience.

Mg.sc.ing. P. Bitāns (Electronics Engineering Project I - III) did leave the VUAS, he was replaced by Mg.sc.ing. A. Orbidans; two lecturers left the LiepU, I. Mockus (Construction I, II, Materials, structures), replaced by Mg.sc.ing. U. Žaimis and V. Kalniņš (Introduction to studies, research, and technology and Environmental and civil defense), replaced by Mg.sc.ing. U. Žaimis and Mg.sc.comp. Dz. Tomsons. Two lecturers passed away - A. Mežinska (Human Resources Management) and A. Jākabsons (Industry legislation and Production organization and management), replaced by Mg.soc. I. Skrīvers. The replacing lecturers have similar qualifications (Mg.sc) and higher experience (U. Žaimis, A. Orbidans), thus the quality of study courses has increased.

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

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

3.4.5. Assessment of the cooperation between the teaching staff members by specifying the mechanisms used to promote the cooperation and ensure the interrelation between

the study programme and study courses/ modules. Specify also the proportion of the number of the students and the teaching staff within the study programme (at the moment of the submission of the Self-Assessment Report).

The teaching staff employed in the study programme cooperate in the development of the content of both the professional specialisation and theoretical courses in the field of study and in the exchange of information on current developments in the field and in the study process. Most courses and modules are designed with several lecturers per course, working on a shared workload, which improves the exchange of information within the course and increases the possibilities to cover for each other in case of illness, travel or other unforeseen circumstances.

The faculty members employed in the study programme cooperate in the development and implementation of joint research and projects within the LiepU Institute of Natural Sciences and Innovative Technologies, in the exchange of information on current events in the field - by meeting at various exhibitions, events, international conferences, seminars and other networking events held within the field. Information exchange is ensured by regular meetings of the teaching staff at meetings organised by the Faculty and meetings within the framework of research activities at scientific institutes.

LiepU faculty qualification improvement is carried out in accordance with the LiepU Academic Staff Development Plan for the year of 2018-2022 (approved 17.05.2018, amended 26.09.2018). The plan is linked to projects under the European Union's Structural and Cohesion Funds for the 2014-2020 programming period, the European Social Fund and the European Regional Development Fund's Operational Programme "Growth and Employment":

- specific support goal "To reduce fragmentation of study programmes and to strengthen resource sharing";
- specific support goal "To strengthen academic staff in higher education institutions in areas of strategic specialisation";
- specific support goal "To ensure better governance in higher education institutions".

Upgrading is planned in the following areas*:*

- academic staff internships to improve the qualifications of academic staff in cooperation with Latvian businesses and educational institutions in the Baltic States. The activities to be carried out during the traineeship are planned to be related to the subject matter of the taught study course. The companies/institutions targeted for traineeships are prioritised those whose activities include innovation, research and technological development. The selected companies/institutions are open to cooperation, with local and international experience, and aim to be recognised in the sector in the region, the Baltics and worldwide. The choice of educational institutions for traineeships focuses on the ability to meet the needs of the strategic areas of specialisation. As the Baltic Resolution adopted by the Baltic Assembly in 2016 aims to intensify cooperation between the three Baltic States, traineeships for academic staff are planned in Latvian, Lithuanian and Estonian educational institutions and cooperation will be based on partnership and the principle of learning by doing and doing to learn, with the active participation of University lecturers.
- mobility activities for academic staff to improve their qualifications are carried out in the framework of *Erasmus+* mobility and projects. LiepU of Applied Sciences provides for 13-15 University lecturer mobilities each year.
- development of academic staff competences aimed at ensuring the core activities of LiepU -

quality study content, scientific research or implementation of artistic creativity. Competence development of academic staff is carried out in accordance with the Scientific Strategy of the Scientific Institution "Liepaja University" for the year of 2015-2020 and the Liepaja University Regulations "Regulations on Elections to Academic Positions", which define the requirements for a candidate for an academic position and confirms the academic and professional qualifications in accordance with the requirements of the field of science and arts for both study and research work.

Evaluation of Cooperation between Teaching Staff at the University of Applied Sciences

The most important criteria for selecting academic staff are scientific and professional competence, which potentially ensures successful collaboration between academics.

Cooperation between the study programme staff is promoted through both formal and informal activities organised by the VUAS. Teaching staff from different faculties are involved in the implementation of the study process, which provides a variety of experiences and promotes professional development.

The success of the cooperation between the study programme's teaching staff can be seen in a number of activities:

- **Interdisciplinary cooperation between academic staff** – for example, faculty members from different study fields are involved and employed in the study programme and can share their experience and discuss topical issues at organised meetings of the Council of Study Programmes, Faculty Council meetings, seminars, meetings with employers, etc.
- **Joint research activities by academic staff**, for example, faculty members involved in a study programme produce joint scientific publications, which indicate both interdisciplinary collaboration and research and joint activities in related scientific fields.
- **Cooperation between teaching staff in the development of study programme content**, by developing and improving the content of the study programme, lecturers carefully follow the thematic division included in the study course, mutually coordinating the thematic areas and the assessment mechanism of the study results. As an example, activities within the project "Next Generation Micro Cities of Europe" (No.UIA03-250), during which guest lecturers A. Orbidāns and G. Dreifogels modernised their courses by introducing student-centred methods, as well as shared their experience with other VUAS FoIT lecturers during several seminars.
- **Informal cooperation among teaching staff.** Various activities are organised at the VUAS FoIT to promote communication among the teaching staff in an informal atmosphere. One example is the weekly coffee breaks, during which lecturers discuss current issues in an informal atmosphere, as well as share their experiences in solving various problems.

The existing education and competence of the programme's lecturers is supplemented by practice, as well as by acquiring new knowledge, as far as possible, by raising their educational level, attending courses, seminars, conferences, congresses, forums, participating in *Erasmus+* mobility events and other experience exchange activities. LiepU provides *Erasmus+* mobility for 13-15 University lecturers every year.

At the time of submission of the self-assessment report, the Professional Bachelor's study programme "Information Technology" involves 28 University teachers for 11 students.

Annexes

III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme	8-1_appendix_D-DS_ENG.pdf	8-1_pielikums_D-DP_LV.pdf
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)		
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)	8-2_appendix_Compliance_with_joint_study_program_requirements.docx.pdf	8-2_pielikums_Kopigas_stud_prog_atb_AL_prasibam.docx.pdf
Statistics on the students in the reporting period	Student statistics - not applicable.pdf	Studējošo statistika - nav attiecināms.pdf
III - Description of the Study Programme - 3.2. The Content of Studies and Implementation Thereof		
Compliance with the study programme with the State Education Standard	8-3_appendix_Compliance_with_national_educ_standart_VTM.docx.pdf	8-3_pielikums_VTM_atbilstiba_valsts_standartam.docx.pdf
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard or the requirements for professional qualification (if applicable)	8-4_appendix_Compliance_with_prof_standart_VTM.docx.pdf	8-4_pielikums_VMT_atbilstiba_prof_standartam.docx.pdf
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	8-5_appendix_Mapping_of_study_courses_VTM.docx.pdf	8-5_pielikums_VTM_studiju_kursu_kartejums.docx.pdf
The curriculum of the study programme (for each type and form of the implementation of the study programme)	8-6_Study_programe_plan_VTM.xlsx	8-6_Studiju_programmas_plans_VTM.xlsx
Descriptions of the study courses/ modules	8-7_appendix_Study_course_descriptions_VTM.pdf	8-7_pielikums_Studiju_kursu_apraksti_VTM.pdf
Description of the organisation of the internship of the students (if applicable)	8-8_appendix_Regulations_on_intership_in_Liepaja_University.doc.pdf	8-8_pielikums_Noteikumi_par_praksi_LiepU.docx.pdf
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)		