APPLICATION

Study field "Mechanics and Metal Processing, Heat Power Engineering, Heat Technology, and Mechanical Engineering" for assessment

Study field	*Mechanics and Metal Processing, Heat Power Engineering, Heat Technology, and Mechanical Engineering*
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Self-evaluation report

Study field "Mechanics and Metal Processing, Heat Power Engineering, Heat Technology, and Mechanical Engineering"

Rēzekne Academy of Technologies

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1. Information on the Higher Education Institution/College

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

RTA was founded in 1993 under the name of Rezekne Higher Education Institution with the aim to develop culture, education and science in Latgale region and throughout Latvia. In 2016, Rēzekne Higher Education Institution changed its name to Rezekne Academy of Technologies, respecting its academic and scientific capacity development indexes, implementing the goal defined by its Constitution - to provide students with academic and professional higher education that is competitive in the European education space and complies with the level of scientific development and Latvian cultural traditions, by developing regional studies and research.

RTA vision in line with RTA operating and development strategy 2016-2023 (RTA Strategy) is to become an internationally competitive Academy of Technologies in the space of European higher education and science integrated with engineering, social sciences and humanities with motivated and creative students that are demanded in the labour market and an open, dynamic academic and scientific environment for sustainable development of the community.

RTA mission is to contribute to the transformation and growth of society and economy through education, research, science and innovation providing new products and technologies in the scientific fields and interdisciplinary fields represented by RTA both nationally and internationally.

The long-term goal set in the RTA Strategy is to strengthen RTA strategic role in Latgale region, in the system of Latvian and European higher education and scientific institutions, positioning itself as an academy of technologies focusing on the development, acquisition, research, popularization and application of multidisciplinary technological solutions.

In the academic year 2021/2022 RTA study process is implemented in 3 faculties, 12 study directions and 37 study programmes (see Table 1.1.) at all study levels - from first level professional higher education to doctoral study programmes.

Table 1.1.

Study directions implemented at RTA

Faculty of Engineering (FE)	**Faculty of Economics and Management (FEM)**	**Faculty of Education, Languages and Design (FELD)**

• "Architecture and Construction" 1 study program • "Information Technology, Computer Engineering, Electronics, Telecommunications, Computer Management and Computer Science" 5 study programs • "Mechanics and Metalworking, Heat Power Industry, Heat Engineering and Mechanical Engineering" 4 study programs • "Production and processing" 2 study programs	• "Management, Administration and Real Estate Management" 4 study programs • "Internal Security and Civil Defence" 2 study programs • "Law" 3 study programs • "Economics" 4 study programs	• “Social Welfare” 2 study programs • "Arts" 2 study programs • "Education, Pedagogy and Sport” 6 study programs • "Translation" 1 study program

RTA study and research infrastructure are located in Rezekne at Atbrivosanas aleja 115. Some study programmes are implemented at RTA branches in Madona and Livani, which were established at the request of Madona and Livani municipality in order to support the preparation of qualitative workforce in accordance with regional development strategies. Since 2017 study programmes are not implemented in Madona, but Livani branch is implementing first level professional higher education study programme “Mechanical Engineering”, which is in line with Livani county development strategy and is aimed at training and employment of specialists in local enterprises. All students are matriculated at the Rezekne Academy of Technology. Līvāni branch is used as a localization place, where the theoretical classes of the study program "Mechanical Engineering" take place.

In 2015 RTA founded Eastern Latvia High School of Technologies, where the general secondary education programme is implemented in STEM fields in order to promote the purposeful and systematic preparation of students for studies in science, technology, engineering and mathematics.

Number of students at RTA from 2014 to 2021 show declining dynamics (see Figure 1.1.)

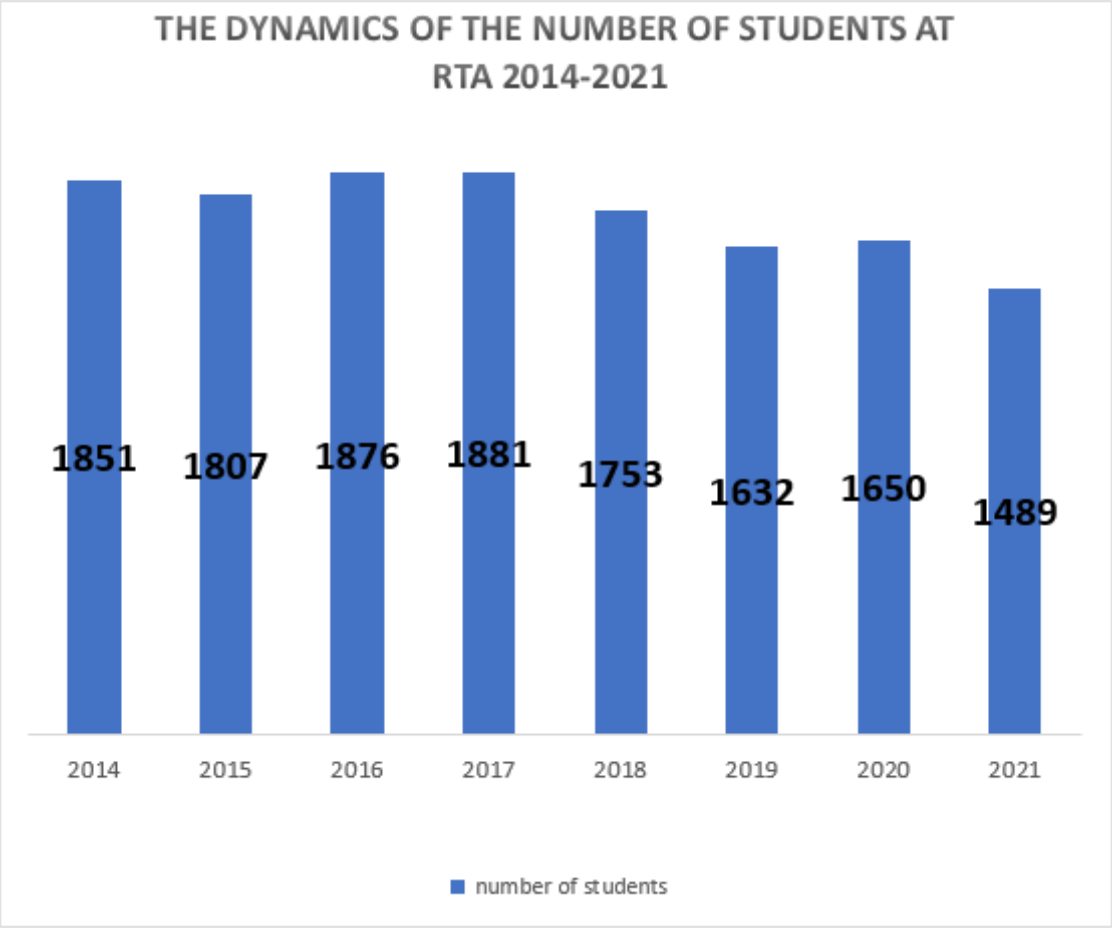

Figure 1.1 ***The dynamics of the number of students at RTA 2014-2021***

According to the statistics data 2020 of the Ministry of Education and Science, RTA is the 6th largest higher education institution among 16 state universities and the 10th largest among 29 state and private education institutions.

RTA operates in accordance with the RTA strategy, strategy, which defines its main strategic objectives:

O1. To ensure purposeful, coherent and successive implementation of STEM and resource-intensive study direction geared towards the development, acquisition and application of innovative technologies in Latgale region by preparing specialists necessary for Latgale, Latvia and European economic growth, promoting the involvement of young specialists in science and research.

O2. To offer science-based, interdisciplinary study programmes focused on the acquisition, application and development of innovative technologies, attractive and modern study and research environment, preparing competitive professionals for regional, national and international job markets and enhancing study quality.

O3. To implement the principle of unity of pedagogical and research work, to develop the scientific research capacity of RTA academic staff, ensuring technological excellence and transfer for the development of business environment and national economy.

O4. To create a modern and sustainable RTA infrastructure complex and modern equipment particularly developing STEM and resource-intensive directions for fundamental and applied research, excellent study environment and innovation support.

O5. To develop the attractiveness of the region by involving academic staff and students of RTA in

the social, cultural and economic life of Latgale, sustainable use of resources, preservation and circulation of the region's cultural and historical values.

Each objective has tasks and main short-term (until 2019) and long-term (until 2023) outcomes.

In the RTA Strategy the following RTA Key Performance Indicators (KPIs) are defined and annually measured and analyzed:

- dynamics of the number of students;
- number of foreign students;
- employment of graduates;
- number of companies founded by graduates;
- matriculation competition coefficient;
- the amount of attracted financial resources;
- percentage of academic staff with a doctoral degree;
- scientific qualification of the academic staff;
- number of defended doctoral theses;
- number of patents obtained and number of licenses sold.

In the academic year 2021-2022 there are changes in the higher education governance model in RTA. The RTA Council is formed, the operation of which is regulated by the Regulations approved by the RTA Senate.

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.

In accordance with the RTA Constitution, RTA is an autonomous educational and scientific institution with self-governing rights. Its autonomy is expressed in the right to freely choose the types and forms of implementation of tasks set by RTA founder that are in compliance with the Law on Higher Education Institutions, as well as in responsibility for the quality of education provided by RTA, purposeful and rational use of financial and material resources, observance of the principles of democracy and the laws regulating the activities of higher education institutions.

RTA has the right to draft and adopt RTA Constitution, to form RTA staff, independently determine the content and forms of study programmes, student enrolment regulations, basic directions of scientific research work, RTA organizational and management structure, pay wage rates not lower than those set by the Cabinet of Ministers and to do other activities that do not contradict the principles and tasks set by the RTA founder and the Law on Higher Education Institutions. See the RTA management structure in Annex 2.

The main RTA institutions involved in the decision-making process are the Constitutional Assembly, the Senate, the Student Council, the Study Council, the Science Council, the Faculty Council, the Study and Direction Council. See Table 1.2.1 for their composition and description of their powers.

Table1.2.1.tabula.

Main RTA bodies involved in RTA decision-making process

RTA decision-making bodies	Structure of the institution	Power of the institution
Constitutional Assembly	39 representatives of academic staff, 9 general staff and 12 students.	Adopts and amends the regulations of the RTA Constitutional Assembly and accordingly adopts and amends the RTA Constitution, elects RTA Senate, approves or amends RTA Senate regulations, revokes RTA Senate members, elects and dismisses RTA Rector, hears RTA Rector's report, elects RTA Academic Arbitration court, approves its regulations, as well as considers other issues of RTA in accordance with the regulations of RTA Constitutional Assembly.
Senate	19 representatives of academic staff members, 1 general staff member and 5 students	Approves the rules and regulations governing all areas of RTA.
Student Council	21 student representatives - 7 from each faculty.	Represents RTA students' interests in the study, science and culture issues participates in the work of RTA institutions (Constitutional Assembly, Senate, Academic Arbitration Court, Faculty Council, Scholarship Commission, Credit Granting Commission, Study Program Self-Evaluation Preparation Working Group), develops and implements projects related to students' interests.
Study Council	Vice-Rector for Studies and Science, Head of the Study Department, Deans, one Head of the Faculty, Deputy Rector for Cooperation and Development, Head of the Lifelong Learning Centre, Head of the Academic Direction of the Student Council	Analyses the study system and determines its improvement and development directions. Evaluates academic and professional study programmes and controls their content and quality. Analyses study budget projects and their implementation. Researches and introduces Latvian and foreign experience in the field of higher education.

Science council	RTA Rector, Vice-Rector for Studies and Science, Deans of Faculties, Heads of Institutes, Project Coordinator, Head of Science Department and Head of Library, Academic Director of the Student Council	By assessing the scientific potential of RTA, the material and financial resources to be used for research, the interests of the research community and individual scientists, it identifies the main directions of research and, through the opportunities available to RTA, facilitates the involvement of scientific and academic staff.
Faculty Council	The Dean of the Faculty, the professors and associate professors elected by the Faculty and RTA, the heads of study directions of the respective faculty, the student representatives, whose proportion in the Council shall not be less than 20% of the composition of this Council.	Defines the basic directions and principles of the development of studies, scientific activities and material and technical base in the faculty. Develops the faculty development concept and controls its implementation. Elects the Dean and heads of the structural units of the faculty. Approves study plans. Approves changes to the content of the study programme if they do not exceed 20% of the content of accredited study programme. Approves and controls the financial estimates of the faculty. Evaluates and directs study field self-evaluation reports, licensing / accreditation materials for approval to the Study Council. Decides on the organizational issues of the faculty scientific and academic conferences. Approves the proposals of the study directions regarding the composition of state and final examination commissions and time of these examinations.
Study Direction Council (SDC)	Directors of the study programmes and modules	SDC plans, coordinates and promotes scientific activities, the development of SD studies and scientific infrastructure, the activities of SDC in the study, research and other projects for the development of the study direction. SDC decides on the main issues of SD study, methodological, scientific and organizational activities, development of study programmes/modules, making significant changes in the study programmes, organization of internships, methodological and organizational provision and management of study research, regular, final and state examinations, planning, preparation and publishing of scientific literature, ensuring self-assessment of SV, co-operation with employers, Latvian and foreign institutions in the field of studies and research, promotion of SD and study programmes in society.

List of RTA laws and regulations, see Annex 1.

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.

RTA quality management system is maintained based on the priorities in higher education set forth in the European Higher Education Standards and Guidelines for Quality Assurance and the Higher Education Act. Quality processes at RTA are monitored by a quality management system specialist who is responsible for analysing, developing, implementing and maintaining the RTA quality management system.

RTA's Quality Management System (QMS) has been developed in line with the Excellence model taking into account the Standards and Guidelines for the Quality Assurance in Higher Education Area elaborated by the European Foundation for Quality Management (EFQM) and ISO9000: 2015 standard recommendations. RTA quality policy is aimed at RTA mission, sustainable development and achievement of strategic goals by providing high-quality study process and scientific work that meets standards and regulatory requirements. RTA has approved QMS implementation plan till 2020, which is fulfilled. RTA has developed and implemented all procedures related to study quality management, supervision and improvement. Since 2005 there is a **study quality management system** (available on RTA DMS) in RTA that covers all major areas of study work: compliance of study process with RTA development strategy, academic staff, study program, study process, infrastructure, financing, etc. quality aspects.

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.	The RTA Quality Handbook, which also covers the RTA quality policy, is available on the RTA website. https://www.rta.lv/uploads/source/content_EN/Studies/SQMS/2/RTA%20Quality%20Management%20Handbook%2020190502-en.pdf RTA study quality management system
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.	Regulations on academic and professional studies and study programmes at RTA, (https://rulv-my.sharepoint.com/personal/shpoint3_rta_lv/_layouts/15/onedrive.aspx?id=%2Fpersonal%2Fshpoint3%5Frta%5Flv%2FDocuments%2FRTA%20normat%C4%ABvie%20akti%2Dpubliskai%20piek%C4%BCuvei) Annual self-evaluation system of RTA study directions and study programmes(Procedure for annual self-evaluation of study fields and corresponding study programs at Rēzekne Academy of Technology (RTA)) Expert councils of RTA study fields have been established ECAD(ExpertCouncils of Academic Directions)shall consistof3 to 7 experts in each academic disciplines. If the academic disciplinesrepresent one or related fields of science, one common ECADcan be establishedforthese academic disciplines. The ECADshall consistofrepresentatives of the corresponding fieldsand sub-disciplines of science and spheres of professionalactivity. The ECADstaff shall be approved by the Faculty Council for three years and, if necessary, also the changes to the ECADstaffshall be approvedby the Faculty Council.
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.	There has been developed study quality system based on learning outcomes, Regulations on study course exams and tests, Regulations on state and final examinations. Available on RTA website, in RTA Student Manual https://rulv-my.sharepoint.com/personal/shpoint3_rta_lv/_layouts/15/onedrive.aspx?id=%2Fpersonal%2Fshpoint3%5Frta%5Flv%2FDocuments%2FRTA%20normat%C4%ABvie%20akti%2Dpubliskai%20piek%C4%BCuvei
4.	Internal procedures and mechanisms for assuring the qualifications of the academic staff and the work quality have been developed.	RTA human resource development plan, academic personnel development guidelines, regulations on RTA lecturer procedure for evaluation of academic staff quality, professional development programme in higher education didactics or innovation in higher https://rulv-my.sharepoint.com/personal/shpoint3_rta_lv/_layouts/15/onedrive.aspx?id=%2Fpersonal%2Fshpoint3%5Frta%5Flv%2FDocuments%2FRTA%20normat%C4%ABvie%20akti%2Dpubliskai%20piek%C4%BCuvei

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.	Student surveys, Annual study program self-evaluation reports, RTA annual reports In order to self-assess and improve the quality of the study process, RTA conducts surveys of students, graduates and employers, which are evaluated by the Study Direction Council. During the evaluation of the surveys, measures to improve the quality of studies are developed and organized (recorded in the Study Direction development plan).
6.	The higher education institution/ college shall ensure continuous improvement, development, and efficient performance of the study field whilst implementing their quality assurance systems.	Annual study direction self-evaluation reports, RTA study direction expert councils RTA has Councils of Study Direction Experts (hereinafter CSDE), which work to improve the quality of study programmes implemented by RTA, taking into account the development trends of the economy, education and science in Latvia, as well as promoting the training of competitive specialists. CSDE provides proposals on changes in RTA study directions and study programmes, opinions on new study programmes to RTA Study Direction Councils, Faculty Councils, gets acquainted with self-evaluation reports of study directions and study programmes, provides proposals for improvement of their work, participates in internal and external evaluation of RTA study programme events.

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.

Vision

The Study Field “Mechanics and Metalworking, Heat Power Industry, Heat Engineering and Mechanical Engineering” (hereinafter – SF) is a training centre for highly qualified technical engineering and engineering science specialists in Eastern Latvia in the field of mechatronics, mechanics, metalworking and laser technologies.

Mission

Mission of the SF is to provide the national economy of the Republic of Latvia with highly qualified professional engineering specialists based on integrated research, capable of solving engineering problems in production, developing and using advanced, eco-friendly technologies based on innovative solutions in mechatronics, metalworking, mechanics, photonics, heat power industry and heat engineering.

Aim

The aim of the SF is to ensure operation of the stable, sustainable and flexible training system for engineering specialists in Eastern Latvia, which is competitive in the global labour market and required for the production industry. The aim is defined on the basis of strategic planning documents of the EU and Latvia: Europa2030, Agenda for Modernisation of Europe's Higher Education Systems, Latvia 2030, Latgale Strategy 2030, Activity and Development Strategy of the Rezekne Academy of Technologies 2016-2023 (hereinafter – RTA Strategy), as well as consulting with students, employers, professional organisations and discussing in the Council of SF, the Faculty of Engineering Council, the Study Council of RTA and the Senate.

SF fully complies with the RTA Strategy and the related RTA Strategy of Scientific Activity 2019-2023, which provides for RTA becoming the leading engineering and technology research and innovation centre in Eastern Latvia, including ensuring purposeful, coordinated and successive implementation of STEM and resource-intensive study directions focused on the development, acquisition and application of innovative technologies in the Latgale region, training the specialists required for the economic growth of Latgale, Latvia and Europe, promoting involvement of the new specialists in science and research, as well as development of the knowledge society and introduction of digitalisation. SF tasks are focused on the implementation of RTA Strategy, which prescribes to continue development of metalworking, heat power industry, heat engineering, mechanical engineering, material engineering study programmes, based on the principle: science → innovation → prototype development → technology transfer → production (P.1.1.1.); in cooperation with Mittweida University (Germany) and other partners to develop studies and research in the field of laser technologies further, as well as to promote the use of laser technologies for development of innovative products and technologies, performance of commissioned works and services in Latvia and abroad. Improve links with companies and labour market to create knowledge-intensive products and services (P.1.1.2).

Tasks of the SF:

- development, improvement and implementation of study programs pursuant to the demand of the labour market;
- continuous improvement of infrastructure, laboratories, methodological, scientific, informative and computer programme base;
- involvement of academic staff in international scientific projects, publications in journals with a high citation index, increase of the Hirsch index;
- continuous development of cooperation with production companies: research, development of new products and technologies, equipment modernisation, student theses, traineeships, etc.;
- establishment of scientific educational clusters and ensuring their operation;
- continuous monitoring and improvement of compliance of the study courses' content with the latest achievements in science, machinery and technologies;
- continuous modernisation of study methods, extensive use of e-learning, hardware, multimedia and Internet;
- expansion and strengthening of international relations in the implementation of SF

programmes; development and implementation of joint cross-border study programmes;
- continuous improvement of the academic staff qualification and English language skills.

It is planned to develop market-oriented research within the SF consequently creating new products with high added value. The most important research directions:

- laser technologies;
- development of new innovative materials and their production technologies;
- development of new innovative products in mechatronics;
- development/improvement of materials and surface treatment technologies;
- applied research in mechanics and mechanical engineering;
- applied research in electronics and telecommunications;
- applied research in the power industry;
- development/improvement of waste recycling technologies;
- development/improvement of biomass processing / use technologies.
- development/improvement of technological equipment for production companies;
- improvement of working conditions in production.

It is possible to acquire higher education of all levels in the SF in the following study programmes:

- 1st level (college) professional higher education study programme Mechanical Engineering (41521),
- 2nd level professional higher education bachelor's study programme Mechatronics (42521),
- academic master's study programme Laser Technologies (45521),
- doctoral study programme Laser Technologies (51521).

The implementation of all study programmes complies with the SF aim, tasks, RTA Strategy, development needs and tendencies of the society and national economy.

All the study programmes are interconnected. The first 4 semesters of Mechanical Engineering and Mechatronics programmes are aligned. They cover basic engineering courses, mechanics, metalworking (CAD/CAE/CAM) and CNC technologies. After that the student can choose: during the 5th semester to take traineeship, defend qualification work of a mechanical engineering specialist and start working in production, or continue studies for another 4 semesters in the programme Mechatronics. Such combination of college and bachelor's study programmes allows to conduct classes for large groups and use the saved funds to ensure workshops in small groups. It also promotes positive competition between students in the same year. The Mechatronics programme incorporates study courses related to laser technology (structure, operation) and laser technologies. Students acquire basic knowledge and skills in laser processing of materials (cutting, welding, hardening, labelling, engraving). This is the beginning so that a mechatronic student can make an informed choice for further master's studies of Laser Technologies. Photonics is a relatively new industry, which is only beginning to enter Latvian production companies intensively in recent years, so there are almost no specialists of this industry. The master's programme Laser Technologies allows to provide companies with appropriate specialists. In order for HT companies to develop, doctoral level specialists are required. Their preparation is ensured by the doctoral study programme of Laser Technologies, which is a logical continuation of the master's study programme Laser Technologies.

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.

For operation assessment and development planning of the SF a regular evaluation of its strengths, weaknesses, opportunities and threats is performed.

Strengths

- Study programmes requested by employers; high employment level of graduates in the specialty; good cooperation with production companies and the Association of Mechanical Engineering and Metalworking Industries (MASOC), inclusion of producers' wishes in the content of study programmes.
- Modern laboratories for testing of materials, CAD/ CAE/ CAM, CNC technologies, laser technologies, electrical, hydraulic and pneumatic actuator, mechatronics, robotics, electrical engineering, electronics, power electronics, physics, chemistry, eco-technologies. Laboratory and workshop equipment allows diploma theses to be completed by prototyping new products (TRL6 and above).
- A successive, coordinated system of study programmes has been created at the college, bachelor's, master's and doctoral level.
- All laboratories and workshops are available for independent work 7 days a week; every student can freely receive consultations from lecturers and technical staff.
- Availability of library, interlibrary reader and scientific literature databases.
- Broad opportunities to study or do a traineeship abroad.
- State-funded study places.
- Stable base of professional traineeships.
- Qualified academic staff and practitioners from the industry (company owners, managers, leading specialists).
- Good cooperation with Latvian and foreign higher education institutions and scientific institutions.
- Successful groundwork in ensuring remote studies (in Covid-19 crisis conditions).

Weaknesses

- Insufficiently balanced workload of academic staff in academic, scientific and administrative work.
- So far unsuccessful applications for participation in international scientific project competitions.
- Insufficient external funding for the purchase and maintenance of laboratory equipment, facilities and the latest software.
- The level of the English language acquisition is still insufficient.
- The academic staff has few scientific publications in high citation index journals, low Hirsch index.
- Insufficient use of funding opportunities of international funds / grants for individual research.
- Few young lecturers with a doctoral degree.

Opportunities

- Greater involvement in international and state funded scientific projects.
- Use of funding from international funds and grants for scientific research of the academic staff.
- Outsourcing / contract research to companies would ensure the maintenance of the base of laboratories and additional remuneration for the staff.
- Continuous improvement of the content of study programmes pursuant to the labour market demand; if necessary – creation of new study programmes demanded in the labour market.
- Increasing the number of lecturers with doctoral degrees, including through doctoral study programmes and international projects implemented by RTA.
- Continuous improvement of the professional qualification and English language skills of the academic staff.
- Use of foreign experience, promoting international scientific cooperation of academic staff, internships, attending international exhibitions, attracting foreign lecturers and specialists to conduct study courses.
- Preparation of new teaching aids for professional specialisation courses, including in English.
- Attracting foreign students would improve SF funding, increase in staff remuneration and motivate better English acquisition.
- Use of the opportunities offered by the Rezekne Business Incubator for graduates to create their own companies and business.
- Improving the management of intellectual property, including patenting products developed in students' diploma theses and introduction thereof in production.
- Further education courses by Lifelong Learning Centre would bring additional funding.

Threats

- Uncompetitive remuneration in the higher education sector.
- Low rates of academic staff renewal.
- Decrease in the number of students related to the demographic situation.
- Due to global crises, the process of attracting foreign students is slowing down.
- The existing infrastructure and laboratory base are aging; problems in finding funding for renewal thereof.
- Implementing the ideas of centralization of higher education, it may become impossible to achieve the aim of the SF.
- Highly qualified academic staff leaves from RTA to private entities due to uncompetitive remuneration.
- Latvian tax policy can make it difficult to attract qualified specialists in a narrow field to read separate, specific, but production-relevant courses (it becomes economically unprofitable for RTA to hire people for low workload)

Measures to reduce the impact of weaknesses and prevent threats are reflected in the SF development plan in Appendix 4. The plan is developed after consultations with partner companies, municipalities, professional associations. The joint doctoral study programme Laser Technologies, which is implemented in partnership with the "Angel Kanchev" University of Ruse in Bulgaria and the Mittweida University in Germany, plays a special role in the implementation of the development plan. This programme significantly increases the competitiveness of the SF and allows to provide several of the opportunities presented in the SWOT analysis. It facilitates: 1) RTA's strategic specialisation in the field of laser technologies, attracting experienced foreign partners with the opportunity to take over the experience of Bulgaria and Germany; 2) renewal of academic staff and

involvement of young scientists in study and research work; 3) international cooperation in science, preparation and implementation of joint scientific projects, increasing the number of publications in high citation index journals, improving skills of English; 4) creation and management of intellectual property.

In 2016, there was established Institute for Engineering to increase the scientific capacity; unites all staff employed in the field of engineering and coordinates preparation of scientific projects and scientific publications. To facilitate preparation of scientific publications, the RTA has established a fund of scientific publications, where additional funding for the development of scientific publications is available to each scientist. In order to promote development of international research projects, RTA participates in the ERDF project Support to International Cooperation Projects in Research and Innovation at Rezekne Academy of Technologies, which provides support for networking, learning research mobility activities, participation in Horizon 2020 and EU 9. Partnership exchanges and information days organized within the framework programme; participation in international scientific conferences.

In order to increase the English competence of the academic staff, SF lecturers participate in the ERDF project Strengthening the RTA academic staff in the study fields "Mechanics and Metalworking, Heat Power Engineering, Heat Engineering and Mechanical Engineering" and "Management, Administration and Immovable Property Management", where 32 members of the teaching staff improve their professional competence doing in-service training with merchants, learning professional English, developing specialised competencies in the leadership, cooperation and digital field. To promote the renewal of the academic staff, 4 doctoral students and 5 foreign lecturers are involved in academic work of SF, specializing in such areas as Mechanics, Electrical Engineering, Electronics, Power Electronics, Robot Control System Development, Robot Programming, Image Recognition, Technical Vision, Machine Learning (robot training).

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

The SF is created in accordance with 11.12.2018 Cabinet Regulation No. 793 "Regulations Regarding Opening and Accreditation of Study Fields". The management of SF of RTA is subject to the Regulations "On Study Field Councils", "On Study Programme/ Module/ Specialization Directors", "On Councils of Experts of Study Field", "On Faculty Board" approved by the Senate. For the most important collegial institutions involved in the management of the SF see Annex 5.

The SF management structure established by RTA ensures the following essential principles of RTA's internal quality:

- involvement of staff – all stakeholders are involved in the SF implementation – students, lecturers, general staff, employers, graduates;
- evidence-based process management – each unit has clearly defined duties, rights and responsibilities;
- continuous learning and improvement – created conditions for exchange of knowledge, introduction of innovations and improvements.

The directors of study programmes are decisive in the implementation of SF; they form the SF Council chaired by the head of the SF.

Director of the study programme:

- develops a study programme considering the demand for relevant specialists in the labour market, justifying by surveys conducted for this purpose, statistical data and other documents proving the demand;
- prepares the study programme for review in RTA's collegial and advisory institutions,
- manages the self-assessment process of his/her programme,
- performs the duties related to the study programme implementation: preparation of study plans, coordination of the study programme learning outcomes with the study course learning outcomes, consultations for students and teaching staff, popularisation of the study programme, etc.

Head of SF:

- plans the work of SF Council;
- manages the preparation of SF self-assessment, licensing and accreditation materials, also involving academic staff and students;
- organises assessment of the activities of the staff employed in the study programmes.

SF Council:

- decides on all the main issues of study, methodological, scientific and organizational activities of the SF, including development of study programmes/modules, significant changes in study programmes, organisation of traineeships, methodological and organisational provision and management of study research, current, final and state examinations, planning, preparation and publishing of study methodological and scientific literature, provision of self-assessment of SF and study programmes, cooperation with employers, Latvian and foreign institutions in the field of studies and research activities, popularisation of study programs in society;
- plans, coordinates and promotes scientific activities, development of studies and scientific infrastructure, activities in studies, research and other projects for the development of the SF. On 27.01.2015, the Senate of RTA approved the "Regulations on Study Field Councils of RTA" introducing a new model of SF administration, establishing a Study Field Council, which includes the directors of all study programmes.

General meeting of SF:

- meets at least three times an academic year;
- nominates and approves the composition of the Study Field Council by the majority of votes present;
- evaluates information about the topical measures and tasks of the SF implementation;
- evaluates the report of the head of the SF on the accomplished during the semester and academic year;
- evaluates reports of the academic staff on the completion of workload.

For the efficient operation of the SF, the RTA has support structural unit staff:

- Specialists of the study process of the Faculty of Engineering: responsible for record keeping and organisational issues of the study process at the faculty level.
- The head of the Līvāni branch (in cooperation with the dean's office, study programme

directors, lecturers and students) organises the study process in the branch, including the provision of classrooms, presentation equipment and computer equipment, student information, technical staff management, cooperation with Līvāni library, student recruitment, etc.

- Specialists of the study process of the Department of Studies: responsible for maintenance of SF data in LAIS, VIIS, Moodle systems, Multirank, academic staff workload planning, maintenance of lecture schedules, preparation of diplomas and diploma appendices, reports, references and other documents on study issues.
- Personnel Department specialists: prepare personnel documentation (incl. Employment Contract), carry out introductory instruction of personnel.
- Employees of the Lifelong Learning Centre: organise professional development courses in higher education institution didactics and innovations.
- Library: participates in planning of study and scientific literature, ensures availability of electronic databases, is responsible for updating the content of the RTA institutional repository, maintains the database of the RTA's academic staff publications.
- Technology transfer and project management contact point: supports planning and implementation of training, scientific, infrastructure projects, commissioned research.
- Financial analyst: plans the financial resources of the SF and study programmes.
- Information Communication Technology Research Centre: maintains electronic open access databases conferences.rta.lv, journals.rta.lv.
- Institute for Engineering: ensures synergy of pedagogical and scientific work, plans and implements scientific projects in the field of engineering sciences and related interdisciplinary industries, performs research and practical support for strengthening the scientific capacity of the SF.

The management system of the SF and the corresponding study programmes can be assessed as well-thought-out, coordinated, based on democratic principles. It receives the necessary support in all basic issues of the SF: study process record keeping, scientific activity, financial planning, lifelong learning, etc. The strengths of the management model: detailed division of responsibilities of the parties involved in the management process, stipulated in the regulations of structural units and job descriptions of officials, developed procedures in all issues of implementation of the SF and its corresponding study programmes, a transparent decision-making system accessible to all parties involved.

The management model of the SF and its corresponding study programmes covers various activities related to the implementation and development of the study process. The model provides for involvement of many departments and persons. This poses a threat to effective management. For instance, the objectively possible influence of the human factor in management becomes topical, which actually manifests itself as risks, insufficient management staff providing comprehensive management of processes in their field of supervision, coordinating the professional and academic activities of the teaching staff, and other factors.

RTA's Quality Management Policy provides for several directions to reduce management risks. They include staff consolidation, professional development measures, the opportunity to resolve work situations in a collegial manner, reviewing them pursuant to the Code of Ethics of RTA.

For transparency of the management process and availability of management decisions, RTA introduced the Electronic Internal Document Management System aimed at prevention of management quality risks, harmonized documentation management and control of operation.

The directors of all study programmes belong to the Council of the study field, where the issues relevant to the study field are decided together, problems are solved, and the development

scenarios of the study field are discussed. Programme directors closely cooperate within the process of preparation of accreditation materials, the process of preparation and implementation of project applications, execution of commissioned research, involvement of students from different study programmes in joint projects, organisation of conferences. Study programme directors work as lecturers in other study programmes.

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

Admission to study programmes of RTA is subject to the Admission Regulations approved by the Senate (see https://rulv.sharepoint.com/:w:/g/EVeRDm4O2EVDsGq_4L1NrLsBwojVYwhv8N4ynTQAaSuncg?e=NUwDaJ).They are based on Cabinet Regulation No. 846 Regulations Regarding the Requirements, Criteria and Procedures for Admission to Study Programmes. of 10.10.2006.

Admission to undergraduate (college, bachelor) programmes requires secondary education acquired previously. Students are admitted in an open and equal competition based on the results of centralised exams. The Admission Regulations of RTA prescribe three centralised examinations: Latvian, mathematics and a foreign language. Additional points are awarded for the annual mark in the certificate of secondary education in informatics, physics, chemistry, natural sciences. In order to select the strongest and most motivated students, RTA has determined the possibilities of receiving additional points to the winners of first, second and third places and recognitions in the Latvian State Competitions in mathematics, physics, informatics, Russian, German and French, to the graduates of the Eastern Latvian Secondary School of Technology and secondary vocational education (related to mechanics, electronics, informatics).

Requirements for admission to the master's programme is a professional or academic bachelor's degree or a second level professional (or equivalent) higher education in engineering, physics, chemistry, biology, environmental science, medicine, computer science, information technology, mathematics or economics. Admission takes place through competition, taking into account the average grade in the diploma supplement. Additional points are awarded for the 5th level professional qualification of a mechatronics, mechanical or electronics engineer, knowledge of German (DSH2, C1 or analogue) and publications in engineering, physics, chemistry, biology, environmental science, medicine, computer science, information technology, mathematics.

Persons who have a master's degree in engineering, natural sciences or equivalent professional education in engineering or natural sciences are admitted to the doctoral study programme, if the study courses acquired in the master's study programme comprise at least 10 CP or the developed master's thesis is related to laser technologies. English knowledge – at least level B2.

Admission Regulations for each subsequent study year are approved by the Senate of RTA and published on the home page by 1 November of the current year.

RTA has developed and introduced procedures for the recognition of qualification and competencies acquired through non-formal education or professional experience and learning outcomes achieved

through previous education, which correspond to the Cabinet Regulation No. 505 "Regulations on Recognition of Competences and Learning Outcomes Acquired Outside Formal Education or in Professional Experience". In accordance with the "Regulation on Recognition of Competences Acquired outside the Formal Education or through Professional Experience and Learning Outcomes Acquired in Prior Education by RTA" approved by the RTA Senate (see https://www.rta.lv/uploads/source/content_LV/studijas/SKVS/5/Nolikums-Par%20iepriekseja%20izgliti ba%20vai%20profesionalaja%20pieredze%20sasniegtu%20studiju%20rezultatu%20atzisanu%2020 18%2012%2018.pdf) the recognition procedure is performed by the Commission for Engineering and Information Technologies, which examines the applications of applicants and makes a decision regarding the recognition of learning outcomes or refusal to recognise the learning outcomes.

If the master's degree is obtained not in engineering, natural sciences or a field of professional activity corresponding to them, the doctoral candidate must certify work experience / non-formal education that complies with the knowledge, skills and competencies specified in level 7 of the LQF in mechanical engineering and mechanics.

Moreover, RTA has developed and, pursuant to the Lisbon Convention, consistently applies the procedures for recognising previous education when transferring from another higher education institution (HEI) to RTA, transferring from one RTA study programme to another, resuming studies after a break, after first/second level professional higher education acquisition by continuing studies for the acquisition of a bachelor's degree or second level professional higher education, after studies within the framework of cross-border or inter-university agreements. For example, one graduate of Riga Technical University has successfully completed the programme Mechatronics in 2019 in a shortened period (because the credit points previously obtained in another HEI were transferred; the student had to take only specific courses related to the profession). Currently, one graduate of the Latvia University of Agriculture is studying in the programme Mechanical Engineering, a large part of the study courses the student passed in the previous HEI were transferred, and now only the courses related to the profession have to be passed.

The procedures for the recognition of academic courses are determined by the Regulations on Academic Recognition of Study Courses at RTA approved by the Senate. Pursuant to the ERASMUS Charter 2014-2020, RTA fully recognises the study period acquired in ERASMUS mobilities abroad.

Admission of foreign students to RTA takes place pursuant to the Admission Regulations. Admission requirements for undergraduate programs are: an annual mark in the subject in the document on secondary education, which is equated to a centralized examination (mathematics; basics of economics; English). In addition, applicants must pass an online test in mathematics and an interview for studies at RTA. Admission requirements for master's studies are the second level higher education or an academic bachelor's degree in economics, marketing or administration (duration of studies at least 4 years, 160 CP). In addition, applicants shall take an interview for studies at RTA. Admission requirements for the doctoral level are discussions on the problems viewed in the admission paper or submitted set of publications, evaluation of the master's thesis, number of publications in cited publications and participation in scientific conferences, number of publications in general publications and participation in local conferences, experience in management or analytics. All additional requirements are agreed and approved by the Higher Education Council.

All foreign applicants must submit a language proficiency certifying document issued by an international testing institution within the past five years, which certifies the foreigner's proficiency in English at least at the level B2. It is not required to attach the document, if the foreigner has acquired the previous education in English. If there is no International Certificate of English proficiency or the language of previous education was not English, the applicant has to pass the

examination. The result of the examination will be passed if the English knowledge comply at least with the level B2.

Recognition of previous education and professional experience is possible in all study programmes of the SF. This process is regulated by the "Regulations on the recognition of competences acquired outside formal education or professional experience and the learning outcomes achieved within previous education at the RTA" and the "Regulations on the academic recognition of study courses at the RTA". For example, since 2017, the issues of recognition of previous education have been resolved in the Mechanical Engineering programme for 30 students, in the Mechatronics programme for 20 students, in the Master's programme Laser Technology for 6 students, but there have been no student applications for recognition of professional experience.

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 procedure for evaluation of student achievements at RTA is elaborated to ensure consistent application of the student-centred approach. The principles of evaluation at RTA are determined by methodological recommendations Study Quality System Based on Learning Outcomes, Regulations on Examinations and Tests of Study Courses, on State and Final Examinations approved by the RTA Senate, Methodological Recommendations for Organising Students' Independent Work approved by RTA Study Council. The evaluation of the student's work during traineeship in the programmes of Mechanical Engineering and Mechatronics is stipulated in the traineeship guidance developed exactly for these programmes.

The main principles of learning outcome evaluation at RTA:

- **Correspondence** of learning outcome evaluation methods **to the study programme and learning outcomes defined for the study course**. RTA teaching staff incorporates the requirements for the assessment of learning outcomes into the study course programmes, which are evaluated and approved at the meeting of the SF Council. During the assessment, the attention is paid to the compliance of the assessment requirements and procedures with the achievement of the study programme aims, the total workload of students, as well as preventing possible duplication of the content of study courses.
- **Clarity, consistency and public availability** of requirements for evaluation of learning outcomes **to students**. RTA teaching staff incorporates the requirements for evaluation of learning outcomes into the study course programme, which is published on the RTA e-course website rta.lv and available to students starting the study course acquisition. In cases when the teaching staff delays in publishing the study programme on the e-course website, they receive a repeated invitation and reminder that the requirements for the evaluation of learning outcomes must not change during the implementation of the study course.
- **Balanced application of measures for evaluation of learning outcomes during the study course implementation period**, providing for that the examination grade consists of the results of formative evaluation during the semester (at least 40% of the evaluation) and evaluation at the end of the study course (60%). Such a system allows to follow the progress of students' study achievements, motivates students for a purposeful study process during the semester, as well as lightens the psychological and physical workload of examination

during sessions.

- **Evaluation of** students' **independent work**, which is a mandatory element of the study process, its content and evaluation are reflected in the content of study courses. The SF Council shall decide about most suitable types of independent work of the SF, agreeing on the independent work amounts, opportunities to make bigger student groups for independent work, and other issues.
- **The right of students to request explanations** and to contest the evaluation according to the procedures established in the Regulations on Examinations and Tests of Study Courses, on State and Final Examinations.
- As far as possible, **several evaluators participate** in the evaluation of learning outcomes. Such a system is applied at RTA during defence of study research works and professional traineeships.
- The learning outcomes in the compulsory and limited elective part are evaluated with a grade in the 10-point system (examination or differentiated test), in the elective course part it is allowed to evaluate the learning outcomes with 'passed'/'failed'.

All information about the summative assessment of learning outcomes is available to students in the LAIS environment, where each student is granted access. The results of the formative evaluation are partially available on the RTA e-course website ekursi.rta.lv

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.

The principles of academic integrity and their application in RTA are subject to the Regulations "Plagiarism Control and Prevention Rules at RTA" approved by the Senate and harmonised with the Copyright Law, Code of Ethics for Scientists, Code of Ethics of RTA and Student Rules and Regulations of RTA. Plagiarism control and prevention measures at RTA are applicable to the study process and academic and scientific activities of the academic staff.

In the study process, measures to control and prevent plagiarism are taken in the course of formative assessment, developing, submitting and defending such written and oral works, which contain the elements of research work and which provides for work with sources, statistical data and literature (study work, course paper, report, presentation , article, etc.). Particular attention is paid to anti-plagiarism measures in the process of development, evaluation and defence of final theses (qualification papers, engineering design projects, master's theses, doctoral theses).

From 2014, the final research works at RTA are tested in the Unified Computerized Plagiarism Control System of Latvian Higher Education Institutions. Each case of identified data match is evaluated at the meeting of the Study Field Council, inviting the director of the respective study programme and the supervisor of the final study research work. The Study Field Council may request oral or written explanations from the student whose work is suspected of plagiarism. Qualifying the established facts as plagiarism, the Study Field Council proposes to the Dean exmatriculation of the student. In the programme Mechatronics of the study field, the only case of plagiarism in the final works was found in 2017. It was profoundly evaluated by the Study Field Council, inviting the student and the engineering design project supervisor; it was decided to expel the student, provided that when resuming his studies, the student had to write a final engineering

design project on another topic. In the final examinations of the study programmes of Mechanical Engineering and Laser Technologies, there has never established plagiarism. Every year, at the beginning of the last study semester, there is a general meeting organised for students and their supervisors on the elaboration of state final examinations. It also provides information on how to avoid plagiarism in student works. Consequently, the plagiarism risk is minimized.

To control plagiarism, RTA has purchased and uses the plagiarism detection system PlagScan, which controls the materials uploaded to the study website ekursi.rta.lv and operates on the RTA conference administration website conferences.rta.lv and on the free access website journals.rta.lv, where scientific articles of the teaching staff and students of the study field are also published in open access. In addition, the RTA staff uses also publicly available anti-plagiarism platforms, such as plag.lv, plagium.com, plagiarismchecker.com, plagiarisma.net, etc.

In addition, RTA systematically carries out educational and informative activities related to intellectual property issues. Representatives of the Patent Office of the Republic of Latvia, who cooperate with the RTA Library, give regular guest lectures at RTA. For example, the Patent Office seminars Protection of Intellectual Property (Industrial Property. Copyright)" on 19.02.2019, Topical Issues in the Patent System on 17.03.2017, etc. Also in the framework of the Lifelong Learning Centre professional development programme Innovations in Higher Education, RTA organises guest lectures and courses on issues related to academic ethics. For example, in the period from 05.11.2021 until 26.11.2021 there is an online lecture series Academic Ethics and Integrity conducted by Dr.sc.soc., MS Bioethics Signe Mežinska.

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.

In order to achieve the aims and outcomes of the study programmes, continuous improvement, development and efficiency of the SF and the corresponding study programmes, RTA has established an Internal Study Quality Assessment and Control System (Quality System), where the following areas are subject to internal assessment:

- Compliance of the study process with the Development Strategy (development policy) of RTA,
- Quality of the academic staff,
- Quality of the study programmes,
- Quality of cooperation with applicants and graduates,
- Quality of the study process,
- Infrastructure quality,
- Funding and quality of economic activity.

The quality of implementation of the SF and corresponding study programmes is subject to regular assessment pursuant to the procedures for internal evaluation of the study fields and programmes approved by the Study Council of RTA. Until 2021, the quality assessment was a multi-level process:

- The **self-assessment working group** approved by the Dean prepared a self-assessment report annually, evaluating therein the areas defined in the Quality System; for the self-assessment report, the working group summarised the statistics of the study field in the preceding year and the results of surveys. If necessary, additional opinions were asked from experts selected by the self-assessment working group.
- The SF self-assessment **was subsequently discussed** in the Council of the Study Field and the Council of Experts of the Study Field, the Study Council and approved by the Senate. The proposals formulated in the discussion process are incorporated into the study programme or its implementation procedures.

The first self-assessment reports of the SF until the academic year 2017/2018 are available at RTA home page. They contain the assessment of both the SF and each study programme corresponding to the SF, and the summary of the most important development plans of the SF.

Each of the Quality System areas in RTA is documented, however, improvements cannot be ruled out. The Quality System of RTA is developed in such a way to receive regular feedback on the quality SF implementation. There are several ways to achieve it:

- Since 2020, pursuant to the annual self-assessment procedure for the study fields approved by the Study Council of RTA and the corresponding study programmes, RTA implements a successive self-assessment procedure for SF and study programmes, identifying and regularly evaluating the most important quality indicators of study process pursuant to the evaluation calendar. Annual self-assessment includes such **aspects of SF quality** as the completion progress of the accreditation/licensing recommendation plan, SWOT evaluation of SF, evaluation of the SF development plan, analysis of annual enrolment results in study programmes, evaluation of the number of students and student movement, identified plagiarism cases and anti-plagiarism measures, analysis of survey results, analysis of study literature, evaluation of teaching staff, mobility measures, traineeship agreements, professional standards, study courses implemented with a problem-based approach, student achievements, evaluation of material and technical base, other information. Self-assessment materials are stored up in RTA's internal document management system.
- Conducting annual surveys of students, graduates and employers, performing their assessment and performing the improvements initiated during the assessment of the surveys;
- in addition, RTA uses the opportunity to participate in international platforms for analysis of individual study quality indicators, for example, in 2021/2022. RTA participates in the system StudentPlus for collection and analysis of student study experience, regularly conducting questionnaires and evaluating student experience during their studies. The first collected data are expected in November 2021.
- Implementing the changes proposed at the national level in order to ensure the pooling of resources, increase in the quality of studies and succession of study programmes, three study programmes were closed in 2021, considering the small number of students (professional bachelor study programme Environmental Engineer, professional master's study programme Environmental Protection, doctoral study programme Environmental Engineering), but a new joint (in cooperation with "Angel Kanchev" University of Ruse in Bulgaria) doctoral study programme Laser Technologies was developed and licensed.

2.2.2. Analysis and assessment of the system and the procedures for the development and review of the study programmes by providing specific examples of the review of the study programmes, the aims, and regularity, as well as the stakeholders and their

responsibilities. If, during the reporting period, new study programmes have been developed within the study field, describe the procedures of their development (including the process of the approval of study programmes).

The documents of the Study Quality Management and Control System are available at https://www.rta.lv/studiju_kvalitates_vadibas_sistema

Development and reviewing of study programmes at RTA are governed by the Regulations on academic and professional studies and study programmes (see https://www.rta.lv/uploads/source/content_LV/studijas/SKVS/5/Nolikums-Par%20akademiskajam%20un%20profesionalajam%20studijam%20un%20studiju%20programmam%202019%2005%2007_1.pdf) approved by the Senate and it determines the schedule of planning new study programmes, involved parties and the procedure. The main principles for development of study programmes are:

- **connection** of the study programme development **with the main strategic and planning documents**: Activity and Development Strategy of the Rezekne Academy of Technologies 2016-2023 and Study Programme Development and Consolidation Plan 2018-2023. The study field corresponds to the strategy of RTA. According to it, 3 new study programmes were developed and licensed in the study field in the reporting period: Mechanical Engineering, Laser Technology (master's), Laser Technology (joint doctoral study programme with Angel Kanchev Ruse University in Bulgaria; licensed in 2021). Due to the small number of students, 3 study field programmes were closed in 2021: professional bachelor study programme Environmental Engineer, professional master's study programme Environmental Protection, doctoral study programme “Environmental Engineering”;
- development of study programmes is based on **stakeholder cooperation.** The process of development and improvement of the study programmes involves formation of a working group, which includes the **teaching staff, general staff and students**. Prior to reviewing a new study programme by the Faculty Board, it shall be evaluated by the Council of Experts of the Study Field. Before the study programme is approved by the Senate, an independent evaluation shall be carried out by independent experts from the academic or professional sector.
- **regular revision of the content and implementation of the study programmes**, ensured in accordance with the procedures for development and approval of annual study plans as well as the process of the study field self-evaluation. In the process of the annual approval of study plans, evaluation of such aspects as content of the study programme, coherence of the study course programmes and the learning outcomes of the study programme, the compliance of the teaching staff with the implemented study programmes is carried out every year. After approval of the study plans by the Faculty Board, the teaching staff shall update the study course programmes and submit the updated versions for inclusion in the Information System of Latvian Higher Education Institutions (LAIS) as well as on the website of e-courses of RTA.
- ensuring regular feedback via surveys of **students**, **graduates and employers.** Results of the surveys are discussed in the Study Quality Commission of RTA, at the meeting of the Council of the Study Field and, whenever possible, taken into account revising the content of study programmes or their implementation procedures. Students shall submit their proposals for improvement of the study process.
- cyclical **external evaluation** of study programmes, coinciding with the procedures for accreditation of study fields stipulated in the Republic of Latvia. An essential aspect of external evaluation are the recommendations of the Expert Commission regarding

improvement of the study field and study programmes, that shall be integrated in the development plans of the study field and study programmes afterwards, outlining a schedule, resources and those responsible for the implementation thereof.

During the reporting period, 3 new study programmes were developed and licensed: 1st level professional higher education study programmes Mechanical Engineering, academic master's study programme Laser Technologies and a new doctoral study programme Laser Technologies (hereinafter – DSP). DSP will be developed within the Project No. 8.2.1.0/18/A/016 “Reduction of fragmentation of study programmes and strengthening the sharing of resources in the study fields “Management, Administration and Real Estate Management” and “Mechanics and Metalworking, Heat Power Industry, Heat Engineering and Mechanical Engineering”” aimed at improvement of the international competitiveness of RTA study programmes, to ensure and strengthen efficient utilisation and sharing of the available resources, to reduce the fragmentation of study programmes consolidating the implemented study programmes and establishing a new joint doctoral study programme Laser Technologies in partnership with Ruse Angel Kanchev University (Bulgaria).

The development of all the new study programmes includes (I) development process of three stages, (II) approbation process, (III) accreditation process and (IV) the implementation process with regular internal and planned external evaluation.

In the FIRST stage of the development process, the idea of a new programme was updated in accordance with the measures specified in the Activity and Development Strategy of RTA. Updating the idea, the main principles of programme development are defined, the resource, research and innovation capacity, cooperation with other higher education institutions and scientific institutions in Latvia and abroad for the development of joint study programmes and resource sharing are evaluated.

The SECOND stage of the development process involved development of the programme’s conceptual content, determining the programme aim and learning outcomes, evaluating compliance of the programme with laws and regulations, planning provision of academic staff, programme resources and material provision, assessing the scientific activities related to the programme, comparing the programmes with similar content programmes in other countries. The conceptual content of the programmes was discussed in the Council of the Faculty of Engineering of RTA and in the meeting of the Scientific Council of the Institute for Engineering (in the case of PhD programme).

The THIRD stage of the development process deals with preparation of the application for the programme licensing. For this purpose, upon the order of the Dean of the Faculty of Engineering of RTA, a working group is established, which is elaborating the programme description, covering the study programme compliance with the study field, programme resources and provision, study content and implementation mechanism, teaching staff description and programme compliance with the laws and regulations. During the development of materials, the working group also consults with other partners. The prepared description of the programme is successively evaluated and discussed at the meeting of the SF Council, the meeting of the Board of the Faculty of Engineering, the RTA Study Council and approved by the Senate, having the study programme previously evaluated by experts at the request of the Senate. Further implementation of the programmes is planned performing regular internal evaluation, which takes place in accordance with the procedures of RTA for the annual self-assessment of the study fields and their corresponding study programmes, and planned external evaluation, which takes place in accordance with the Cabinet Regulation No. 793 “Regulations Regarding Opening and Accreditation of Study Fields” of 11.12.2018.

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.

Normative documents of RTA are stored on the internal server of RTA, accessible to all the students in the premises of RTA. The most important laws and regulations regulating the rights of students are summarised in the publication "My Higher Education Institution". You can find them at https://www.rta.lv/dokumenti_studentiem. The procedures for submitting student complaints and proposals are provided for in the internal regulatory enactments of RTA (see Table 2.2.3.1).

Table 2.2.3.1

The right of students to submit complaints and proposals provided for in the internal regulatory enactments of RTA

Complaint regarding exmatriculation	to the Rector	Student Rules and Regulations (4.5)
	possibility to appeal to the Senate	Student Rules and Regulations (4.5)
Proposals regarding study process	to the Dean's Office	Student Rules and Regulations (3.3.4)
Appeal against evaluation in the state testing	to the Vice-Rector for Studies and Sciences	Regulation on State and Final Examinations (27-33)
Appeal against evaluation of examinations and tests	To the Dean	Regulation on Study Course Examinations and Tests (6.1-6.5)
To appeal against the decisions made by the Academic Court of Arbitration of RTA	In accordance with the procedures specified in the Administrative Procedure Law.	Constitution of RTA

Students' Self-Government shall be entitled: · to request and receive information and explanations from the authorised representatives of any structural unit of RTA regarding the issues affecting students' interests; · to exercise the right of veto in the Constitutional Assembly, the Senate and the Faculty Board on issues affecting students' interests; · to participate in RTA decision-making institutions and to take part in tests and examinations as observers in accordance with the normative documentation of the RTA; · to propose adoption, amendment and repeal the laws and regulations of the Republic of Latvia and normative documents of the RTA affecting students' interests.	The Regulation of Students' Self-Government of RTA

Quality Management System (QMS) of RTA stipulates the RTA Student Complaint Policy. The QMS stipulates that the responsible employee of RTA shall register complaints, references, proposals, incidents and risks, inform the process manager and employees involved, and address them in accordance with his/her competence and the granted authority, thereby managing and improving relationships with students, coordinating activities, resolving complaints, strengthening the relationships as well as ensuring feedback. Student satisfaction is measured and the results are used for improvements.

In 2019, the Whistleblowing Law entered into force in Latvia. Based on this law, there was developed an internal whistleblowing system of RTA and it is available on the RTA home page. A whistleblower (also a student) is entitled to blow the whistle especially regarding the following violations: failure to act and negligence of officials, or abuse of the official position by them, corruption, fraud, environmental safety threat, labour safety threat, infringement of human rights and other issues.

In 2021, the Students' Self-Government of RTA created a trust e-mail, to which students can send their complaints, objections and proposals that shall be resolved by the head of the academic sector of students' self-government in cooperation with the Vice-Rector for Studies and Sciences according to the competency.

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.

Quality Management System (QMS) of RTA defines the information and knowledge required for strategic and operative actions, providing that the information must be reliable and easily accessible to the relevant persons. The QMS prescribes that RTA collects and manages necessary data in the information systems. The data are analysed, reports for the access of relevant user groups are prepared and published, employees and external users are provided with access to the necessary information, ensuring their security and protection of intellectual property. RTA regularly summarises data related to the study process and scientific activity, submits them to the external data managers according to the national procedures, or uses the data for improvement of the study process (see Table 2.2.4.1). RTA collects internal statistics in order to ensure more efficient programme management, evaluate the quality of study programmes, obtain feedback and recommendations from internal and external evaluators for improvement of the quality of a study programme.

Table 2.2.4.1

Areas of statistical data created by RTA

Information for the third parties:	Internal statistics (every semester / academic year):
● the Central Statistical Bureau – study fields, study programmes, number of students, admission results, distribution of students in accordance to different criteria, academic staff, budget, etc. ● the Ministry of Education and Science – studies in state-funded study places, coefficients of competition, tuition fees, graduates, etc. ● U-Multirank – information according to programme groups, on-demand. ● VIIA – Erasmus + mobility statistics.	· Records of students' attendance of classes on the RTA e-course website https://ekursi.rta.lv/ · The data requested by RTA from the State Employment Agency on RTA graduates registered as unemployed · Qualification of the academic staff (with a PhD degree, elected staff). · Records of plagiarism risk by faculties and study fields. · Data obtained from surveys of students, graduates and employers.

For the improvement of the study field, the own information collected by RTA is used. **Data on class attendance by students** are used for regular monitoring of the student count. This is especially important in groups of foreign students, where class attendance is an important condition for the legitimacy of their residence permit. From 1 September 2019, the attendance was registered on the e-website vis.rta.lv for all students and now on the RTA e-course website https://ekursi.rta.lv/. The specialist of the study process checks lecture attendance every month. In cases when it is discovered that a student has not attended classes for more than a month, the specialist of the study process contacts the student to find out the reasons for his/her absence. If the reason is justified, the respective solutions are sought, for the student to be able to acquire the amount of the missed studies and pass the missed formative testing.

Every year, RTA requests data from the State Employment Agency on RTA graduates who are registered as **unemployed** persons. RTA also analyses the graduate monitoring data collected by the MES, which are available on the MES home page: Studies in the thematic group of engineering

(https://www.izm.gov.lv/lv/media/11031/download), brief description of college and bachelor graduates (https://www.izm.gov.lv/lv/media/2116/download) and a brief description of doctoral and master's degree graduates (https://www.izm.gov.lv/lv/media/2113/download). The data of the Ministry of Education and Science show that the employment of RTA bachelor's and college graduates exceeds 80%, and employment in higher qualification professions also exceeds 65%. The income of engineering, production and construction bachelor graduates is the third highest among seven higher education institutions, at the same level with RTU and LLU graduates in this field.

Statistical indices of the academic staff are also important for the quality of the study process. The most important of them are the elected and unelected academic proportion in the study programme as well as the proportion of academic staff of RTA having a PhD degree – generally and in the study field, especially in academic and doctoral study programmes.

There are mechanisms to obtain feedback while working with students, graduates and employers. According to the procedures specified in the annual self-assessment procedure of the study fields and the corresponding study programmes of RTA and approved by the Study Council, there are organised surveys of students, graduates and employers to ensure feedback. Information acquisition mechanisms:

- From students: anonymous questionnaires at the end of each semester; individual conversations with the director of a study programme;
- From graduates: firstly, sending centralised electronic questionnaires, which are later summarised by the Department of Studies and evaluated by the SF Council; secondly, the programme director conducts telephone surveys calling former students 1 year after graduating from RTA and asking 5 questions:
- Where do they work, their position, do they study?
- What is the evaluation for the study programme, its study courses and the level of teaching (0-10) in general?
- What was the most useful in the study programme (what is needed further at work)?
- What else should be included in the study programme?
- What was superfluous in the study programme and what are the main shortcomings?

After a year, graduates have already become professionals in the industry, so they see and are clearly aware of the shortcomings and the good in their education. An open, honest 10-15 minute conversation with them enables getting the most important information to improve the quality of the study programme. Graduates' recommendations are definitely taken into account. For example, according to the results of the graduates' survey, the programme Mechatronics is changed every year, which ensures its topicality and demand in the labour market.

- From employers: the latest developments, vacancies, opportunities of traineeships and development of theses in the company, shortcomings in the training of specialists, and other issues are discussed during every meeting with them in the company, RTA premises, seminars, public events or non-formal events in the industry. An open, honest conversation between the programme director and an entrepreneur allows to understand the wishes of the companies in the field of specialist training and shortcomings in the study programme. Such personal contacts facilitate cooperation between RTA and the company, allow to solve many problems related to the study process much easier and faster.

RTA monitors so that the respondents receive summarised feedback on the results of the surveys. Department of Studies of RTA prepares informative announcements about centralised surveys publishing them on RTA home page or sending to respondents.

See the information about the outcomes of the surveys in Annex 9.

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

Information about the study direction and the corresponding study programs is available on the RTA website and the LAIS system (see Table 2.2.5.1)

Table 2.2.5.1

Information about the study field and programmes of the study field

Information	Website	Type of access	Responsible
Study programmes implemented by RTA	RTA home page: LV - https://www.rta.lv/rta_istenotas_studiju_programmas ENG -https://www.rta.lv/engineering_faculty	free access	The specialist of the study process of the Department of Studies of RTA
Self-evaluation reports of the study fields of RTA (until 2018)	RTA website https://www.rta.lv/pnzs	free access	The specialist of the study process of the Department of Studies of RTA
Study Programme Register of RTA , study plans	LAIS: https://luis.lu.lv/pls/lu/stud.menu?l=1&mn=K	Authorized users	The Chief specialist of the study process of the Department of Studies of RTA
ECTS catalogue of study programmes corresponding to SF	RTA home page: ENG-https://www.rta.lv/uploads/source/content_LV/sadarbiba/%C4%80SD/ErasmusPlus/ECTS_catalogue_2021-2022.pdf	free access	External Relations Coordinator

Information on current issues in the field of laser technologies is available on the website “RTA Physical Processes and Laser Technologies Research Centre” (http://lazers.rta.lv/en/), which also has up-to-date information about projects, summer schools, commercial offers, etc.

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.

To ensure the study process successfully, Rezekne Academy of Technologies uses both state budget grants and private funds. Since the establishment of the higher education institution in 1993, the financial position is assessed as stable. Revenue consists of:

- a grant from general revenue,
- tuition fees for higher education,
- funding of the EU structural funds,

- participation fees in seminars, conferences, courses,
- student hostel services,
- other operating income.

Expenditures are planned in proportion to the revenue in the budget. The main items of expenditure are:

- employee remuneration,
- maintenance expenditure and utility bill payments,
- material expenditure of the study process,
- purchase of new equipment,
- reconstruction and repairs of premises.

When planning the expenditure of study fields, the respective amount of funding from the state budget is allocated for the implementation of study programmes, as well as a percentage of the forecasted income of the study programme (tuition fees and other payments related to the study process) is provided. Thus, a stable quality of study programmes is ensured.

See Table 2.3.1.1 for the annual financial provision for study programmes of RTA in the study field Mechanics and Metalworking, Heat Power Industry, Heat Engineering and Mechanical Engineering. The total funding consists of both the state budget funding and RTA's own revenues.

Table 2.3.1.1

Funding of the Study Field “Mechanics and Metalworking, Heat Power Industry, Heat Engineering and Mechanical Engineering”

Funding	2016 EUR	2017 EUR	2018 EUR	2019 EUR	2020 EUR	2021 EUR
State budget funding (excluding funding for scholarships)	415 829	493 827	518 209	534 529	491 485	476 644
Own revenues – tuition fees of the SF’s students	11 824	13 460	11 685	15 113	8 260	8 260
Total funding	427 653	507 287	529 894	549 642	499 745	484 904

See Table 2.3.1.2 for funding for the study programmes implemented in the SF (excluding study programmes intended for closure). The doctoral programme Laser Technologies has just been licensed, so there are no data on funding for 2021.

Table 2.3.1.2

Funding for implementation of the study programmes

Funding	2016 EUR	2017 EUR	2018 EUR	2019 EUR	2020 EUR	2021 EUR

Mechanical Engineering	-	63 949	86 781	144 607	158 209	169 042
Mechatronics	138 244	168 162	176 042	183 341	184 145	196 754
Laser Technologies (master's)	20 397	21 316	22 315	42 607	42 794	45 725
Laser Technologies (doctoral)	-	-	-	-	-	

According to the RTA Senate 28.04.2020. approved regulations "RULES ON THE PRINCIPLES OF ALLOCATION OF SCIENTIFIC FUNDING AT Rēzekne ACADEMY OF TECHNOLOGY (RTA)" funding of the science base and funding of scientific activity (performance) is not divided by study fields, but in accordance with the decision of the Senatet directed to the provision of the scientific activity of RTA (remuneration of scientific staff, business trip expenses, grant financing, database subscription, capital expenditures) and scientific institutes, in which the academic staff employed in science represents different study fields. See Table 2.3.1.3 for the yearly breakdown of funding for science base and funding for research activities (performance).

Table 2.3.1.3

Funding to ensure research (creative) activity of the academic staff of RTA

Funding	2016 EUR	2017 EUR	2018 EUR	2019 EUR	2020 EUR	2021 EUR
Funding of the science base	152 622	194 774	209 367	190 347	191 094	151 788
Funding of national research programmes	56 619	77 401	87 065	91 916	326 952	188754
Performance funding	87 738	39 843	138 087	104 009	80 480	29 569
Other revenue from the state budget	36 531	10 000	-	-	-	-
EU structural funds	345 945	786 571	1 143 562	347 690	90 712	184 820

Revenue from contract work with legal persons of the Republic of Latvia	53 011	14 841	21 536	12 182	28 488	17 217
Total funding	732 466	1 123 430	1 599 617	746 144	717 726	572 148

The funding for the acquisition of RTA's library collections (see Table 2.3.1.4) is not divided by study fields, because often students of several study fields use the library resources within the study process. There is a cyclical update of the most important literature within each course, but the most relevant additional literature items are updated regularly.

Table 2.3.1.4

Funding for the acquisition of RTA's library collections

Expenditure on acquisition of library collections	2016 EUR	2017 EUR	2018 EUR	2019 EUR	2020 EUR	2021 EUR
Periodic expenditure	3 814	2 940	3 009	3 333	3 369	2918
Books	11 402	12 102	8 206	7 419	12 407	6891
Electronic documents and databases	16 166	19 184	15 828	7 086	2 930	5424
Total:	31 382	34 226	27 043	17 838	18 706	15233

Funding for the Students' Self-government is provided annually in the amount of at least one two hundredth of the state funding for the study process and tuition fee revenues and fluctuates around twelve thousand EUR a year (see Table 2.3.1.5).

Table 2.3.1.5

Funding for Students' Self-government

Funding	2016 EUR	2017 EUR	2018 EUR	2019 EUR	2020 EUR	2021 EUR
Funding for Students' Self-government	11 668	12 422	12 729	12 331	12 918	14 399

State budget funding for the study process	1 926 867	2 001 323	2 076 881	2 162 918	2 242 195	2 492 457
Tuition fee revenue	406 790	482 993	468 832	303 241	341 409	375 370
Total revenues from the study process	2 333 657	2 484 316	2 545 713	2 466 159	2,583 604	2 867 827
Students' Self-government funding proportion,%	0.5	0.5	0.5	0.5	0.5	0.5

The 1st level professional higher education study program "Mechanical Engineering" is being implemented in the Līvāni branch. Financial resources are not allocated to the branch separately, the respective amount of financing from the state budget is allocated for the implementation of study programs (salaries of lecturers and general staff). Every year, the RTA Senate strengthens the funds necessary for the operation of the RTA Līvāni branch as a certain percentage of the forecasted RTA revenues (tuition fees, other payments related to the study process, rent of premises and other revenues), which are used for rent and other maintenance expenses. Thus, a stable realization of the study process is ensured.

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 infrastructure and material and technical base of the Faculty of Engineering of RTA fully ensures successful implementation of all the study programmes of the study field. The total value of laboratory equipment, computer equipment, presentation equipment and software available for the study field is approximately 4 million EUR. For full information on the infrastructure, software and laboratory base with the most important equipment available to the SF see the Annex.

The infrastructure of the Faculty of Engineering consists of: 1) a new faculty building (put into operation in 2014) with laboratories, workshops, lecture rooms, staff and student premises; 2) Information Technology Centre (computer rooms, electronic publications room, computer equipment service room, server room); 3) Laser Technology Centre (put into operation in 2019). In addition, the main building of RTA is used for the acquisition of study courses in social sciences and humanities. The premises of RTA Branch in town Līvāni are also used in the study programme Mechanical Engineering.

Information on laboratories of the SF, their area and total value of equipment is given in Table 2.3.2.1.

2.3.2.1.tabula

Laboratory base

No.	Laboratory	Total value, EUR	Area of the premises, m2
1.	CAD/ CAE/ CAM laboratory	512’000	153
2.	Mechanical workshop	40’000	53
3.	Physics laboratory	120’000	102
4	Laboratory of electrical engineering, electronics and electric actuators	215’000	130
5.	Laboratory for research of mechanical properties of materials	470’000	97
6.	Chemistry laboratory	626’000	130
7.	Ecology laboratory	394’000	99
8.	Mechatronics laboratory	347’000	75
9.	Laboratory of fluid mechanics and hydraulics	95’000	57
10.	Laser technology centre	274’000	323
11.	Laboratory of microbiology	141’000	60
12.	Human environmental health laboratory	9’000	31
13.	Ecotechnology laboratory	131’000	67
14.	Soil testing laboratory	105’000	77
Total:		3’479’000	1454

The equipment of all laboratories/workshops is freely available to every student, lecturer and researcher on working days from 7:30 to 19:30, at weekends from 7:30 to 17:30. 9 engineers and 5 laboratory assistants are involved in work with the expensive and specific laboratory equipment. They help students to carry out scientific research, develop and manufacture equipment prototypes in laboratories and workshops, as well as provide quality consultations on the development of course projects and engineering design projects. This staff provides support to lecturers during classes, and to researchers during their research, development, production and approbation of experimental test benches and prototypes. The Department of Information and Communication Technologies ensures administration and normal functioning of computer systems and computer networks of RTA; it has 7 employees (2 administrators of computer systems and computer network, 2 programming engineers, 1 programming technician, 1 computer system technician, 1 computer technician). The available software can be used freely by any student, lecturer or researcher. The equipment and facilities of all laboratories/workshops are the property of RTA. All buildings (study, laboratory, household), student dormitories and land (4.2 ha), on which they all are located, are the property of RTA.

Information on the lecture rooms available to the SF, their area and number of work places is given in Table 2.3.2.2. The premises of some laboratories are also simultaneously used as lecture rooms.

Table 2.3.2.2

Provision of Faculty of Engineering of RTA with lecture rooms

No.	Lecture room	Area, m2	Number of places
1.	Lecture room No. 105	158	96
2.	Lecture room No. 111	95	60
3.	Lecture room No. 112	61	30
4.	Lecture room No. 113 (Laboratory of fluid mechanics and hydraulics)	57	16
5.	130.auditorija	63	30
6.	Computer room No. 118 (CAD/CAE/CAM laboratory)	70	10
7.	Lecture room No. 132	70	30
8.	Lecture room No. 013	94	60
9.	Lecture room No. 015 (Laboratory of electrical engineering, electronics and electric actuators)	130	36
10.	Lecture room No. 308 / conference and presentation hall	106	50
11.	Lecture room No. 102	64	30
12.	Computer room No. 201	44	10

13.	Computer room No. 203	109	20
14.	Computer room No. 204	99	20
	Total:	1220	498

All the lecture rooms are equipped with interactive whiteboards (8 pcs.) or multimedia projectors (10 pcs.). The total number of computers at the faculty (excluding library) that students can use in the study process is approximately 100 and most of them are connected to the internet. Given that the total number of students at the Faculty of Engineering (including part-time students) is about 600, it can be concluded that the number and area of the existing laboratory and lecture room premises, the number of workplaces, computers and presentation equipment in the faculty fully meet the needs of the study process. Wi-Fi is freely available everywhere. All rooms are accessible for the persons with disabilities.

All RTA laboratories and equipment in Rēzekne are also freely available to the students of the Līvāni branch. As most of the students of the Līvāni branch work in the industry, classes are organised for them on weekday evenings, Saturdays and Sundays. Lectures and practical works that do not require laboratory equipment take place in the premises of the Līvāni branch (lecturers go to Līvāni from Rēzekne). Practical works with laboratory equipment take place in Rēzekne on Saturdays and Sundays (students go from Līvāni to Rēzekne; classes take place all day long; students have on average one trip to Rēzekne per week). The Līvāni branch has a computer room with all the necessary specialised software (SolidWorks, Comsol, Matlab, etc.), which is used by students for practical classes and independent work. Students receive license codes for this software for the semester (or year) and install them on their personal computers. This made it much easier to run many study courses remotely (without losing quality) during the Covid crisis.

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.

The RTA library has been located in the Faculty of Engineering building since 2014. The library offers its users comfortable facilities – the reading room, borrowing, rooms suitable for individual work – for independent studies and research. The total area of the library is 459 m^2, which provides 30 workspaces for the users.

The library collection corresponds to RTA study programmes and fields. The total size of the collection is 55041 copies. The latest literature in the corresponding spheres is acquired on a

regular basis; the majority of the funding intended for such acquisition is used for specialised literature in the English language. In accordance with the Procedures for the Acquisition of Literature, literature request lists are submitted to the library on a regular basis. To make the requesting process easier and faster, a special Library Collection Expansion Form has been created, which is available in an electronic form in the RTA document management system. Books purchased or issued as part of projects make a significant contribution to the collection. Database subscription is decided on during RTA Scientific Council meetings after getting acquainted with the Database subscription price offers and the usage statistics from previous periods. Inter-library loan services are available to the library users.

In the academic year 2020/2021, the library offered its users the following databases: iFinanses, iTiesības, Latvijas Standartu bibliotēka, BilancePLZ, EBSCO, ScienceDirect, Scopus, Web of Science, ASTM Compass Abstracts, Digital collections of LNB (https://www.rta.lv/library_online_databases). Database trial subscriptions are also offered, for example in academic year 2019/2020 there were 13. Databases can also be used remotely. In 2020, database usage was 31592 sessions. To enable students to learn about the RTA library e-resources, their use and availability, the library offers classes and individual consultations. The library offers testing the e-resources of different foreign publishers on a regular basis.

In the RTA library's electronic catalogue, it is possible to select literature in the sphere of interest. For the users' comfort, the library website has the e-resources section, which contains the summary of links which provide access to databases, scientific articles of RTA and other higher education institutions, open-access resources, and e-books.

The RTA library uses the Latvian Library Information System ALISE for keeping record of its collection, which ensures remote access to the library catalogues and a variety of options to search for information, as well as ordering /reserving items for authorised users. The library e-catalogue website allows logging into the Unified Catalogue of Higher Education Institutions and Special Libraries, the Unified Catalogue of the Rēzekne Region, the National Unified Catalogue, which allow searching for and ordering the necessary resources, which is possible using the interlibrary loan option.

The library is open on business days from 9:00 until 17:00/18:00. Every year, following the proposal of master's / part-time students or the management of the study fields, the library also serves readers on Saturdays; however, these hours are not regular but adapted to current demand and return to normal working hours when the actual demand subsides.

See the SF book supply in Table 2.3.3.1.

Table 2.3.3.1

Study field's book supply on 01.04.2021.

Field	RTA library collection		
	Number of titles (total)	Number of copies (in the Latvian language)	Number of copies (in foreign language/ English)

Mechatronics	197	337	189/68
Technical sciences	634	1142	735/264
Physics	195	482	257/35
Mechanical Engineering	58	131	48/6
Environmental Protection	450	1175	477/220
Biochemistry. Biophysics	19	10	18/13
Laser technology	22	6	34/7

The book collection is expanded on a regular basis; information on the most recently acquired books can be found on the RTA home page https://www.rta.lv/biblioteka_jaunieguvumi.

RTA is persistently working on ensuring unrestricted access for students to the broadest information possible about the study process and content. The most significant information sources available to students at RTA include:

1. Latvian Higher Education Institution Electronic Information System (LAIS), which contains the following information available to students: descriptions of study courses, study plans, class schedules, any changes in them, students' grades, information about orders related to the study process (matriculation, exmatriculation, scholarships, etc.). The LAIS environment also has an integrated plagiarism control system where students' final papers are tested.
2. Electronic learning management website in the Moodle system ekursi.rta.lv, which provides access to study course programmes, learning outcome evaluation requirements, lists of recommended literature, study course learning materials. The system is improved every year.
3. The scientific journal and article collection website jornals.rta.lv, where RTA conference article collections and journals are uploaded with open access.
4. The materials of the annual RTA international scientific conference "Environment. Technologies. Resources", which are available with open access at the website *rta.lv*.
5. The library of books newly published by RTA and available electronically at *rta.lv*.

The students of the Līvāni branch use the services of the RTA library on weekends, when they have classes in Rēzekne. The director of the study programme informs about the head of the library, who ensures the availability of the library on the specific Saturdays or Sundays. Access to RTA subscribed databases and other electronic resources is possible not only from the RTA or the Līvāni branch computers, but also from students' home computers at any time. Līvāni City Library is also available to students on weekdays; funding for regular replenishment of its stocks is provided by Līvāni District Council.

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.

In the study process, RTA uses the Moodle system. Regulation on the RTA Lecturer stipulates that each study course the lecturer designs a description of the study course in accordance with the provisions approved at the RTA Study Council "Provisions on Designing Study Course / Module Descriptions at RTA", study course materials, which cover the theoretical material of the study course, student self-examination tasks, independent work tasks, and learning outcome evaluation criteria/materials. The lecturer uploads study course materials to the study course website ekursi.rta.lv, following the Methodological Recommendations for the Creation and Maintenance of the Study Course Content on the Website ekursi.rta.lv approved by the RTA Study Council, which include a prepared study course template, including survey forms, which the member of teaching staff can use for obtaining feedback at the end the study course, which helps the teaching staff to create study courses in *Moodle*. In accordance with the RTA Rector's order, student attendance is also recorded in Moodle.

In the circumstances of remote studies, to implement contact hours (lectures, practical classes, incl. laboratory works, if these can be implemented remotely, consultations, discussion clubs, forums, etc.) and virtual mobilities, RTA uses communication tools *Ms Teams* or *Google Meet* (if *Microsoft Teams* is unavailable). RTA has designed methodological recommendations for the teaching staff and students for work in the *Ms Teams* environment. If necessary or upon individual request, RTA provides trainings, individual consultations, or technical support for work in the *Moodle* or *Ms Teams* environment. Ms Teams platform is widely used for remote study course management, including the implementation of hybrid classes (where some students are present in the classroom and others are studying remotely from home), for videorecording of classes, and providing all types of consultations. In the circumstances of the Covid-19 crisis, it was also used for the defence of traineeships/ study projects/ diploma papers. Interactive whiteboards are widely used in conjunction with *Ms Teams* (for example, practical classes, task performance, and remote consultations); any issues that are not clear to the students are explained on the board, and at the end of the class the data are saved in the PDF format and uploaded to the *Ms Teams* platform, where they are freely accessible to the students.

To learn about the needs of the teaching staff when working with the communication platforms determined by RTA, RTA conducts surveys encouraging the teaching staff to express their suggestions regarding the required support measures. Overall, 20 members of teaching staff responded to the survey conducted in September 2021. 12 respondents said that additional training and consultations were not required, thus appreciating the methodological materials and instructions prepared; 8 respondents were provided with individual consultations or technical support for work with the *Microsoft Teams* environment. Regarding work in the *Moodle* environment, no requests have been made for a seminar or an individual consultation.

The use of ICT developed especially extensively during the Covid-19 crisis, when each docent had to teach classes remotely, provide students with methodological learning materials and independent work tasks, implement consultations and test the students' knowledge remotely.

The LAIS system is accessible to students and docents via a username and password; it contains all the information regarding the study process: evaluation and credits for the courses acquired, class schedule, study course programmes; it enables registration for elective courses, registration with study project, diploma project, and traineeship supervisors, etc.

SolidWorks, Comsol, C++ and other software licence codes are available to all students; they install

this software on their own computers; this allows doing independent work at home and organising practical classes remotely, which is especially important in the circumstances of Covid-19.

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.

RTA academic staff planning issues are regulated by the RTA Activity and Development Strategy 2016–2023, and the RTA Academic Staff Development Measure Plan 2018–2018. Other issues related to the planning of the academic staff of the RTA are regulated by Regulation on the RTA Lecturer, Rules for Planning, Accounting, Control and Payment of Teaching Methodological Developments and Scientific Research, Procedures of Planning and Accounting of the Amount of Work of RTA Academic Staff, Procedures of Evaluation of the Quality of Work of Academic Staff of the RTA, and other documents. The most important criteria for the selection of academic staff are scientific and professional competence.

RTA assistants, lecturers and docents are elected for six years in accordance with the requirements of the Law on Higher Education Institutions. Professors and associate professors are elected for the first time for a term of six years, providing for the conversion of a fixed-term contract into an open-ended contract after evaluation of compliance for the position within the term set by RTA. All job advertisements for vacancies of academic staff are announced in an open competition, published in the Official Gazette “Latvijas Vēstnesis” and other reference media. Applicants' compliance with the announced vacancy is assessed in accordance with the Regulations on Academic Positions at RTA. RTA publishes advertisements on the Euraxes portal to attract foreign teachers.

An important direction of professional development of the academic staff is doctoral studies. The study field purposefully plans development of the academic staff, including promoting the strongest graduates of the master's programme to continue their studies in doctoral studies. The lecturer Dainis Kļaviņš is currently elaborating his doctoral dissertation in Daugavpils University in the doctoral study programme Solid-State Physics. The RTA doctoral study program Laser Technology, the implementation of which commenced in 2021, will enable lecturers of the study field to obtain a doctoral degree here in Rezekne.

Since 1 December 2018, two SAM 8.2.2. projects that provide for involvement of foreign lecturers within the project, as well as involvement in the academic work after implementation of the project. Within the study field of this project, Jade Hochschule (Germany) professor Dr. Ing. Josef Timmerberg, Professor of Technical University of Gabrovo (Bulgaria), Dr. Ing. Tsanko Karadzov.

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.

RTA quality management policy determines quality principles, including:

- Staff involvement and development – employees have a similar value system, mutual trust and a sense of responsibility. RTA invests resources in the professional development of employees and stimulates them to become more involved in the operation and development of the institution. RTA assesses the professional competence of employees and compliance with satisfactory execution of duties, supports and motivates the improvement of professional qualification, career development, provides social guarantees. RTA promotes employee cohesion and the creation of a unified corporate culture.
- Continuous learning and improvement - introduction and utilization of new, innovative technologies, mutual exchange of knowledge, introduction of innovations and improvements. Employees are introduced and trained to work with new and innovative technologies, which are used at work and increase the competitiveness of RTA.

The academic staff development guidelines of RTA define the main processes related to the development of the academic staff:

- Student-centred study process;
- A research process focused on public demand for the creation of innovative products and services;
- A communicative process involving the exchange of knowledge and innovation at inter-university level, effective international academic and research cooperation;
- A technological process aimed at the availability of high-quality, science-based higher education, introduction of new modern technologies in the study and research process.

The qualification assessment of the teaching staff of the study field takes place in several stages: the compliance with the formal requirements of the specific position is assessed when concluding an employment contract; student surveys on the competence and professionalism of the teaching staff are organised during the study process. In all cases, compiled feedback information on the results of the surveys is prepared and sent to both students and teaching staff.

Academic staff of a SF is selected to implement the aims of the study programmes and achieve the set study results. Both elected lecturers and guest lecturers are employed for a SF. Lecturers-practitioners with extensive professional work experience in the field are involved in the implementation of study field programmes:

- Lecturer A.Igavens conducts study courses related to metal working, CNC, CAD, CAM technologies, maintenance and repairs of CNC machine tools; is employed as an engineer and laboratory manager at SIA Promold (manufacture of fabricated metal products); 20 years of experience in the industry.
- Lecturer D.Kļaviņš teaches courses related to microcontrollers, robotics, telecommunications and laser technologies; is the owner and manager of the company SIA DKRobotics, which is engaged in the design and production of laser equipment and CNC machine tools; 15 years of experience in the industry.
- Prof. L.Litavniece teaches study courses Production Organization and Planning, Innovation Management, directs the development of the economic part of students' diploma papers and engineering design projects; 7 years of experience in the banking sector; 5 years - RTA project department manager; owner and manager of the company SIA Safīra L (food processing), member of the Council of Rezekne Association of Entrepreneurs, member of the Latgale Regional Council of the Latvian Chamber of Commerce and Industry, member of the Knowledge Economic Council of the Latvian Chamber of Commerce and Industry.

- Professor I.Arbidāne teaches accounting and human resource management study courses, 26 years of professional work experience in the field, practicing accountant and Dean of the Faculty of Economics and Management.
- Lecturer M.Kijaško leads the study course Computer Networks and other IT related study courses, 20 years of professional work experience in the IT industry.
- Professor A. Teilāns teaches courses related to automatic control and regulation, the total work experience in the IT sector is 25 years; from 1992 to the present: employed as a programmer, systems analyst, senior project manager and head of academic cooperation at A/S Exigen Services Latvia (previously named as SWH RIGA, SIS and Data).

Attracting professionals from the industry facilitates students' interest in studies and significantly improves the quality of studies. For full information on the length of professional service and experience of lecturers in the field, see Annex 14 and their CV in Annex 11.

The qualification of the teaching staff of RTA is assessed and increased in several ways:

- Once in the election period, the elected academic staff must complete a professional development programme *University Didactics* or *Innovations in Higher Education* in the amount of 160 hours. The programme also offers courses for personal development, scientific writing, other topical issues of higher education: student-centred approach, quality management, etc.
- All teaching staff has an opportunity to apply for an evaluation of the quality of work carried out by the academic staff (this is a voluntary measure), which provides for the determination of the quality coefficient, which is applied to the next year's salary. Starting from 2018, the indicators of the work quality of the teaching staff have been aligned with the principles of the student-centred approach, evaluating the contribution of the teaching staff to the increase of the student's academic, scientific and professional competence.
- Within the framework of the RTA project No. 8.2.2.0/18/A/0168: “Strengthening of RTA academic staff in the study field “Mechanics and metal working, heat power industry, heat engineering and mechanical engineering” and “Management, administration and real estate management”, the lecturers involved in the study field can increase their English language skills, acquire digital skills and leadership competencies, as well as carry out internships for up to 200 hours, thus improving the professional competencies corresponding to their field, which will later be approbated and introduced in study courses.
- Lecturers and engineers of the study field regularly increase their qualification by attending industrial exhibitions in Riga, Hannover, Munich, Frankfurt am Main, Prague, etc. Over the last 6 years, visiting of foreign exhibitions has been organised for groups of employees (7-10 people) and financed by the project funds (travel, accommodation), but exhibition tickets have been usually presented by cooperation partners – Festo, Trumpf, Coherent, LaserLine, etc., who introduce their latest products, technologies and demonstrate them all in action to SF lecturers and engineers, as well as give detailed replies to questions of interest. Usually, these visits are also coordinated with visits to foreign partner universities, enabling the group of lecturers to meet colleagues of a particular foreign university in person, get acquainted with their research, organisation of the study process and laboratory base. The acquired knowledge and established contacts are further used to improve the study and research process.
- Projects related to infrastructure development are always provided with funding for training in the use of purchased equipment (e.g. CNC machines for metalworking, laser equipment, vacuum sputtering equipment, welding equipment, 2 Festo laboratories, laser scanning microscope, etc.). Training for RTA staff is led by Latvian or foreign specialists. This allows to involve immediately the new, modern equipment in the study and scientific process. In this

way, the qualification of lecturers is increased and the quality of the study process is improved, which promotes the attraction of a larger number of students (including foreign ones).

- The involvement of lecturers and students in projects increases the professional qualification of the project participants and promotes the development of the study process (see examples in Chapter 2.4.2). In projects, students and lecturers learn to work in a team, new products are developed and prototypes are made together, and issues related to the commercialisation of these products are addressed. All this motivates students and lecturers to think about starting their own businesses. Working on projects also provides additional competitive salary. In turn, in order to get involved in projects, both lecturers and students need appropriate professional competence.
  The new knowledge and skills, which can be acquired as well as professional competencies and opportunities that increase salary motivate lecturers to participate in these events.

  Indicators have been developed to assess the added value of the opportunities used (for implementation of the study process and for quality of studies), the most important of them are:

  1) dynamics of the number of students;

  2) number of foreign students;

  3) employment of graduates;

  4) the number of companies established by graduates;

  5) matriculation competition coefficient;

  6) the amount of attracted financial resources;

  7) the percentage of the academic staff with a doctoral degree;

  8) scientific qualification of the academic staff;

  9) the number of defended doctoral theses;

  10) the number of patents obtained and licenses sold.

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.

46 lecturers are involved in the implementation of the study programmes of the SF. Of them, 27 (59%) lecturers are elected to the RTA academic or scientific positions, 19 (41%)- are non-elected to the RTA. 25 (54%) lecturers have a doctoral degree; 19 of them are RTA elected.

Distribution of RTA elected lecturers by positions:

- Professors- 5 (including, RTA-elected leading researchers- 5);
- Assoc. Professors- 4 (including, RTA-elected leading researchers- 3, researcher- 1);
- Docents – 5 (including, RTA-elected leading researchers- 5);
- Lecturers -8 (including, RTA-elected researchers- 4);

Distribution of RTA guest lecturers by positions:

- Guest Professors – 5 (including, RTA-elected leading researchers- 3, researcher- 1);
- Guest Assoc. Professors- 2;
- Guest Docents – 4 (including, RTA-elected researcher- 1);
- Guest Lecturers - 13.

25 lecturers of the SF are involved in the work of the Līvāni branch. They ensure the implementation of the study programme “Mechanical Engineering” both in the Līvāni branch and Rēzekne. For additional information about the lecturers of the study programme “Mechanical Engineering”, see Chapter 3.4.1.

46 lecturers are involved in the implementation of the study programmes of the SF. Of them, 27 (59%) lecturers are elected to the RTA academic or scientific position, 19 (41%)- are non-elected to the RTA. 25 (54%) lecturers have a doctoral degree; 19 of them are RTA elected.

Distribution of RTA elected lecturers by positions:

- Professors- 5;
- Professors- 4;
- Docents - 5;
- Lecturers -8;
- Leading Researchers - 16;
- Researchers - 7.

Distribution of RTA guest lecturers by positions:

- Guest Professors - 5;
- Guest Assoc. Professors- 2;
- Guest Docents - 4;
- Guest Lecturers - 13.

For full information about SF lecturers, see Annex 10. and for the lecturers' CVs – Annex 11. For the certification of SF lecturers' official language knowledge, see Annex 12, for the certification of SF lecturers' English language knowledge – Annex 13.

The regulations on types and amount of academic workload of the teaching staff, work planning, accounting and control procedures are regulated by the Procedures for Planning and Accounting of Work Amount of Academic Staff at RTA for the current academic year. The RTA procedures are developed according to the Cabinet of Regulation No. 445 Regulations Regarding Remuneration of Teachers and provide for a full-time workload of 900 hours per year for a professor and an associate professor, 950 hours per year for a docent with a doctoral degree, and 1000 hours per year for a docent without a doctoral degree, a lecturer, and assistant. The academic workload consists of teaching staff’s work in the lecture room, consulting students, supervision of study research and evaluation of learning outcomes.

Scientific work is a mandatory part of the academic staff’s work. It may be performed working as a scientist (leading researcher, researcher or scientific assistant), scientific technical personnel or scientific service personnel. The academic staff elected to the scientific position performs scientific work in accordance with the RTA Provisions for Planning, Accounting, Controlling and Paying the Workload of Scientific Work. The workload of the scientific work consists of scientific projects / contract work, scientific publications, study research (if the scientific staff is studying for a master's or doctoral degree) as well as expertise, evaluation and review of scientific work, assembly of scientific articles and material collections, scientific editing, etc. A scientist may be concurrently elected also to the academic position of a professor, associate professor, docent, lecturer or

assistant. RTA ensures that the total annual workload of the academic staff does not exceed the amount of hours specified in the Labour Law.

RTA full-time academic staff works a 40-hour week. In accordance with the Senate's approved Procedures for Planning and Accounting of Work Amount of Academic Staff at RTA, the total annual workload of the academic staff shall not exceed the amount of hours specified in the Labour Law.

The academic workload of SF staff, similarly as in RTA altogether, prevails over the amount of scientific work. It is determined by two aspects:

- in accordance with Latvian laws and regulations, the monthly base remuneration for one unit of scientific staff complies with 50 % of the lowest rate of the monthly salary of a professor, and it is a poor motivation for the teaching staff to participate in scientific research work actively;
- scientific activity is combined not only with the pedagogical workload, but also with professional activity in the field or administrative duties at RTA, which limits scientists' ability to participate in large-scale research projects.

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

In order to ensure a successful higher education environment, RTA provides both physical resources (laboratories, workshops, libraries and IT infrastructure) and human resources (teaching staff, study consultants, engineers, and laboratory assistants). To support students otherwise than by means of structural units of Administration (Dean's offices, Department of Studies, Department of Science, External Relations Department, etc.), RTA offers:

- individual services of a psychologist concerning such psychological issues as organisation of personal studies, mutual relationships and other issues related to studies and communication in the study process. RTA offers individual and group classes. Communication, relationship building, skills and self-image improvement group classes – trainings are available. A practicing psychologist offers its services. Consultations are free for RTA students;
- individual career counselling services thus helping students to identify their interests, skills, abilities and values, deepen understanding of the career choice, professional suitability; inquire about the peculiarities of personality and the profession; to obtain topical information regarding career issues; receive support for successful career planning; to ascertain the choice of the right profession for oneself. In regards to the career choice, RTA offers individual and group classes delivered by a certified career counsellor. Consultations are free for RTA students; In addition to individual career counselling, RTA provides an RTA Career Portal, where information on traineeship, work and volunteering opportunities is regularly published;
- an opportunity to create an individual study plan for independent learning supported by RTA on conditions when due to work or family circumstances the student is unable to adjust to the general study schedule. This possibility is prescribed by the RTA Student Rules and Regulations.

At the Faculty of Engineering of RTA, a mentor (usually the programme director) is linked to the 1st year student groups, who helps students to integrate into the academic environment easier. Each lecturer provides official consultations once a week, when students can receive help with uncomprehended questions from the study courses delivered by the lecturer.

RTA always follows the principle which implies that the most important person of the higher education institution is the student; all aspects of the work process shall be organised in such a way that is convenient and comfortable for the student. All employees of RTA follow this principle. Considering that the number of students is relatively small, every student of the Faculty of Engineering has an opportunity (without making a prior appointment, almost at any time when the employee is not busy in classes or meetings) to receive consultations from laboratory technicians, engineers, lecturers and administrative staff on issues concerning the studies and scientific activities of the student, as well as the use of laboratory / workshop's machinery and equipment, etc.

All buildings of RTA are adapted to needs of students with reduced mobility. In order to inform the teaching staff about the impact of disability on the study process, in 2021, MIC of RTA organizes a cycle of professional development classes Disability Awareness and Communication in Education, thus exploring such themes as disability awareness and experience, communicating with and about people with disabilities, disability – lectures and classes, why it is useful for academic staff to include diversity and disability in classes and lectures, and other issues of interest to students and teaching staff.

In 2020 and 2021, the main attention is paid to support of students in conditions of remote studies, organising informative and consultative measures for work in the e-environment.

All of these events are also applied to foreign students. The International Office of the RTA is intended to provide support for foreign students.

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).

As a scientific institution, RTA was registered with the Latvian Register of Scientific Institutions in 2013 (reg. No. 1172165). The aims of scientific activity are determined by the “Strategy of Scientific Activity of RTA 2019–2023”; those are:

- excellence in research, ensuring transfer of innovation and knowledge to business environment and economic development;
- synergy between research and pedagogical work, ensuring the training of high quality competitive specialists;
- popularization of research results and recognition of scientists through international scientific conferences, seminars, discussions and other public activities in the fields of engineering, education and social sciences;

- focusing on research and innovation policy goals defined by the EU – open innovations, open science and openness to the world;
- collaboration between staff, students, alumni and partners of all levels, institutes and fields of activity;
- effective administrative and financial management at all levels, ensuring targeted and efficient use of resources for implementation of high quality studies and excellence-focused research.

https://www.rta.lv/uploads/source/content_LV/zinatne/RTA_Zinatniskas_darbibas_strategija_2019-2023.pdf

Research at the Faculty of Engineering is coordinated by the Institute for Engineering of RTA. The goal of the Institute is to carry out research in the domain of engineering science and technology, perform contract research works in engineering science and associated interdisciplinary domains in order to ensure research and scientific activities, availability of research-based higher education, transfer of knowledge to national economy and cooperation with the production industry to conduce economic growth across Latgale, Latvia and Europe. Areas of activity of the Institute:

- electronics, power electronics, information and communication technologies;
- laser technologies;
- mechanical engineering and mechanics;
- material engineering;
- environmental engineering and power industry;
- other engineering sciences and technologies, including food and beverage technologies.

The scientific subject area of the SF is in line with the fields of concern of the Institute for Engineering. A considerable share of teaching staff of the SF is comprised of employees of the Institute for Engineering.

Once in every two years, the Faculty of Engineering of RTA hosts an international scientific and practical conference "Environment. Technology. Resources". The 13th conference took place on 17 and 18 June 2021. Having accepted 157 articles, it was attended by scientists from 10 countries (Belarus, Bulgaria, Estonia, Italy, Russia, Latvia, Lithuania, Poland, Germany and Turkey). The collection of articles of the conference is indexed within the SCOPUS database. These articles are freely available at the RTA`s website http://journals.rta.lv/index.php/ETR.

Each year, the RTA Faculty and Engineering holds an international scientific and practical student conference "Human. Environment. Technology." 21 April 2021 was the date of the 25th conference. The collection of articles of the conference is available at http://journals.rta.lv/index.php/HET.

To strengthen the scientific capacity of RTA, there was developed a joint doctoral study programme Laser Technologies (RTA, "Angel Kanchev" University of Ruse in Bulgaria). The Activity and Development Strategy of RTA 2016-2023 determines implementation of full-cycle studies as the priority development objective for the study field, which also includes cooperation with other higher education institutions both in Latvia and abroad in terms of developing joint study programmes. The doctoral study programme ensures involvement of international academic personnel with doctoral degrees, renewal of the RTA`s academic staff, as well as conduces the synergy of studies and research within the study field. This programme facilitates the transfer of knowledge of laser technologies to the production industry, promoting the development of Latvian national economy. The programme is implemented through the involvement of leading academic personnel from both education institutions; this conduces the transfer of knowledge to the academic environment.

Cohesion between the study process and research in the domain of public information is further evidenced by active participation of the teaching staff and students in the annual events of the

European Researchers' Night. Examples to provide an insight into the activities of the latest few events can be found here: https://www.rta.lv/aktualitates/2076, https://www.rta.lv/aktualitates/1579/.

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.

One of the core objectives set by the RTA Strategy is the implementation of science-based study process. Scientific research is closely correlated with the study process. Scientific research is addressed by the core study programmes (Mechanical Engineering, Mechatronics) as early as during the first year of studies; the principles are taught within the boundaries of the Principles of Research subject. A mandatory requirement for all term papers, qualification theses and the engineering design project is to study the scientific literature sources on the issue in question. Bachelor, master and doctoral study programmes always include scientific research as a prerequisite to obtain a diploma. Course projects done within the boundaries of the programme Mechatronics (Design of automatic control systems, Computed control system design) can be deemed a start of the students' scientific and research work, which they continue to develop in their engineering design projects. The programme Mechatronics is intended to culminate in the defence and publication of an engineering design project (or a patent application). Development of a master's thesis in laser technology is a research project (commonly production-related); publication of the results of their research (publication or a patent application) is a mandatory requirement for master's degree students to be granted a diploma. The doctoral programme in laser technologies is based on scientific and research work; a doctoral dissertation cannot be defended without publications in internationally quoted periodicals and journals.

Students are involved in the development of scientific projects. For instance, in the "Integration of Safe Technologies for Protection from Covid-19 in Healthcare and High Risk Areas" project of the Government Research Programme "Mitigation of Consequences of Covid-19", RTA coordinated the implementation of WP4 "Automated and Robotised Equipment for Air and Surface Disinfection". Project implementation period 01.07.2020 - 31.12.2020. Project funding 497’581 EUR. Project partners: Riga Technical University (the leading partner), Rezekne Academy of Technologies, Institute of Atomic Physics and Spectroscopy of the University of Latvia, Institute of Electronics and Computer Science, Latvian Institute of Organic Synthesis, Institute of Solid State Physics of the University of Latvia, Latvian Biomedical Research and Study Centre, Riga Stradiņš University, Latvian State Institute of Wood Chemistry. RTA was represented in this project by 7 persons, 4 of whom were students (3 from the Mechatronics program, 1 from the master's programme in laser technology). Over the course of this project, 1 student developed his own engineering design project in mechatronics, 1 produced a Master's Thesis in laser technology, 1 student continued pursuing this line of research after completion of the project and intends to defend an engineering design project in mechatronics in January 2022. https://vppcovid.rtu.lv/par-projektu/

The annual RTA Research Grant allocates small funding (1’500 to 2’000 EUR) to allow a broader community of students to become involved in scientific research. For example, many (25-30) students of the programme Mechatronics and the master's programme Laser Technologies took part in the following projects over the last few years:

- "Material Impact Resistance Testing Bench I, II";

- "Robotic Arm for Grabbing Soft and Fragile Objects";
- "Development of Composite Carbon Fibre and Fibre Plant Materials for the Production of High-Strength Parts";
- "Increasing the Impact Resistance of Composite Materials";
- "Interdisciplinary Research for the Application of Laser Machining (Laser Engraving, Laser Cutting) Technology in Textile Materials";
- "Use of 3D Printing Technology in Textile Product Design";
- "eNose for IoT devices", "Use of 3D Printing Technology in the Production of Prototype Orthoses", etc.

Based on these projects, the students have developed their own term papers, and some went as far as to produce their engineering design projects and Master's Theses.

The teaching staff and students of the study field also cooperated in the performance of research ordered by local businesses. For example,

- Action programmes: "Growth and Employment", European Regional Development Fund project "Technology Transfer Programme" (project identification number 1.2.1.2/16/I/001) contract No. 9.17/2019-04-1 "On the development of a prototype CO2 laser labelling / cutting machine with automatic surface levelling" 31 January 2019. Voucher No.2 (valid through 04 January 2020, contracting authority: "DKRobotics" LLC).
- Event 1.2.1.1. "Support for the development of new products and technologies within the boundaries of competence centres" of the specific support purpose 1.2.1 "Increase the investments of the private sector in R&D" of the action programme "Growth and employment", subparagraph 1.3 of the project No. 1.2.1.1/16/A/003 "Development of a machine engineering competence centre" "Development of an Energy Efficient Wood Chip Dryer".
- Event 1.2.1.1. "Support for the development of new products and technologies within the boundaries of competence centres" of the specific support purpose 1.2.1 "Increase the investments of the private sector in R&D" of the action programme "Growth and employment", subparagraph 1.5 of the project No. 1.2.1.1/16/A/003 "Development of a machine engineering competence centre" "Development of a high-efficiency wood chip gasifier".
- Contract on research services between the Rezekne Academy of Technologies and the Institute of Horticulture for the development and production of a prototype nitrogen mill adapter (2017).
- Research contract No. 7.6.3 / 48-2016 between the Rezekne Academy of Technologies and "IRBIS Technology" LLC, development of 3 new mechatronic products, 8 April 2016 – 31 January 2018.

Several students (2 from the programme Mechatronics, 2 from the master's programme Laser Technology, 1 from the master's programme Computer Systems) also participated in the "Continuously variable transmission for micro-mobility vehicles" project of the Investment and Development Agency of Latvia (IDAL) (stages 1 and 2; 2020-2022; Funding at the 1st stage – 24'894 EUR, at the 2nd stage – 302'000 EUR). Within the boundaries of the project, the students work on the development of a new type of drive gear for electric go-carts; having studied the appropriate scientific literature, the students have developed and produced an experimental bench for measuring the mechanical and electrical parameters of go-carts, and now do test drives and measurements on the track, apply improvements to the design, produce parts and units, program the automatic control system. A patent application has been filed in. For students, this project serves as a real-life example of how research is transfused into innovation. https://www.rta.lv/arhivs?project_id=157

Participation of students in scientific research projects also yields a great improvement of the quality of the study process: students face real scientific problems that need to be solved, and develop genuine interest in these; they go through all stages of scientific work – from the study of literature sources and similar structures to the development of a complete prototype or technology.

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.

RTA participates in the development and implementation of various scientific projects. A brief description of these projects is provided below.

ERDF project "Support to international cooperation projects in research and innovations at Rezekne Academy of Technologies", No. 1.1.1.5/18/I/012. Project duration: 03.09.2018 - 31.12.2022. Funding 113’384 EUR. The aim of the project is to increase the research and innovative capacity of RTA, ensuring the participation of the scientific staff in international research, networking and fellowship events in the European research area and preparing at least five project applications of the programme HORIZON 2020 and the EU Ninth Framework Programme in the priority research areas of RTA, evaluated above the quality threshold. The funds allocate for the project were used to support the participation of teaching staff and researchers of the SF in international conferences, seminars at the project development stage; funding was provided to hold the international scientific conference “Environment. Technologies. Resources" in 2021.

RTA together with German partners - Hochschule Mittweida and Fraunhofer Gesellschaft zur Foerderung der Angewandten Forschung E.V prepared and submitted the project application “Latvia Laser Technology Center” for Horizon 2020 programme (Horizon 2020 - Research and Innovation Framework Programme, Call: H2020-WIDESPREAD-04-2017- TeamingPhase1). The project application was rated at 12 points (with the quality threshold being 10 points, to the maximum of 15). Unfortunately, this was not enough to gain support for the project. In spite of that, the teaching staff has acquired vast experience in the preparation of projects of this level, contacts have been established, and partners have been identified for future high-level scientific projects.

ERAF project: "Analysis of laser marking process parameters of new industrial materials for high-tech applications", No. 1.1.1.2/VIAA/3/19/474. Project duration: 01.04.2020 - 31.03.2023. The aim of the project is to obtain optimal technological parameters of the laser marking process of new industrial materials based on theoretical and experimental studies and mathematically describe the mechanisms of this process. Scientists from Bulgaria are involved in the project as partners.

Latvian Council of Science project: lzp-2019/1-0094 Application of deep machine learning and datamining for the study of plant-pathogen interaction: the case of apple and pear scab pathosystems. Project duration: 01.01.2020 - 31.12.2022. Funding 129’747 EUR. Partners: Latvia University of Life Sciences and Technologies, the Institute of Horticulture; RTA. Project tasks: 1) apply semantic analysis and datamining for studying the interaction between plants and pathogens: apple and pear scab pathosystems; 2) develop systems for timely identification of apple and pear scab; 3) develop an IoT system model for apple and pear tree monitoring.

The project NEW METRO embeddiNg kEts and Work based learning into MEchaTROnic profile / Uz

darbu balstītas mācīšanās iekļaušana MEchaTROnic profilā, No.600984-EPP-1-2018-1-IT-EPPKA2-SSA http://www.newmetro.eu/. Project duration: 01.12.2018 – 30.11.2021. Partners: Sistemi Formativi Confindustria SCPA (Italy), CIS Scuola Per La Gestione D'impresa Societa' Consortile A RESP (Italy), Lombardini SRL (Italy), FH Joanneum Gesellschaft MBH (Austria), Technologiko Ekpedeftiko Idryma IPIROU (Greece), Ministero Dell'istruzione Dell'universita' E Edella Ricerca (Italy), Federazione Sindacale Dell'industria Metalmeccanica Italiana (Italy) Hanse Parlament (Germany), Wyzsza Szkola Logistykiz (Poland), ENSE Generalitat de Cataluna (Spain), Rēzeknes Tehnoloģiju akadēmija (Latvia). Project tasks: 1) to develop a common European framework of competencies for specialists in the field of mechatronics; 2) to develop a learning platform and new study methods for mechatronics study programmes; 3) to promote cooperation between vocational education institutions, experts, employers (European Union companies) and policy makers in the field of training mechatronics specialists.

These and the projects indicated in paragraph 2.4.2 have a positive impact on the implementation process of all study programmes of the SF (Mechanical Engineering, Mechatronics, master's in Laser Technologies, doctoral in Laser Technologies), because the lecturers of the said study programmes work on these projects. Work on projects raises the qualification of lecturers, improves their knowledge of foreign languages, reveals new cooperation partners and opportunities to benefit from their expertise. Lecturers can later pass on the acquired knowledge and skills to their students. To the extent possible, students are also involved in the implementation of certain tasks of the project; within the framework of the projects, they develop their course projects and diploma theses. International research projects are particularly important for doctoral students, as they enable them to adopt the world's best practices, carry out high-level scientific research, create innovations, transfer the acquired knowledge and skills to production and education system.

International cooperation in scientific research continues its development, new partners are sought, new project applications are prepared. Particular attention is paid to the preparation of 'Horizon' project applications. For example, there was prepared and on 07.10.2021 submitted the application Teaming for Excellence HORIZON-WIDERA-2022-ACCESS-01-two-stage project for "Center of Excellence in Photonics and Knowledge Transfer PHOTONICS-LV", which along with the colleagues from the University of Latvia (Latvia), Lund University (Sweden), Westfaelische Wilhelms-Universitaet Muenster (DE), Daugavpils University (LV) also involves researchers of RTA – lecturers of the SF subject to accreditation. The aim of the project is to increase the performance of Latvian research and innovation in photonics by modernising the Center of Excellence for Photonics and Knowledge Transfer of the University of Latvia FOTONIKA-LV (CoE FOTONIKA-LV). The project aims to increase the R&I performance of Latvia in Photonics through the upgraded Centre of Excellence in Photonics and Knowledge transfer FOTONIKA-LV (CoE FOTONIKA-LV) of the University of Latvia. The project provides that the existing Photonics Centre of the University of Latvia, Rezekne Academy of Technologies and Daugavpils University will be involved in the further operation of the modernised centre.

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.

The involvement of RTA teaching staff in scientific research is regulated by the Regulation for

Scientific Activity in the RTA. It states that scientific work is a mandatory part of work of the elected academic staff at RTA. A lecturer can carry out scientific work by working on projects, working part-time as a scientist (leading researcher, researcher, research assistant), scientific technical or scientific service personnel, developing his/her doctoral thesis. The results of the scientific work are reflected in the lecturers' scientific publications (or patents), without them it is not possible to elect a lecturer to an academic position, which takes place every 6 years. In addition to conducting lectures and practical classes, most lecturers also work on projects, including scientific ones. Some part of academic staff are also employed in production companies.

In order to promote the involvement of teaching staff in scientific/applied research, a motivation system that covers the three main aspects of motivation has been developed at RTA. FIRST, material support. A Scientific Publications Support Fund has been established at RTA, where staff elected into scientific positions can apply for financial support to cover all or part of the costs related to scientific publications. Using ERDF project funding, RTA covers “Horizon” projects evaluated above the quality threshold. In order to facilitate contract research, RTA regulations stipulate that deductions from RTA are planned only in cases should the amount of the contract exceed EUR 15 000. To the extent possible, RTA also announces internal scientific grants, where it is possible to obtain start-up funding for the development of a scientific idea, which can be further developed in national and international scientific projects. SECOND, methodological and career support. The basic support system developed by RTA provides an opportunity for the career development of academic staff, which is not possible without scientific activity. RTA doctoral study programmes provide an opportunity for scientific career development. RTA organises professional development courses and seminars on issues relevant to scientific work, such as scientific writing, academic probity, patent procedures, etc. THIRD, moral support. The annual award regulations developed by RTA also provide for such nominations as “Scientist of the Year”, “Innovation of the Year”, etc.

For more information on scientific activities, publications, patents, projects, achievements, etc. of the academic staff in the past 6 years, see their CV (Annex 11 and Annex 14).

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

The following activities (at least 11 CP) related to scientific work are provided for in the study programme of Mechanical Engineering (1st level prof. higher education :

- In the 2nd semester, a compulsory study course “Introduction to Research” (1 CP) is planned;
- the compulsory part of the study project (2 CP) and qualification paper (8 CP) is the research of scientific literature; RTA Rector's Order No. 4-5/10 of 02.12.2011 stipulates that the study project must have at least 30 literature sources, including at least 5 scientific articles; the qualification paper must have at least 35 literature sources, at least 8 of which are scientific articles;
- the topics of the qualification paper are focused on novelty, in most cases they are related to solving the problems of production companies; this work may include the performance of tasks related to scientific research, for example, research of scientific literature, designing of

new equipment (possibly a patentable solution), approbation of developed equipment (collection of experimental data, establishment of regularities), etc.;
- students have free access to all laboratories and workshops of the Faculty of Engineering of RTA for their scientific work; according to the laboratory base, they are free to choose the research topic, receive consultations from lecturers and technical staff;
- during the defence of the qualification paper the State Examination Commission gives its opinion (high/low) regarding the commercialisation potential of the obtained outcomes. If the commercialisation potential is assessed as high, then the RTA shall consider possibility of patenting the obtained outcomes;
- involvement of students in European Researchers' Night events.

The 2nd level professional higher education bachelor study programme of Mechatronics provides for all scientific work activities (except for the qualification work) given in the programme of Mechanical Engineering and is supplemented by the following (the total amount of these activities is at least 21 CP):

- The compulsory part of 3 study projects (2..3 CP) and engineering design project (14 CP) is the research of scientific literature; RTA Rector's Order No. 4-5/10 of 02.12.2011 stipulates that the engineering design project must have at least 50 literature sources, including at least 15 scientific articles;
- the topics of an engineering design project are novelty-oriented, in most cases they are related to solving the problems of production companies or developing new products in mechatronics; this work may include the performance of research-related tasks; they require calculations using one of the CAE (Computer-aided engineering) programmes, such as COMSOL Multiphysics, SolidWorks Simulation;
- the study programme stipulates that in order to obtain the diploma, a student must have at least one publication (or patent). One can publish a scientific article in any scientific publication. Students are also offered to do so within the framework of the collected articles suggested at the student international scientific and practical conference “Human. Environment. Technology”, or, the collected articles of the international scientific and practical conference “Environment. Technology. Resources” held by students of Faculty of Engineering of RTA (in the collection of ETR papers, usually a lecturer or an engineering design project supervisor is a co-author under the guidance of which the student has carried out his/her own research, since a student without any previous experience cannot achieve the quality of a scientific paper corresponding to the collection indexed in the SCOPUS database).

The academic study programme for acquisition of master’s degree in laser technologies embraces all of the scientific work activities stated in the programme Mechatronics (except for 3 study projects and an engineering design project), plus the following ones (with the total amount of these activities at least 40 CP):

- A scientific research project I and II is provided for (in 2 semesters), in the framework of which students will have to study literature related to the given problem and develop an experimental test bench, elaborate a plan and methodology for carrying out experiments. Moreover, students will have to carry out pilot studies in laboratories of Faculty of Engineering of RTA and the Laser Centre, or in partners’ higher education institution (for instance, Mittweid Hochschule in Germany) in the framework of ERASMUS + or other projects, students will have to process and analyse the obtained results of the pilot studies and prepare a report or publication;
- The study course Modelling and Simulation (I, II) (in 2 semesters) is provided for. Within the course, students will have to develop a mathematical model describing a process related to

laser technologies. Ready-made software such as COMSOL Multiphysics, SolidWorks Simulation, etc. can be used for modelling. For solving differential equations of the model, one can also use own software programme written independently, like Mat Lab, C++ or in some other environment. The developed model and the calculations related thereto is an essential part of the subsequent master's thesis.

- The subject of master's thesis and the problems to be solved therein are focused on novelty; there must be at least one publication on the research outcomes;
- The mandatory element of the master's thesis is the research of scientific literature; RTA Rector's Order No. 4-5/10 of 02.12.2011 stipulates that the master's thesis should have at least 70 literature sources, including at least 35 scientific articles;

The doctoral study programme Laser Technologies provides for all of the scientific-work-related activities listed in the master's programme of Laser Technologies (except for master's thesis) and additionally the following (the total amount of activities is at least 100 CP):

- In comparison with the master's thesis – a much more profound, innovative, fundamental or applied scientific research;
- Publication of research outcomes in scientific journals and collections of papers delivered at international conferences cited in SCOPUS or Web of Science databases;
- Presentation of research outcomes at scientific conferences.

Other examples of students' getting involved in research studies (in programmes implemented within the framework of the study field) are given in paragraphs 2.4.2 and 2.4.3.

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.

The uniqueness of the SF programmes in comparison with other similar programs in Latvia and abroad is manifested in the implementation of the study process, resulting in preparing specialists of excellent level for the industry. It is based on the infrastructure of laboratories and workshops, which is one of the best in the Baltic States. It ensures the practical implementation of all the basic courses and professional specialization courses in engineering (50%–100% of contact hours are devoted to practical classes), using the most modern equipment. Students have free access to all laboratories and workshops 7 days a week for both classes and independent work. Students have a free choice of topics for their research, course projects and diploma theses. Any student is free (on the same day without prior appointment) to receive a consultation of a professor, engineer or laboratory assistant. Students are involved in research projects, company-commissioned research. The quality of studies is also ensured by the fact that a large part of professional specialization courses is led by practitioners currently working in the industry, including the founders and owners of manufacturing companies. A mandatory requirement for college and bachelor's degree diploma theses is to develop new equipment (for example, which is a part of the production line), to modernise the existing equipment or create a new innovative product, to test own development, to perform economic evaluation of its introduction into production. Master's and doctoral programmes are focused on industry-relevant research, the results of which would promote introduction of innovations in production.

In order to improve the quality of study process, RTA ensures that new ideas, pilot projects and

technologies referring to scientific, technical, social, cultural or other field are applied in the study process and are aimed at achieving the strategic goals of RTA. RTA pays a particular attention to such indicators related to the study process as the compliance of the study programmes with current issues of engineering development, industry needs, and research-based studies. To that end, RTA has developed and implemented the following innovations:

- RTA-established Council of Experts of SF, which assesses the compliance of the learning outcomes of study programmes with the needs of industry and recommends making some improvements in the content of study programmes and didactic strategy. Based on Decision No. 9 of RTA Senate of 26 November 2019 "Regulations on Councils of Experts of Study Fields in Rezekne Academy of Technologies", the composition of Council of Experts of SF was confirmed at the session of the Faculty Board of the Faculty of Engineering of RTA that took place on 14 June 2021. The Council of Experts of SF comprises professionals in mechanical and metalworking industry and representatives of employers.
- The job quality of RTA teaching staff is assessed based on the criteria of the student-focused approach and assessing the teaching staff's contribution to the improvement of the students' professional and scientific competence. The work quality coefficient determines the additional payment to the salary of the teaching staff for the next year.
- The possibilities of information and communication technologies are used: digitalised registration of students for semesters and study courses, digitalised system for registration of students' attendance of classes, managing remote study classes under the conditions of Covid-19 crisis, etc.
- In 2015, RTA established the Eastern Latvia Technology High School, which promotes connection and succession of secondary and higher education.
- The first 4 semesters in the programmes Mechanical Engineering and Mechatronics are almost identical; this allows optimizing the use of financial resources of the SF. Lectures delivered within the first four semesters for students of both programmes are planned in one large group, so the cost per 1 student can be reduced. The saved funds can be used for improvement of the quality of practical work (for instance, operating metalworking CNC equipment is organized in small groups (up to six people each)) and for increasing the range of elective study courses in the professional specialisation offered in the 6 (sixth) semester of the programme Mechatronics. As a result, students working in small groups can select and subsequently master exactly the courses that are of particular interest to them, which are currently in demand in the labour market and where each of the students sees value for his/her professional activity.

In order to optimise the use of financial resources allocated for the study process, joint lectures for RTA students of all study fields are delivered in the following courses: Entrepreneurship, Environmental and Civil Protection, Labour Protection, Introduction to Humanities. Within the framework of the Faculty of Engineering, lectures for students from different study fields are combined as well to make the study process more profitable; for instance, in Mathematics, Materials Science, Project Management and other courses, lectures are delivered to large combined groups.

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.

Development is impossible without cooperation. Strategic partners of SF in Latvia are given in Table 2.5.1.1

Table 2.5.1.1

Strategic partners in Latvia

Cooperation institution	Title
Higher education institutions	Riga Technical University – RTU
	Daugavpils University – DU
Professional organisations	Association of Mechanical Engineering and Metalworking Industries of Latvia – MASOC
	Latvian Electrical Engineering and Electronics Industry Association – LETERA
	Rezekne Entrepreneurs Association – REUB
	Rezekne Special Economic Zone – SEZ

Companies	RSEZ SIA „LEAX Rēzekne”
	SIA “OptoElektronika LV”
	RSEZ SIA “Promold”
	SIA “CeramOptec”
	SIA “NOOK, LTD”
	A/s Latvijas Finieris RSEZ SIA “Verems”
	SIA DKRobotics
	SIA “Light Guide Optics International”
	A/s “Daugavpils Lokomotīvju Remonta rūpnīca”
	Festo Latvija

Cooperation partners are selected according to the following criteria:

- partner's contribution to the development of study programmes;
- possibility to prepare applications for scientific projects together and further implement them;
- partner staff’s involvement in reading of unique lectures and classes;
- opportunities of traineeship for students; opportunities of developing theses and entering into employment in the partner’s company;
- internship opportunities for RTA staff in the partner’s company; ensuring the knowledge transfer to RTA;
- possibility to use partner’s resources to improve the RTA laboratory basis;
- members of partner’s and RTA’s staff readiness to work together;
- possibility to increase the number of RTA students when cooperating with the partner;
- the partner's influence on the political and social processes that can benefit the stability and development of RTA.

Cooperation with RTU is manifested in collaborative scientific projects for time period of many years (see Chapter 2.4.2 and lecturers' CVs); a part of SF lecturers has graduated from RTU and 5 lecturers have defended their doctoral theses at RTU.

DU is the geographically closest higher education institution. Cooperation with DU manifests in the development of joint scientific projects; 1 lecturer of SF has defended the doctoral thesis in DU, 1 lecturer is currently studying at DU's doctoral study programme.

Cooperation with production companies during the reference period manifested as follows:

- ensuring traineeship, development of theses and working places for students;
- execution of commissioned research for companies (see Chapter 2.4.2);
- internship of lecturers in the companies;
- educational tours at companies for students and lecturers;
- recommendations for the improvement and updates of the study programmes' content

(provided by owners, managers, leading specialists of companies);
- delivering training courses at RTA for employees of the companies regarding programming and setup of metalworking CNC machine, PLC programming, automation of electric actuator control. For example, in October 2021, four employees of Dinex LTD completed a 10-hour training of PLC programming in RTA.

The key factor in methods of attracting employers is the professional qualification of graduates obtained at RTA. Students of the study programmes Mechanical Engineering, Mechatronics and Laser Technologies (master's and doctoral) have free access to one of the best study laboratory basis in the Baltic states; professional courses are delivered by industry experts; all learning outcomes are aimed at development of new products and technologies, relevant problem-solving skills for production companies, as well as founding own companies. All this does not leave employers indifferent – they have a genuine stake in employing such professionals in their companies. Therefore, graduates of all study programmes have no problems with gaining employment.

The second key factor in methods of attracting employers is the programme directors' personal relation with the leading specialists, managers and owners of companies (foreign as well). It greatly facilitates and quickens the resolution of many issues related to the study process and scientific research, as well as benefits to the influx of investments into the region. Finding a place for traineeship in programmes Mechanical Engineering and Mechatronics is no concern. There are usually more places than students.

An important partner is LEAX Rēzekne, where five graduates of the programme Mechatronics work as engineers, and one of them – Normunds Teirumnieks – is the Production Manager in the company. The company not only provides traineeship places for students, but also offers the students jobs, entrusting to solve of serious production problems. For example, the company currently employs two 4th-year students from the study programme Mechatronics, whose task is to put into operation a globally unique grinding machine designed for the production of cogwheels for electric cars.

The most essential cooperation partner representing the professional organisations is MASOC. Managers of the company participate in the work of State Examination Commissions of study programmes Mechanical Engineering and Mechatronics, provide recommendations for improvement of the study programmes' content. Cooperation takes place in the development process of industry's policy and professional standards, for example, in 2021, the head of the study field – professor A.Martinovs, participated in the MASOC working group, which developed four professional standards: Mechatronics Engineer, Mechanical Engineer, Mechatronics Specialist, Mechanical Engineering Specialist.

An important local partner is REUB (Rezekne Entrepreneurs Association). It facilitates the provision of places for traineeships and employment for students, informs about opportunities to carry out a research for the company needs. The staff involved in the implementation of the study field participates in REUB's activities – meetings, experience exchange, exhibitions, etc. Cooperation with REUB is facilitated as the associate professor working in the study field Lienīte Litavniece is the Council Member of REUB. She is the founder, owner and manager of the company Safīra L, LTD (food processing industry), a member of the Latgale Regional Council and a member of the Knowledge Economy Council in the Latvian Chamber of Commerce and Industry.

An important cooperation partner is Rezekne SEZ (Special Economic Zone). In 2011, the Board of Rezekne SEZ and the RTA concluded a cooperation agreement on the exchange of information and experience, methodical cooperation in scientific research and studies, as well as the implementation of student traineeship programmes; http://www.rsez.lv/index.php/en/about-us. The

cooperation is facilitated as the docent Sandra Ežmale working in the study field is the Manager of the Board of Rēzekne SEZ.

Students, lecturers and engineers of RTA participate in organization of different public events, for example, Dean of the Faculty of Engineering Ērika Teirumnieka, lecturer Dainis Kļaviņš and engineer Kārlis Pīgožņis were co-organisers of the RTA stage of Latvian Robotics Championship in Malta 2019 and Baltic Robots Sumo 2019, whereas students of the programme Mechatronics were the competition judges. Representatives of Poland, Lithuania, Belarus and Latvia participated in the competition with total number of robots 314. http://robotika.pvg.edu.lv/rta2019/participants.

These measures ensure:

- continuous updating and improvement of SP content;
- the number of traineeships required for students;
- an opportunity for students to develop high-quality diploma, master's and doctoral theses on a basis of companies;
- an opportunity for lecturers to increase their qualification in partner universities and companies;
- improvement of the study process by attracting lecturers from industry;
- development of scientific research (joint projects, commissioned research, etc.) and commercialisation of their results.

This contributes to the achievement of the aim of the SF and the learning outcomes of the SP.

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.

SF pays a particular attention to cooperation and internationalisation. Foreign strategic partners of the SF are given in Table 2.5.2.1

Table 2.5.2.1

Strategic foreign partners

Cooperation institution	Title	Country

Higher education institutions and scientific institutions	Hochschule Mittweida, Laser Institute	Germany
	Bulgarian Academy of Sciences, Institute of Electronics	Bulgaria
	Technical University of Gabrovo	Bulgaria
	"Angel Kanchev" University of Ruse	Bulgaria
	Jade Hochschule	Germany
	Hochschule für Angewandte Wissenschaften Hamburg	Germany
Professional organisations	Bulgarian Chamber of Commerce and Industry	Bulgaria
Companies	TRUMPF Ltd.	Germany
	Coherent Inc.	USA, Germany
	ZVK GmbH	Germany
	Festo	Germany
	Laserline GmbH	Germany
	Laservorm GmbH	Germany

Cooperation partners are selected according to the same criteria as Latvian partners (see paragraph 2.5.1). Special attention is paid to the opportunity of preparing and implementing Horizon projects together with the partner.

Cooperation with foreign higher education institutions/ scientific institutes manifests as the design and implementation of joint scientific projects and study programmes. For example, the programme Mechatronics was designed in cooperation with colleagues from Jade Hochshule (Germany); the master's programme Laser Technologies was developed in cooperation with colleagues from Hochschule Mittweida (Germany); the Laser technology doctoral programme was designed and is

implemented in cooperation with colleagues from "Angel Kanchev" University of Ruse (Bulgaria). Best practices of these and other foreign higher education institutions have been adopted in all SF programmes.

Jade Hochschule (JH) plays a special role in our cooperation. Since the cooperation agreement concluded in 1998, there have been about 100 mutual mobilities for lecturers and students; close personal contacts have formed with JH professors and employees. In their student years, RTA professor E.Teirumnieks and docent A.Skromulis studied at JH for a semester, and professor A.Martinovs developed the experimental part of his doctoral dissertation in 2005. JH professor Dr. Ing. Josef Timmerberg was the one who maintained this cooperation. Thanks to prof. J.Timmerberg, RTA programme Mechatronics has adopted the experience of German colleagues in the following areas: study programme content and structure, study course content and teaching methodology, practical training content and organisation methodology, diploma project design methodology, noting the necessary laboratory equipment and preparing specifications for its acquisition. Prof. J.Timmerberg has provided significant support to the creation stage of the RTA programme of Mechatronics; he personally conducted training courses in mechatronics for RTA docents; he brought groups of German students to Rezekne and organised joint classes for them with the students of RTA programme of Mechatronics, gifted equipment and computers, provided consultations on the issues of the implementation of the study programme. He is still supporting the implementation of the study field's programmes. Since 2012, Prof. J.Timmerberg has been a member of the State Examinations Commission for the programme Mechatronics; he reads lectures to RTA students in English in the following courses: Electrical Engineering, Electronics and Industrial Electronic Equipment, Electrical Machinery and Electrical Drive, Automatic Control Systems of Electrical Drive. Almost every year (except during the Covid-19 crisis) groups of students and 1-2 lecturers from Jade Hochschule (8-10 people) visit RTA; joint practical classes are organised for the students of Mechatronics and Laser Technologies programmes of JH and RTA during the week.

In the sphere of laser technologies, Hochschule Mittweida (HM, Germany) plays a special role, especially the head of the German University's Laser Centre Dr.Ing. prof. Horst Exner The RTA master's programme Laser Technologies was developed with the support and help of the Prof. H. Exner. Many RTA lecturers and engineers have done internships at the Laser Institute of HM, the acquired knowledge and skills have been transferred to Latvia and are successfully applied in the implementation of the master's programme of Laser Technologies. During the development of the master's programme Laser Technologies, RTA has received a number of laser equipment and an industrial robot arm as a gift from HM. The German colleagues have repeatedly delivered classes for RTA students of Laser Technologies; several students of this programme have studied at HM within the ERASMUS project. RTA and HM have prepared several project applications and some of them are implemented. Leading Researcher of RTA, Dr.Ing., guest Professor Ļubomirs Lazovs has been working for many years at HM and Technical University of Gabrovo (Bulgaria), has gained rich experience in laser technologies at both of these universities; now he is one of the leading specialists in the field at RTA.

The geography of cooperation can also be traced after the composition of the Scientific Committee of the article collections of the RTA international conference "Environment. Technology. Resources". It includes colleagues from Germany, Estonia, Serbia, Belarus, Bulgaria, Italy, Russia, Lithuania, Romania, etc.

http://journals.rta.lv/index.php/ETR/issue/viewIssue/164/612

Cooperation with foreign companies during the reporting period is manifested in the following aspects:

- providing students traineeships, opportunities to develop diploma theses and jobs;
- sponsorship of industrial exhibition attendance for lecturers of the SF (TRUMPF Ltd., Coherent Inc., Festo, Laserline GmbH u.c.);
- providing recommendations regarding development, improvement and updating of the content of study programmes;
- attracting investments into the region.

There has been established a successful cooperation with the German company ZVK GmbH and its owner Joachim Zellner. In the last 6 years, 5 mechatronics students have completed a six-months traineeship at this company in Germany; 4 of them have also developed their engineering design projects in mechatronics there. Now these former students work as leading specialists in ZVK group companies, one of which is SIA “OptoElektronika” located in Rezekne. Jānis Fedotovs, a graduate of the master’s programme of Mechatronics and later Laser Technologies, is the technical director of SIA “OptoElektronika”. This company is planning significant growth; it is expected that it will need dozens of mechanical engineering specialists in the coming years. The existence of programmes Mechanical Engineering and Mechatronics was an important factor why ZVK Group entered and invested in Rezekne. Currently, ZVK GmbH is ready to hire several graduates/students of the RTA programme Mechanical Engineering for work at its plant in the Czech Republic.

These measures contribute to achievement of the aim of the SF and the learning outcomes of the SP.

Mechanisms for attracting foreign partners:

- ERASMUS opportunities for contact development;
- Close cooperation between RTA and Rēzekne Special Economic Zone; ability to persuade potential investors to enter Latvia and Rēzekne ("You are building a factory, we provide it with specialists. We prepare the necessary specialists together: theory and laboratories - RTA, practice and diploma work - in the company");
- preparation of joint scientific project applications and joint work on projects;

private contacts.

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.

ESF project: Strengthening of the academic staff of Rezekne Academy of Technologies in the study fields “Mechanics and Metalworking, Heat Power Industry, Heat Engineering and Mechanical Engineering” and “Management, Administration and Real Estate Management”, No. 8.2.2.0/18/A/016 (duration 01.12.2018-30.11.2022; funding 646’999 EUR) provides for the involvement of 9 members of foreign teaching staff into academic work. An open competition is announced for the positions of lecturers, and foreign professors and doctors can apply for them.

Within the framework of this project, prof. Josef Timmerberg from Jade Hochshule (Germany) delivers lectures to RTA students in the following courses: Electrical Engineering, Electronics and Industrial Electronic Equipment, Electrical Machinery and Electrical Drive, Automatic Control Systems of Electrical Drive. Within the framework of this project, the Professor of Technical University of Gabrovo (Bulgaria) Dr. Ing. Tsanko Karadzov delivers lectures to RTA students in the following courses: Mechanics I, Mechanics II, Power Electronics.

RTA has concluded more than 170 agreements for student and lecturer mobilities in the ERASMUS + project (see https://www.rta.lv/partneri). Every student is free to use ERASMUS + project funding to organise their own mobility; there were no problems related to receiving funding during the reporting period. In terms of the number of outgoing ERASMUS + mobilities, RTA students and lecturers rank one of the leading positions among Latvian higher education institutions. Prior to mobility, the student together with the director of the programme draw up a plan for studies at a foreign higher education institution. It is as close as possible to the study plan of the current or following semester of the RTA programme. This approach ensures the recognition of all study courses acquired abroad and minimises the number of compulsory study courses that a student will have to take as a debt upon return from abroad.

During the reporting period, teaching staff from Germany, Bulgaria, Lithuania, Poland and Turkey delivered lectures in the programmes of the SF within the ERASMUS + project (see Table 2.5.3.1). The total number of incoming mobilities of foreign lecturers was 63. Number of outgoing mobilities of lecturers working in the RTA programmes of the SF subject to accreditation – 203 (see Table 2.5.3.2) Due to the Covid-19 crisis, there is observed a decline in the number of mobilities in recent years. See Annex19 for full information on the mobility of foreign lecturers and lecturers of the SF.

Table 2.5.3.1

The incoming mobility of foreign lecturers in the study programmes of the SF subject to accreditation

Academic year	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021
Number of incoming mobilities	8	2	10	7	14	21	1
Breakdown of incoming mobilities by country	Bulgaria – 4 Germany – 4	Bulgaria – 1 Germany – 1	Bulgaria – 2 Germany – 8	Bulgaria – 2 Lithuania – 1 Poland – 1 Germany – 3	Bulgaria – 9 Turkey – 1 Germany – 4	Bulgaria – 7 Lithuania – 5 Germany – 9	Lithuania – 1

Table 2.5.3.2

Outgoing mobilities of the SF lecturers

Academic year	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021

Number of outgoing mobilities	30	21	29	35	45	33	10

During the reporting period, students from Bulgaria, Lithuania, Serbia and Turkey studied in the programmes of the SF, and students from Bulgaria and Lithuania completed their traineeships within the ERASMUS + project (see Table 2.5.3.3). The total number of incoming mobilities was 36

Table 2.5.3.3

Incoming mobilities of foreign students

Academic year	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021
Total number of mobilities	0	5	3	7	14	2	5
Mobilities for studies	0	2	3	7	2	2	0
Traineeship mobilities	0	3	0	0	12	0	5
Breakdown of mobilities by country	-	Bulgaria – 4 Turkey – 1	Lithuania –2 Turkey – 1	Serbia – 3 Turkey – 4	Bulgaria – 10 Lithuania – 2 Turkey – 2	Turkey – 2	Bulgaria – 5

As part of other projects, 8-10 groups of students form Jade Hochschule (Germany) visit RTA for a week almost every year. Classes for German and Latvian students take place at the Mechatronics Laboratory and Laser Centre of RTA. Students are divided into small groups (2-3 people). Each group includes students from both countries who work together programming Festo MPS stations or developing a project related to laser technology. At the closing conference, each group presents their achievements. There are joint excursions, visits to production companies, there are joint student events in the evenings. Positive factors of such projects: 1) students learn to communicate and make contacts with their foreign colleagues; 2) update of English knowledge; 3) during the development of their projects, students receive consultations of lecturers of both higher education institutions; 4) students get to know the culture of both countries; 5) RTA students get rid of their sense of insecurity and have a desire to study or do traineeship abroad for a semester. The next visit of Jade Hochschule students is planned in spring 2022.

During the reporting period, students of the study programmes of the SF subject to accreditation studied in Germany, Bulgaria, Turkey within the ERASMUS + project, but completed traineeships in Germany, Bulgaria and Slovakia. The total number of these outgoing mobilities – 37 (see Table 2.5.3.4).

Table 2.5.3.4

Outgoing mobilities of RTA students

Academic year	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021
Total number of mobilities	7	4	4	10	4	7	1
Breakdown of mobilities by country	Bulgaria – 3 Germany – 4	Bulgaria – 3 Germany – 1	Bulgaria – 2 Germany – 2	Bulgaria – 3 Slovakia – 1 Germany – 6	Bulgaria – 1 Germany – 2	Bulgaria – 2 Germany – 4 Turkey – 1	Germany – 1
Laser Technologies, mast.							
Mobilities for studies	-	-	0	3	2	0	0
Traineeship mobilities	-	-	0	1	1	1	0
Mechatronics							
Mobilities for studies	0	0	2	2	0	4	1
Traineeship mobilities	7	4	0	4	1	2	0
Mechanical Engineering							
Traineeship mobilities	-	-	2	0	0	0	0

For full information on incoming and outgoing mobilities of students see Annex 18.

There are no difficulties for RTA in organising mobility. Anyone who wants to take part in mobility can do so without any problems.

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.

From all SF programmes, the previous accreditation was only for the 2nd level professional higher education study program Mechatronics. Recommendations of the previous accreditation and measures aimed at elimination of drawbacks are given in Annex 20.

The recommendations given by the experts have been fulfilled. The results are as follows:

- Significantly increased efficiency of international cooperation;
- Significantly increased the number of the ERASMUS inbound and outbound mobility for students and lecturers;

- An RTA student campus with renovated buildings, a new laboratory building of the Faculty of Engineering, a laser centre and a student dormitory building has been established.
- Significantly updated academic staff, attracting the best graduates of the SF programmes and young researchers with a Ph.D. degree;
- Regular professional development measures for academic staff are as a rule in the SF;
- Developed e-learning environment, especially in the Covid crisis;
- Developed and licensed a joint doctoral study programme Laser Technologies with Ruse Angela Kanchev University (Bulgaria);
- Implementation of CAD, CAE, CAM and CNC technologies in the study process, including the use of the following computer programs: SolidWorks, Comsol, MatLab, MasterCam, WinNC, C ++, Step7, Ciros, KiCad, etc.
- A Lifelong Learning Centre established in RTA, which coordinates and organises all activities related to lifelong learning;
- Contract researches commissioned by Latvian and Latgale region companies are regularly performed;
- A system for assessing and improving the qualifications of lecturers has been established.

The implementation of these measures has significantly improved the quality of studies in all programmes implemented by SF

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).

During the reporting period, there were licensed 3 programs corresponding to the study field:

- first level (college) professional higher education study programme “Mechanical Engineering“(41521),
- academic master's study programme “Laser Technologies” (45521),
- doctoral study programme “Laser Technologies” (51521)

For an overview of implementation of the accreditation and licensing recommendations see the Annex 20.

Recommendations:

1.:

1.1) At present, there are no obstacles to fit in the deadline;

1.2) Two meetings have taken place - one at the RTA (December, 2021) and the other at the DU (January, 2022) to discuss the establishment of a joint promotion council. The work continues;

1.3) The deadline for the establishment of a joint promotion council remains 2024. Interinstitutional meetings and preparation of the necessary documents are planned every six months.

2 .: Completed.

6 .: An in-depth analysis of this recommendation has revealed that a clerical error has occurred. All lecturers have at least a B2 level (see CV`s).

9.:

9.1) The main difficulties for in-depth cooperation are posed by the situation in the Covid-19 pandemic. In the specialties of engineering, direct contacts and acquaintance with laboratories, which are currently limited, are very important.

9.2) Laser technology programmes at the doctoral level in Lithuania, Estonia and Poland has been analyzed.

9.3) Starting cooperation at least with Lithuanian and Estonian colleagues. The current pandemic situation is hampering rapid inter-institutional cooperation. It is currently difficult to indicate predictable and achievable planning deadlines. It is expected that by 30.06.2022. a cooperation agreement could be signed with Vilnius University.

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)	Annex 1.docx	1.pielikums.docx
List of the governing regulatory enactments and regulations of the higher education institution/ college	Annex 2.docx	2.pielikums.docx
The management structure of the higher education institution/ college	Annex 3.docx	3.pielikums.docx
II - Description of the Study Field - 2.1. Management of the Study Field		
Plan for the development of the study field (if applicable)	Annex 4.docx	4.pielikums.docx
The management structure of the study field	Annex 5.docx	5.pielikums.docx
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.	Annex 6.docx	6.pielikums.7z
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.	Annex 7.docx	7.pielikums.pdf
Standard sample of study agreement	Annex 8.docx	8.pielikums.docx
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	Annex 9.zip	9.pielikums.zip
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	Annex 10.xlsx	10.pielikums.xlsx
Biographies of the teaching staff members (Curriculum Vitae in Europass format)	Annex 11.7z	11.pielikums.7z
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.	Annex 12.docx	12.pielikums.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)	Annex 13.docx	13.pielikums.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.	Annex 14.docx	14.pielikums.docx
List of the publications, patents, and artistic creations of the teaching staff over the reporting period.	Annex 15.docx	15.pielikums.docx
II - Description of the Study Field - 2.5. Cooperation and Internationalisation		
List of cooperation agreements, including the agreements for providing internship	Annex 16.docx	16.pielikums.docx
Statistical data on the teaching staff and the students from abroad	Annex 17.docx	17.pielikums.docx
Statistical data on the incoming and outgoing mobility of students (by specifying the study programmes)	Annex 18.docx	18.pielikums.docx
Statistical data on the incoming and outgoing mobility of the teaching staff	Annex 19.docx	19.pielikums.docx
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.	Annex 20.docx	20.pielikums.docx
An application for the evaluation of the study field signed with a secure electronic signature	Iesniegums ENG.edoc	Iesniegums LV.edoc
III - Description of the Study Programme - 3.1. Indicators Describing the Study Programme		
Sample of the diploma and its supplement to be issued for completing the study programme		
For academic study programmes - Opinion of the Council of Higher Education in accordance with Section 55, Paragraph two of the Law on Higher Education Institutions (if applicable)		
Compliance of the joint study programme with the provisions of the Law on Higher Education Institutions (table) (if applicable)		2. pielikums.odt
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
Latvijas Universitāte. Līgums	3.6_32 Latvijas Universitāte.pdf
Daugavpils Universitāte. Līgums	Sadarbibas_ligums_RTA-DU.pdf
Daugavpils Universitāte. Vienošanās nr. 1	20211129_papildus vien.par prom.darbu_aizskat._DU-RTA.docx.pdf
Trumpf. Līgums	Ligums_Trumpf_RTA_23.03.2017.pdf
Igaunijas DZU. Līgums	RTA_Igaunijas_DZU_ligums.pdf
Bulgārijas Aizsardzības institūts. Līgums	4.7_1 Bulgārijas Aizsardzības institūts_RTA_final_10.2021.PDF
AB Metal. Sadarbības līgums	4.6_34 Sia ,,AB METAL'' Sadarbības līgums.pdf
Materiālā bāze_Material base.docx	Materiālā bāze_Material base.docx

Mechanical Engineering (41521)

Study field	*Mechanics and Metal Processing, Heat Power Engineering, Heat Technology, and Mechanical Engineering*
ProcedureStudyProgram.Name	*Mechanical Engineering*
Education classification code	*41521*
Type of the study programme	*First level professional higher education study programme*
Name of the study programme director	*Andris*
Surname of the study programme director	*Martinovs*
E-mail of the study programme director	*Andris.Martinovs@rta.lv*
Title of the study programme director	*Dr.sc.ing., profesors*
Phone of the study programme director	*+371 28325519*
Goal of the study programme	*To train mechanical engineering specialists who ensure the production process; develop, modernise and introduce into production mechanical equipment and its assemblies, perform supervision, diagnostics, maintenance and repairs of the equipment; use industrial metrology methods to ensure quality; use IT tools to process information; manage the subordinated staff.*
Tasks of the study programme	*1. To provide knowledge in the basic engineering courses and professional specialisation courses typical of mechanical engineering, in accordance with the standard requirements of the profession of a Mechanical Engineering Specialist.* *2. To educate a comprehensively developed personality, whose behaviour is based on generally accepted ethical principles, who is able to work in a team, manage the subordinated staff, comply with occupational safety, labour legislative enactments and environmental protection requirements, communicate in the official language and 2 foreign languages using the professional terminology.* *3. To develop the skills and competencies required for the work of a mechanical engineering specialist: to develop, modernise and introduce mechanical equipment in production, to carry out their supervision, diagnostics, maintenance and repairs, to use industrial metrology methods to ensure production quality; use IT tools for information processing; to ensure the production process;* *4. To guide students to further education, creation of innovative products and establishment of their own companies.*

Results of the study programme	*Ability to design, develop and modernise the mechanical part of mechanical equipment and mechatronic systems.* *Ability to put into operation, set up and maintain mechanical equipment.* *Ability to perform diagnostics, maintenance and repairs of mechanical equipment, to prepare proposals for improvement of the equipment, to ensure compliance of equipment operation with the requirements of the technological process, to plan the required amounts of operation materials.* *Ability to manage the company's measuring system, use industrial metrology methods to ensure production quality, discover the causes of changes in size and surface quality of manufactured parts, ensure compliance of cutting tool geometry with the requirements of computer numeric control machine tools.* *Ability to use IT tools to process information; to analyse compliance of design data with the technical task and the scope of implementation of the production programme; create algorithms; visualise design results; identify risks in the operation of equipment; systematise and analyse equipment maintenance and repair data.* *Ability to ensure compliance with the requirements of occupational, fire, and electrical safety, environmental and civil protection* *Ability to use engineering and technology competencies, improve own knowledge in the field of professional activity, comply with ethical principles, communicate in the official language and 2 foreign languages, including use of professional terminology.*
Final examination upon the completion of the study programme	*Qualification work*

Study programme forms

Full time studies - 2 years, 6 months - latvian

Study type and form	*Full time studies*
Duration in full years	*2*
Duration in month	*6*
Language	*latvian*
Amount (CP)	*100*
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)	*Mechanical Engineering Specialist*

Places of implementation

Place name	City	Address
Līvāni branch of Rēzekne Academy of Technologies	LĪVĀNI	RĪGAS IELA 113/117, LĪVĀNI, LĪVĀNU NOVADS, LV-5316
Rēzekne Academy of Technologies	RĒZEKNE	ATBRĪVOŠANAS ALEJA 115, RĒZEKNE, LV-4601

3.1. Indicators Describing the Study Programme

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

The parameters of the study programme – title, code, duration and place of implementation, language of implementation, programme director, admission requirements, professional qualification to be awarded – have not changed during the reporting period. It has been decided to refuse from part-time studies because this form of studies has not justified itself (few potential students; part-time form of studies is not suitable for acquiring a large amount of practical work and achieving learning outcomes successfully).

There were made the required changes in the content of the study courses and small changes in their volume: the study course “Mechanics I” was reduced from 5 CP to 4 CP; study courses of foreign language (2 CP) and Communication Psychology (1 CP) were cancelled. New study courses introduced: “Introduction to Research” – 1 CP, “Introduction to Humanities” – 2 CP; the amount of the study course “Fundamentals of Design II” was increased from 1 CP to 2 CP. Acquisition of foreign languages(English and the second foreign language) should mainly take place in secondary school, as this is a compulsory subject at school. According to the standard requirements of the profession of a mechanical engineer, the ability to communicate in a foreign language and use professional terminology fall within the general knowledge and competences used at the level of comprehension, therefore the use of the special terminology is included in the content of almost all study courses of the industry, in turn, the ability to improve independently the knowledge and professional vocabulary of a foreign language(s) specified in the standard is developed when elaborating study research papers, where the use of literature in foreign languages is a mandatory requirement.

During the reporting period, there have been changes in the composition of the academic staff working in the programme (10 lecturers no longer work in the programme: 5 – retired, 3 – dead, 2 – working elsewhere); the courses they delivered are taught by lecturers having equivalent qualification. The composition of academic staff has been renewed; its average age has reduced significantly.

Table 3.1.1.1

Parameters of the study programme Mechanical Engineering

Title of the study program in Latvian	Mašīnbūve
Title of the study program in English	*Mechanical Engineering*
Code of the study program according to the Latvian Education Classification	41521

Type and level of the study program	first level professional higher education study programme	
Qualification level to be acquired (NQF / EQF)	5	
Occupation code in Classification of Occupations	3115 66	
Volume of the study program (CP, recommending also ECTS)	100 CP, 150 ECTS	
Form, type, duration and language of implementation		
full-time studies	2 years and 6 months	Latvian
Implementation place	Rezekne; Livani branch	
Director of the study programme	Andris Martinovs, Dr.sc.ing., Professor	
Admission requirements	Admission takes place through competition according to the results of 3 centralised examinations in the following subjects: 1) mathematics; 2) Latvian language and literature; 3) foreign language (English, German, French or Russian; one at the applicant's choice). The full text of the admission conditions is available on the RTA home page in the section "Studies" ®"Information for applicants" https://ieej.lv/9Fpai	
The degree to be conferred, professional qualification or degree and professional qualification	professional qualification – Mechanical Engineering Specialist	
Aim of the study programme	To train mechanical engineering specialists who ensure the production process; develop, modernise and introduce into production mechanical equipment and its assemblies, perform supervision, diagnostics, maintenance and repairs of the equipment; use industrial metrology methods to ensure quality; use IT tools to process information; manage the subordinated staff.	

Tasks of the study programme	1. To provide knowledge in the basic engineering courses and professional specialisation courses typical of mechanical engineering, in accordance with the standard requirements of the profession of a Mechanical Engineering Specialist. 2. To educate a comprehensively developed personality, whose behaviour is based on generally accepted ethical principles, who is able to work in a team, manage the subordinated staff, comply with occupational safety, labour legislative enactments and environmental protection requirements, communicate in the official language and 2 foreign languages using the professional terminology. 3. To develop the skills and competencies required for the work of a mechanical engineering specialist: to develop, modernise and introduce mechanical equipment in production, to carry out their supervision, diagnostics, maintenance and repairs, to use industrial metrology methods to ensure production quality; use IT tools for information processing; to ensure the production process; 4. To guide students to further education, creation of innovative products and establishment of their own companies.

Learning outcomes to be achieved	Ability to design, develop and modernise the mechanical part of mechanical equipment and mechatronic systems. Ability to put into operation, set up and maintain mechanical equipment. Ability to perform diagnostics, maintenance and repairs of mechanical equipment, to prepare proposals for improvement of the equipment, to ensure compliance of equipment operation with the requirements of the technological process, to plan the required amounts of operation materials. Ability to manage the company's measuring system, use industrial metrology methods to ensure production quality, discover the causes of changes in size and surface quality of manufactured parts, ensure compliance of cutting tool geometry with the requirements of computer numeric control machine tools. Ability to use IT tools to process information; to analyse compliance of design data with the technical task and the scope of implementation of the production programme; create algorithms; visualise design results; identify risks in the operation of equipment; systematise and analyse equipment maintenance and repair data. Ability to ensure compliance with the requirements of occupational, fire, and electrical safety, environmental and civil protection Ability to use engineering and technology competencies, improve own knowledge in the field of professional activity, comply with ethical principles, communicate in the official language and 2 foreign languages, including use of professional terminology.
The final examination at the end of the study program	Qualification work

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, aim, tasks, learning outcomes of the study programme Mechanical Engineering and professional qualification of the Mechanical Engineering Specialist to be acquired are interrelated and fully comply with the requirements of the Latvian Qualifications Framework (LQF) harmonised with the European Qualifications Framework and the professional standard of a Mechanical Engineering Specialist. The study programme typologically and in terms of its content corresponds to the thematic group of Engineering Sciences, Production and Construction Education (the component of the code 5) to the thematic area of Engineering Sciences and Technology Education (component of the code 52) and to the group of Mechanical and Metalworking curricula (the component of the code 521) determined by the LQF.

The compliance of the study programme "Mechanical Engineering" with the study field has also been defined by the Metalworking and Mechanical Engineering Sectoral Expert Council (NEP) of the Employers' Confederation of Latvia (LDDK), because the professional qualification – Mechanical Engineering Specialist (which is obtained after graduation of the study programme) is included in the map of professions of the given branch (see https://registri.visc.gov.lv/profizglitiba/dokumenti/nozkval/NKSK_metalapstrade.pdf)

The structure of the study programme and the content of the study courses ensure achievement of the learning outcomes of the study programme, which are defined on the basis of the requirements of the LQF and the professional standard of a Mechanical Engineering Specialist. The study programme has been implemented at RTA since 2016. Admission requirements have not changed fundamentally during this time. The gained experience leads to the conclusion that the results of the centralised examinations in mathematics, Latvian language and literature and a foreign language are fully sufficient for the successful acquisition of the study programme. Many years of experience in implementation of programmes of Mechanical Engineering and Mechatronics show that the key to successful acquisition of the study programme is not so much the knowledge acquired in secondary education institutions, but the ability to think logically (first of all, offered by mathematics); ability to formulate one's opinion in speech and the written word clearly, precisely, without redundancy, without grammatical and stylistic errors, to present one's idea, to describe the designed construction or developed technology (this requires Latvian language and literature); ability to find, understand and analyse literature, scientific articles, patents, analogous constructions, technical documentation related to the engineering problem to be solved, which in most cases are in foreign languages (this requires knowledge of foreign languages). Admission requirements are fully sufficient for a successful start of the study process; they are the basis for achieving the aim and the learning outcomes of the SP.

The volume of the study programme is 100 CP (150 ECTS), the duration of implementation is 2 years and 6 months. During this time, the knowledge, skills and competences specified in the standard of the profession of a mechanical engineering specialist can be fully acquired.

The final version of the professional standard "Mechanical Engineer" has been agreed at the meeting of the National Tripartite Cooperation Council (NTCC) on 15.12.2021.

The study programme is implemented both in Rēzekne and in the Līvāni branch. This is due to the fact that the majority (80-90%) of students in this programme come from Līvāni and their surroundings. Most of the students in the Līvāni branch work in industry. They can only attend classes on weekday evenings or on weekends. It is impossible for people working in production to

go to classes every day to Rēzekne (which is 100 km away); in addition, it requires a significant amount of time and money. It is easier to provide a trip of one / two lecturers from Rēzekne to Līvāni to give lectures or conduct practical works (without the use of laboratory equipment). In turn, practical classes that require laboratory equipment, are organised for the Līvāni branch students on Saturdays or Sundays in Rēzekne. The student groups in the Līvāni branch are large enough for the training process at RTA to be profitable. There is a small number of students in the Mechanical Engineering programme in Rēzekne (see point 3.1.4). In order to make the study process profitable, most of the classes for the Rēzekne group are organised together with the students of the Mechatronics programme. This can be done without any problems regardless of the number of Mechanical Engineering students, because the first 4 semesters of both study programmes (Mechanical Engineering, Mechatronics) are almost identical.

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

In 2019, the companies of the Latvian Mechanical Engineering and Metalworking Industry Association (MASOC) ensured 18% of the total manufacturing turnover and 24% of the total exported goods in Latvia. https://www.masoc.lv/en/members/about-sector. In 2018, the industry turnover was 1.8 billion EUR, and ~230 000 were employed in the industry. Mechanical engineering specialists are also required in companies working in wood processing, food, and other industries. According to the data provided by the Chairperson of the Metalworking, Mechanical Engineering, and Theoretical Engineering Expert Council, in 2020 the sector is lacking over 1000 of engineering personnel or 37% of those working in 2020; the highest demand has been found to be specifically for 4th professional qualification level mechanical engineering specialists (~170). The chairperson of the Council of Experts states that the lack of qualified specialists is a significant problem and the overall demand for qualified specialists remains and there is no reason to believe that the issue will fade. (in this relation see https://ieej.lv/T2Qy5). Manufacturing companies are constantly developing, introducing new technologies and equipment, and CNC machines are used more and more. To enable companies to manufacture products with higher added value, raise the productivity of labour, and increase their profit and tax contributions to the state, adequate staff is required. Manufacturing companies always need college level specialists in mechanical engineering who have an understanding of design and are able to work with CAD/ CAE/ CAM software, who know metal working technologies, who can set up and programme CNC machines and perform maintenance and repairs of the mechanical parts, and work as machine operators. The demand for these specialists is evidenced by the constant interest from companies: calls at RTA asking to recommend students for work at the company, discussions with company management; regular job advertising on the Internet websites www.visidarbi.lv; www.cvmarket.lv; http://www.irdarbs.lv; http://www.cv.lv etc. The study programme Mechanical Engineering has been created in close cooperation with manufacturers, considering their demand for specialists and recommendations regarding the content of the study programme. SIA “Promold”, SIA “LEAX Rēzekne”, A/S “Daugavpils Lokomotīvju Remonta rūpnīca”, SIA “NOOK, LTD” etc., as well as Livani Town Council and largest companies in Livani – SIA “Light Guide Optics International”, SIA “CeramOptec”, SIA “LīvMet” have participated in the development of the programme. This is why the programme is implemented both in Rezekne and in the Livāni branch of RTA.

The training of specialists for work with CNC machines requires large financial investments. For example, training in relation to CNC setup and programming with the manufacturers of these

machines in Germany or Austria costs about 1500 EUR per day. Small and medium Latvian companies cannot afford such training abroad for their staff in terms of finance. This is why RTA, using the ERDF project resources, has created one of the best training laboratory bases in the Baltic States for the training of mechatronics, metalworking, and mechanical engineering specialists to be able to provide Latvia's production companies with modern technological level specialists.

The Mechanical Engineering programme promotes the influx of investments in the region. For example, after the beginning of the Mechanical Engineering programme, ZVK group (Germany) started making significant investments in Rēzekne into the company SIA "OptoElektronika" in order to develop manufacturing in the metalworking industry. This creates new jobs for the graduates of the study programme and for local residents.

The first graduation from the programme Mechanical Engineering took place in 2019; by now, the programme has 33 graduates. The vast majority of them work in the specialty. Their jobs are mainly in local companies of the Latgale region. In 2020, according to data of State Employment Agency, one graduate of the programme was registered as unemployed; there are no unemployed graduates of 2021.

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 study programme Mechanical Engineering has been implemented since 2016. The study process is organized only as full-time studies in Latvian. The studies take place at the expense of the state budget; there are no paying students in this programme. For information about the students of the programme, see Table 3.1.4.1. (the table shows the total number of students in the SP, in brackets - the number of students, whose place of study is Rēzekne). Most of the students in the mechanical engineering programme come from the Līvāni branch. The table shows that the number of students in the Mechanical Engineering programme has stabilised and practically has not changed during the last 5 years.

Table 3.1.4.1

Information about the students of the study programme Mechanical Engineering

Year	2,016	2017	2018	2019	2020	2021
Number of students (as of October 1 of the current year)	45(0)	74(2)	80(3)	86(6)	73(13)	79(7)

Number of students enrolled in the 1st year	45(0)	30(2)	17(0)	27(3)	32(9)	21(6)
Number of graduates	-	-	-	15	14	4
Number of ex-matriculated (as of October 1 of the current year)	-	-	12	6	31	12

From the number of students matriculated in the 1st year, 24–47% of the students complete the programme. For example, out of 45 students enrolled in the 1st year in 2016, only 15 graduated and obtained the Diploma of a Mechanical Engineering Specialist in 2019. The main reasons for students' ex-matriculation are poor progress, non-compliance with the requirements set during the study process (for example, fail to start studies at all, do not sign a study agreement, etc.) or at own will. Most students who have been expelled due to unsatisfactory evaluation, have the required abilities to complete the study programme successfully; many of these people work in production and are unable to combine work with the study process. To take into account the interests of working students, most classes in this programme (especially for Livani branch students) are organized on Saturdays and Sundays. A large part of students who have been expelled due to unsatisfactory evaluation have completed almost all study courses but have not developed and defended their qualification work. Such students to reestablish themselves in the study programme after one or a few years and complete it.

For more detailed information about students during the reporting period, see Annex 2.

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).

The content of the study programme Mechanical Engineering consists of:

- general education courses 20 CP;
- industry-related training courses 54 CP;
- course project 2 CP;
- production traineeship 16 CP;
- qualification work (8 CP).

See the study programme plan in the Annex 6. The study programme fully complies with the national 1st level professional higher education standard (see Annex 3) and the professional standard of the Mechanical Engineering Specialist (see Annex 4). In 2021, the director of the RTA programme Mechanical Engineering as an expert in the MASOC working group participated in the development of the professional standard of Mechanical Engineering Specialist. Heads or leading specialists of several large companies were involved in this work. The previous standard of the

profession was radically revised. The new standard incorporates updated requirements for the professional qualification of a mechanical engineering specialist. In 2021, also the RTA study programme Mechanical Engineering was revised including in it the latest requirements of the industry according to the updated requirements.

The aims, content, acquired knowledge, skills and competencies of the study courses are in line with the aims of the study programme and the outcomes to be achieved. In its turn, the aims of the study programme and the results to be achieved correspond to the professional standard of a Mechanical Engineering Specialist. There was developed a mapping of the learning outcomes of the study programme (see Annex 5), which, based on the knowledge, skills and competences specified in the professional standard, harmonises the learning outcomes of the study programme and study courses in which the relevant knowledge, skills and competences are acquired. The knowledge, skills and competences to be acquired in each specific study course constitute a proportion of the total outcomes to be achieved in the study programme.

The descriptions of the study courses (see Annex 7) define the outcomes of the study programme, which are harmonised with the professional standards of the LQF and the Mechanical Engineering Specialist, and the corresponding expected knowledge, skills and competences in the specific study courses. The study course programme indicates what grounding (passed courses) is required to acquire the given study course successfully. Therefore, acquisition of the study courses is implemented in the prescribed sequence. The general trend is as follows: at first, the student shall acquire mathematics, general education and basic engineering courses, and only afterwards professional specialization courses. Nevertheless, there are some exceptions, when professional specialization courses are acquired immediately in the initial period of studies (for example, “Metalworking Technologies and Technological Equipment I”, “Hydraulic and Pneumatic Drive”). This approach stimulates the students’ interest during the 1st and 2nd semesters in the specialty they are studying, what reduces the probability for them to drop out. Whereas, the general education course “Production Organization and Planning” is planned shortly before the development of the qualification work; it helps the student to develop the economic part of his/her engineering design project better.

Knowledge of physics, chemistry and informatics is also very important for a mechanical engineer specialist and mechatronics engineer. Unfortunately, some of the students have not studied physics at the level of secondary education (they acquired natural sciences instead). In this regard, RTA has found a solution to ensure successful achievement of learning outcomes. Physics is not provided for in the study programme as a separate subject, but at the beginning of all basic engineering courses students are provided knowledge from the relevant parts of physics. For example, at the beginning, the corresponding chapters of the study course “Mechanics I” view the concepts and laws of mechanics from the school physics course; these topics are further developed to the requirements of the physics course for higher education (differential equations and integration are added); then the physics of higher education is supplemented with calculation methods (basically it is the numerical solution of differential equations; basics of analytical solving), as a result of which the student acquires “Mechanical Engineering” instead of “Mechanics–Physics”. There is a similar approach in other basic engineering courses: rigid body physics, basics of chemistry and optics are mastered during Materials Science; molecular physics –during Thermodynamics and Heat Engineering; electric current – during electrical engineering; electromagnetism – during electric machines and drives; hydraulics in physics – during Hydraulic and Pneumatic Drive. Thereby, the course Physics and basic courses of Engineering avoid duplication of topics, as well as Physics course releases the credits, which can be devoted to the acquisition of technologies.

The aims of the study programme, the outcomes to be achieved and the learning outcomes and content of the study courses harmonised with them fully meet the needs of the mechanical

engineering and metalworking industry, the requirements of the labour market and scientific trends.

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 content of the study programme Mechanical Engineering consists of:

- general education courses 20 CP;
- industry-related training courses 52 CP;
- free choice courses 2 CP;
- course project 2 CP;
- production traineeship 16 CP;
- qualification work (8 CP).

See the study programme plan in the Annex 6. The study programme fully complies with the national 1st level professional higher education standard (see Annex 3) and the professional standard of the Mechanical Engineering Specialist (see Annex 4). In 2021, the director of the RTA programme Mechanical Engineering as an expert in the MASOC working group participated in the development of the professional standard of Mechanical Engineering Specialist. Heads or leading specialists of several large companies were involved in this work. The previous standard of the profession was radically revised. The new standard incorporates updated requirements for the professional qualification of a mechanical engineering specialist. In 2021, also the RTA study programme Mechanical Engineering was revised including in it the latest requirements of the industry according to the updated requirements.

The aims, content, acquired knowledge, skills and competencies of the study courses are in line with the aims of the study programme and the outcomes to be achieved. In its turn, the aims of the study programme and the results to be achieved correspond to the professional standard of a Mechanical Engineering Specialist. There was developed a mapping of the learning outcomes of the study programme (see Annex 5), which, based on the knowledge, skills and competences specified in the professional standard, harmonises the learning outcomes of the study programme and study courses in which the relevant knowledge, skills and competences are acquired. The knowledge, skills and competences to be acquired in each specific study course constitute a proportion of the total outcomes to be achieved in the study programme.

The descriptions of the study courses (see Annex 7) define the outcomes of the study programme, which are harmonised with the professional standards of the LQF and the Mechanical Engineering Specialist, and the corresponding expected knowledge, skills and competences in the specific study

courses. The study course programme indicates what grounding (passed courses) is required to acquire the given study course successfully. Therefore, acquisition of the study courses is implemented in the prescribed sequence. The general trend is as follows: at first, the student shall acquire mathematics, general education and basic engineering courses, and only afterwards professional specialization courses. Nevertheless, there are some exceptions, when professional specialization courses are acquired immediately in the initial period of studies (for example, “Metalworking Technologies and Technological Equipment I”, “Hydraulic and Pneumatic Drive”). This approach stimulates the students’ interest during the 1st and 2nd semesters in the specialty they are studying, what reduces the probability for them to drop out. Whereas, the general education course “Production Organization and Planning” is planned shortly before the development of the qualification work; it helps the student to develop the economic part of his/her engineering design project better.

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In order to follow the demand of the labour market, scientific tendencies and observe the interests of students, the study programme envisages a 2 CP elective course in professional specialisation and a 2 CP free choice course. These courses can be changed each year on request. Students are also free to choose the topic of the course project in mechanical drive design (2 CP), the place of production traineeship (16 CP) and the topic of the qualification work (8 CP).

The content of the study courses is updated in accordance with the development trends of the industry, the labour market and science. For this purpose, each lecturer regularly follows current events in his / her field; reads scientific literature; works on projects; carry out scientific research; participates in scientific conferences and seminars; visits exhibitions, production companies, Latvian and foreign universities; make appropriate adjustments to the content in his / her study course each year; regularly updates the course programme with the latest literature.

The aims of the study programme, the outcomes to be achieved and the learning outcomes and content of the study courses harmonised with them fully meet the needs of the mechanical engineering and metalworking industry, the requirements of the labour market and scientific trends.

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).

Not 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.

Acquisition of the content of study courses takes place in lectures, workshops, laboratory works and students' independent work. 40 hours are provided for the acquisition of 1 credit point (1 CP = 1.5 ECTS) of the study course, including 16 contact hours (lectures, practical and laboratory works) in the lecture room / laboratory / computer room / workshop and 24 hours – for independent work at home / library / laboratories / computer rooms / workshops. The proportion between lectures and practical classes or hours devoted to laboratory work is determined by the lecturer of the particular study course. In most study courses this proportion is as follows: lectures – 50%, practical and laboratory works – 50% of the number of contact hours. The programme also includes study courses in which 90-100% of the number of contact hours is devoted to practical work; classes in these courses take place in the laboratories of the Faculty of Engineering; they are based on professional specialization courses in which it is important to acquire the skills required for the future profession, such as "Programming and Setup of CNC Machine Tools I, II", "CAM Technologies", "Monitoring, Maintenance and Repair of Mechatronic Equipment", "Computer Programmes for Engineering". The types of students' independent work are defined in the description of the specific study course. The student receives assignments for independent work during the classes. All laboratories and workshops of the Faculty of Engineering are freely available to students 7 days a week for independent work. Each lecturer has 1 hour per week for student consultations; this time is precisely specified in the list of lecturers' consultations. Unlike in large universities, RTA lecturers are available to students not only during the official consultation time; if the lecturer does not have a class, meeting or other urgent work, then a student can come to him/her without a prior appointment and immediately receive a consultation, defend the assigned homework or laboratory work. In addition, the student is free to receive consultations from engineers and laboratory assistants working in laboratories.

Each study course programme indicates the type of examination – exam or test. Requirements for obtaining credit points are specified in the description of the study course. The form of organization of the examination/test shall be set by the lecturer provided that the content of the examination/test work corresponds to the content of the study course and is able to show the

degree of acquisition of the learning outcomes specified for the study course. The defence of the traineeship, course project and qualification work are also assessed with a grade (differentiated test). In order to ensure a balanced process of acquiring learning outcomes, RTA has introduced the traineeship so that during the semester a student can earn 40% of the summative grade. This is an incentive for the student to study the content of the study course regularly throughout the semester, rather than mostly leaving it for the exam session. In some courses (for example, Mechanics I) a student can earn up to 80% of the exam grade during the semester. For this purpose, a student must regularly (every week) complete the tasks of independent work assigned by the lecturer and defend them during the consultations to convince the lecturer that the student has completed the independent work him/herself and understands everything about it; each such task is evaluated with a grade and influences the grade of the exam.

The place of implementation of the study programme is Rezekne and Livani branch of RTA. Livani group students are matriculated at RTA. Only theoretical lectures take place in the premises of the Livani branch. In 2020 and 2021, during Covid-19-affected emergency, theoretical classes are conducted remotely using the *MsTeams* communication tool. All laboratories and workshops take place in Rezekne mainly on Saturdays and Sundays, because these students work. For students of the programme Mechanical Engineering, who are in the Rezekne group, all lectures take place together with the students of the programme Mechatronics. If a student in the Rezekne group is employed, he/she can complete laboratory and practical work on Saturdays and Sundays together with students of Livani group or individually (upon agreement with the lecturer of the particular study course).

The principles of student-centred education in the study programme are ensured, firstly, evaluating the students' previous preparedness and offering such study content that can ensure achievement of the learning outcomes of the study programme the best. Secondly, RTA offers flexible ways of studies, including taking into account that students have a job during their studies, planning classes at a time convenient for students. Thirdly, students are provided with full consultative support and full access to the study resources (including the ones available remotely) necessary to achieve their learning outcomes. Fourthly, students' studies and research activities are focused on their personal growth, including development of their personality and motivating to continue their studies to obtain the fifth level of professional qualification. Fifthly, students receive feedback on evaluation of the learning outcomes, which enables them to plan the course of studies and the best ways to achieve learning outcomes independently.

The principles of the student-centered education and methods of implementation of study courses based on practical work contribute to achievement of the aim of the SP: to prepare mechanical engineering specialists, who ensure the production process; develop, modernise and introduce into production mechanical equipment and their assemblies, perform equipment supervision, diagnostics, maintenance and repairs; use industrial metrology methods to ensure quality; use IT tools to process information; manage subordinate staff.

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

The study programme of Mechanical Engineering provides for Production traineeship (16 CP = 24 ECTS; 16 working weeks). The traineeships take place in the companies of metalworking, mechanical engineering and other industries, which are able to ensure completion of the tasks provided for by the traineeships. Each student has 2 traineeship supervisors: one from RTA, another – from the company. RTA has concluded basic agreements with traineeship places; however, each student has the opportunity to choose the traineeship place by him/herself. Initially, a student chooses a traineeship place him/herself, including foreign companies, but if necessary, the Faculty of Engineering and the External Relations Department of RTA provides help the student in finding a traineeship place. The companies – cooperation partners, where students most often do their traineeships, are viewed in detail in Part 2 of the self-assessment report "Description of the Study Field", in Paragraphs 2.5.1 and 2.5.2. Traineeship is planned in the final stage of the study process (end of the 4th semester, the 5th semester), when the theoretical part has been acquired; the student is free from classes at the higher education institution and can start full-time work in the company. RTA informs students about potential and up-to-date traineeship places. RTA offers the companies that are its cooperation partners or that have informed RTA about their readiness to offer students traineeship places. The student is recommended to choose a traineeship place thinking of the company as his/her future working place, where the student will need to develop the qualification work and continue working after graduation from the study programme. This approach satisfies companies, encourages their interest and active involvement in the process of organising the traineeship, as initially they hire a trainee (rather than a permanent employee). During the traineeship the company can get to know the student, train him/her, use the student's competences in solving problems relevant to the company (which manifests as student's qualification work), and after graduating to supplement the staff with a qualified mechanical engineer (no need to waste time to train the new specialist, reduced risks that the new specialist will not be appropriate to perform his/her duties in the company). The result is that the number of offered traineeship places usually exceeds the number of students.

Goals of the production traineeship:

- to acquire the necessary skills and competencies in accordance with the standard requirements of the profession of a mechanical engineering specialist;
- to collect the necessary information, including experimental data, for development of the qualification work.

Tasks of the production traineeship:

- To get acquainted with the operation, structure, aims of the traineeship company and technologies implemented there; to get an idea of the place and role of the company in the general economic system.
- To get acquainted and comply with labour safety regulations, fire safety rules, electrical safety precautions, civil defence regulations, environmental protection rules, the internal rules and provisions of material responsibility.
- To learn to do the work of a locksmith, turner, miller and welder in practice (without using CNC machine).
- To be fully involved in the company's production (or designing) process, working in a designated workplace in one of the company's structural units, using the acquired theoretical knowledge in solving practical tasks, mastering specific work skills and methods; complying with instructions and orders of the traineeship supervisor at the company, workshop manager, foreman, and other officials of the company (institution).
- Make detailed inquiries about the principles of structure and operation of the equipment

available in the production company and the technological processes implemented in the company.

- To carry out the functions of an operator of CNC machine tools and other mechatronic equipment.
- To learn to programme and set up the mechatronic equipment available at the place of traineeship.
- To do the work related to the maintenance, supervision, and repair of the technological equipment, furnishing the equipment with spare parts, and ordering raw materials for production.
- To perform the individual task related to the development, improvement and introduction into production of a new product, production technology or technological equipment; to find out about problems existing in the company, which could be solved in the process of qualification paper development; define the topic of the qualification paper in cooperation with the traineeship supervisor from RTA.
- To prepare a technical task for the qualification paper; the preparation takes place in cooperation with the company's representatives (customer).
- To perform all tasks related to development of the qualification paper to the maximum extent, for example, collect, research, analyse the necessary information, develop a technical proposal, select the necessary devices and additional equipment, prepare a conceptual design, develop a technical design to the extent feasible, develop routing schemes for technological operations of machining, write control programmes for CNC machine tools, make a model/prototype and approbate it, prepare documentation for the qualification paper to the extent feasible.
- To collect materials that are not considered confidential in the company, compile them and draw up a traineeship report.

The aims and tasks of the traineeship correspond to the learning outcomes to be achieved in the study programme Mechanical Engineering. Full information about the organisation of the traineeship; the skills and competencies to be acquired during traineeship (which are in accordance with the professional standard of a mechanical engineering specialist), functions of the traineeship supervisor, drawing up the traineeship report, evaluation of the traineeship results are given in the traineeship guidelines in the Annex 8.

See the traineeship agreements concluded with the companies in the Annex 16 (in chapter 2).

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).

Not applicable.

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

A qualification work is done at the final stage of the programme Machine Engineering. The

qualification work may be comprised of development of a mechanical unit of a device or a separate complicated component; development of the mechanical section of a processing line; upgrade or improvement of operation of a separate unit or an entire processing line; development of a prototype/model for a new product using CAD/CAM/CAE technologies; development and production of a separate complicated part; solution to any other problem concerning mechanical engineering or machining. Every qualification work has a mandatory requirement, without which it is not possible to defend it – the project must be developed so that it can actually be implemented in production. For methodological guidance for the development of a qualification work see the Annex. The topics of qualification works by years are given in Table 3.2.6.1. Great part of the qualification works is developed based on production companies. Qualification works solve real problems related to production, equipment development and modernisation, new product creation and innovation.

The process of developing a qualification paper is controlled throughout the semester; the student must regularly report to his/her supervisor (at least once every 2 weeks) and the director of the programme Mechanical Engineering (twice a semester) on the performed work. A pre-defence is organised a few days before the deadline for submission of qualification works. There is a commission consisting of the programme director and the supervisors of the qualification works who assess the development quality of the qualification work. The commission makes the final decision on admitting the student to defend the qualification work based on the pre-defence results. Only the students whose works were rated as “almost good”, “good”, “very good”, “excellent” or “outstanding” are allowed to defend their qualification works. This ensures early elimination of poorly developed qualification works. In the reporting period, qualification works were evaluated with grades 7, 8, 9 (good, very good, excellent), except for some works with the evaluation of 6 (almost good).

Table 3.2.6.1

The topics of qualification works in the study programme Mechanical Engineering

No.	Student	Title (Latvian)	Title (English)
Year: 2019			
1.	Aizpuris Māris	Optiskās šķiedras kūļu konektoru anodēšanas līnija	Anodizing line of optical fiber bundle connectors
2.	Daugavietis Kalvis	Stacionārā metāla ripzāģa izgatavošana	Stationary metal circular saw manufacturing
3.	Gasperovičs Valērijs	Siltumsūkņu cirkulācijas sistēmas atgaisošanas iekārta	Circulation station for the heat pump heat systems
4.	Haritonovs Konstantīns	Frēzes iekārta koka dēļu izmēra kalibrēšanai	Cutters for calibrating the size of boards
5.	Lāce Krestina	PVC aizsargapvalka sagarumošanas iekārta	PVC protective cover cutter
6.	Lubāne Olga	Detaļu ekscentritātes mērīšanas palīgierīce	Specificationaccessory for the extrateriality of the parts
7.	Lubāns Jānis	Automātiskā padevējmehānisma modernizācija schleuniger Eco Cut 3200 garumotājam	Modernising the automatic mechanism forthe schleuniger Eco Cut 3200 long term
8.	Lukstiņš Vilnis	Detaļu augstspiediena mazgāšanas stends	High- pressure washing machine
9.	Maksimovs Genādijs	Portāla metināšanas iekārtas mehāniskās daļas uzlabošana	Improvement of mechanical part of portal welding equipment

10.	Onckule Laura	Autonomo fotovoltisko bateriju uzstādīšana	Installation of autonomus photovoltaic batteries
11.	Reinholds Māris	Ķiploku rušināmās iekārtas izstrāde	Development of a garlic-weeding machine
12.	Reinholds Vairis	Medicīnas izstrādājumu uzgaļu vaskošanas pistole	Medical product tippinggun
13.	Rubāns Artūrs	Cauruļu lokāmās iekārtas projektēšana un izgatavošana	Making and designing the pipe bending machine
14.	Vaivods Haralds	Pārvietojamā estakāde auto virsbūves remontam	Portable ramp for car body repair works
15.	Vanaģelis Renārs	Telferu riteņreduktora modernizācija un adaptācija	Modernizing and adopting telfer reduktor
Year: 2020			
1.	Artemjevs Oskars	Optiskās šķiedras konektoru montēšanas ierīce	Optical fiber connector assembly device
2.	Bartusevičа Iluta	Ēdiena pagatavošanas automātiskā iekārta uz mangala ar liesmas dzēšanas sistēmu	Automatic cooking machine on a grill with flame detection system
3.	Bartusevičа Lolita	Veļas žāvēšanas iekārta telpu un āra apstākļiem	Indoor and outdoor tumble drier
4.	Kaimiņa-Ciša Kristīne	Sulu pārstrādes līnijas pasterizācijas iekārtas modernizācija	Pasteurizing equipment`s modernizing in juice producing line
5.	Karpovs Jurijs	Tricikla projekts	Trike project
6.	Miņina Rita	Automātiskā trušu barotava	Automatic rabbit feeder
7.	Pastars Lauris	Remontbedres hidrauliskais domkrats	Hydraulic jack for the pit
8.	Puidītis Mārtiņš	Slēdzeņu serdeņu izvilcēja modernizācija un izstrāde	Locking core extractor and its modernization
9.	Raubiška Daniels	Lentveida slīpmašīna detaļu abrazīvai apstrādei	Abrasive belt sander for machining parts
10.	Rāviņš Dzintars	Koksnes gazifikācijas malkas apkures katla modernizācija	Modernization of wood gasification firewood boiler
11.	Tutins Gatis	Degvielas uzpildes stacijas nojumes, metāla konstrukciju ražošana	Dealing station awnings, metal structures
12.	Ustinovs Igors	Mehāniskā darbnīca automobiļu dzinēju remontam	Mechanical workshop for car engine repair
13.	Ustinovs Ivans	Metalafons ar MIDI vadību	Metalaphone with MIDI control
14.	Zarāns Artūrs	Kokskaidu granulu testēšanas iekārtas izstrāde	Development of a chip pellet testing machine
Year: 2021			
1.	Dževečka Jānis	Slīpēšanas darbgalda 3M636 modernizācija	The modernisation of the 3M636 machine for grinding
2.	Kalačova Anna	Mehanizēta malkas skaldāmās iekārtas projektēšana un izgatavošana	Design and manufacture of mechanized firewood splitting equipment
3.	Krauklis Jānis	SMA/FSMA 905 konektoru montēšanas iekārtas mehāniskās daļas projektēšana	Designing of the mechanical part of SMA / FSMA 905 assembly device.
4.	Narovska Sintija	Ultraskaņas vanna – svārsta mehānisms	Ultrasonic bath –pendulum mechanism

The qualification work defence committee of the RTA study programme Mechanical Engineering is comprised of Vilnis Rantiņš, one of MASOC executives (former Chairman of the Board of MASOC, Chairman of the MASOC Council, now the member of MASOC Council), as well as representatives of production companies – SIA Leax Rēzekne Production Director Normunds Teirumnieks and SIA Optoelektronika Mechatronics Engineer Arturs Ziļs. Company representatives who expressed to RTA their interest in hiring graduates of the programme Mechanical Engineering to work for their companies are also invited to attend the qualification work defence proceedings. The content of a

student's qualification work and the course of defence thereof provide a comprehensive idea of the student's competence level as a specialist. Representatives of the industry always openly indicate the drawbacks of the qualification work and professional competence of a specific student. These remarks are taken into account when making adjustments to the study programme and the content of the respective study courses as soon as possible; in some cases introducing a new study course. Thereby, the study programme is improved and constantly updated with each following year; this process of improving the programme is continuous.

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 programme Mechanical Engineering (also for students of the Līvāni branch) has absolutely all resources and provision of the study field, which are described in detail in criteria 2.3.1-2.3.3. The Līvāni branch offers theoretical and practical classes that do not require the use of a laboratory base. All practical classes with the use of laboratory equipment for the Līvāni branch students take place in Rēzekne. The amount and quality of all theoretical and practical classes for students of both Rēzekne and Līvāni branches is the same.

The available infrastructure, laboratory/workshop base and information provision allow to implement the study programme successfully, to achieve all the learning outcomes provided for in it. On average, 50% of the study courses are practical classes with the maximum use of the available software, laboratory/workshop equipment and facilities. Most of the prototypes developed in the qualification papers are of TRL6 and higher.

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).

Not 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).

Information on the financing of the study programme Mechanical Engineering (including, by years in the reporting period) and its sources is viewed in detail in the criterion 2.3.1.

RTA calculations suggest that the direct costs of the first level professional higher education study programme Mechanical Engineering (remuneration of academic and general staff) are 2,078.39 EUR/ 75% per one reference student a year, the indirect costs (expenses for ensuring RTA activities, including library, immovable property tax, rent of premises, operating expenses of buildings and equipment, telephone subscription and service costs, utilities, current repairs, special programmes, etc.) are 692.80 EUR/ 25% per one reference student a year. In general, the tuition costs for one full-time student are estimated at 2771.19 EUR per year, which does not exceed the costs in European states for the training of one student in a similar speciality.

Funding of the study programme Mechanical Engineering

Financial year	2016	2017	2018	2019	2020	2021
Minimum Ratio of Study Costs:	1,7	1,7	1,7	1,7	1,7	1,7
Ratio of Study Level:	1	1	1	1	1	1
Basic Costs of Studies (euro)	1333	1393.22	1458.51	1518.98	1518,98/1538,98	1630,11
Amount of scholarship (euro)	150,82	150,82	150,82	150,82	150,82	200,00
Sports, culture, student hostel (euro)	13,52	13,52	13,52	13,52	13,52	13,52
The number of state-budget funded study places	0	27	35	56	61	61
The number of state-budget funded study places	0	38 386	92 533	153 810	168 234	182 067

Tuition fee revenue for ensuring the implementation of the study programme	0	0	0	0	0	0

There are only full-time students in this study programme. Several years of experience show that if there are 70 students in the programme, the programme is profitable and students receive a quality education. On average, practical classes make up at least 50% of the total number of classes. Practical classes and laboratory works are organised in small groups of up to 10 people, and for work with CNC equipment – in groups of up to 6 people. This is possible because the lectures are conducted for large groups, combining students from different study programmes (even different faculties). Learning outcomes could also be achieved with a smaller number of students in the programme (50-60 students); in this case, the quality of studies would slightly decrease in comparison with the current, but would not fall below the standard requirements for the profession of a Mechanical Engineering Specialist. This requires little changes in the process of practical class organisation: 1) to combine students of different study programmes in one group; 2) increase the number of people in the group to 12; 3) to acquire only the crucial skills during the practical lessons, and leave acquisition of nuances for independent work in the laboratory/workshop after the lesson under the supervision of laboratory assistants/ engineers. The indicated number of students and costs are also applicable to the Livani branch.

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.

25 lecturers are involved in implementation of the study programmes Mechanical Engineering. Of them, 16 (64%) lecturers are elected to the academic and/or scientific position at RTA, 9 (36%)- are non-elected at RTA. 11 (44%) lecturers have a doctoral degree; 10 of them are RTA elected.

Distribution of elected lecturers of the study programme Mechanical Engineering by positions:

- Professors- 4 (including, RTA-elected leading researchers- 4);
- Assoc. Professors- 2 (including, RTA-elected leading researchers- 2);
- Docents – 3 (including, RTA-elected leading researchers- 3);
- Lecturers -6 (including, RTA-elected researchers- 3);

Distribution of RTA guest lecturers by positions:

- Guest Docents – 2 (including, RTA-elected researcher- 1);
- Guest Lecturers - 8.

All these lecturers ensure the study process both in Rēzekne and in the Līvāni branch.

For full information about study programme lecturers and their publications see Annex 15 and

for the lecturers' CVs – Annex 11. For certification of the official language knowledge of the

teaching staff of the study programme see Annex 12.

Lecturers-practitioners with extensive professional work experience in the field are involved in the implementation of study programme (see criterion 2.3.6 of the Chapter 2). The qualification of the teaching staff fully complies with the requirements of the laws and regulations and ensures the achievement of the learning outcomes of the study programme.

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.

Opportunities to attract new, perspective staff for the implementation of the study process are constantly being sought.

There is a continuous process of renewing the teaching staff. Since its licensing (2016), 8 lecturers have left the study programme (Dr.sc.ing. Prof. I.Silineviča, Dr.habil.sc.ing. Guest Prof. E.Lavendelis, Dr.sc.ing. Prof. O.Užga-Rebrovs, Dr.phys. Docent P.Narica, Dr.iur. Docent G.Makarova, Dipl.ing. Docent I.Meirāns, Dipl.ing. Lecturer V.Ciganskis, Guest Lecturer I. Jurčs), i.a. 6 of them were at retirement age. Instead of them, new lecturers have been attracted to the SP: 3 Professors (Dr.sc.ing. A.Teilāns, Dr. philol. S.Martena, Dr.oec. I.Arbidāne), 1 Docent (Dr.oec. S.Ežmale), 2 Guest Docents, young scientists (Dr.sc.ing. A.Skromulis, elected to RTA as a researcher and Dr.arg. L.Poiša); 1 Lecturer (Dipl.ing. Mg.comp. G.Koļčs) and 5 Guest Lecturers (Mg.sc.ing. E.Zaicevs, Mg.sc.ing. R.Rēvalds, Dipl.ing. A.Pacejs, Mg. iur. I.Novika, Mg. Šiļina). During the review period in the SP, 1 lecturer (A.Martinovs) obtained the title of Professor, 2 lecturers (I.Kangro, L.Litavniece)- Assoc. Professors name. The best graduates of the Mechatronics (professional bachelor's) and Laser technology (master's) study programmes are offered to work in academic work; currently, the such following 4 lecturers work in the Mechanical Engineering programme: G.Koļčs, E.Zaicevs, R.Rēvalds, A.Pacejs, who provide a large part of professional specialisation study courses.

The study course Mechanics I is led by Prof. Dr.sc.ing. A.Martinovs instead of Guest Professor Dr.habil.sc.ing. E.Lendendelis. The study course Automatic Control is read by Prof. Dr.sc.ing A.Teilāns instead of Prof. Dr.sc.ing. O.Užga-Rebrovs. The lectures in the Electrical Engineering are given by prof. Dr.sc.ing. A.Martinovs instead of Prof. Dr.sc.ing. I.Silineviča, but the laboratory works are lead by Dipl.ing. A.Pacejs. Guest Docents Dr.agr. L.Poiša and Dr.sc.ing. A.Skromulis are involved in the teaching of the course Thermodynamics and Heat Engineering. The study course Basics of Metrology is led by an RTA researcher, Guest Docent Dr.sc.ing. A.Skromulis instead of Docent Dr.phys. P.Narica. The study courses (or parts thereof) Technical graphics, Basics of design I, II, Course project in mechanical drive design, Machine elements, accuracy and standardisation of parts are led by Dipl.ing. Mg.comp. G.Koļčs and Mg.sc.ing. E.Zaicevs instead of Lecturer Dipl.ing. V.Ciganskis. The study course Electronics and industrial electronic equipment is led by Dipl.ing. Mg.comp. G.Koļčs and Dipl.ing. R.Rēvalds instead of Dipl.ing. Docent I. Meirāns. The study course Labour law is led by RTA lawyer, Lecturer Mg.iur. I.Novika instead of Docent G. Makarova. The study

courses Labour protection and Civil protection are led by Lecturer E. Šiļina instead of Lecturer I. Jurčs. New courses have been involved in the SP: Introduction to research (led by Prof. Dr. philol. S.Martena), Human Resources Management (Prof. Dr.eoc. I.Arbidāne), Project Management (Docent Dr.oec. S.Ežmale).

From this information it can be concluded that the lecturers' staff of the SP is renewed significantly; young lecturers with a new approch to the learning process have been involved in the SP; the lecturers that have left the SP are replaced with equal-qualified lecturers, so the quality of the study remains the same.

Management of separate professional specialisation study courses is offered to the leading specialists from the industry; these people are interested in teaching and have the opportunity to find good employees for their company among the students;

It is a common practice in the study programme, that there are several (2-4) lecturers who deliver the same study course. The topics of the study course are divided among the lecturers; each delivers his/her own part, but may be replaced by colleagues if necessary. This approach is based on the principles of LEAN management; it has several advantages:

- A new specialist who has just started working can be included in delivering the study course without any issues; in order to prepare a new course with high quality, a lecturer needs at least 2 years; however, a separate part of the study course can be prepared in a considerably shorter time;
- The new specialist delivers the study course together with an experienced lecturer, who guarantees the quality and mentors – consults, helps the new lecturer to prepare his/her study course quality sections and learn the teaching methodology; gradually the new specialist can also take over the entire study course;
- The risks of study programme implementation reduce: colleagues can always replace a lecturer if he/she goes on a long-term business trip, starts working in a research project or administrative position (no time to give classes), starts preparing a completely new innovative study course, prepares a new project application or terminates employment at RTA;
- It is possible to balance the workload of lecturers for the current study year, taking into account his/her employment in other places (administrative position, scientific projects, duties of an engineer/ laboratory assistant, second job), and to ensure a competitive salary for each lecturer. The distribution of hours in the study course is different between lecturers, e.g. a professor can conduct only some of the most important lectures and carry out control of the entire study course, but the other contact hours are taught by the new specialist/ lecturer/ engineer; such approach guarantees quality and makes the study process more affordable.

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 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).

Not 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).

Lecturers cooperate with each other during the study process. The following mechanisms are used to promote cooperation:

- most of the study courses are conducted by 2-4 lecturers instead of 1 lecturer; the advantages of such approach are described in criterion 3.4.2; the lecturers of the specific study course mutually agree on the topics that each of them will deliver; lecturers organise the course of examinations/tests and evaluate students' knowledge jointly;
- lecturers' work (office) places are located in the same or adjacent rooms; lecturers often meet up; regularly exchange information concerning the study process, scientific research and the development of projects; this is particularly important during project development, as immediate discussion with colleagues can significantly speed up the solution to a problem;
- the principle of mutual assistance; lecturers, engineers, laboratory assistants always help each other with professional advice/consultation; according to his/her qualification helps a colleague to make parts (turning, milling, sawing, drilling, bending, welding, 3D printing, laser cutting, laser marking, vacuum spraying, etc.), electronics assemblies, programme microcontrollers, make an experimental stand or prototype, train to work with a device for experiment or measurement purposes, to test a prototype;
- joint meetings of lecturers and last semester students on the development of qualification work:
    - during the first meeting at the beginning of the semester the students' wishes and interests on the topic of the qualification work and the potential supervisor are heard; after the collegial consultation of the lecturers, the student is assigned a qualification work supervisor;
    - the second meeting in the middle of the semester is for defence of the traineeship and

an interim report on the progress made in the development of the qualification work; all qualification work supervisors shall participate in it; each lecturer asks questions to the student and gives recommendations for improvement of the qualification work;
    - pre-defence of qualification works at the end of the semester; all qualification work supervisors shall participate; each of them asks questions to the student; finally gives recommendations on how to improve the qualification work and its presentation;
- joint work in scientific projects and commissioned research;
- work on joint publications and participation in conferences;

In November 2021, there are 79 students in the study programme of Mechanical Engineering and 24 lecturers are involved in its implementation.

The ratio of students to teaching staff in the study program is considered according to the methodology set by the OECD, dividing the full-time equivalent (FTE) of students in the program (31.6) by the full-time equivalent of teaching staff (FTE) employed in the program (2). At the time of submitting the self-assessment in 2021. the ratio of teaching staff to students is 15.8, which is slightly higher than the Latvian average in short-cycle programs (13), but close to the OECD average (15).

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	Annex 1.docx	1.pielikums.docx
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	Annex 2.docx	2.pielikms.docx
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	Annex 3.docx	3.pielikums.docx
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)	Annex 4.docx	4.pielikums.docx
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	Annex 5.docx	5.pielikums.docx
The curriculum of the study programme (for each type and form of the implementation of the study programme)	Annex 6.docx	6.pielikums.docx
Descriptions of the study courses/ modules	Annex 7.zip	7.pielikums.zip
Description of the organisation of the internship of the students (if applicable)	Annex 8.docx	8.pielikums.docx
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)		

Mechatronics (42521)

Study field	*Mechanics and Metal Processing, Heat Power Engineering, Heat Technology, and Mechanical Engineering*
ProcedureStudyProgram.Name	*Mechatronics*
Education classification code	*42521*
Type of the study programme	*Professional bachelor study programme*
Name of the study programme director	*Andris*
Surname of the study programme director	*Martinovs*
E-mail of the study programme director	*Andris.Martinovs@rta.lv*
Title of the study programme director	*Dr.sc.ing., profesors*
Phone of the study programme director	*+371 28325519*
Goal of the study programme	*To train mechatronics engineers who develop, modernise and implement mechatronics systems in production, perform their monitoring, diagnostics, maintenance and repair, organise and plan the production process, manage projects and the staff subordinated to him/her, provide consultations on innovations in the mechatronics industry and their implementation in production.*
Tasks of the study programme	*1. To provide knowledge in the basic engineering courses and professional specialisation courses typical of mechatronics, in accordance with the standard requirements of the profession of a Mechatronics Engineer.* *2. To educate a comprehensively developed personality, whose behaviour is based on generally accepted ethical principles, who is able to work in a team, manage projects and the subordinated staff, comply with occupational safety, labour legislative enactments and environmental protection requirements, communicate in the official language and 2 foreign languages using the professional terminology.* *3. To acquire the skills and competences required for the work of a mechatronics engineer: to develop, modernise and implement mechatronics systems in production, to perform their supervision, diagnostics, maintenance and repairs, to organise and plan the production process.* *4. To guide students to scientific research, creation of innovative products and establishment of their own companies.*

Results of the study programme	*Ability to design, develop and upgrade equipment and mechatronic systems.* *Ability to put into operation, set up and maintain equipment and mechatronic systems.* *Ability to perform diagnostics, maintenance and repairs of mechatronic systems, to prepare proposals improvement of the mechatronic systems, to ensure compliance of equipment operation with the requirements of the technological process, to plan the required amounts of operation materials.* *Ability to ensure compliance with the requirements of occupational, fire, and electrical safety, environmental and civil protection* *Ability to use engineering and technology competencies, improve own knowledge in the field of professional activity, comply with ethical principles, communicate in the official language and 2 foreign languages, including use of professional terminology.*
Final examination upon the completion of the study programme	*Engineering Design Project*

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
Rēzekne Academy of Technologies	RĒZEKNE	ATBRĪVOŠANAS ALEJA 115, RĒZEKNE, LV-4601

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. For studies in English: a certificate of proficiency in English at least at B2 level.*
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
Rēzekne Academy of Technologies	RĒZEKNE	ATBRĪVOŠANAS ALEJA 115, RĒZEKNE, LV-4601

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.

Parameters of the study programme– title, code, place of implementation, programme director, admission requirements, degree and professional qualification to be awarded have not been changed. In order to make the study programme more competitive, its amount has been reduced from 180 CP (270 ECTS) to 160 CP (240 ECTS), keeping the quality of the trained specialists. In order to attract foreign students, the programme has 2 implementation languages– Latvian and English. It has been decided to refuse from part-time studies because this form of studies has not justified itself (few potential students; part-time form of studies is not suitable for acquiring a large amount of practical work and achieving learning outcomes successfully).

The following have been removed from the section of compulsory study courses of the study programme: "Computer Programmes in Engineering Mechanics II" – 2 CP, "Higher Mathematics III" – 3 CP. The following study courses have been transferred from the compulsory courses to the elective part: “Mathematical Methods” – 2 CP, “Foreign Languages” – 6 CP, “Personnel Management” – 2 CP, “Project Management” – 2 CP. The amount of the study course “Mechanics II” has been reduced from 6 CP to 3 CP. Traineeship was reduced from 26 CP to 20 CP; the amount of engineering design project development has been reduced from 16 CP to 14 CP. There were compulsory study courses introduced: “Entrepreneurship” – 4 CP, “Introduction to Research” – 1 CP, “Thermodynamics and Heat Engineering” – 2 CP, “Metal Processing Technologies II” – 3 CP, “Servo Drive” – 2 CP. In the elective part, several study courses relevant to the field have been introduced: “Industry 4.0 and Technological Process Visualization”, “Quality Management”, “Sensor Data Processing”, “Fundamentals of Artificial Intelligence”, “Laser Engineering and Laser Technologies”, etc. The content of the programme corresponds to the updated version of the Mechatronics Engineering Standard (developed in 2021).

During the reporting period, there have been changes in the composition of the academic staff working in the programme (10 lecturers no longer work in the programme: 5 – retired, 3 – dead, 2 – working elsewhere); the courses they delivered are now conducted by lecturers having equivalent qualification. The composition of academic staff has been renewed; its average age has reduced considerably.

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, aim, tasks, learning outcomes of the study programme “Mechatronics”, the obtained bachelor’s degree in mechatronics and the professional qualification of a mechatronics engineer are interrelated. They fully correspond to the Latvian Qualifications Framework (LQF), the European Qualifications Framework (EQF) and the professional standard of a mechatronics engineer. The structure of the study programme and the content of the study courses ensure achievement of all the learning outcomes.
The study programme typologically and in terms of its content corresponds to the educational thematic group of Engineering sciences, production and construction (the component of the code 5), to the educational thematic area of Engineering sciences and technology (component of the code 52) and to the group of Mechanical and Metalworking curricula (the component of the code 521) determined by the LQF.
The compliance of the study programme “Mechatronics” with the study field has also been defined by the Metalworking and Mechanical Engineering Sectoral Expert Council (NEP) of the Employers' Confederation of Latvia (LDDK), because the professional qualification – Mechatronics Engineer (which is obtained after graduation of the study programme) is included in the map of professions of the given branch (see https://registri.visc.gov.lv/profizglitiba/dokumenti/nozkval/NKSK_metalapstrade.pdf).
The study programme has been implemented since 2007. Admission requirements have not changed fundamentally during last 5 years. The gained experience leads to the conclusion that 3 criteria at entrance testing are fully sufficient for successful acquisition of the study programme – the results of the centralised examinations in 1) mathematics, 2) Latvian language and literature, 3) foreign language. Many years of experience show that the key to successful acquisition of the study programme is not so much the knowledge acquired in secondary education institutions, but 1) the ability to think logically (first of all, resulting from mathematics); 2) ability to formulate one’s opinion clearly, precisely, without redundancy, without grammatical and stylistic errors, to present one’s idea, to describe the designed construction or developed technology (this requires Latvian language and literature); 3) ability to find, understand and analyse literature, scientific articles, patents, analogous constructions, technical documentation related to the engineering problem to be solved, which in most cases are in foreign languages. a mandatory requirement for each student before defending an engineering project is development and publication of a scientific article (this in all need knowledge of foreign languages). Admission requirements are fully sufficient for a successful start of the study process; they are the basis for achieving the aim and the learning outcomes of the SP.
The volume of the study programme is 160 CP (240 ECTS), the duration of implementation is 4 years. During this time, the knowledge, skills and competences specified in the profession standard of a mechatronics engineer can be fully acquired.
The final version of the professional standard “Mechatronics Engineer” is planned to be agreed at the meeting of the National Tripartite Cooperation Council (NTCC) on February 2022.
The resources of the SP, lecturers’ qualification and English knowledge allow to implement the study programme in Latvian, as well as in English. The implementation of the SP in Latvian is necessary to prepare mechatronics engineers mainly for the Latvian labour market, therefore it is funded mostly by the Latvian state budget. The implementation of the SP in English allows to attract additional funding (foreign students pay tuition fees themselves), acquire new experience within the work with foreign students, which can be used to develop international cooperation.

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

In 2019, the companies of the Latvian Mechanical Engineering and Metalworking Industry Association (MASOC) ensured 18% of the total manufacturing turnover and 24% of the total exported goods in Latvia. https://www.masoc.lv/biedri/par-nozari. In 2018, the industry turnover was EUR 1.8 billion, and ~230 000 were employed in the industry. Mechatronics engineers are also required in companies working in wood processing, food, and other industries. According to MASOC, the industry as a whole lacks over 1,000 engineering staff members in 2020, or 37% of the employees working in 2020; including about 45 mechatronics engineers and about 80 mechatronicians. Production companies are constantly developing, introducing new technologies and equipment. To enable companies to manufacture products with higher added value, raise the productivity of labour, and increase their profit and tax contributions to the state, adequate staff is required. Production companies need mechatronics engineers who know how to design, upgrade and install production lines, perform their programming, maintenance and repair, manage metalworking, CAD, CAE, CAM, CNC technologies, PLC, microcontroller and robot programming. The demand for these specialists is evidenced by the constant interest from companies: calls to RTA asking to recommend students for work in the company, regular job advertising on the Internet websites www.visidarbi.lv; www.cvmarket.lv; http://www.irdarbs.lv; http://www.cv.lv etc. The laboratory equipment at the disposal of RTA completely ensures training of specialists for production companies in accordance with the level of modern technologies. The study programme and all its study courses fully meet the needs of the mechanical engineering and metalworking industry, labour market requirements and scientific trends.

The programme of Mechatronics Engineering facilitates the influx of investments in the region. For example, ZVK Group (Germany), due to the implementation of Mechatronics programmes in Rezekne, started making significant investments in the company SIA “OptoElektronika” in order to

develop production in the field of metalworking. This creates new jobs for the graduates of the study programme and for local residents.

During the reporting period (since 2014), 59 graduates have completed the programme Mechatronics. The vast majority of them work in the specialty. Their workplaces are in local companies in Latgale region and Latvia; some graduates work in Germany and Great Britain. In 2020, according to data of State Employment Agency, one graduate of the programme was registered as unemployed; there are no unemployed graduates of 2019 and 2021.

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 study programme Mechatronics has been implemented since 2007. The study process is organized only as full-time studies in Latvian. For foreign students of Erasmus+, classes are organised in a separate group in English or together with a Latvian group in English (or bilingually). Studies are carried out at the expense of the state budget and for tuition. For information about the students of the programme, see Table 4.1.4.1.

Table 4.1.4.1.

Information about the students of the study programme Mechatronics

Year	2014	2015	2016	2017	2018	2019	2020	2021
Number of students (as of October 1 of the current year)	80	72	80	79	77	79	75	84
Number of students enrolled in the 1st year	13	14	24	21	39	16	9	14
Number of graduates	7	7	10	9	7	7	4	8
Number of ex-matriculated (as of October 1 of the current year)	17	16	4	11	18	33	28	6

Out of the number of students matriculated in the 1st year, 39% of the students complete the programme. The main reasons for students' ex-matriculation are poor progress, expiration of the student exchange program agreement (foreign students through ERASMUS +), non-compliance with the requirements set during the study process (for example, fail to start studies at all, do not sign a study agreement,) or at own will. Most students who have been expelled due to unsatisfactory evaluation, have the required abilities to complete the study programme successfully; many of

these people work in production and are unable to combine work with the study process. A large part of students who have been expelled due to unsatisfactory evaluation have completed the majority of study courses but have not developed and defended their engineering design project. Such students to re-establish themselves in the study programme after one or a few years and complete it.

For more detailed information about students during the reporting period, see Annex 2.

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).

Not applicable.

3.2. The Content of Studies and Implementation Thereof

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

The content of the study programme Mechatronics consists of:

- general education courses 20 CP;
- basic theoretical courses in the field and courses in information technologies 37 CP;
- professional industry-specialization courses 63 CP (including 4 CP elective courses);
- elective courses 6 CP;
- traineeship – 20 CP;
- engineering design project with publication (14 CP);
- engineering project (14 CP).

In the study programme, which is implemented in English, the amount of professional industry-specialization courses is 61 CP, and the vacated 2 CP are intended for learning the Latvian language. See the study programme plan in Annex 6. The study programme fully complies with the national education standard (see Annex 3) and the professional standard of the mechatronics engineer (see Annex 4). In 2021, the director of the RTA programme Mechatronics as an expert in the MASOC working group developed the professional standard Mechatronics Engineer. Heads or leading specialists of several large companies were involved in this work. The previous standard of the profession was radically revised. The new standard incorporates the requirements topical in

2021 for the professional qualification of a mechatronics engineer. Accordingly, in 2021, also the RTA study programme Mechatronics was revised including in it the latest requirements of the industry pursuant to the updated requirements.

The aims, content, acquired knowledge, skills and competencies of the study courses are in line with the aims of the study programme and the outcomes to be achieved. In turn, the aims of the study programme and the results to be achieved correspond to the professional standard of a Mechatronics Engineer. There was developed a mapping of the study programme (see Annex 5); it reflects the knowledge, skills and competences specified in the professional standard and the study courses corresponding to them (in which the specific knowledge, skills and competences are acquired). The knowledge, skills and competences to be acquired in each specific study course constitute a small part of the total outcomes to be achieved in the study programme. Therefore, it is important not to lose any of the knowledge, skills or competencies specified in the standard during the study process. Using the study programme mapping, it can be traced that all the knowledge, skills and competencies specified in the professional standard are included in the study content.

The descriptions of the study courses (see the Annex 7) define the outcomes of the study programme, which are harmonised with the professional standards of the LQF and the mechatronics engineer, and the corresponding expected knowledge, skills and competences in the specific study courses. The study course programme indicates what grounding (passed courses) is required to acquire the given study course successfully. Therefore, acquisition of the study courses is implemented in the prescribed sequence. The general trend is as follows: at first the student shall acquire mathematics, general education and basic engineering courses, and only afterwards professional specialisation courses. Nevertheless, there are some exceptions, when professional specialization courses are acquired immediately in the initial period of studies (for example, “Metalworking Technologies and Technological Equipment I, “Hydraulic and Pneumatic Drive). This approach stimulates the students’ interest during the 1st and 2nd semester the specialty they are studying, what reduces the probability for them to drop out. Whereas, the general education course Production Organization and Planning is planned shortly before the development of the engineering design project; it helps the student to develop the economic part of his/her engineering design project better.

Knowledge of physics, chemistry and informatics is also very important for a mechatronics engineer. Unfortunately, some of the students have not studied physics at the level of secondary education (they acquired natural sciences instead). In this regard, there was found a solution to ensure successful achievement of learning outcomes. Physics is not provided for in the study programme as a separate subject, but at the beginning of all basic engineering courses students are provided knowledge from the relevant chapters of physics. For example, at the beginning of the corresponding chapters of the study course “Mechanics I” the concepts and laws of mechanics from the school physics course are considered; these topics are further developed to the requirements of the physics course for universities (differential equations and integration are added); then the physics of higher education is supplemented with calculation methods (basically it is the numerical solution of differential equations; a little of analytical solution), as a result of which the student acquires “Mechanical Engineering” instead of “Mechanics-Physics”. There is a similar approach in other basic engineering courses: In solid science physics, basics of chemistry and optics are mastered; In thermodynamics and heat engineering - molecular physics; In electrical engineering – electric current; In electric machines and drives – electromagnetism; Hydraulic and pneumatic drive – hydraulics in physics. The positive aspect of this approach is that the course Physics and basic courses of Engineering avoid duplication of topics, as well as Physics course releases the credits, which can be devoted to the acquisition of technologies.

In order to follow the demand of the labour market, scientific tendencies and observe the interests of students, the study programme envisages elective courses in professional specialisation (4 CP – in Latvian group, 2 CP – in English group) and free choice courses (6 CP). These courses can be changed each year on request. Students are also free to choose the topics of 3 course projects – in mechanical drive design (2 CP), in automatic control systems design (2 CP), in computer control systems design (2 CP), the topic of the study course Robotics practice (2 CP), the place of the production traineeship (16 CP) and the pre-diploma traineeship (4 CP), the topic of the engineering project (14 CP).

The content of the study courses is updated in accordance with the development trends of the industry, the labour market and science. For this purpose, each lecturer regularly follows current events in his / her field; reads scientific literature; works on projects; carry out scientific research; participates in scientific conferences and seminars; visits exhibitions, production companies, Latvian and foreign universities; make appropriate adjustments to the content in his / her study course each year; regularly updates the course programme with the latest literature.

The aims of the study programme, the outcomes to be achieved and the learning outcomes and content of the study courses harmonised with them fully meet the needs of the mechanical engineering and metalworking industry, the requirements of the labour market and scientific trends.

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).

Not 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.

Studiju kursu satura apguve notiek lekcijās, praktiskajos darbos, laboratorijas darbos un studentu patstāvīgajā darbā. Studiju kursa 1 kredītpunkta (1 KP=1.5 ECTS) apguvei ir paredzētas 40 stundas, tai skaitā 16 ir kontaktstundas (lekcijas, praktiskie un laboratorijas darbi) auditorijā/ laboratorijā/ datorzālē/ darbnīcā un 24 stundas- patstāvīgajam darbam mājās/ bibliotēkā/ laboratorijās/ datorzālēs/ darbnīcās. Proporciju starp lekcijām un praktiskajām nodarbībām vai laboratorijas darbiem atvēlētajām stundām nosaka konkrētā studiju kursa docētājs. Vairumā studiju kursu šī proporcijā ir šāda: lekcijām – 50%, praktiskajiem un laboratorijas darbiem – 50% no kontakstundu

skaita. Lai gan ir arī studiju kursi, kuros praktiskajiem darbiem ir atvēlēti 90-100% kontaktstundu skaita; nodarbības šajos kursos notiek Inženieru fakultātes laboratorijās; tie pamatā ir profesionālās specializācijas kursi, kuros ir būtiski iegūt nākamajai profesijai nepieciešamās prasmes, piemēram, Metālapstrādes CNC darbgaldu programmēšana un iestatīšana I, II, CAM tehnoloģijas, Mehatronisko iekārtu uzraudzība, apkope un remonti, Datorprogrammas inženiermehānikā, Robotikas praktikums, Automātiskās vadības sistēmu projektēšana, Robotu vadības sistēmas, Ražošanas procesu automatizācijas sistēmu programmēšana. Studentu patstāvīgā darba veidi ir nodefinēti konkrētā studiju kursa programmā. Uzdevumus patstāvīgajam darbam students saņem nodarbību laikā. Patstāvīgā darba veikšanai studentiem 7 dienas nedēļā brīvi pieejamas Inženieru fakultātes visas laboratorijas un darbnīcas. Katra docētāja slodzē 1 stunda nedēļā paredzēta studentu konsultācijām; šis laiks ir precīzi noteikts docētāju konsultāciju sarakstā. Atšķirībā no lielajām universitātēm, RTA docētāji studentiem ir pieejami ne tikai oficiāli noteiktajā konsultāciju laikā; ja docētājam nav nodarbība, sanāksme vai cits neatliekams darbs, tad students var nākt pie viņa bez iepriekšēja pieraksta un uzreiz saņemt konsultāciju, aizstāvēt uzdoto mājas darbu vai laboratorijas darbu. Students konsultācijas brīvi var saņemt arī pie laboratorijās strādājošiem inženieriem un laborantiem.

Katrā studiju kursa programmā ir norādīts pārbaudījuma veids- eksāmens vai ieskaite. Prasības kredītpunktu iegūšanai par doto kursu ir noteiktas studiju kursa programmā. Eksāmena/ ieskaites organizēšanas formu nosaka katrs docētājs pats ar nosacījumu, ka eksāmena/ ieskaites darba saturs atbilst studiju kursa saturam. Prakses aizstāvēšana, trīs kursa projekti un inženierprojekts arī tiek vērtēti ar atzīmi (diferencētā ieskaite). RTA ir ieviesta prakse, ka semestra laikā students var nopelnīt 40% no eksāmena atzīmes. Tas ir stimuls studentam apgūt studiju kursa saturu regulāri visa semestra garumā, nevis atstāt to uz eksāmenu sesijas laiku. Atsevišķos kursos semestra laikā students var nopelnīt 80% (Mehānika I, II) un 100% (Ražošanas procesu automatizācijas sistēmu programmēšana) no eksāmena atzīmes. Šim nolūkam studentam regulāri (katru nedēļu) jāizpilda docētāja uzdotie patstāvīgā darba uzdevumi un konsultāciju laikā tie jāaizstāv, lai docētājam rastos pārliecība, ka students patstāvīgo darbu ir izpildījis pats un tajā visu saprot; katrs šāds uzdevums tiek vērtēts ar atzīmi un ietekmē eksāmena atzīmi.

Turpmāk ir paredzēta Mehatronikas studiju programmas īstenošana latviešu un angļu valodā. Docētājiem ir atbilstošas angļu valodas zināšanas un bagāta pieredze darbā ar ārzemju ERASMUS+ studentiem. Studiju programmas prasības un apgūšanas laiks, studiju kursu saturs un apjoms, studiju metodes, prasības kredītpunktu iegūšanai un vērtēšanas sistēma ārzemju un Latvijas studentu grupām ir identiska. Ir tikai 2 atšķirības:

- ārzemju studentiem nodarbības notiek angļu valodā;
- ārzemju studentiem 2KP apjomā ir paredzēts obligāts studiju kurss “Latviešu valoda”; tam nepieciešamie 2KP ir paņemti no profesionālās specializācijas izvēles kursiem.

Latvijas studentiem izvēles kursiem ir paredzēti 10KP (profesionālajā specializācijā- 4KP, brīvajā izvēlē- 6KP), Ārzemju studentiem izvēles kursiem paredzēti 8KP (profesionālajā specializācijā- 2KP, brīvajā izvēlē- 6KP). Latvijas un ārzemju studenti brīvi var izvēlēties:

- 3 studiju projektu tēmas (6KP);
- Robotikas praktikuma tēmu (2KP);
- uzņēmumu, kur iziet praksi (20KP);
- Inženierprojekta tēmu (14KP).

Ja Mehatronikas programmas students ir strādājošs, tad viņš laboratorijas un praktiskos darbus var veikt arī sestdienās un svētdienās kopā ar Mašīnbūves (Līvānu grupa) studentiem vai individuāli (vienojoties ar konkrētā studiju kursa docētāju).

Studentcentrētas izglītības principi studiju programmā tiek nodrošināti, pirmkārt, izvērtējot studējošo iepriekšējo sagatavotību un piedāvājot tādu studiju saturu, kas visveiksmīgāk spēj nodrošināt studiju programmas studiju rezultātu sasniegšanu. Otrkārt, RTA piedāvā elastīgus studiju ceļus, tai skaitā ievērojot studējošo nodarbinātību studiju laikā, plānojot nodarbības studējošajiem ērtā laikā. Treškārt, studējošajiem tiek nodrošināts pilns konsultatīvais atbalsts un pilna piekļuve studiju rezultātu sasniegšanai nepieciešamajiem studiju resursiem (tais skaitā attālināti pieejamiem). Ceturtkārt, studējošo studiju un pētnieciskā darbība tiek vērsta uz viņu personības izaugsmi, tai skaitā sekmējot viņu personības veidošanos un motivējot turpmākām studijām 5.profesionālās kvalifikācijas līmeņa iegūšanai. Piektkārt, studējošajiem ir nodrošināta atgriezeniskā saikne par studiju rezultātu vērtēšanu, kas ļauj viņiem patstāvīgi plānot studiju gaitu un labākos ceļus studiju rezultātu sasniegšanai.

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

The study programme Mechatronics provides for two type traineeships: Production traineeship (16 CP = 24 ECTS; 16 working weeks) and Pre-diploma traineeship (4 CP = 6 ECTS; 4 working weeks). Traineeships take place in Latvian or foreign companies (or organizations) that use mechatronic equipment and/or CNC/ CAD/ CAM technologies in the production (or designing) process. Each student has 2 traineeship supervisors: one from RTA, another – from the company. Initially, a student looks for and chooses a traineeship place him/herself, including foreign companies, but if necessary, the Faculty of Engineering and the External Relations Department of RTA provides help to the student in finding the traineeship place. The companies – cooperation partners, where students most often do their traineeships, are viewed in detail in Part 2 of the self-assessment report, in criteria 2.5.1 and 2.5.2. Traineeships are planned in the final stage of the study process 7th and 8th semester), when the theoretical part has been acquired; the student is free from classes at the higher education institution and can start full-time work in the company. RTA informs students about potential and up-to-date traineeship places. RTA offers the companies that are its cooperation partners of or that have informed RTA before about their readiness to offer students traineeship places. The student is recommended to choose a traineeship place considering the company as his/her future working place, where the student will need to develop the engineering design project and continue working after graduating from the study programme. This approach satisfies companies, encourages their interest and active involvement in the process of organising the traineeship, as they initially hire a trainee (rather than a permanent employee). During the traineeship the company can get to know the student, train him/her, use the student's competences in solving problems relevant to the company (which manifests as student's engineering design project), and after graduating to supplement the staff with a qualified mechatronics engineer (no need to waste time to train the new specialist, reduced risks that the new specialist will not be appropriate to perform his/her duties in the company). The result is that the number of offered traineeship places usually exceeds the number of students. In exceptional cases (for example, for foreign students), the traineeship can also take place at the Metalworking

and Mechatronics Research Centre or the Physical Processes and Laser Technologies Research Centre of RTA, as the staff and existing equipment can ensure completion of all the traineeship tasks.

Aim of the production traineeship: to acquire the required skills and competences according to the requirements of the standard of the profession of a Mechatronics Engineer. Aim of the pre-diploma traineeship: to collect the necessary information, including experimental data, for elaboration of engineering design project.

Tasks of the production traineeship

- To get acquainted with the operation, structure, aims of the traineeship company and technologies implemented there; to get an idea of the place and role of the company in the general economic system.
- To get acquainted and comply with labour safety regulations, fire safety rules, electrical safety precautions, civil defence regulations, environmental protection rules, the internal rules and provisions of material responsibility.
- To acquire the skill to do the work of a locksmith, turner, miller and welder in practice (without using CNC machine).
- To be fully involved in the company's production (or designing) process, working in a designated workplace in one of the company's structural units, using the acquired theoretical knowledge in solving practical tasks, mastering specific work skills and methods; complying with instructions and orders of the traineeship supervisor at the company, workshop manager, foreman, and other officials of the company (institution).
- To examine in detail the principles of construction and operation of mechatronic equipment available in the manufacturing company and the technological processes implemented there.
- To perform the functions of the mechatronic equipment operator.
- To learn to programme and set up the mechatronic equipment available at the place of traineeship.
- To perform works related to maintenance, supervision, and repair of mechatronic equipment, furnishing the equipment with spare parts, and ordering production raw materials.
- To perform an individual task related to development of a new product, design and optimization of operation of mechatronic equipment or individual components thereof and the improvement of production technology.
- To collect materials that are not considered confidential in the company, compile them and draw up a traineeship report.

Tasks of the pre-diploma traineeship

- To get acquainted with the operation, structure, aims of the traineeship company and technologies implemented there; to get an idea of the place and role of the company in the general economic system.
- To get acquainted and comply with labour safety regulations, fire safety rules, electrical safety precautions, civil defence regulations, environmental protection rules, the internal rules and provisions of material responsibility effective in the traineeship place; comply with instructions and orders of the traineeship supervisor at the company, workshop manager, foreman, and other officials of the company (institution).
- To complete an individual task related to the acquisition of experimental, design project, computer modelling and other data necessary for the development of the engineering design project.
- To collect materials that are not considered confidential in the company, compile them and draw up a traineeship report.

The aims and tasks of the traineeships correspond to the learning outcomes to be achieved in the study programme Mechatronics. Full information about the organisation of the traineeship; the skills and competencies to be acquired during traineeship (which are in accordance with the professional standard of a mechatronics engineer), functions of the traineeship supervisor, drawing up the traineeship report, evaluation of the traineeship results are given in the traineeship guidelines in the Annex 8.

See the traineeship agreements concluded with the companies in the Annex 16(Part 2).

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).

Not 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 work in the study programme Mechatronics is an engineering design project. The engineering design project can be: development of a real mechatronic equipment or a separate, complex component thereof, which includes all the elements characteristic of mechatronics – mechanical, electronic and computer control; development of a technological line consisting of mechatronic equipment; modernisation of a technological line or separate mechatronic equipment or optimisation of its work; development of a new product prototype/model applying CAD/CAM/CAE technologies, solving other problems related to mechatronic equipment. Every engineering design project has a mandatory requirement, without which it is not possible to defend it – the project must be developed so that it can actually be implemented in production. For methodological guidance for the development of an engineering design project, see other annexes. For the topics of engineering design projects in the last 2 years see Table 4.2.6.1, in the reporting period – see other annex. Great part of the engineering design projects is developed based on production companies. Engineering design projects solve real problems related to production, equipment development and modernisation, new product creation and innovation. The process of developing an engineering design project is controlled throughout the semester; the student must regularly report to his/her supervisor (at least once every 2 weeks) and the director of the Mechatronics programme (twice a semester) on the performed work. A pre-defence is organised a few days before the deadline for submission of engineering design project. There is a commission consisting of the programme director and the supervisors of the engineering design projects who assess the development quality of the engineering design project. The commission makes the final decision on admitting the student to defend the engineering design project based on the pre-defence results. Only the students whose pre-defence evaluation results is “almost good”, “good”, “very good”, “excellent” or “outstanding” are admitted to the defence of the engineering design project. This ensures early elimination of poorly developed engineering design projects. In the reporting period, engineering design projects were evaluated with grades 7, 8, 9 (good, very good, excellent). Some engineering design projects were evaluated with grade 6 (almost good) and some – with 10

(outstanding). There has been no lower grade for the defence of engineering design projects than 6.

Table 4.2.6.1.

The topics of engineering design projects in the study programme "Mechatronics"

No.	Student	Title (Latvian)	Title (English)
Year: 2020			
1.	Adejanovs Didzis	Piena produktu dozēšanas un fasēšanas iekārtas modernizācija	Modernisation of dosing and packaging machine for milk products
2.	Apeināns Elvijs	Mehāniskais iecirknis optiskās šķiedras izstrādājumu ražotnē	Mechanical section in the fibre optic production unit
3.	Āboliņš Dāvis	Eksoskeleta rokas daļa ar trošu piedziņas sistēmu	Exoskeleton arm part with wire rope drive system
4.	Pacejs Antons	Mikromobilitātes elektriskais transportlīdzeklis ar bezpakāpju pārvada sistēmu	Micro-mobility electric vehicle with stepless transmission system
Year: 2021			
1.	Dudenkovs Raitis	Kūdras iepakojuma kalibrēšanas iekārta	Peat packaging calibration device
2.	Katkovskis Rolands	Elektriskā gana traucējumu atpazīšanas un kļūmju paziņošanas iekārta	Electric shepherd fault detection and error reporting device
3.	Kuzmins Artjoms	Automatizēta bezpilota laiva valsts ugunsdzēsības un glābšanas dienestam	Unmanned automated boat for the State Fire and Rescue Service.
4.	Lapšovs Ņikita	Optisko konektoru pulēšanas sistēmas rb-550d1 modernizācija	Upgrading the polishing system of optical connectors rb-550d1.
5.	Maslobojevs Igors	Dezinfekcijas vārti ar sīkdispersas dezinfekcijas līdzekļa miglas ultraskaņas ģeneratoru	Disinfection gate with fine disinfectant mist ultrasonic generator

6.	Pikuma Brenda	Datu analīzes programmatūras izstrāde mērierīcei dažādu tīkla savienotāju tipiem	Development of data analysis software for measuring device for different types of network connectors
7.	Poplavskis Elvijs	CO2 lāzeriekārta ar automātisko galdu maiņu	CO2 laser cutter with automatic table change
8.	Vasiļjevs Edgars	Automatizēta urbjmašīna koka izstrādājumu ražošanai	An automated drilling machine for production of wooden products.

Since 2012, the engineering design project defence committee of RTA study programme Mechatronics comprises Vilnis Rantiņš, one of MASOC executives (former Chairman of the Board of MASOC, Chairman of the MASOC Council, now the member of MASOC Council), as well as leading specialists of production companies – SIA Part IT Director Normunds Teirumnieks and SIA Optoelektronika Mechatronics Engineer Arturs Ziļs. The person known among scientific and business actors – Dr.habil.sc.ing., Professor, Academician Egons Lavendelis has been teaching Mechanics courses within the study programme of RTA Mechatronics since 2008 and acting in the engineering design project defence commission since 2012; owing to the ideas and support of this person, a completely new and effective methodology for teaching courses of Mechanics was developed and implemented, which allows to master the basics of this engineering successfully even without profound prior knowledge of physics and mathematics. Moreover, the Professor of Dr. Ing. Josef Timmerberg from Jade Hochschule (Germany), also acts in the engineering design project defence commission on a regular basis; he provided tremendous support in the creation and development of the study programme Mechatronics. Company representatives who expressed to RTA their interest in hiring graduates of the programme Mechatronics to work for their companies are also invited to attend the engineering design project defence proceedings. According to the content and defence of the engineering design project, one can obtain a complete understanding of the readiness level of the student as a specialist. The members of the commission always openly point out the shortcomings in the engineering design project and professional training of a particular student. These remarks are taken into account when making adjustments to the study programme and the content of the respective study courses as soon as possible; in some cases introducing a new study course. Thereby, the study programme is improved and constantly updated with each following year; this process of improving the programme is continuous.

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 programme Mechatronics has all the resources and provision of the study field, which are described in detail in criteria 2.3.1-2.3.3. The available infrastructure, laboratory/workshop base and information provision allow to implement the study programme successfully, to achieve all the learning outcomes provided for in it. On average, 50% of the study courses are practical classes when the available software, laboratory/workshop equipment and facilities are used to the maximum extent. Most of the prototypes developed in the engineering design projects are of TRL6 and higher.

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).

Not 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).

Information on the financing of the study programme Mechatronics (including by years in the reporting period) and its sources is viewed in detail in the criterion 2.3.1.

RTA calculations suggest that the direct costs of the second level professional higher education study programme Mechatronics (remuneration of academic and general staff) are EUR 2,078.39 / 75% per one reference student a year, the indirect costs (expenses for ensuring RTA activities, including library, immovable property tax, rent of premises, operating expenses of buildings and equipment, telephone subscription and service costs, utilities, current repairs, special programmes, etc.) are EUR 692.80 / 25% per one reference student a year. In general, the tuition costs for one full-time student are estimated at EUR 2,078.39 per year, which does not exceed the costs in European states for the training of one student in a similar speciality. The minimum number of students that will ensure the profitability of the study program is 7 students in one study year.

The annual study costs for one non-EU student are estimated at EUR 2,400.00; direct costs amount to EUR 1,800.00 per one reference student a year, indirect costs amount to EUR 600.00 per one reference student a year. The minimum number of students that will ensure the profitability of the study program is 5 students in one study year.

Funding of the study programme Mechatronics

Financial year	2016	2017	2018	2019	2020	2021
Minimum Ratio of Study Costs:	1,7	1,7	1,7	1,7	1,7	1,7
Ratio of Study Level:	1	1	1	1	1	1
Basic Costs of Studies (euro)	1 333	1393,22	1458,51	1518,98	1518,98/ 1538,98	1630,11
Amount of scholarship (euro)	150,82	150,82	150,82	150,82	150,82	200,00
Sports, culture, student hostel (euro)	13,52	13,52	13,52	13,52	13,52	13,52
The number of state-budget funded study places	61	71	71	71	71	71
The number of state-budget funded study places	148257	179830	187710	195009	195 813	211915
Tuition fee revenue for ensuring the implementation of the study programme	11 824	3 714	4 470	6 365	8 260	8 260

There are only full-time students in this study programme. Several years of experience show that if there are 70 students in the programme, the programme is profitable and students receive a quality education. On average, practical classes make up at least 50% of the total number of classes. Practical classes and laboratory works are organised in small groups of up to 10 people, and for work with CNC equipment – in groups of up to 6 people. This is possible because the lectures are conducted for large groups, combining students from different study programmes (even different faculties). Learning outcomes could also be achieved with a smaller number of students in the programme (50-60 students); in this case, the quality of studies would slightly decrease in comparison with the current, but would not fall below the standard requirements for the profession of a mechatronics engineer. This requires little changes in the process of practical class organisation: 1) to combine students of different study programmes in one group; 2) increase the number of people in the group to 12; 3) to acquire only the crucial skills during the practical lessons, and leave acquisition of nuances for independent work in the laboratory/workshop after the lesson under the supervision of laboratory assistants/ engineers.

If the number of students in a group is small (for example, a group of foreign students in the initial period), additional expenses must be taken into account. This is similar to any other business – in the beginning it requires investments until the production process develops. There could be the following measures in this case: 1) to organise acquisition of the general education study courses

for foreign students of various study programmes in one large group; 2) to minimize the number of lectures in basic engineering courses and professional specialization courses; lectures should include only the main topics and assigning tasks for independent work; training according to an individual plan; 3) to provide for additional time for student consultations; 4) to intensify acquisition of Latvian (including organising additional courses) for foreign students; 5) to conduct practical classes for foreign and Latvian students together (in English or bilingually). After the number of foreign students in the study programme reaches 50–60, it is possible to switch to the normal (the same as for Latvian student groups) study process in English.

3.4. Teaching Staff

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

38 lecturers are involved in implementation of the study programme Mechatronics. Of them, 24 (63%) lecturers are elected to the academic and/or scientific position at RTA, 14 (37%)- are non-elected at RTA. 20 (53%) lecturers have a doctoral degree; 17 of them are RTA elected.

Distribution of elected lecturers of the study programme Mechatronics by positions:

- Professors – 5 (including, RTA-elected leading researchers- 5);
- Assoc. professors- 4 (including, RTA-elected leading researchers- 3, researcher- 1);
- Docents – 4 (including, RTA-elected leading researchers- 4);
- Lecturers -7 (including, RTA-elected researchers- 3);

Distribution of guest lecturers of the study programme Mechatronics by positions:

- Guest Professors – 4 (including, RTA-elected leading researchers- 2, researcher- 1);
- Guest Docents – 3 (including, RTA-elected researcher- 1)
- Guest Lecturers - 11.

For full information about study programme lecturers and their publications see Annex 15 and for the lecturers' CVs – Annex 11. For the certification of SF lecturers' official language knowledge, see Annex 12, for the certification of SF lecturers' English language knowledge – Annex 13.

Lecturers-practitioners with extensive professional work experience in the field are involved in the implementation of study programme (see criterion 2.3.6 of the Chapter 2). The qualification of the teaching staff fully complies with the requirements of the laws and regulations and ensures the achievement of the learning outcomes of the study programme.

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.

Opportunities to attract new, perspective staff for the implementation of the study process are constantly being sought.
There is a continuous process of renewing the teaching staff. 8 lecturers have left the study programme during the review period programme (Dr.sc.ing. Prof. I.Silineviča, Dr.habil.sc.ing. Guest Prof. E.Lavendelis, Dr.sc.ing. Prof. O.Užga-Rebrovs, Dr.phys. Docent P.Narica, Dr.iur. Docent G.Makarova, Dipl.ing. Docent I.Meirāns, Dilp.ing. Lecturer V.Ciganskis, Guest Lecturer I. Jurčs), i.a. 6 of them were at retirement age. Instead of them, new lecturers have been attracted to the SP: 2 Professors – Dr.sc.ing. A.Teilāns, Dr. philol. S.Martena, 3 Guest Professors – Dr.Ing. J.Timmerberg (Germany), Dr.Ing. L.Lazov (Bulgaria), Dr.phil. G.Marzano (Italy); 1 Assoc. Professor – Dr.sc.ing. S.Kodors; 1 Docent – Dr.oec. S.Ežmale; 3 Guest Docents – Dr.sc.ing. A.Skromulis (RTA researcher, new scientist), Dr.arg. L.Poiša (new scientist), PhD. T.Karadzhov (Bulgaria, new scientist); 1 Lecturer – Dipl.ing., Mg.comp. G.Koļčs and 5 Guest Lecturers – Mg.sc.ing. E.Zaicevs, Mg.sc.ing. R.Rēvalds, Dipl.ing. A.Pacejs, Mg.iur. I.Novika, Mg. E.Šiļina. During the review period in the SP, 3 lecturers (I. Arbidāne, A. Martinovs, E. Teirumnieks) obtained the title of Professor, 2 lecturers (I.Kangro, L.Litavniece)- Assoc. Professors name. The best graduates of the Mechatronics (professional bachelor's) and Laser technology (master's) study programmes are offered to work in academic work; currently, the such following 4 lecturers work in the Mechanical Engineering programme: G.Koļčs, E.Zaicevs, R.Rēvalds, A.Pacejs, who provide a large part of professional specialisation study courses.
The study courses Mechanics I, II are led by Prof. Dr.sc.ing. A.Martinovs and Guest Docent PhD. T.Karadzhov instead of Guest Professor Dr.habil.sc.ing. E.Lendendelis. The study course Automatic Control is read by Prof. Dr.sc.ing A.Teilāns instead of Prof. Dr.sc.ing. O.Užga-Rebrovs. The lectures in the Electrical Engineering are given by prof. Dr.sc.ing. A.Martinovs and Guest Professor Dr.Ing. J. Timmerberg instead of Prof. Dr.sc.ing. I.Silineviča, but the laboratory works are lead by Dipl.ing. A.Pacejs. Guest Docents Dr.agr. L.Poiša and Dr.sc.ing. A.Skromulis are involved in the teaching of the course Thermodynamics and Heat Engineering. The study course Basics of Metrology is led by an RTA researcher, Guest Docent Dr.sc.ing. A.Skromulis instead of Docent Dr.phys. P.Narica. The study courses (or parts thereof) Technical graphics, Basics of design I, II, Course project in mechanical drive design, Machine elements, accuracy and standardisation of parts are led by Dipl.ing. Mg.comp. G.Koļčs and Mg.sc.ing. E.Zaicevs instead of Lecturer Dipl.ing. V.Ciganskis. The study course Electronics and industrial electronic equipment is led by Guest Professor Dr.Ing. J.Timmerberg, Dipl.ing. Mg.comp. G.Koļčs and Dipl.ing. R.Rēvalds instead of Dipl.ing. Docent I. Meirāns. The study course Labour law is led by RTA lawyer, Lecturer Mg.iur. I.Novika instead of Docent G. Makarova. The study courses Labour protection and Civil protection are led by Lecturer E. Šiļina instead of Lecturer I. Jurčs. A new course has been involved in the SP: Introduction to research (led by Prof. Dr. philol. S.Martena). Guest Professor PhD. G. Marzano (he is voted as an RTA researcher) and Guest Lecturer R. Rēvalds lead a new study course Industry 4.0 and simulation. Guest Professor Dr.Ing. L. Lazov (he is voted as a leading RTA researcher) reads lectures in a new study course Laser technique. Guest Professor Dr.Ing. J. Timmerberg reads lectures also in following courses: Electric machines and electric drive, Automatic control systems for electric drives.
From this information it can be concluded that the lecturers' staff of the SP is renewed significantly; young lecturers with a new approch to the learning process have been involved in the SP; the lecturers that have left the SP are replaced with equal-qualified lecturers; 3 foreign guest professors have been involved in the SP; the quality of the study has significantly improved after the performed changes in the lecturers' staff.
Management of separate professional specialisation study courses is offered to the leading specialists from the industry; these people are interested in teaching and have the opportunity to find good employees for their company among the students;
It is a common practice in the study programme, that there are several (2-4) lecturers who deliver the same study course. The topics of the study course are divided among the lecturers; each delivers his/her own part, but may be replaced by colleagues if necessary. This approach is based on LEAN management principles; it has several advantages:
• A new specialist who has just started working can be included in delivering the study course without any issues; in order to prepare a new course with high quality, a lecturer needs at least 2 years; however, a separate part of the study course can be prepared in a considerably shorter time;
• The new specialist delivers the study course together with an experienced lecturer, who guarantees the quality and mentors – consults, helps the new lecturer to prepare his/her study course quality sections and learn the teaching methodology; gradually the new specialist can also take over the entire study course;
• The risks of study programme implementation reduce: colleagues can always replace a lecturer if he/she goes on a long-term business trip, starts working in a research project or administrative position (no time to give classes), starts preparing a completely new innovative study course, prepares a new project application or terminates employment at RTA;
• It is possible to balance the workload of lecturers for the current study year, taking into account his/her employment in other places (administrative position, scientific projects, duties of an engineer/ laboratory assistant, second job), and to ensure a competitive salary for each lecturer. The distribution of hours in the study course is different between lecturers, e.g. a professor can conduct only some of the most important lectures and carry out control of the entire study course, but the other contact hours are taught by the new specialist/ lecturer/ engineer; such approach guarantees quality and makes the study process more affordable.

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 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).

Not 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).

Lecturers cooperate with each other during the study process. The following mechanisms are used to promote cooperation:

- most of the study courses are conducted by 2-4 lecturers instead of 1 lecturer; the advantages of such approach are described in criterion 4.4.2; the lecturers of the specific study course mutually agree on the topics that each of them will deliver; lecturers organise the course of examinations/tests and evaluate students' knowledge jointly;
- lecturers' work (office) places are located in the same or adjacent rooms; lecturers often meet up; regularly exchange information concerning the study process, scientific research and the development of projects; this is particularly important during project development, as immediate discussion with colleagues can significantly speed up the solution to a problem;
- the principle of mutual assistance; lecturers, engineers, laboratory assistants always help each other with professional advice/consultation; according to his/her qualification helps a colleague to make parts (turning, milling, sawing, drilling, bending, welding, 3D printing, laser cutting, laser marking, vacuum spraying, etc.), electronics assemblies, programme microcontrollers, make an experimental stand or prototype, train to work with a device for experiment or measurement purposes, to test a prototype;
- joint meetings of lecturers and last semester students on the development of engineering design projects:
    - during the first meeting at the beginning of the semester the students' wishes and interests on the topic of the engineering design project and the potential supervisor are heard; after the collegial consultation of the lecturers, the student is assigned an engineering design project supervisor;
    - the second meeting in the middle of the semester is for defence of the pre-diploma traineeship and an interim report on the progress made in the development of the engineering design project; all engineering design project supervisors shall participate in it; each lecturer asks questions to the student and gives recommendations for improvement of the engineering design project;
    - pre-defence of engineering design projects at the end of the semester; all engineering design project supervisors shall participate; each of them asks questions to the student; finally gives recommendations on how to improve the engineering design project and its presentation;

- joint work in scientific projects and commissioned research;
- work on joint publications and participation in conferences;

In November 2021, there are 84 students in the study programme of Mechatronics and 38 lecturers are involved in its implementation.

The ratio of students to teaching staff in the study program is considered according to the OECD methodology, dividing the full-time equivalent (FTE) of students in the program (33.6) by the full-time equivalent of the teaching staff employed in the program FTE (2.4). At the time of submitting the self-assessment in 2021 the ratio of teaching staff to students is 14, which is lower than the Latvian average in bachelor's and master's degree programs (18), but is equal to the EU average (14). Taking into account the fact that professional specialization study courses occupy an important place in the program, the lower ratio of students and teaching staff promotes the implementation of a student-oriented study process and a more individual approach to the needs of 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	Annex 1.docx	1.pielikums.docx
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	Annex 2.docx	2.pielikums.docx
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	Annex 3.docx	3.pielikums.docx
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)	Annex 4.docx	4.pielikums.docx
Compliance of the study programme with the specific regulatory framework applicable to the relevant field (if applicable)		
Mapping of the study courses/ modules for the achievement of the learning outcomes of the study programme	Annex 5.docx	5.pielikums.docx
The curriculum of the study programme (for each type and form of the implementation of the study programme)	Annex 6.docx	6.pielikums.docx
Descriptions of the study courses/ modules	Annex 7.zip	7.pielikums.zip
Description of the organisation of the internship of the students (if applicable)	Annex 8.docx	8.pielikums.docx
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)		

Laser Technologies (45521)

Study field	*Mechanics and Metal Processing, Heat Power Engineering, Heat Technology, and Mechanical Engineering*
ProcedureStudyProgram.Name	*Laser Technologies*
Education classification code	*45521*
Type of the study programme	*Academic master study programme*
Name of the study programme director	*Dainis*
Surname of the study programme director	*Kļaviņš*
E-mail of the study programme director	*dainis.klavins@rta.lv*
Title of the study programme director	*Mg.sc.ing.*
Phone of the study programme director	*+371 20228868*
Goal of the study programme	*To provide a set of knowledge, skills and competencies in laser technologies that correspond to the knowledge, skills and competencies in engineering of LQF level 7, integrating knowledge of laser technologies and related fields in the creation of new products, technologies and methods.*
Tasks of the study programme	*1. To provide in-depth knowledge in the fundamental subjects of Mechanics and Metalworking, Heat Power Industry, Heat Engineering and Mechanical Engineering.* *2. To provide in-depth knowledge in the field of laser technology and its practical application.* *3. To create and develop the ability to use the acquired knowledge in practical and research work.* *4. To provide an interdisciplinary approach to the acquisition of theoretical and practical study courses.* *5. To create and develop skills of scientific research work, as well as the ability to conduct independent research in the field of laser technologies.* *6. To prepare competitive specialists who are able to plan, design, implement and develop laser technologies within the production process.* *7. To guide for doctoral studies.* *8. To implement innovative solutions aimed at use of laser technologies in production.* *9. To develop cooperation with similar or thematically related programmes in other countries.* *10. To guide students to creation of innovative products and establishment of their own companies.*

Results of the study programme	*Ability to analyse and evaluate laser technologies and processes from point of view of engineering, economy, environment and society, as well as to explain and discuss the complex or systemic aspects of laser technology with both specialists and non-specialists;* *Ability to demonstrate advanced or expanded knowledge and understanding in the field of laser technologies, some of which are in line with the latest discoveries in the field and which provide a basis for creative thinking or research, including interdisciplinary activities;* *Ability to analyse, evaluate and use scientific and applied research, as well as formulate independently and analyse critically complex scientific and professional problems and make informed decisions;* *Ability to conduct research in the field of laser technologies, analyse the results and prepare suggestions for further improvement and development of laser technologies, as well as the ability to participate in and manage research projects in the field of laser technologies.* *Ability to develop and implement innovative, non-standard, the most technologically efficient and cost-effective solutions in production;* *Ability to direct the development and specialization of own competencies independently, take responsibility for work results and analysis thereof, be engaged in entrepreneurial activities, innovate in the field of laser technologies, carry out work, research or further learning and, if necessary, transform them using new approaches.*
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)	*Professional or academic bachelor´s degree (duration of studies at least 3 years (120 CP)) or second level professional higher education in engineering, physics, chemistry, biology, environmental science, medicine, computer science, information technology or mathematics.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Master´s degree of engineering in mechanics and metalworking*

Qualification to be obtained (in english)	-

Places of implementation

Place name	City	Address
Rēzekne Academy of Technologies	RĒZEKNE	ATBRĪVOŠANAS ALEJA 115, RĒZEKNE, LV-4601

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)	*Professional or academic bachelor´s degree (duration of studies at least 3 years, 120 CP) or second level professional higher education in engineering, physics, chemistry, biology, environmental science, medicine, computer science, information technology, mathematics. For studies in English: a certificate of proficiency in English at least at B2 level.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Master´s degree of engineering in mechanics and metalworking*
Qualification to be obtained (in english)	-

Places of implementation

Place name	City	Address
Rēzekne Academy of Technologies	RĒZEKNE	ATBRĪVOŠANAS ALEJA 115, RĒZEKNE, LV-4601

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.

Parameters of the study programme – title, code, place of implementation, admission requirements, degree to be awarded have not been changed. The programme directors have changed twice since the licensing of the programme. Since 2020, the director of the programme is Mg.sc.ing. guest lecturer engineer Dainis Kļaviņš.

In the framework of the assessment procedure it is planned: 1) to specify the conditions of admission, removing graduates of economic programmes from the requirements of previous education. Such changes were made in order to ensure compliance of the programme with the standard of academic education, which envisages the need for appropriate prior knowledge for successful acquisition of the master´s study programme; 2) it is no longer planned to implement the programme in German, keeping the implementation of the programme in Latvian and English what is related to the fact that it is possible to study in English at all partner institutions of RTA using mobility opportunities.

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, aim, tasks, learning outcomes of the academic master´s study programme Laser Technologies, the master´s degree to be obtained in engineering in mechanics and metalworking are interrelated. The programme corresponds to the study field of Mechanics and Metalworking, Heat Power Industry, Heat Engineering and Mechanical Engineering. According to the education classification of the Republic of Latvia, the programme **belongs to** the thematic group of Engineering Sciences, Manufacturing and Construction (code digit 5) to the thematic area of education in **Engineering Sciences and Technology** (code digits 52) and to the group of **Mechanics and Metalworking** curricula (code digits 521) determined by the LQF. Considering that the academic master's study programme, in accordance with its aim and learning outcomes, is also focused on the development of research skills and abilities, the programme content is adapted to the latest conclusions in the mechanical engineering and mechanics industry. The programme includes a module of 12 CP, which is designed for development of scientific competences. The structure of the study programme and the content of the study courses ensure achievement of all learning outcomes.

The study programme has been implemented since 2015. Student admission to the study programme takes place through competition, taking into account the average grade in the diploma supplement. Admission requirements have not changed fundamentally within last five years. An applicant can be enrolled if he/she has obtained a professional or academic bachelor´s degree (duration of studies at least 3 years (120 CP)) or second level professional education in engineering, physics, chemistry, biology, environmental science, medicine, computer science, information technology, mathematics. Foreign students have to go through an additional interview.

In order to select the most competent and motivated master's students, including the competences required for studying at foreign partner institutions, the admission requirements have additional items (a copy of a certifying document needs to be submitted and the original document needs to be presented): 1) for the fifth level professional qualification of a mechatronics, mechanical, or electronics engineer – 1 point; 2) for a certificate certifying the knowledge of the German language at least at the DSH-2, C1 or equivalent level – 1 point. Additional points are awarded for publications in engineering, physics, chemistry, biology, environmental science, medicine, computer science, information technologies, or mathematics in scientific publications or professional journals in the period from 01.09.2018. (copy of publications required) – 0.5 point (for each). Admission requirements and the additional points given to them facilitate the admission of students with a previous education more closely related to laser technology, as well as those who have started research work.

The usefullnes of the program in English is also confirmed by the fact that in 2021 50% of the 1st year students are foreign students.

The amount of credit points and content of the study programme corresponds to Cabinet Regulation No.240 *Regulations for the State Academic Education Standards* of 13 May 2014. Its volume is 80 CP (120 ECTS), the duration of implementation is 2 years. The knowledge, skills, and competences defined in the programme which form the content of the engineering master's degree in mechanics and metalworking can be fully acquired in this period.

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

The Latvian economy is shifting to a model of sustainable development, and one of the most important issues in changing the economic paradigm is the development opportunities of manufacturing industries, including mechanical engineering and metal working. One of the challenges of industrial policy is the development of high/medium-high-tech industries that will ensure the production of high value-added goods and services. As a result, the demand of companies for highly qualified engineering specialists capable of solving complex engineering tasks in the manufacturing sector, developing and operating advanced, environmentally friendly, resource-efficient, energy-efficient and competitive technologies based on innovative solutions in mechanics and metalworking has been growing rapidly in recent years. Therefore, there is a need for specialists, whose knowledge, skills and competence ensure continuous adaptation of the product to the customer's requirements, as well as continuous and systematic product improvement, considering trends in the raw materials market or increasing demands for better product properties.

Modern lasers are high-performance instruments with the widest range of applications. Lasers can be used for manufacturing and processing purposes, as well as for data transmission, measurement

or medical applications. The use of laser radiation is very diverse and is one of the main objects of technological research and development in the 21st century. Laser technologies have been used in production for decades and their use is only growing, as they ensure not only an efficient production process, thus creating high-quality products, but also increase productivity by considerable amount.

There is a growing need for highly qualified laser technology specialists in the mechanical engineering, metal working, heat engineering and other industries, who are able to create and implement the most technologically efficient and cost-effective solutions in production. This requires both highly qualified professionals and specialists whose knowledge and competence allow them to carry out scientific research in the field of laser technology. This will allow for the creation of new products and technologies in the field of lasers and laser technology, ensuring sustainable development of the manufacturing industry.

During the reporting period (since 2017), 20 graduates have graduated from the study programme. All the graduates are employed, two are continuing their studies in the joint doctoral study programme Laser Technology at RTA, and one – at the University of Ruse. Graduates who obtained the master's degree work in technologically highly advanced companies using laser systems, as well as they hold positions of the leading specialists (for example, RSEZ LEAX – Rezekne production manager, engineers, RSEZ SIA Optoelektronika – technical director, engineers, SIA Ceram Optec – engineers, Latgale Machinery and Technology Centre – engineer, JSC Valmieras stikla šķiedra – engineer, etc.). Several graduates have established their companies for the development of innovative products (SIA Exponential Technologies), for the production of laser systems (laser equipment manufacturing company *"DK Robotics"*), are employed in the maintenance, development and management of high-tech systems (State Border Guard), perform academic and research work at RTA as lecturers and engineers, participate in the implementation of projects. The above confirms the demand for highly qualified specialists in the region and the quality of the trained specialists and their ability to create and produce new products based on the research conducted during their studies (for example, marking of electric cables using laser equipment at SIA Optoelektronika, laser marking of parts (also of complex shapes), laser hardening at RSEZ LEAX Rezekne etc.).

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 study programme Laser Technologies has been implemented since 2015. The study process is organized only as full-time studies in Latvian and English. English classes are organized for foreign students and in joint groups, and in cooperation with teachers and students of Mitweide University. Mostly studies are funded by the state budget, only foreign students from outside the European Union study for a tuition fee. For information about the students of the programme, see Appendix 3.

The average number of students in the programme is 16 students per year. The average percentage of graduate students is 52% of the first year master's students. The main reasons for ex-matriculation are poor progress and non-compliance with the study process (50%), failure to renew studies after academic leave (25%), which is often also affected by students' professional employment, and termination of the exchange programme agreement (25%), which applies to

mobility students. In order to increase the number of students, there is commenced work on attraction of foreign students. In 2021, 50% of the students enrolled in the first year and 30% of the students in the programme as a whole are foreign students: 6 – from Bulgaria, 1 – from India. In 2019, one out of six graduates of the programme were foreign student who is currently continuing his studies in the doctoral study programme Laser Technologies.

For more detailed information about students during the reporting period, see Appendix 3.

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).

Not applicable.

3.2. The Content of Studies and Implementation Thereof

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

The content of the study programme has been developed in accordance with the Cabinet Regulation No. 240 *Regulation on the State Standard for Academic Education* with the aim to create a competitive master's programme ensuring knowledge, skills and competencies corresponding to the level 7 of LQF, ensures the opportunity for mobility and encourages to continue studies at the doctoral level. Compliance of the study programme with the state education standard is described in Appendix 4.

Structure of the study programme

Semester 1		**Semester 2**		**Semester 3**		**Semester 4**
A. Compulsory part						
Courses of part A	CP	Courses of part A	CP	Courses of part A	CP	

Laser Technologies I (Lazov, Adijāns, Balchev)	3	Laser Technologies II (Lazov, Adijāns, Balchev)	3			Master's Thesis 20 CP
Solid-State Physics (Kļaviņš)	3					
Quantum Mechanics and Statistical Physics (Martinovs, Balchev)	3	Physical Analytics (Noviks)	3			
Technical Optics (Kļaviņš, Fedotovs, Zaicevs)	3	Design of Laser Equipment I (Zaicevs)	3	Design of Laser Equipment II (Zaicevs)	3	
Methodology for Scientific Research Work (Teirumnieks, Kangro)	2	Scientific research project I (Lazov, Kļaviņš, Martinovs, Teirumnieks)	5	Scientific research project II (Lazov, Kļaviņš, Martinovs, Teirumnieks)	5	
Latvian (for foreign students) (Kļavinska)	0 / 2	Modelling and simulation I (Grabusts, Kangro, Martinovs, Teilāns)	2	Modelling and simulation II (Grabusts, Kangro, Martinovs, Teilāns)	2	
B. Limited elective part						
Courses of part B	4 / 2	Courses of part B	2	Courses of part B	8	
Specialisation in laser processing of materials						

Laser Radiation and Physics of Substance Interaction I (Kļaviņš, Lazovs)	2	Laser Radiation and Physics of Substance Interaction II (Kļaviņš, Lazovs)	2	Surface Treatment Technologies (Rēvalds)	3	
				Micro and nanotechnologies (Fedotovs)	2	
Specialisation in designing of laser equipment						
Laser Technique (Lazov, Adijāns)	2	Components of Laser Equipment (Lazov, Rēvalds)	2	Prototyping of Laser Equipment (Zaicevs, Rēvalds)	3	
Specialisation in modelling and optimisation of laser processes						
Pyton Programming I (Kodors)	2	Pyton Programming II (Teilāns)	2	Modelling and Optimisation of Technological Processes (Teilāns, Cacivkins)	2	
Specialisation in organisation of production related to laser technologies						
Project Management (Ežmale)	2	Innovation Management (Ežmale)	2	Risk management (Litavniece)	3	
		Marketing (Dembovska)	2	Planning of Production Premises and Equipment (Fedotovs)	2	
C. Free elective part						

Courses of part C	2	Courses of part C	2	Courses of part C	2	
Total, CP						
20		20		20		20

Courses of part C	**CP**
German language for engineers I	2
German language for engineers II	2
English language for engineers I	2
Environmental protection	1
Labour protection	1
Labour law	1
Biomaterials and biotechnology	2
Environmental and civil protection	2
Laser radiation and physics of substance interaction I	2
Laser radiation and physics of substance interaction II	2
Marketing	2
Laser technique	2
Laser components	2
Risk management	3
Project Management	2
Micro and nanotechnology	2
Python programming I	2
Python programming II	2
Surfaces treatment technologies	3
Prototyping of laser equipment	3
Planning of production premises and equipment	2

Modelling and optimisation of technological processes	2
Innovation management	2
Or other study course	

The content of the study programme consists of:

- **compulsory part (60/62 CP)** contains study courses, which form a base for the acquisition of laser technologies, including also a master's thesis in amount of 20 CP. For the foreign students, there is provided for a study course Latvian Language in amount of 2 CP, as stipulated by the Law on Higher Education Institutions. The compulsory part includes the following modules:
    - Laser Physics (Solid-State Physics, Quantum Mechanics and Statistical Physics, Technical Optics, Physical Analytics);
    - Laser technologies;
    - Modelling and simulation;
    - Design of Laser Equipment;
    - Scientific Research (Methodology for Scientific Research Work, Scientific research project I, II, Master's Thesis);
- **limited elective part (14/ 12 CP)** is targeted at student specialisation in the following areas:
    - Laser processing of materials;
    - Development of laser equipment;
    - Modelling and optimisation of laser processes;
    - Planning and organization of production related to laser technologies.

If the master's student studies at a partner university for some time, then the acquisition of other courses relevant to the field of laser technologies (not specified in the compulsory elective part) is also acceptable;

- **in the free elective part (6 CP)**, students can choose the courses of Environmental Protection (1 CP), Civil Protection (1 CP), Occupational Safety (1 CP), Labour Law (1 CP), if they have not been acquired in the previous stage of studies. Students can learn German in Engineering I, II, III, if they plan to study at Mittweida University in Germany in the framework of the cooperation agreement, or English Engineering I, II, III. Master's students also have the opportunity to choose any other study course of interest to them, which is offered at RTA or the partner higher education institution.

The content of study courses / modules is updated in accordance with the development trends of the industry, labor market and science:

Evaluation of topicality of the study courses' content and compliance thereof with the needs of the field of management science, the needs of the labour market is a mandatory study quality measure at RTA. The assessment has several stages aligned with the study schedule:

1. **the process of drawing up, coordinating and approving annual study plans** involves reviewing the study course programmes, updating the offer of the literature to be used, updating of alignment with the learning outcomes in the study programme. In order to control the correlation between the outcomes of the study course and the study programme, in the form of a study programme approved by the RTA each member of the teaching staff shall define the learning outcomes of his/her study course aligning them with the learning outcomes of the study programme,

2. **the process of drawing up annual self-assessment reports of the study fields and study programmes**, including based on the feedback obtained in surveys of students, employers and graduates,
3. discussing the outcomes of the study programme content, outcomes of the study programme and study courses, the requirements for development of research work at the **Council of the Study Field** and **general meetings of lecturers of the Study Field**,
4. discussing the content of the study programme, the outcomes of the study programme and study courses in the **Council of Experts of the Study Field**,
5. the process of defending master's theses.

The didactic strategy of the master programme provides for **uniformity** of the international, regional, professional, and research dimension.

The **international context** of the programme is ensured through cooperation with Mittweida University in Germany. Both the design of the study programme and the content of separate study courses are cross-compared. The objective of the comparison is to provide students with the opportunity of mobility acquiring study courses at Mittweida. The **regional and professional dimension** is ensured by linking students' research competence with the needs of the labour market, developing master's theses on the basis of specific companies, offering topical innovations in national economy. The master's programme pays particular attention to **current events in research** in order to ensure that the conferral of a master's degree is based on the latest achievements and findings in engineering. Research theory and practice issues in the Programme comprise 32 CP (the study course Methodology for Scientific Research Work (2 CP) Scientific research project I, II (5+5 CP), and development and defence of the master's thesis (20 CP)). Current events of research methodology are also included in study courses in order to acquire the latest scientific topicalities in a certain field of laser technologies.

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).

In the study program, the award of a master's degree of engineering in mechanics and metalworking is based on the achievements and findings of the respective field of science. The Master's student conducts research in the field of Mechanical Engineering in one of the sub-sectors for 3 semesters:

- Mechanical engineering technology (specialisation in laser processing of materials; specialisation in modelling and optimisation of laser processes; specialisation in organisation of production related to laser technologies)
- Machine design (specialisation in designing of laser equipment).

Scientific research project I, II (5 + 5 CP) and Master's thesis (20 CP) are planned for these researches.

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.

Acquisition of the content of study courses takes place in lectures, workshops, laboratory works and students' independent work. 40 hours are provided for the acquisition of 1 credit point (1 CP = 1.5 ECTS) of the study course, including 12 (or 30%) contact hours (lectures, practical and laboratory works) in the lecture room / laboratory / computer room / workshop and 28 hours – for independent work at home / library / laboratories / computer rooms / workshops. The proportion between lectures and practical classes or hours devoted to laboratory work is determined by the lecturer of the particular study course. In most study courses this proportion is as follows: lectures – 50%, practical and laboratory works – 50% of the number of contact hours. Although there are also study courses in which a larger number of contact hours is devoted for practical work. Classes in these courses take place in the laboratories of the Faculty of Engineering and in the Laser Centre. The types of students' independent work are defined in the programme of the specific study course. The student receives assignments for independent work during the classes. All laboratories and workshops of the Faculty of Engineering are freely available to students 7 days a week for independent work. The workload of each lecturer includes the number of consultations corresponding to the volume of his/her workload; the time of a consultation is precisely specified in the list of lecturers' consultations. Unlike in large universities, RTA lecturers are available to students not only during the official consultation time; if the lecturer does not have a class, meeting or other urgent work, then a student can come to him/her without a prior appointment and immediately receive a consultation, defend the independent or laboratory work. In addition, the student is free to receive consultations from engineers and laboratory assistants working in laboratories.

Each study course description indicates the type of summative testing – examination or test – and the requirements to obtain credit points. The form of organization of the examination/test is determined by each lecturer, provided that the content of the examination/test corresponds to the content of the study course and can completely reveal at what level a student has achieved the learning outcomes planned in the study course. RTA has introduced the practice that during the semester a student can earn 40% of the total evaluation completing all independent works and practical works of the study course. This is an incentive for the student to study the content of the study course regularly throughout the semester, rather than mostly leaving it for the examination session. In some courses a student can earn up to 80% of the examination grade during the semester. For this purpose, a student must regularly (every week) complete the tasks of independent work assigned by the lecturer and defend them during the consultations to convince the lecturer that the student has completed the independent work him/herself and has acquired the topic; each such task is evaluated with a grade and influences the grade of the examination.

The study programme is offered for implementation in English. Lectures for foreign students are organized separately, practical works – together with the Latvian students or individually.

At the master's level, an individual student-cantered approach is essential for students, as almost all master's students have jobs, therefore laboratory and practical work can be done individually,

too (upon agreement with the lecturer of the specific study course and the engineer and laboratory assistants of the Laser Technology Centre).

The principles of student-centred education in the study programme are ensured, first of all, by evaluating the students' previous preparedness and offering such study content that can ensure achievement of the learning outcomes of the study programme the best. Secondly, RTA offers flexible ways of studies, including taking into account employment of students during their studies, planning classes at a time convenient for students. Thirdly, students are provided with full consultative support and full access to the study resources (including the ones available remotely) necessary to achieve their learning outcomes. Fourthly, students' studies and research activities are focused on their personal growth, including development of their personality. Fifthly, students receive feedback on evaluation of the learning outcomes, which enables them to plan the course of studies and the best ways to achieve learning outcomes independently.

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).

Not 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).

Not 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 develop a master's thesis in accordance with the Methodological Recommendations approved by the Council of the Study Field for development of a master's thesis. A master's thesis, within the meaning of the Methodological Recommendations, is a study performed by a student which confirms the acquisition of theoretical knowledge and skills, demonstrates the student's competence in the field of laser technologies, is based on personally conducted theoretical and experimental research at a company and its mathematical analysis, which results in a product with practical application – a laser device/equipment or a laser application technology. Methodological

recommendations provide that the topic of a master's thesis should be topical; it should solve important tasks related to the use of laser technologies in the field of mechanics and metalworking. A student have to choose a theme of interest to him/her that is directly related to solving of the tasks of the company chosen by the student.

Since 2017, twenty master's theses have been developed and defended in the study programme. Commission for Defence of Master's Theses (Dr.ing. Lyubomir Lazov, Chairman of the Commission (senior researcher at RTA); Deputy Chairman of the Commission: Andris Martinovs (professor Dr.sc.ing., RTA), Members of the Commission: Edmunds Teirumnieks (professor Dr.sc.ing., RTA), Dmitrijs Saharovs (Dr.phys., SIA "Ceram Optec" head of the laboratory)) has evaluated all the theses with good (7) (1 master's thesis), very good (8) (4 theses) and excellent (9) (15 theses).

The topics of the master's theses deal with such important issues in laser technologies as the use of laser ablation: for creating Braille writing and alphanumerical characters on polyvinyl chloride, for removal of the copper layer for PCB plates. The use of laser technologies for the needs of different sectors of the national economy: for marking eggs of domestic birds, corks and industrial cork products, polypropylene materials, CLT materials; for the processing of birch plywood; in the microparticle filer manufacturing process, etc. Laser illumination optimisation issues and solutions: replacing runway navigation illumination with lasers at aerodromes, a room illumination element using a blue laser diode and a phosphorous diffuser, as well as other master's thesis topics concerning the general optimisation challenges in laser cutting, laser hardening, laser micromarking, laser sublimation, and laser processing.

RTA has a uniform requirement for master students to participate in at least one scientific conference to enable them to independently formulate and critically analyse complex scientific and professional problems, justify decisions, and, if necessary, perform additional analysis, design and defend a master's thesis. To ensure that the master project contributes to creation of new knowledge, development of research or professional activity methods, as well as certifies that the master student is able to demonstrate advanced or broader knowledge and understanding, part of which corresponds to the latest findings in the industry of mechanics and metalworking, RTA has in place the Rector's order 4-5/100 dated 2 December 2012 providing for the requirement to obligatory use in design of master projects the latest scientific journals in the field and scientific articles from internationally recognised databases in English. Such a requirement allows master students to explore the latest studies in the field and evaluate the innovation of their research ideas.

Before the defence of a master's thesis, there are master's theses research discussion seminars organised in the study field with the participation of all master's students and supervisors of their theses, and if the theme is related to the needs of a specific company, then its representatives also attend it, and pre-defence of master's theses during which the teaching staff and students in the study field discuss the methodology and literature chosen for the master's theses and the innovative capacity of the research. During their studies, master's students also present their research at events organized by RTA for entrepreneurs, within the framework of projects thus developing the ability to speak publicly on research topics, participate in discussions, and defend their scientific opinion. Before defending the master's thesis, it is checked in the Unified Latvian Plagiarism Checker. The Council of the Study Field deals with analysis of each case of coincidence, as well as evaluates the level of innovation of master's thesis research. On the basis of this research, several patent applications have been filed in accordance with the Intellectual Property Management Policy of RTA.

Presentation of master projects at RTA takes place as an open session where the state examination committee and everyone present can ask the candidate for the master's degree questions; whereas

the candidate demonstrates their ability to use arguments to explain and discuss complex or systemic issues in the corresponding field of management with specialists and non-specialists.

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 programme Laser Technologies has absolutely all resources and provision of the study field, which are described in detail in criteria 2.3.1-2.3.3. The available infrastructure, laboratory/workshop base and information provision allow to implement the study programme successfully, to achieve all the learning outcomes provided for in it. On average, 50% of the study courses are practical classes with the maximum use of the available software, laboratory/workshop equipment and facilities.

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).

Not 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).

Information on the financing of the study programme Laser Technologies (including by years in the reporting period) and its sources is viewed in detail in the criterion 2.3.1.

RTA calculations suggest that the direct costs of the academic master’s study programme Laser Technologies (remuneration of academic and general staff) are EUR 3 117.59/ 75% per one reference student a year, the indirect costs (expenses for ensuring RTA activities, including library, immovable property tax, rent of premises, operating expenses of buildings and equipment,

telephone subscription and service costs, utilities, current repairs, special programmes, etc.) are EUR 1 039.19/ 25% per one reference student a year. Predicting the number of students in the group of 6 and more to ensure the profitability of the study programme. In general, the tuition costs for one full-time student are estimated at EUR 4 156.78 per year, which does not exceed the costs in European states for the training of one student in a similar speciality.

The annual study costs for one non-EU student are estimated at EUR 2,400.00; direct costs amount to EUR 1,800.00 per one reference student a year, indirect costs amount to EUR 600.00 per one reference student a year.

Funding of the study programme Laser Technologies						
Financial year	2016	2017	2018	2019	2020	2021
Minimum Ratio of Study Costs:	1,7	1,7	1,7	1,7	1,7	=1,7
Ratio of Study Level:	1,5	1,5	1,5	1,5	1,5	=1,5
Basic Costs of Studies (euro)	1333	1383,22	1458,51	1518,98	1518,98/1538,98	<1630,11
Amount of scholarship (euro)	150,82	150,82	150,82	150,82	150,82	<200,00
Sports, culture, student hostel (euro	13,52	13,52	13,52	13,52	13,52	=13,52

The number of state-budget funded study places	6	6	6	11	11	=11
The number of state-budget funded study places	21 318	22 302	23 301	44 415	44 602	<48 073

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.

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lecturers are involved in implementation of the study programme Laser Technologies. Of them, 15 (60%) lecturers are elected to the academic and/or scientific position at RTA, 10 (40%)- are non-elected at RTA. 14 (56%) lecturers have a doctoral degree; 13 of them are RTA elected.

Distribution of elected lecturers of the study programme Laser Technologies by positions:

- Professors – 3 (including, RTA-elected leading researchers- 3);
- Assoc. professors- 4 (including, RTA-elected leading researchers- 3, researcher- 1);
- Docents – 3 (including, RTA-elected leading researchers- 3);
- Lecturers -2 (including, RTA-elected researchers- 2);

Distribution of guest lecturers of the study programme Laser Technologies by positions:

- Guest Professors – 3 (including, RTA-elected leading researchers- 3);

- Guest Docents – 1;
- Guest Lecturers - 9.

For full information about study programme lecturers and their publications see Annex 15 and for the lecturers' CVs – Annex 11. For the certification of SF lecturers' official language knowledge, see Annex 12, for the certification of SF lecturers' English language knowledge – Annex 13.

The study programme employs teaching staff competent in the corresponding industry and study field – 13 out of 20 teaching staff members have Mg. degree (5) and, respectively, a doctoral degree (7) in engineering. Lecturers of innovation and entrepreneurship courses have Mg. and Dr. degree in social sciences, for language courses – 2 lecturers have a doctoral degree in humanities. Study courses related to mathematics, computing and modelling are taught by Dr. paed. in mathematics, the course of biomaterials and biotechnology – by Dr. biol., labour protection course – by a professional master in labour protection.

In academic programmes, scientific research competence is ensured by the active scientific activity of the teaching staff of the industry. All the teaching staff members have publications during the reporting period. The *h-index* of the new teaching staff members (E. Zaicevs, R. Rēvalds) is 2/1, for others it ranges from 3 to 6. Foreign teaching staff from Bulgaria (L. Lazov and I. Balchev) as well as teaching staff from Germany is also involved in the implementation of the programme. I. Balchev is also a researcher at the postdoctoral research "Analysis of the parameters of the laser marking process of new industrial materials for high-tech applications" (research application No.1.1.1.2/VIAA/3/19/474).

The professional experience of the teaching staff employed in the study programme that they gained in the companies of the industry has a great importance: for example, the director of the programme D.Kļaviņš is the owner and manager of SIA DKRobotics (production, maintenance, repairs of laser equipment, CNC equipment); the guest lecturer E.Zaicevs is the Member of the Board of SIA DKRobotics, Head of the Production Department; guest lecturer R.Rēvalds – the Member of the Board of SIA DKRobotics, mechatronics engineer; the guest lecturer J.Fedotovs – the Technical Director at SIA Optoelektronika, the Professor A.Teilāns – the programmer, systems analyst, senior project manager, head of academic cooperation at JSC Exigen Services Latvia (previous titles of the company SWH RIGA, SIS and Dati).

For full information about study programme lecturers and their publications see Chapter 2 Annex 14.,15 and for the lecturers' CVs – Annex 11. For the certification of SF lecturers' official language knowledge, see Annex 12, for the certification of SF lecturers' English language knowledge – Annex 13. The qualification of the teaching staff fully complies with the requirements of the laws and regulations and ensures the achievement of the learning outcomes of the study programme, as well as complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (Annex 8).

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 total number of teaching staff members in the programme has increased from 15 (at the beginning of the programme) to 20. This increase was determined by several factors: 1) attraction of foreign teaching staff. To work in the programme in addition to the senior researcher guest prof. L. Lazov (Bulgaria) there was attracted a postdoctoral researcher

I. Balchev (Bulgaria); 2) replacing the director of the programme Dr.phys. P. Narica, who passed away prematurely, the new lecturers D. Kļaviņš (director of the programme), R. Rēvalds and E. Zaicevs were attracted to the programme, who combine the duties of guest lecturers with the position of engineer at RTA and at the same time work in the professional sector of the industry. Which allows you to give students a vision from the point of view of manufacturing companies.

The academic staff of the programme has significantly improved during the reporting period: the number of associate professors has increased by one, the number of leading researchers has increased from 1 (in 2015) to 10, as well as now there are two new researchers, what significantly increased the number of teaching staff members involved in science and scientific activity developing and engaging in projects. It is important for the quality of the programme that 8 lecturers are elected to both pedagogical and scientific positions at the same time. Three lecturers elected as senior researchers work as guest professors in the programme. One lecturer has started the election procedure as a professor. Evaluating the composition of the teaching staff, it must be concluded that it complies with the strategic settings of the programme and is able to ensure plans for research, professional and international cooperation fully.

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 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).

Not 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).

Lecturers cooperate with each other during the study process. The following mechanisms are used to promote cooperation:

- most of the study courses are conducted by 2-4 lecturers instead of 1 lecturer; the advantages of such approach are described in criterion 4.4.2; the lecturers of the specific study course mutually agree on the topics that each of them will deliver; lecturers organise the course of examinations/tests and evaluate students' knowledge jointly;
- work (office) places of lecturers are located in one room or adjacent rooms; they exchange information concerning the study process, scientific research and project development on a regular basis;
- the principle of mutual helpfulness; lecturers, engineers, laboratory assistants always cooperate in accordance with their qualifications;
- regular seminars of lecturers and students of the last semester on the course of development of the master's theses:
- joint work in scientific projects and commissioned research;
- work on joint publications and participation in conferences.

The ratio of students to teaching staff in the programme is obtained in accordance with the methodology provided by OECD dividing the number of full-time equivalent (FTE) students in the programme (6.9) by the number of FTE teaching staff (0.6) employed in the programme. In 2021, at the time of submitting the self-assessment, the ratio of teaching staff to students is 8, which is lower than the Latvian average indicator in bachelor's and master's level programmes (18) and the EU average indicator (14). Taking into account that the didactic strategy of the programme provides for an individual approach to students, a lower ratio of students and teaching staff promotes implementation of a student-oriented study process and a more individual approach to the needs of students, which is especially relevant at the level of master's studies. The comparative analysis shows that the ratio of students to teaching staff at the level of bachelor's and master's studies is close or lower for example, in Hungary (10), Luxembourg (5) and Norway (9).[1]

[1] EDUCATION AT A GLANCE 2021 © OECD 2021. Available: https://ieej.lv/gHSYU pp.355.

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	Annex 1.docx	1.pielikums.docx
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)	Annex 2.odt	2.pielikums.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	Annex 3.docx	3. pielikums.docx
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	Annex 4.docx	4.pielikums.docx
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	Annex 5.docx	5.pielikums.docx
The curriculum of the study programme (for each type and form of the implementation of the study programme)	Annex 6.docx	6.pielikums.docx
Descriptions of the study courses/ modules	Annex 7.zip	7.pielikums.zip
Description of the organisation of the internship of the students (if applicable)		
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)		
Confirmation that the academic staff of the academic study programme complies with the requirements specified in Section 55, Paragraph one, Clause 3 of the Law on Higher Education Institutions (if applicable)	Annex 8 _.docx	8.pielikums.pdf

Laser Technologies (51521)

Study field	*Mechanics and Metal Processing, Heat Power Engineering, Heat Technology, and Mechanical Engineering*
ProcedureStudyProgram.Name	*Laser Technologies*
Education classification code	*51521*
Type of the study programme	*Doctoral study programme*
Name of the study programme director	*Edmunds*
Surname of the study programme director	*Teirumnieks*
E-mail of the study programme director	*edmunds.teirumnieks@rta.lv*
Title of the study programme director	*Dr.sc.ing.*
Phone of the study programme director	*+371 20225595*
Goal of the study programme	*1.Expand student knowledge about the research area of their choice (including theoretical foundations of optoelectronics and special methods used for its study) and the opportunity to acquire knowledge about a broader area in engineering research, including one or several applications of lasers, for example, in production (welding, cutting, heat treatment, modification of surfaces, photochemistry), biology, medicine, manufacturing and commerce, entertainment and recreation, imaging, measurement, and process control, etc.* *2.Develop skills in scientific literature analysis, preparation/writing of scientific articles, oral presentation of the results obtained (including at conferences), ensuring the publication of research results in scientific journals with a high citation index.* *3.Train specialists with specific research and analytical skills who would be prepared for post-doctoral research at higher education institutions and scientific organisations, or work in the industrial sector – in public service manufacturing engineering, electrical engineering and electronics, healthcare, environmental engineering, military engineering, and other spheres related to laser technologies.* *4.Train highly qualified experts (specialists) and researchers who are able to create new knowledge in the field and obtain the degree of a doctor of sciences (Ph.D.) that meets international standards.*

Tasks of the study programme	*1.To implement research-based studies, involving doctoral students in research led by the academic staff and in other national and international research.* *2.To develop research directions relevant to the field in the context of national, European and world research, promoting creation of new knowledge, approbation of research findings and their transfer in the practice of the industry.* *3.To facilitate presentation and publication of the results of scientific communication and doctoral research in the relevant field publications recognized on the national and international scale.* *4.To organize and promote the cooperation of a doctoral student and scientific supervisor, cooperation among doctoral students, and cooperation of the academic staff in conducting scientific research.* *5.To promote doctoral students' understanding of scientific and academic careers and to improve the pedagogical competence required for academic work.* *6.To facilitate the mobility and experience of doctoral students and academic staff cooperating with foreign universities and international research organizations in attracting guest professors and implementing joint research projects, promoting comprehensive and independent growth opportunities in the context of the European Higher Education Area.* *7.To develop analytical and critical research skills of doctoral students by integrating theoretical knowledge into applied research and problem solving. To prepare scientists, researchers, experts, high-level professionals for analytical, research and management work in the public and private sector. To increase the quality and capacity of research in Latvia, Europe and the common global research space.*

Results of the study programme	*I Knowledge (knowledge and understanding):* *1. Understands the theory of photonics (laser technologies), scientific findings, current scientific trends in Europe and the world, including from an interdisciplinary perspective.* *2. Understands the importance of laser technologies in the development of the national economy, solving technical problems of certain sectors, development of innovations.* *3. Knows and is able to choose reasonably modern research methods, adapt the existing ones and develop new methods based on an interdisciplinary approach to research.* *4. Is able to demonstrate the basic and specialized knowledge in the field of laser technologies and a critical understanding of this knowledge, which corresponds to the highest level of scientific achievement.* *II Skills (ability to apply knowledge, communication, general skills):* *1. Is able to plan and conduct research related to laser technologies, prepare publications to be cited at the international level, patent applications and create innovations.* *2. Is able to provide a new understanding of the existing knowledge and is able to synthesize new knowledge in the field of laser technologies and mechanical engineering, focusing on its application in practice.* *3. Is able to demonstrate and justify scientific approach to problem solving, take responsibility and initiative working individually, in a team or leading other people's work, including cooperate in international context.* *4. Is able to communicate both orally and in writing about his/her field of scientific activity with the scientific community and society, providing a new understanding of it.* *III Competence (analysis, synthesis and evaluation):* *1. Is able to independently and systematically find, analyse and synthesize information using scientific databases, patents and other sources of information.* *2. Is able to put forward a research idea, plan and manage high-level national and international scientific projects.* *3. Is able to manage research processes in companies, solve innovation tasks using the latest research-based knowledge. Is able to increase scientific qualification* *4. Is able to transfer new knowledge to students constantly, demonstrate scientific and professional independence.*
Final examination upon the completion of the study programme	*Doctoral 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)	*Requirements for admission to the doctoral study programme are a master's degree in engineering, natural sciences or equivalent professional education in engineering or natural sciences, if the study courses acquired in the master's study programme comprise at least 10 CP or the developed master's thesis is related to laser technologies. English knowledge complying at least the level B2. If the applicant has master's s degree not in engineering or natural social sciences or corresponding field of professional activity, the applicant has to prove the work experience / non-formal education that corresponds to the knowledge, skills and competences in mechanical engineering and mechanics specified in LQF level 7 pursuant to the procedure laid down in the Cabinet Regulation No. 505 Regulations on Recognition of Competences Obtained outside of Formal Education or in Professional Experience and the Learning Outcomes Achieved in Previous Learning.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Doctor of Science (Ph.D.) in Mechanical Engineering and Mechanics*
Qualification to be obtained (in english)	-

Places of implementation

Place name	City	Address
Rēzekne Academy of Technologies	RĒZEKNE	ATBRĪVOŠANAS ALEJA 115, RĒZEKNE, LV-4601

Part time extramural studies - 4 years - latvian

Study type and form	*Part time extramural studies*
Duration in full years	*4*
Duration in month	*0*
Language	*latvian*
Amount (CP)	*120*
Admission requirements (in English)	*Requirements for admission to the doctoral study programme are a master's degree in engineering, natural sciences or equivalent professional education in engineering or natural sciences, if the study courses acquired in the master's study programme comprise at least 10 CP or the developed master's thesis is related to laser technologies. English knowledge complying at least the level B2. If the applicant has master's s degree not in engineering or natural social sciences or corresponding field of professional activity, the applicant has to prove the work experience / non-formal education that corresponds to the knowledge, skills and competences in mechanical engineering and mechanics specified in LQF level 7 pursuant to the procedure laid down in the Cabinet Regulation No. 505 Regulations on Recognition of Competences Obtained outside of Formal Education or in Professional Experience and the Learning Outcomes Achieved in Previous Learning.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Doctor of Science (Ph.D.) in Mechanical Engineering and Mechanics*
Qualification to be obtained (in english)	-

Places of implementation

Place name	City	Address
Rēzekne Academy of Technologies	RĒZEKNE	ATBRĪVOŠANAS ALEJA 115, RĒZEKNE, LV-4601

Part time extramural studies - 4 years - english

Study type and form	*Part time extramural studies*
Duration in full years	*4*
Duration in month	*0*
Language	*english*
Amount (CP)	*120*
Admission requirements (in English)	*Requirements for admission to the doctoral study programme are a master's degree in engineering, natural sciences or equivalent professional education in engineering or natural sciences, if the study courses acquired in the master's study programme comprise at least 10 CP or the developed master's thesis is related to laser technologies. English knowledge complying at least the level B2. If the applicant has master's s degree not in engineering or natural social sciences or corresponding field of professional activity, the applicant has to prove the work experience / non-formal education that corresponds to the knowledge, skills and competences in mechanical engineering and mechanics specified in LQF level 7 pursuant to the procedure laid down in the Cabinet Regulation No. 505 Regulations on Recognition of Competences Obtained outside of Formal Education or in Professional Experience and the Learning Outcomes Achieved in Previous Learning.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Doctor of Science (Ph.D.) in Mechanical Engineering and Mechanics*
Qualification to be obtained (in english)	-

Places of implementation

Place name	City	Address
Rēzekne Academy of Technologies	RĒZEKNE	ATBRĪVOŠANAS ALEJA 115, RĒZEKNE, LV-4601

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)	*Requirements for admission to the doctoral study programme are a master's degree in engineering, natural sciences or equivalent professional education in engineering or natural sciences, if the study courses acquired in the master's study programme comprise at least 10 CP or the developed master's thesis is related to laser technologies. English knowledge complying at least the level B2. If the applicant has master's s degree not in engineering or natural social sciences or corresponding field of professional activity, the applicant has to prove the work experience / non-formal education that corresponds to the knowledge, skills and competences in mechanical engineering and mechanics specified in LQF level 7 pursuant to the procedure laid down in the Cabinet Regulation No. 505 Regulations on Recognition of Competences Obtained outside of Formal Education or in Professional Experience and the Learning Outcomes Achieved in Previous Learning.*
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	*Doctor of Science (Ph.D.) in Mechanical Engineering and Mechanics*
Qualification to be obtained (in english)	-

Places of implementation

Place name	City	Address
Rēzekne Academy of Technologies	RĒZEKNE	ATBRĪVOŠANAS ALEJA 115, RĒZEKNE, LV-4601

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 full-time and part-time study plan of the doctoral study programme Laser Technologies is maintained the same as when receiving the license (07/05/202. license No. 2021/04K). The reason for introducing no changes is based on the fact that the study process was started in the autumn of 2021/2022. As the study process was started only in this semester, currently there is no approbated and experience-based justification for making any changes in the implementation of the study programme.

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.

Joint doctoral study programme Laser Technologies complies with the continuation of the study programmes implemented within the framework of the Study Field “Mechanics and Metalworking, Heat Power Industry, Heat Engineering and Mechanical Engineering” at the level of doctoral studies.

The study field “Mechanics and Metalworking, Heat Power Engineering, Heat Engineering and Mechanical Engineering” is a training centre for the highest qualification level engineering and science specialists in Eastern Latvia in the field of ecotechnologies, mechatronics, metalworking, laser technologies and mechanics. The **mission** of the study field is to provide the economy of the Republic of Latvia with highly qualified professional engineering specialists capable of solving engineering tasks in the field of production, developing and operating advanced, environmentally friendly, resource-saving, eco- and energy-efficient, competitive technologies based on innovative solutions in mechatronics, metalworking, mechanics, heat power industry and heat engineering.

The **aim** of the study field is to ensure operation of the stable, sustainable and flexible training system for engineering specialists in Eastern Latvia, which is competitive in the global labour market and required for the production industry. The aim is defined on the basis of strategic planning documents of the EU and Latvia: Europa2030, NAP2027, Latvia 2030, Latgale Strategy 2030, Activity and Development Strategy of the Rezekne Academy of Technologies 2016-2023 and other strategic and planning documents, as well as consulting with students, employers, professional organizations and discussions in the Council of the Study Field, the Board of the

Faculty of Engineering, the Study Council and the Senate of RTA.

The **tasks** of the study field are:

1. Elaboration, improvement, and implementation of programmes and study courses in the study field according to the development plans for the national economy and scientific priorities of the Republic of Latvia, the requirements of the job market, and RTA development strategy at all levels of education (including doctoral degree).
2. Development, continuous modernisation and improvement of the training and research laboratory resources and infrastructure.
3. Creation of experimental and training grounds.
4. Creation of scientifically educational innovative clusters (study programme – research centre – company) and ensuring their operation;
5. Continuous monitoring and improvement of the compliance of the content and structure of the study courses with the latest achievements in science, machinery and technologies;
6. Continuous modernisation of study methods, extensive use of e-learning, hardware, multimedia and Internet;
7. Expansion of the network of companies for student traineeships and optimisation of its operation.
8. Continuous improvement and modernisation of the learning, methodological, scientific, information, and software resources.
9. Expansion and strengthening of international relations in the implementation of the programmes of the study field; development and implementation of joint cross-border study programmes.
10. Development and implementation of a long-term plan for the improvement of qualification, traineeships and training of academic and scientific staff.
11. Activation and support of the scientific research of the academic staff; increasing the number of publications in internationally cited journals.
12. Ensuring efficient work of the Council of the Study Field.

The strategy for the study field provides for development of market-oriented research, which would result in the creation of new products with high added value. The following **research areas have been determined as the most significant for the development of the study field**:

1. Laser technologies.
2. Development of new innovative materials and their production technologies.
3. Development of new innovative products in mechatronics.
4. Development/improvement of materials and surface treatment technologies.
5. Applied research in mechanics and mechanical engineering.
6. Applied research in electronics and telecommunications.
7. Applied research in the power industry.
8. Development/improvement of waste recycling technologies.
9. Development/improvement of biomass processing / use technologies.
10. Development/improvement of technological equipment for production companies.
11. Improving working conditions in production.

The thematic clusters of study and research (metalworking, engineering mechanics, engineering, mechanical engineering technology, bionics, materials science, mechatronics, production technology) covered in the study programme corresponding to the educational programme group Mechanics and Metalworking build up an analytical basis for the doctoral study program Laser Technologies, which includes in-depth studies of photonics, laser systems, mechanical engineering, mechanics, application of ICT in data processing.

The study programmes corresponding to the educational programme group Mechanics and Metalworking have been created as interrelated, supplementing and successive:

- First level professional higher education bachelor's study programme **MECHANICAL ENGINEERING,**
- Professional bachelor's study programme**MECHATRONICS,**
- Academic master's study programme**LASER TECHNOLOGIES,**
- Joint doctoral study programme**LASER TECHNOLOGIES.**

Creation of the programme and its title has been agreed with the Ministry of Education and Science, and the professional organisations MASOC, LIKTA, and LETERA provided a positive opinion in this relation.

As the Programme was created as a joint doctoral study program in partnership with "Angel Kanchev" University of Ruse (UR) in Bulgaria and Mittweida University in Germany, RTA has the opportunity to take over the experience of Bulgaria and Germany and develop a topical STEM study field in Latvia. Secondly, the doctoral study programme will promote renewal of academic staff and involvement of the young researchers in studies and research. Thirdly, the doctoral study programme will intensify international cooperation in science promoting development of joint scientific publications and preparation of scientific projects. Fourthly, the doctoral programme will promote creation and management of intellectual property.

The title, aim, tasks and learning outcomes of the programme are defined in accordance with:

1. The National Classifications Framework complying with the European Qualifications Framework. As the doctoral study programme corresponds to **level 8 of LQF**, its learning outcomes are defined in accordance with the descriptions of knowledge, skills and competences corresponding to the level 8, which are available in Regulation of the Cabinet of Ministers (Cabinet Regulation) No. 332 *Regulations on the Classification of Education in Latvia* of 13.06.2017.
2. Cabinet Regulation No. 49 *Regulations on Latvian Science Branches and Sub-Branches* and Cabinet Regulation No. 522 *Procedure and Criteria for Conferring Doctoral Degrees*.

The programme is based on the evaluated best practices of the EU countries, including regarding the study content, the applied teaching, learning and evaluation methods. The programme is planned so that it would facilitate development and defence of the doctoral thesis in the specified study period, in accordance with the latest trends in the implementation of doctoral studies in Bulgaria and Latvia.

The **aims** of the doctoral study programme Laser Technologies are:

1. Expand student knowledge about the research area of their choice (including theoretical foundations of optoelectronics and special methods used for its study) and the opportunity to acquire knowledge about a broader area in engineering research, including one or several applications of lasers, for example, in production (welding, cutting, heat treatment, modification of surfaces, photochemistry), biology, medicine, manufacturing and commerce, entertainment and recreation, imaging, measurement, and process control, etc.
2. Develop skills in scientific literature analysis, preparation/writing of scientific articles, oral presentation of the results obtained (including at conferences), ensuring the publication of research results in scientific journals with a high citation index.
3. Train specialists with specific research and analytical skills who would be prepared for post-doctoral research at higher education institutions and scientific organisations, or work in the industrial sector – in public service manufacturing engineering, electrical engineering and electronics, healthcare, environmental engineering, military engineering, and other spheres

related to laser technologies.
4. Train highly qualified experts (specialists) and researchers who are able to create new knowledge in the field and obtain the degree of a doctor of sciences (Ph.D.) that meets international standards.

Tasks of the programme:

1. To implement research-based studies, involving doctoral students in research led by the academic staff and in other national and international research.
2. To develop research directions relevant to the field in the context of national, European and world research, promoting creation of new knowledge, approbation of research findings and their transfer in the practice of the industry.
3. To facilitate presentation and publication of the results of scientific communication and doctoral research in the relevant field publications recognized on the national and international scale.
4. To organize and promote the cooperation of a doctoral student and scientific supervisor, cooperation among doctoral students, and cooperation of the academic staff in conducting scientific research.
5. To promote doctoral students' understanding of scientific and academic careers and to improve the pedagogical competence required for academic work.
6. To facilitate the mobility and experience of doctoral students and academic staff cooperating with foreign universities and international research organizations in attracting guest professors and implementing joint research projects, promoting comprehensive and independent growth opportunities in the context of the European Higher Education Area.
7. To develop analytical and critical research skills of doctoral students by integrating theoretical knowledge into applied research and problem solving. To prepare scientists, researchers, experts, high-level professionals for analytical, research and management work in the public and private sector. To increase the quality and capacity of research in Latvia, Europe and the common global research space.

The degree to be obtained in the joint doctoral study programme Laser Technologies (code 51521) is the doctoral degree in Doctor of Science (*Ph.D.*) in Mechanical Engineering and Mechanics.

Volume (CP) and duration of the study programme:

- Full-time studies – 120 CP/ 3 years,
- Part-time studies- 120 CP/ 4 years.

Requirements for admission to the doctoral study programme are *a master's degree in engineering, natural sciences or equivalent professional education in engineering or natural sciences, if the study courses acquired in the master's study programme comprise at least 10 CP or the developed master's thesis is related to laser technologies. English knowledge complying at least the level B2.*

If the applicant has master's s degree not in engineering or natural social sciences or corresponding field of professional activity, the applicant has to prove the work experience / non-formal education that corresponds to the knowledge, skills and competences in mechanical engineering and mechanics specified in LQF level 7 pursuant to the procedure laid down in the Cabinet Regulation No. 505 *Regulations on Recognition of Competences Obtained outside of Formal Education or in Professional Experience and the Learning Outcomes Achieved in Previous Learning*.

In the process of developing the programme, the learning outcomes of the programme have been mapped with the aim to make sure that:

- the planned learning outcomes of the study courses correlate with the learning outcomes of

the study programme;
- the topics in the study course programmes do not overlap;
- the defined outcomes of the study programme and study courses correspond to the objectives of higher education (personal development; preparation of active citizens for work in a democratic society; sustainable employment; development of an expanded knowledge base), the Latvian Qualifications Framework and the European Qualifications Framework.

The doctoral study program “Laser Technologies” has been developed taking into account the regulatory enactments of Latvia and the European Union in the field of higher education. The program has been developed as the final stage of the study field “Mechanics and Metalworking, Heat Power Engineering, Heat Engineering and Mechanical Engineering” - doctoral studies. Its development was accepted by the Ministry of Education and Science and professional organizations (MASOC, LETERA). In terms of content and structure, the program focuses on the development and incorporation of new technologies (in this case, laser technologies) into the academic environment and the transfer of inventions into production. The title of the program, the code, the degree to be obtained, the goals and objectives, the study results, as well as the admission requirements are interrelated and integrated.

The doctoral study program is implemented in Latvian and English.

The duration and scope of the study program implementation complies with the requirements of legislation and the Bologna process. Type and form of studies: part-time and full-time studies have been selected taking into account the specifics of the regional university. In the study direction in general and in other study programs implemented by RTA, full-time and part-time studies are carried out. This is related to the specifics of Latgale region in low indicators of employment and wages in the Latvian context. As a result, students often choose to study in parallel with their work. It is best and most useful to ensure the study process in such a situation, for example, in part-time studies. Therefore, in the given doctoral study program, such a choice is acceptable for the student.

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

Programme presentation aspects, economic assessment and justification as well as social gain and substantiation in Latgale and Latvia, based on common production industry development trends in Europe and worldwide, considering the inclusion of interdisciplinary production forms into the business environment and integrated cooperation between educational and scientific institutions and business.

Nowadays, laser has become a high-performance tool with a multitude of applications in production industry, research, medicine, military tech and other domains. Lasers are easy to integrate into existing technology lines and have relatively low operating costs. The main advantages of laser are its high precision, quick action, local effect on materials, as well as no-contact processing that reduces mechanical wear of the items being processed.

Laser technologies underwent rapid and dynamic development over the last few decades. Analyses of laser system markets and expert findings forecast increased demand in the area in the nearest future. Widespread application of laser technologies for practical purposes is due to the specific properties of laser radiation, such as high coherence, monochromatic spectrum, ability to achieve high energy density (meaning greater power) within the processing area.

Major advancements in technology over the past decades are due in no small part to the use of lasers in production. Nowadays, this is a universally acknowledged, innovative and highly efficient technology employed by many research institutions and the production industry. Apart from having become more efficient and affordable, laser technologies have produced the optimum alternative for traditional production systems. Laser systems are used by the industry in such technological processes as quenching, welding, engraving, drilling, marking, cutting, etc. Apart from that, laser technologies assertively take their place design, leather processing, textile industry, food production and numerous other areas. Laser processing technologies can be optimised and automated through the integration of IT solutions. Automated laser system control facilities release more time for businesses to attend to other important operations.

In July 2020, IndexBox has reported in "World-Lasers, Other Than Laser Diodes - Market Analysis, Forecast, Size, Trends and Insights Update: COVID-19 Impact[1]" a rapid increase in the laser device production volumes over the past few years, with a trend for increase and ever more comprehensive transition from traditional production technologies to laser technologies. Countries with the most prominent laser equipment production market increase are China and the USA. In order to avoid getting left behind in terms of laser industrialisation, Europe must develop its photonics and engineering science domains relevant for upgrading laser systems, innovations in the development and production thereof, as well as pay greater attention to educational and scientific processes in laser technologies. Moreover, the range of areas where laser technologies can be used is expanding steadily. For instance, historical use of lasers in production has now evolved into a broad spectrum of applications in medicine, defence & military, communication technologies, etc.

"Europe's age of light! How photonics will power growth and innovation Strategic Roadmap 2021–2027[2]" states that photonic technologies are indispensable for driving and developing the future digital economy of Europe. Photonic technologies mark a path to a wealth of yet undiscovered scientific advances to be used in many other areas, e.g. healthcare, space, mobility and security. On the top of that, laser technologies are a vital component for achieving the requirements set by the Industry4.0 standard, especially as pertains to the production of identical and individual parts / products. Photonics is the key technology for the digital revolution of the future, which requires European countries to make strategically oriented investments at the current stage in the preparation of new scientists and scientific institution capacity development.

The European Commission (hereinafter – EC) has declared its choice of the European Green Deal (Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. European Green Deal [3]) - *the European Green Deal* is a set of EC policy initiatives aimed at Europe to become climate neutral by 2050. Promoting economy through environmentally friendly technologies such as hydrogen and fuel cells, creating sustainable industry and production while reducing pollution are all key features of the Directive. The European Green Deal provides for development of technologies that are environmentally friendly in terms of both energy consumption and creating minimum waste. Laser technologies are those, which the most directly correspond to these guidelines. The main problem related to their introduction is the lack of specialists and scientific research capacity in the EU member states. It is planned that research and innovation endeavours will be supported through the entire range of tools offered by the "Horizon Europe" programme. Knowledge and innovation communities under the control of the European Innovation and Technology Institute will continue promoting the cooperation of higher education institutions, research organisations, and companies in such areas as climate change, sustainable energy, food of the future, and smart, green, and integrated transport. The European Innovation Council will allocate funding, capital investments, and business acceleration services for start-ups and SMEs

with high potential to allow them to achieve revolutionary green path innovation, which can be rapidly expanded on the world markets. Through a greater focus on experimentation and intersectoral and interdisciplinary work, a systemic approach required for the achievement of green path goals will be integrated into the EU research and innovation agenda. Thanks to the initiatives of the "Horizon Europe" programme, which strive to combine the effect of social demand with a technology push, local communities will get involved in the work directed at more sustainable future. Essentially, the EU plans for even greater cooperation of higher education and scientific institutions in the future.

Latvia's Sustainable Development Strategy until 2030 (Latvija 2030)[4], which is hierarchically the highest long-term development planning document in Latvia, provides for the choice and implementation of a "green" or environmentally friendly path while solving the issue of improving efficiency, which is based on educated society and the introduction of new technologies in manufacturing. Latvia's National Development Plan for 2021 - 2027 (NAP2027)[5] also provides for an integrated approach to the introduction of new technologies at companies and for inter-sectoral cooperation, including the transition from low-cost labour economy to efficiency based on commercialisation of knowledge, which includes innovations, digital skills, and the training of engineering specialists. NAP2027 provides for that innovative solutions should form a stable foundation for the Latvian economy on the "green deal" to climate neutrality. At the level of technology, the development of laser technologies is also implied here.

National Industrial Policy Guidelines 2014-2020 [6] already provided for the manufacturing of products with high added value, including the cooperation of companies and higher education institutions for designing innovative products, especially in key enabling technologies (KET), which also include photonics. This approach are also included in the "National Industrial Policy Guidelines 2021-2027" document. It is already obvious that the role of innovation, research and development is only going to grow, largely on the basis of new technologies and their application in the industry. Laser technologies are one of them.

A big problem in Europe (and especially in Latvia) is depopulation and aging society. This will create problems in the future for the competition of companies. This is why we already need to prepare high-level specialists who are not only able to work with the workbenches available on the market, including laser machines, but also understand and know the principles of their operation and are able to use their knowledge, for example, for designing new workbenches and systems. This is impossible without proper education, including doctoral studies.

In this case, laser technologies are the main connective element, which applies to the creation of designs, ICT and environmentally friendly materials, etc. The doctoral study programme will allow RTA to implement not only academic and research cooperation at the international level, but will also promote active involvement of entrepreneurs in the implementation of the programme, considering that the implementers of the programme are already actively cooperating with the largest manufacturers and users of laser machines and laser system designers in the world and in Latvia. Besides, all these companies are actively cooperating with scientific and higher education institutions and conducting scientific research themselves. RTA actively cooperates and has concluded cooperation agreements with several companies and institutions, such as Coherent Inc. (before – ROFIN-SINAR Laser GmbH), IPG Photonics, Mittweida Higher Education Institution (Hochschule Mittweida), ACI Laser GmbH, Laserinstitut Mittelsachsen e.V. an der Hochschule Mittweida, SIA "O.R. Laser Technology Baltic", TRUMPF Laser- und Systemtechnik GmbH, SIA „AB METAL".

The concluded agreements cover several fields of cooperation:

- Exchange of information to ensure the study process and scientific research activities;

- Joint organization of meetings, symposiums, seminars, conferences, cooperation days and other events;
- Joint development of academic, scientific research and other projects;
- Publication of jointly written scientific or scientific methodological works (articles and presentations) and joint projects in the scientific collections of the Parties;
- Cooperation in the development and implementation of joint study programmes;
- Cooperation in the field of lifelong learning;
- Support for mobility of students, academic staff and employees;
- Cooperation in installation of laser and laser system devices and establishment of laboratories;
- Cooperation in research of experimental laser cutting technology and its testing and implementation in the production process, etc.

RTA is convinced that the concluded agreements will allow to ensure successful implementation of the doctoral study programme.

Cooperation contracts for research and design and implementation of joint projects have also been concluded with several higher education institutions, such as the Estonian University of Life Sciences, the University of Niš (Serbia), etc.

RTA and UR in accordance with the project No. 8.2.1.0/18/A/016 “The reduction of fragmentation of the study programmes and strengthening the sharing of the resources in the study directions “Management, administration and real estate management” and “Mechanics and metalworking, heat power industry, heat engineering and mechanical engineering” at Rezekne Academy of Technologies” have agreed on development and implementation of a new joint doctoral study program “Laser Technologies” for both higher education institutions. The creation of the programme was supported by the Ministry of Education and Science and industry associations.

The doctoral study programme “Laser Technologies” has been created in accordance with existing trends in the European Higher Education Area (EHEA) and the European Research Area (ERA), which provide for the synchronisation of the research system with the systems in the EU member states, as well as to strengthen the ability to solve important social problems[7]. Laser technologies (more specifically – photonics) are mentioned in the “Science, Technological Development and Innovation Guidelines 2014–2020”[8] approved by the Cabinet of the Republic of Latvia as one of the key technologies at the European level.

“Doctoral education in Europe today: approaches and institutional structures”[9] points out the necessity for international cooperation in the implementation of doctoral study programmes, including cooperation in the supervision of doctoral theses and consultation, ensuring international mobilities for doctoral students and the use of the research infrastructure, which is unavailable to separate higher education institutions individually.

Laser technologies offer many advantages, such as greater speed, greater precision, and lower cost, compared to traditional methods. These advantages expand the application of this technology in different areas of the industry. At the global level, the laser technology market is considered to be at the stage of growth. The growth of the laser technology market is determined by such factors as, for example, huge demand for its use in healthcare, as well as the improved performance of laser equipment in traditional material processing areas. Laser technologies give several advantages compared to traditional material processing methods, such as higher precision, lower labour cost, and wasting less material. For example, laser sensors can measure a larger area than capacitive or inductive distance sensors. Progress to the manufacturing of nano- and microdevices will promote the growth of the laser technology market and the strengthening of its global impact even more.

The requirement for cheap solutions is the main challenge for the global market, which can be solved using laser equipment. It is possible that soon there will be a shortage of professionals on the job market, as well as in educational institutions, who are able to use high performance laser systems and apply this technology in research which gives high added value in the manufacturing industry.

In keeping with the end-user, the laser technology market continues quickly filling the niche product space in telecommunication, aviation, the military industry, healthcare, the automotive industry, medicine, electronics, research, etc. Essentially, the application of laser technologies is already an integral part of our everyday lives.

In the priority of the European Commission (EC) strategy for 2019-2024 "A Europe Fit for the Digital Age", **photonics** is recognised as one of the key enabling technologies (KET) in the 21st century Europe, which should promote innovation. The EC emphasises that the EU will support the development of such important key technologies which are strategically significant for Europe's industrial future. These include **robotics, microelectronics**, high performance computing and data cloud infrastructure, blockchains, quantum technologies, **photonics**, industrial biotechnology, biomedicine, nanotechnologies, pharmaceuticals, progressive materials and technologies. For this purpose, as emphasised in the EC statement "The New Industrial Strategy for Europe" [10], **higher and professional education and training systems will have to provide a greater influx of scientists, engineers, and technicians on the job market.**

The doctoral study programme focuses on the theoretical foundations of laser applications in photonics and optoelectronics, an in-depth study of research methodologies covering one or more aspects of laser applications, such as manufacturing (welding, cutting, heat treatment, surface modification, photochemistry), biology, medicine, industry and trade, entertainment and recreation, imaging, measuring and process control, etc.

It should be noted that the Programme has been implemented only since the autumn 2021 and currently there are no graduates of this programme and it is impossible to evalua te/analyse the graduates.

[1] IndexBox report "World - Lasers, Other Than Laser Diodes - Market Analysis, Forecast, Size, Trends and Insights Update: COVID-19 Impact". July 10, 2020.

[2] Europe's age of light! How photonics will power growth and innovation Strategic Roadmap 2021–2027 https://www.photonics21.org/download/ppp-services/photonics-downloads/Europes-age-of-light-Photonics-Roadmap-C1.pdf

[3] Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. European Green Deal. European Commission, Brussels, 11.12.2019. COM (2019) 640 final. https://eur-lex.europa.eu/legal-content/LV/TXT/?qid=1588580774040&uri=CELEX:52019DC0640

[4] Latvia's Sustainable Development Strategy until 2030 (Latvia 2030) *Saeima* of the Republic of Latvia. 2010 https://www.pkc.gov.lv/lv/valsts-attistibas-planosana/latvijas-ilgtspejigas-attistibas-strategija

[5] Latvia's National Development Plan for 2021 - 2027 (NAP2027). *Saeima* of the Republic of Latvia. 2020. https://www.pkc.gov.lv/lv/nap2027

[6] National Industrial Policy Guidelines 2014-2020. The Cabinet of Ministers of the Republic of Latvia. 2013. http://polsis.mk.gov.lv/documents/4391

[7] Latvian European Research Area Roadmap 2016-2020. Ministry of Education and Science of the Republic of Latvia. 2016.

[8] Zinātnes, tehnoloģijas attīstības un inovācijas pamatnostādnes 2014. – 2020.gadam. Latvijas Republika. Ministru kabinets. 2013. http://tap.mk.gov.lv/mk/tap/?pid=40306267

[9] Doctoral education in Europe today: approaches and institutional structures. Authors: Alexander Hasgall, Bregt Saenen, Lidia Borrell-Damian. Co-authors: Freek Van Deynze, Marco Seeber, Jeroen Huisman. EUA CDE. 2019. https://eua.eu/resources/publications/809:doctoral-education-in-europe-today-approaches-and-institutional-structures.html

[10] Jauna Eiropas industriālā stratēģija. Communication from the European Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. Brussels. 10.03.2020. Available at: https://eur-lex.europa.eu/legal-content/LV/TXT/PDF/?uri=CELEX:52020DC0102&from=LV

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 joint doctoral study programme Laser Technologies is licenced on 21.04.2021, decision No. 2021/11-L (licence No. 2021/04K). The implementation of the programme was commenced in September 2021. In the academic year 2021/2022, RTA has enrolled 1 student (for own funding) to the programme, equalization and recognition of the learning outcomes has been performed for 2 students who previously studied in the doctoral study programme of RTA Environmental Engineering. Pursuant to the agreement between the Ministry of Education and Science and the RTA, it was planned to close this study programme after the beginning of implementation of the doctoral study programme Laser Technologies. Thus, in total there are three students in the Programme, two are studying at the “Angel Kanchev” University of Ruse.

The main problem that affected the autumn admission is the lack of budget places in the Programme. Currently, the Ministry of Education and Science and the RTA are coordinating the planning of budget places. It is planned that the Ministry of Education and Science will allocate state-funded budget places to the Programme, which will have a positive influence on admission. It is related to the fact that already during the autumn admission graduates demonstrated a high interest exactly in budget places and studies. This is probably the specifics of the Latgale region, taking into account that Latgale has the lowest level of remuneration in the country.

In the future, it is planned to admit three students each year at each higher education institution.

RTA and “Angel Kanchev” University of Ruse are taking steps to popularise the 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).

The Programme is developed in accordance with the Activity and Development Strategy of RTA 2016-2023 and Strategy of Scientific Activity of RTA 2019–2023, which provides for RTA to become the leading engineering and technology research and innovation centre in Eastern Latvia, including ensuring purposeful, coordinated and successive implementation of STEM and resource-intensive study directions focused on the development, acquisition and application of innovative technologies in the Latgale region, training the specialists required for the economic growth of Latgale, Latvia and Europe, promoting involvement of the new specialists in science and research, as well as development of the knowledge society and introduction of digitalisation. One of the measures to achieve this goal is to develop and start implementation of a doctoral study programme in laser technologies in accordance with the international standards (P.1.1.3). For this purpose, the RTA Strategy prescribes a number of short-term and long-term outcomes (see Table 3.1.5.1).

The programme has been developed pursuant to the **Study Programme Consolidation and Development Plan of RTA**, approved by the Ministry of Education and Science and providing for the development and implementation of a new doctoral study programme Laser Technologies, which replaces the doctoral study programme Environmental Engineering (51526).

The development of the doctoral study programme and the challenges of its further implementation are also related to the development and implementation of a new funding model for doctoral studies in Latvia. RTA in cooperation with Vidzeme University of Applied Sciences and Ventspils University of Applied Sciences in the third round of selection of project applications for the specific support objective “Strengthen the academic staff of higher education institutions in the fields of strategic specialization” 8.2.2 of the Operational Programme “Growth and Employment”. RTA has developed the **Doctoral Study Programme Development Plan of RTA 2020-2026** and submitted it to the Ministry of Education and Science for approval. The plan:

- provides for measures to ensure the research environment,
- evaluates the compliance of doctoral study programmes and Doctoral Schools with European best practices and international standards,
- plans establishment of Doctoral Schools, their functions and operating models,
- outlines the procedures for internal assessment of the quality of doctoral study programmes,
- provides for a system of advanced training for lecturers of doctoral study programmes and supervisors of doctoral theses,
- criteria for selection of reviewers,
- principles of introduction of academic ethics procedures,
- applicant selection procedures for doctoral study programmes, provision of research places and remuneration during the doctoral study process,
- career development opportunities for doctoral students,
- involvement in post-doctoral activities,
- outlines the conditions for cooperation with other Latvian and foreign scientific institutions, other higher education institutions.

In addition, the Doctoral Study Programme Development Plan includes preparation and inclusion of the doctoral study programme Laser Technologies in the conceptual **joint interdisciplinary Doctoral School of RTA, Vidzeme University of Applied Sciences (ViA) and Ventspils University of Applied Sciences (VeA)**, the start of establishment of which is planned from 2022. Doctoral study programmes of RTA to be implemented within the joint interdisciplinary Doctoral School of RTA, ViA and VeA are given in the Figure 3.1.5.1.

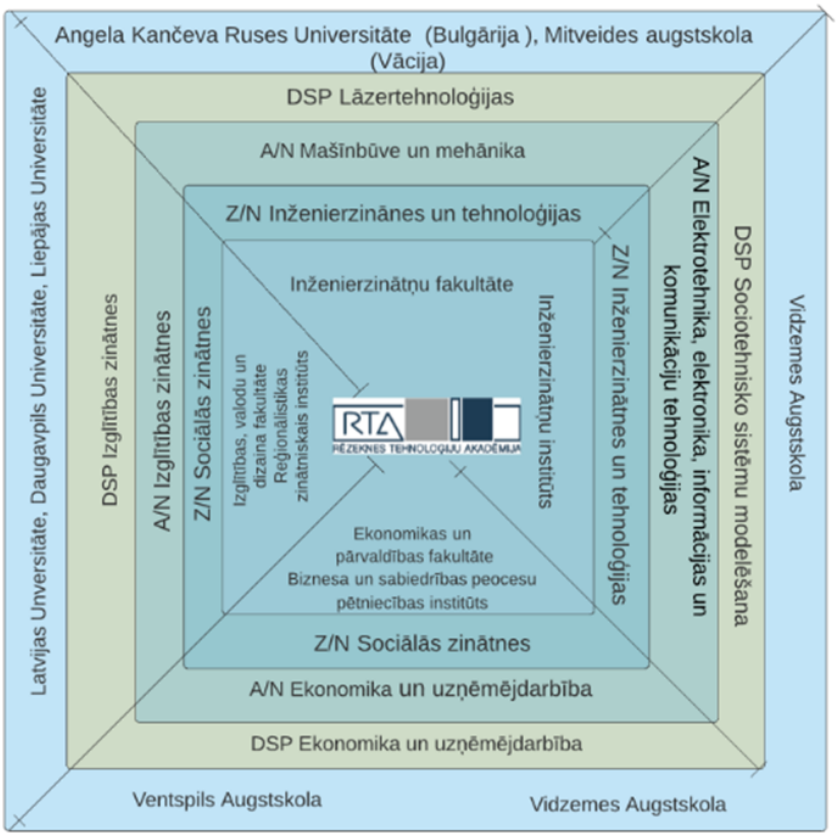

Figure 3.1.5.1. System of RTA for doctoral study programmes

The joint doctoral study programme was developed within the Project No. 8.2.1.0/18/A/016 “Reduction of fragmentation of study programmes and strengthening the sharing of resources in the study fields “Management, Administration and Real Estate Management” and “Mechanics and Metalworking, Heat Power Industry, Heat Engineering and Mechanical Engineering”” aimed at improvement of the international competitiveness of RTA study programmes, to ensure and strengthen efficient utilisation and sharing of the available resources, to reduce the fragmentation of study programmes consolidating the implemented study programmes and establishing a new joint doctoral study programme Laser Technologies in partnership with “Angel Kanchev” University of Ruse (UR) (Bulgaria).

The development of programmes includes (I) development process of **three stages**, (II) approbation process, (III) accreditation process and (IV) the implementation process with regular internal and planned external assessment.

At the FIRST stage of the development process (in 2018), the idea of the new Programme was updated in accordance with the activity P.1.1.3 defined by the Activity and Development Strategy of RTA – development and implementation of a doctoral study programme in laser technologies to meet the international standards, which was respectively included in the **Study Programme Consolidation and Development Plan of RTA.** The idea updating stage was comprised of:

1. **Defining the core Programme development principles**: research-based studies, synergy of academic and scientific work, mobility of students and the academic staff, involvement of doctoral students in research projects, availability of research materials through free-access databases (journals.rta.lv), shared usage of resources (access to partners' academic, infrastructural and informational resources), ensuring interdisciplinary linkage,
2. Assessing the**research and innovation capacity**,

3. Assessing the**cooperation** with other higher education institutions (HEI) and scientific institutions (SI) in Latvia and abroad for the development of a common study programme and shared usage of resources.
4. The plan of the programme creation **has been agreed** with the Ministry of Education and Science, and a positive conclusion has been received from professional organisations MASOC, LIKTA, and LETERA.

The SECOND stage of the development process (year 2019) featured the development of conceptual content of the Programme, which, in accordance with the provisions of Project No. 8.2.1.0/18/A/016, was carried out with the involvement of three experts: Professors of RTA Dr.sc.ing. L. Lazov and Dr.sc.ing. E. Teirumnieks and PhD R. Minev from UR. The stage of development of the conceptual content involved:

1. defining the aim, learning outcomes of the Programme,
2. assessment of the compliance of the Programme with the requirements of laws and regulations,
3. planning of provision with academic staff, Programme resources and material provision,
4. evaluation of scientific activities related to the Programme,
5. comparison of the Programme with programmes of similar content implemented in other countries.

The conceptual content of the Programme was **discussed** in the Council of the Faculty of Engineering of RTA and in the meeting of the Scientific Council of the Institute for Engineering (minutes No.13.1.1.6., 12.05.2020.).

The THIRD stage of the development process deals with preparation of the application for the programme licensing. For this purpose and in accordance with the order of the Dean of the RTA Engineering Faculty No. 13.2/358 dated 03.07.2020 a task team was assembled, comprising as follows: Dr.sc.ing. L. Lazov and Dr.sc.ing. E. Teirumnieks – the professors of RTA, PhD R.Miņevs Ruses Universitāte, G.Jačuks, RSEZ SIA "Leax", O.Skredelis, "Latgale Machinery and Technology Centre", V.Rantiņš, Mechanical Engineering and Metalworking Industry Association, A.Pacejs – master student of the master´s study programme Laser Technologies at RTA, K.Pīgožnis – a graduate of the master´s study programme Laser Technologies at RTA. The working group elaborated the programme description, covering the study programme compliance with the study field, Programme resources and provision, study content and implementation mechanism, teaching staff description and programme compliance with the laws and regulations. During the development of materials, the working group also consulted with other partners. Due to the international nature of the team, it worked both face-to-face and remotely in the *Microsoft Teams* environment. The prepared description of the Programme was later evaluated and discussed at the meeting of the Council of the Study Field "Mechanics and Metalworking, Heat Power Industry, Heat Engineering and Mechanical Engineering" (Minutes No. 13.4/1MP of 06.10.2020), at the meeting of the Board of the Faculty of Engineering (Minutes No. 13.1/2 of 12.10.2020), at the Study Council of RTA (at the meeting on 08.12.2020, minutes No. 11.1/7) and approved by the Senate (Decision No. 1 of the Senate of RTA on 15.12.2020). The opinions of external experts on the study programme are attached in five appendices (the documents – Opinion on the Programme).

The choice of a partner university has been discussed several times in the meetings of the academic staff of the Faculty of Engineering. The choice in favor of Angel Kanchev University of Ruse (Bulgaria) is linked to the successful previous cooperation in lecturer mobility, including ERASMUS +, in joint projects (including the UNIVERS project, although it did not receive EU funding, but cooperation with partners is still ongoing). The competence of lecturers and long-term cooperation opportunities have been taken into account. Angel Kanchev Ruse University has proven

to be a reliable and predictable partner. We consider the current inter-university cooperation to be successful and mutually beneficial.

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 content and all study courses within the study programme have been developed in observance of the relevant trends in the field, both in Europe and worldwide. Other reference points include the foreign (European) doctoral study programme assessment, in particular, the "Optics and Photonics" doctoral study programme of Karlsruhe Institute of Technology (Germany), as well as the doctoral study programme “Lasers, Photonics and Vision” developed jointly by the University of La Coruña, the University of Santiago de Compostela and the University of Vigo (Spain). The development trends of the industry and its connection with science are described in Section 3.1.3.

Already in the process of developing the Programme, the working group got acquainted with and took into account the doctoral study programmes described above, as well as the **Salzburg recommendations for doctoral study programmes** and the **Salzburg Recommendation Progress Report** [1].

- Research-based studies. A volume of 90 CP, which is equal to 75% of the doctoral study programme Laser Technologies, is allocated for scientific work, encompassing the development of a doctoral thesis, preparation of scientific publications and presentations at scientific conferences, participation in the development and implementation of scientific projects.
- Relevance of doctoral graduates for the labour market is a crucial aspect of implementation of the Programme, which is taken into account across all stages of development thereof and observed at the implementation stage. While the Programme was in development, a research was undertaken to study the industry trends in Europe and Latvia (see section 3.1.3). The studies are intended to include student career planning efforts, undertaken by the Doctoral School. The Programme delineates three main graduate career lines: 1) post-doctoral research, 2) academic (also scientific) work at higher education and scientific institutions, 3) employment with enterprises within the industry in order to strengthen the scientific, innovative and technological capacity thereof. The Salzburg Recommendation Progress Report also defines a new challenge – to create a conclusive coherence between the higher education sector and the public. A major emphasis within the boundaries of the Laser Technologies study programme is the cooperation with Latvian and foreign companies in the industry, which reveals many opportunities for doctoral students to perform scientific research important for the industry.

- Reflection in strategy and policy of the higher education institutions. The programme is fully in line with development strategy of RTA and future challenges.
- One of the strengths of doctoral programmes, including joint doctoral programmes, is their diversity in Europe. This diversity must be based on quality and good practice. The programme is implemented by RTA and “Angel Kanchev” University of Ruse. Moreover, RTA cooperates with other Bulgarian higher education and research institutions and the Laser Institute of the Mittweida University (Germany) in the implementation of the programme. Bulgaria and Germany have a strong and traditional study and research environment in laser technology. Involvement in an international consortium provides RTA the opportunity for a new breakthrough for studies and research in the field of laser technology. Including development of bachelor’s and master’s study programmes.
- Doctoral students are scientists at their earlier stage, and they need to be recognised as professionals with the corresponding range of rights, who make a considerable contribution into the creation of new knowledge. Pursuant to the Doctoral study programme development plan of RTA, drawn up based on the new doctoral study funding model in Latvia, doctoral students will be enrolled to Programme in the position of non-elected scientific staff. In addition, doctoral students will be involved in research projects implemented by RTA and cooperation partners.
- The crucial role of supervising and evaluating a doctoral thesis: **as regards each individual doctoral student, organization of supervision and evaluation must be based on a clear and transparent contractual relationship, which provides for division of responsibilities between the doctoral student, the supervisor and the higher education institution (and other parties if necessary).** The Doctoral study programme development plan of RTA prescribes that, starting from 2022, a trilateral agreement will be made upon commencement of doctoral studies between a doctoral student, RTA and the doctoral thesis supervisor.
- Critical mass must be achieved. Critical mass, within the context of the Salzburg Recommendations, is an incitement to reach critical mass, encompassing, inter alia, regional, countrywide and international cooperation between universities. The new Programme implies both regional/national and international cooperation. At the national level, there is a cooperation agreement concluded with Daugavpils University, and at the international level, there is cooperation with Bulgarian and German universities.Bearing in mind the Salzburg recommendations for doctoral studies asindividual research, a critical mass of 22 students is planned in the programme by 2026.
- Doctoral programmes must be of appropriate duration (three to four years). The duration of the programme is three years 120 CP (180 ECTS), which corresponds to the international standards.
- Promotion of innovative structures: meeting the needs for interdisciplinary training and developing transversal skills. The content of the study programme includes study courses for the development of transversal skills, strengthening the understanding of research integrity and research ethics in accordance with the competencies specified in the level 8 of LQF: “Methodology of Scientific Research in Laser Technologies”, “Scientific Writing and Communication, Intellectual Property”.
- Promoting mobility: doctoral programmes should tend to offer both geographical and interdisciplinary mobility, as well as international cooperation within a joint cooperation structure between universities and other partners. The joint study programme provides for mobility of both students and teaching staff in each partner institution in accordance with the study plan and an individual research plan developed for each doctoral student. In addition,solutions for an open study and research environment are provided for in the implementation of the Programme. First of all, for the acquisition of the theoretical part of the

study programme, it is planned to create a study programme website on the platformlv allowing doctoral students free access to study materials. Secondly,part of the study courses will be acquired in the remote study mode allowing students to participate in the class regardless of their country of residence and geographical location. Thirdly, the research results of RTA are published on the open access website journals.rta.lv.

- **Ensuring adequate funding: both development of high-quality doctoral programmes and successful completion of these programmes by doctoral students require adequate and regular funding.** At RTA, doctoral studies are financed from the state budget, the doctoral students' own tuition fees and attracted project funding. Starting from 2022, doctoral students are expected to be recruited as non-elected research staff for scientific projects. This will meet the challenge announced in the Salzburg Recommendations Progress Report – a global vision for doctoral studies that provides for collaboration between doctoral students and the teaching staff employed in the programme regardless of geographical distance. According to the progress report, foreign doctoral students represent the access point for talented researchers contributing to the development of the future of European knowledge society. Therefore, it is important to integrate foreign doctoral students into the Latvian research environment, to appreciate their contribution to intellectual and cultural diversity and to support their development and career in Europe or even beyond.

The structure of study programmes at RTA is regulated by the Regulations on Development of Study Course Programmes approved by the Study Council, which provide for the inclusion in the study course programme of such information as requirements for commencement of the study course, the body of knowledge, skills and attitudes (learning outcomes) to be acquired at the end of the study course, which correspond to the learning outcomes of the study programme and topics planned according to the volume and title of the study course, as well as individual work of students, requirements for assessment of learning outcomes to obtain credit points, literature and other organizational issues of the study course

To ensure the connection of the course content and outcomes with the aims and outcomes of the study programme:

1. Teaching staff plans course outcomes in accordance with specific outcomes of the study programme, which are reflected in the form of study course programme;
2. Teaching staff shall agree with the learning outcomes defined in the course with the director of the education programme who is responsible for setting learning outcomes in the study programme.

The study programme is developed so that the student is able to carry out his/her independent research work in cooperation with the supervisor of the doctoral thesis and so that the research topics are topical on a global, national and regional scale, as well as from the point of view of a certain sector of economy.

The study courses emphasize the acquisition of research methods, critical analysis, so that the student chooses the most appropriate methods for the research and the possibilities of the modern technological solutions. As a student will already know the topic of his/her thesis when starting studies, each study course will give an opportunity to analyse the specific topic, which will provide a broader view of the research topic in the end.

The study courses "Scientific research methodology" and "Scientific writing and communication, intellectual property" are created so that the doctoral student is able to work skilfully with the selection of scientific literature, its critical evaluation, preparation of independent scientific publications. The knowledge and skills acquired in these study courses would also be applied in communication with other researchers, field and society as a whole, as well as showing the

possibilities in researching the chosen topic of the thesis and explaining the situation/results in an interdisciplinary perspective.

The mapping of the learning outcomes shows that the study courses and research/ scientific work develop the skills of synthesis and analysis, which are necessary to solve the problem chosen for the thesis and create new knowledge, as well as to supplement and strengthen the existing knowledge in today's changing conditions.

The mapping of the learning outcomes of the programme was performed in order to make sure that:

- the planned learning outcomes of the study courses correlate with the learning outcomes of the study programme;
- the topics in the study course programmes do not overlap;
- the defined outcomes of the study programme and study courses correspond to the objectives of higher education (personal development; preparation of active citizens for work in a democratic society; sustainable employment; development of an expanded knowledge base), the Latvian Qualifications Framework and the European Qualifications Framework.

Learning outcomes of the doctoral programme

By the end of the doctoral programme, students must possess comprehensive and analytical knowledge of scientific and industry-specific literature in the domain of laser technologies, as well as good command of scientific methods and techniques applicable in scientific research. Students must be capable of demonstrating an original approach to the application of their knowledge, as well as practical understanding of how research and the respective results are applied to create and interpret the obtained data. Students must have a well-developed ability to perform critical assessment of the current research and techniques and methodology thereof, used in the course of planning and conducting research. A student must be able to plan and perform research at his/her own discretion, obtain results, summarise and present these.

Results of the study programme are formulated in adherence to the European Qualifications Framework (EQF) and the Latvian Qualifications Framework (LQF) level 8, third cycle qualification level of the Framework for Qualifications of the European Higher Education Area, as well as the goals and objectives of the Programme (see section 3.1.2).

[1] Salzburg recommendations. https://www.eua-cde.org/downloads/publications/2016_euacde_doctoral-salzburg-implementation-new-challenges.pdf

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).

In order to ensure a student-centred approach, reinforce the potential weak points of doctoral students, the Programme includes specific brief courses – seminars implying discussions between the doctoral students of the Programme, their supervisors and lecturers involved in the implementation of the Programme. Seminars are scheduled twice a semester. Given that the

Programme will be implemented in two countries, these seminars are planned remotely, for example, on ZOOM, Teams, Webex or other platforms (RTA has been using Microsoft Teams since 2020, but does not exclude the use of other platforms). This is required to identify in a timely manner the skills and knowledge that need to be developed immediately.

The study courses are divided into thematic groups in order to avoid fragmentation of the content and allow flexible implementation of different study programme acquisition scenarios.

The study courses are designed with the common goal of creating and strengthening independent research skills, so that each study course contributes to the development of the doctoral thesis and the application and popularisation of its results.

In the Programme, research activities will be contextualised according to the area of interest of each applicant and his/her chosen scientific theme. They will include:

1) analysis of the problem at hand;

2) theoretical research (including modelling of processes associated with the implementation of laser technologies and interaction of laser energy with specific materials);

3) experimental research of laser systems or laser technologies (including the influence of laser rays on specific materials, heat and light reflection absorption mechanisms, sublimation, dispersion, material strengthening and other laser surface quality aspects).

The programme provides for intensive scientific exchanges between higher education institutions and companies. It will include the following partner institutions and organizations: Laser Institute of Mittweida University (Germany); Institute of Electronics at the Bulgarian Academy of Sciences; Bulgarian Defence Institute, “Angel Kanchev” University of Ruse (Bulgaria); TRUMPF Ltd. (Germany); Coherent-ROFIN (USA, Germany) and other.

The doctoral study programme determines specific student activities that will promote research in the development of a dissertation. These activities are divided into several categories and will provide a certain number of credit points. They include:

- writing specific parts of the dissertation;
- periodic reports;
- participation in research projects;
- scientific publications;
- participation in seminars;
- writing critical reviews;
- pre-defence of the dissertation; etc.

In the study process, combined teaching methods dominate, where solving real problems of the industry requires doctoral students’ continuous activity and mutual communication. Lecturers use methods aimed at active participation of doctoral students, development of critical thinking, independent in-depth research activities in the development of doctoral research, and reflection. The e-learning environment *Moodle* is also used to promote independent studies in the study process.

In order to promote development of students’ research competence, doctoral students have the opportunity to analyse and research in depth various industry problems that are interesting to them during their successive courses.

Doctoral students will be involved in conducting study courses and study research for the students of bachelor’s and master’s level. Students’ prior knowledge, previous professional experience and experience in research are taken into account in the study process, thus allowing flexible planning

of the content and methodology of study courses.

Moreover, the study process involves the use of digital technologies, providing doctoral students with the opportunity to actively participate in group work, pose questions and promote discussion.

The material and technical base for studies in the partner universities promotes the implementation of a student-cantered approach: lecture rooms can be easily transformed to facilitate group work, individual work, students can use digital technologies that aid high-quality participation in meetings, classes, lectures from anywhere with high-speed Internet access.

During the implementation of the programme, the mobility of doctoral students and teaching staff will be promoted, doctoral students will participate in research and social activities initiated by the academic staff, thereby gaining significant experience that will enable the use of doctoral study experience in practice.

The topics of the doctoral theses offered to doctoral students (see Appendix) have been developed and compiled in cooperation with higher education and research institutions, professional organisations representing the interests of the industry, as well as the companies themselves. As already mentioned, the doctoral student is free to choose a topic that is relevant and scientifically innovative. The choice of topic may also be connected to the approval of a scientific project or a commissioned research.

In this case, all the topics of the dissertation have a high scientific potential and provide for creation of new scientific findings that could further be used in the national economy.

It is expected that the Programme will promote the development of research in the field of laser technologies at RTA, providing for cooperation between different study levels, as well as cooperation with other higher education institutions and scientific institutions.

The conferral of a doctoral degree is based on an independent research, its planning during the process of development, in order to achieve the research results in a certain period, including scientific publications on the research theme, which can be presented in the international scientific and professional environment. The aim of the research is to create knowledge and approbate it in the industry or production.

Doctoral degree is conferred for the knowledge, skills and competencies proven in the study programme acquisition process, including doctoral thesis / scientific work developed and defended during the study period and under the guidance of an experienced scientist.

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.

In the course of the Programme, the basic principles for the evaluation of the learning outcomes are based on European standards and guidelines (ENQUA) for quality assurance in the European Higher Education Area, which set out the main principles of the student-centred process. According to the

ENQUA standards, RTA has developed the requirements and rules governing the formal evaluation. The most important of these for the doctoral studies are: Regulation of Examinations and Testing Session at RTA, Methodological recommendations for organizing students' independent work at RTA, Regulations on course examinations and tests, Outcome-Based Study Quality System of RTA, Plagiarism Control and Prevention Rules at RTA.

There are several basic principles for the implementation of studies: **quality** (for the academic staff (AS) it is the main factor facilitating significant intellectual and educational results), **synergy** (AS performs research-based academic activities), **accessibility** (AS is the most important study resource available to students), **motivation** (AS are motivated for development) and **ethics** (AS observe the academic and corporate ethics).

Both RTA and "Angel Kanchev" University of Ruse recognise that the most important aspects of study quality are: **student-cantered study process**, **research process** focused on the society's demand for innovative products and services, **communicative process** involving knowledge and innovation exchange at the inter-university level; effective international academic and research cooperation and **technological process** targeted at access to high-quality, science-based higher education, introduction of new modern technologies in the study and research process (including distance learning).

The relatively small number of students in higher education institutions in general and in groups of students facilitates the possibility to take into account and respect students' contingent and the diversity of their needs, creating learning ways appropriate for them. The programme will be implemented by facilitating the doctoral students' aspiration for independence, while ensuring the guidance and support of teaching staff, as well as mutual respect in their relations. In each institution involved in the implementation of the programme, the program director shall ensure that:

- the teaching staff involved in implementation of the program know the methods of evaluation of learning outcomes and receive support for the development of their skills in this field;
- the evaluation criteria and methods, as well as criteria for awarding points, have been published in advance;
- the evaluation enables doctoral students to show the extent to which they have achieved the learning outcomes;
- doctoral students receive feedback, which, if necessary, provides advice related to the study and research process;
- evaluation is consistent, fairly applied to all doctoral students and is implemented in accordance with the approved study course descriptions.

Acquisition of the content of study courses takes place in lectures, practical works and independent work of doctoral students. The proportion between the hours allocated for lectures and practical classes is determined by the lecturer of the specific study course. The laboratories of the Faculty of Engineering and the Laser Technology Center are freely available to doctoral students for independent work 7 days a week. Each lecturer has 1 hour per week for student consultations. This time is precisely specified in the list of lecturers' consultations. Taking into account the specifics of the doctoral program, it is the performance of scientific research work, the doctoral student must also cooperate with the lecturers, the direct scientific supervisor or supervisors outside the official consultation hours. This also applies to the close work of conducting research with master study level students and bachelor study programmes students.

The type of examination is indicated in each study course program. Requirements for obtaining credit points for a given course are specified in the study course program. The form of organization of examinations is determined by the lecturer.

The main emphasis in the implementation of the program is on a student-centered approach. In the student-centered approach, the study process is implemented as the main one, in which the doctoral student is given the opportunity to become a creator of his / her professional growth. In such an approach, the main function of the administrative and academic staff is to formulate an understanding of the student-centered approach and to provide support in the study process, actualizing the independence and responsibility of doctoral students. Cooperation between doctoral students and cooperation between lecturers and doctoral students is important.

The principles of student-centered education in the study program are provided:

1. evaluating the doctoral student's previous training and offering such study content that is most able to ensure the achievement of the study results of the study program.
2. offering flexible study paths, including observing the employment of students during studies, planning classes at a time convenient for students.
3. doctoral students are provided with full consultative support and full access to the study resources necessary to achieve the study results, including those available remotely.
4. doctoral students studies and research activities are focused on the development of their personality, including the development of their personality.

The considered spectrum of methods is applied in both languages of the study program - Latvian and English. And is the basis for achieving the results and goals of the study course and study program.

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).

Not applicable to the doctoral study programme.

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).

The programme provides for defence of doctoral theses in the institution implementing the programme – at the “Angel Kanchev” University of Ruse.

There has been concluded an agreement on promotion with the Promotion Council in Physics and Astronomy of Daugavpils University.

Given that the Licensing Commission has recommended to establish RTA its own promotion council, RTA is considering this possibility together with Daugavpils University, especially considering the intention of the Ministry of Education and Science to merge RTA and DU. This would enable

combining academic forces and creating a strong promotion council.

An agreement has been signed with DU on the establishment of a joint promotion council, attracting RU staff. The procedure for the promotion will be ensured in accordance with the Cabinet of MInisters Regulation no. 1001 "Procedure and Criteria for Awarding a Doctoral Degree".

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.

Not applicable, as there are no graduates in the programme.

Evaluation criteria for the final (doctoral) thesis are set in accordance with Cabinet of Ministers regulations No. 1001 of 27 December 2005 "Procedure and Criteria for Awarding a Doctoral Degree" (the title of the Regulations has been amended by Cabinet of Miinsters Regulation No. 522 of 14 August 2018).

Provisions on Development and Layout of a Doctoral Thesis at the Rezekne Academy of Technologies, approved at the meeting of the RTA Scientific Council on 24.03.2020 No.16.1/7, see annex.

It is envisaged that the final work in the program consists of: an independently developed **doctoral dissertation** (thesis) containing the results of original scientific research and providing new findings in the relevant field or sub-sector, or **a thematically unified set of scientific publications**, where publications must be published, is available internationally in repositories of scientific information and is cited in internationally available databases.

Evaluation criteria for the final work / dissertation:

1. the choice of the topic is substantiated, the aims and tasks of the research are defined, the scientific achievements in the research of the topic and the methods used are described, the results and findings are discussed and summarized in the conclusions and theses to be defended;
2. the doctoral thesis is a completed original research, the results of which are of significant importance in the relevant sub-branch of science;
3. the amount of scientific work is sufficient in accordance with the requirements specified in the RTA Provisions;
4. modern methods of analysis and data processing are used in the work;
5. the results of the work have been published in at least 5 scientific publications or monographs or the related intellectual property is patented;
6. the results of the work have been presented in at least 3 international scientific conferences or seminars;
7. the work is not a forgery or plagiarism or other violation of scientific ethics.

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 programme is implemented at the Faculty of Engineering of RTA in cooperation with the Institute for Engineering of RTA and the Faculty of Mechanical Engineering and Manufacturing of the "Angel Kanchev" University of Ruse in Bulgaria. The Faculty of Engineering of RTA was established in 1993. It implements four study fields ("Mechanics and Metalworking, Heat Power Industry, Heat Engineering and Mechanical Engineering", "Information Technology, Computer Equipment, Electronics, Telecommunications, Computer Control and Computer Science", "Architecture and Construction", "Manufacturing and Processing") and 15 study programmes: five first level professional higher education programmes, three professional bachelor study programmes, two academic master's study programmes, two professional master's study programmes and two doctoral study programmes.

At RTA, doctoral studies are organized by the relevant faculty, coordinated and controlled by the RTA Science Department and the Doctoral Commission. Currently, Latvia is gradually shifting to the model of Doctoral Schools.

The Faculty organises classes and guides the course of traineeship for students, organises examinations, tests and annual doctoral student attestation, keeps record of the students' academic results, keeps and stores the students' personal files, organises the process of doctoral thesis defence. The Scientific Department coordinates and controls doctoral studies: prepares information and documents regarding doctoral studies at RTA, performs assessment of informational and methodological bases. The Doctoral Commission: evaluates applications of doctoral students and prepares a proposal to the Scientific Council on allocating doctoral budget places to doctoral students of RTA; evaluates reports of doctoral students of RTA and prepares a proposal to the Scientific Council for approval of the reports; examines the issues related to the doctoral study process and promotion and prepares recommendations or proposals for the improvement of the doctoral study process, approves doctoral students' individual work plans for the academic year, prepares proposals concerning approval of themes and scientific supervisors of doctoral students' doctoral theses, reviews draft normative documentation regulating the doctoral study process at RTA, and prepares proposals for the Science Council.

Doctoral studies are implemented in close cooperation with the **Institute of Engineering** (IE), which was founded in 2016 as a subdivision of the Faculty. IE oversees the operation of five research centres, 13 laboratories and other smaller units (see Fig. 3.3.1.1). The Institute of Engineering operates in the scientific domain of engineering science and technology. Activity areas of the Institute: electrical engineering, information and communication technology, machinery production and mechanical engineering, materials science and engineering, environmental and power engineering, other scientific and technological fields of engineering, including food and beverage technologies.

The doctoral studies at the "Angel Kanchev" University of Ruse (UR) are coordinated and supervised by the Directorate for Academic Development, which is also supported by the Centre of Doctoral Students, eight faculties and thirty-two departments. The doctoral study programmes at UR cover 20 professional and research areas in engineering and social sciences, including Mechanical Engineering and Manufacturing Engineering, Materials Science, Information and Communication Engineering, Electrical Engineering and Electronics, and Transport, Shipping and

Aviation, Economics, Management and Administration, etc. https://www.uni-ruse.bg/en/education/phd The Centre of Doctoral Students was established in 2000; its aim is to support the academic development of young researchers by attracting national, international and private funding. The Centre is managed by the staff of UR and students. The Centre hosts regular seminars and meetings related to doctoral studies. The Faculty of Electrical Engineering, Electronics and Automation, the Faculty of Transport and Agrarian Industry, as well as the Department of Materials Science and Technology, the Department of Telecommunications, the Department of Mechanics, Machine Elements and Physics, and the Department of Electronics will be involved in the implementation the joint doctoral study programme Laser Technologies

In order to strengthen the functions of science transfer into society, RTA has a Project Management and Technology Transfer Contact Point, which takes care of the involvement of RTA staff (including doctoral students) in projects and the correlation of research capacity with the challenges concerning industry transformation. Information about the projects implemented by RTA, project calls is available on the RTA webpage https://www.rta.lv/aktualie_projektu_konkursi (information available only in Latvian).

UR has a **Technology and Intellectual Property Transfer Centre** in this field, which supports both researchers and students in the registration and transfer of intellectual property into the industry.

So far, RTA has involved in the development of laser technologies at RTA several partners such as Mittweida University (Mittweida Hochschule) and Jade University (Jade Hochschule) in Germany; “Angel Kanchev” University of Ruse and Vasil Levski National Military University in Bulgaria.

At the international scientific and practical conference of RTA “Environment. Technology. Resources ” the section of laser technologies is currently a separate unit the scientific field. Its collection of scientific articles is cited in the SCOPUS database. More information about the conference is available at https://conferences.rta.lv/index.php/ETR/ETR2021.

Laser technologies play an important role for RTA, UR and the manufacturing industry in terms of an involvement of our trained specialists in development of national economy – in Latvia, Bulgaria, Germany, India, and other countries around the world. In 2019, RTA has built a **Laser Technology Centre for the Faculty of Engineering**, totalling to 277 m2 in area, and purchased laser facilities and other equipment for scientific research, such as a 3D measurement laser microscope, a magnetron sputtering system for surface coating application; 8 different laser units for cutting, welding and engraving. The Laser Centre has been built within the boundaries of the project “Updating the laser technology, mechatronics and machine engineering study programme of the Rezekne Academy of Technologies”, specific objective 8.1.1 “Increase the number of up-to-date STEM study programmes, including those in medicine and production industry” of the operational programme “Growth and Employment”. The existing material and technical resources at the disposal of RTA allow full-fledged implementation of the doctoral study programme Laser Technologies, also using the research infrastructure provided by partnering organisations.

ERASMUS+ agreements have been concluded, for example, with the Mittweida University, the "Angel Kanchev" University of Ruse and the Sophia Technical University on the performance of research in the domain of laser technologies in these higher education institutions. Research opportunities are also provided at such global-level enterprises as Trumpf, Coherent-ROFIN, Laserline, Laservorm, etc.

The University of Ruse is one of the first universities in Bulgaria to start participating in the ERASMUS programme. As of today, over 450 bilateral agreements have been signed with higher education institutions from 50 countries. Each year, about 80 bachelor, postgraduate and doctoral

students take part in exchange programmes.

The implementation of the programme will involve academic staff mostly from RTA and “Angel Kanchev” University of Ruse. However, guest lecturers from Technical University of Sofia, Mittweida University, the Aachen University, as well as other partners will be involved in teaching separate parts of the programme, if necessary.

RTA has provided an informative and methodological basis for the implementation of the Programme. The main information resources of RTA are:

1. RTA home page(rta.lv), which contains information about the faculty, study fields and programmes, the Institute for Engineering, and other information related to the study process (documentation of the study quality system, lesson schedules, etc.) and directly doctoral studies: doctoral study programmes, library services, conditions for publication in the collections of scientific articles of RTA, requirements for the development and design of a doctoral thesis, research topics of doctoral students, defended doctoral theses, Promotion Councils of RTA, binding normative documentation.
2. Internal Document Management System (DMS) of RTA for storing the normative documentation of RTA’s structural units, which are available to all staff of RTA (employees and students).
3. Informative System of RTA, which is a part of the Information System for Universities of Latvia (LAIS), adapted to the needs of higher education institutions. RTA students and employees are ensured access to LAIS, which deals with management of student study and personnel, printout of prepared matriculation, ex-matriculation, registration instructions, changes in study data, changes in personal data and awarding scholarship orders, maintenance of course and study plan register, record keeping of student progress, preparation of diplomas and diploma supplements, etc.

The methodological basis of the study process is created in the e-environment https://ekursi.rta.lv/, which also maintains the catalogue of study courses. In accordance with the Regulations on the development of study course / module descriptions at the RTA approved by the RTA Study Council, commencing the implementation of a study course to ensure quality thereof and organise the study process and independent work of students the lecturer ensures availability of study materials in the e-environment (on the website ekursi.rta.lv) and informs students about the content of the study course, the main study requirements and learning outcomes, indicating the address of the electronic website and the conditions of its use. Remote studies are ensured using mostly the Microsoft Teams platform. There is quality equipment is available for remote study process, seminars, conferences.

In 2005, UR established the **Remote Learning Centre,** which is responsible for the placement and maintenance of teaching materials in the e-environment, as well as provides support to staff for the preparation of interactive lessons in the e-learning environment. UR developed its own functioning e-study platform maintained by the Centre. https://e-learning.uni-ruse.bg/.

The RTA regulations on lecturers stipulate that a lecturer shall develop and place on the website ekursi.rta.lv for each his/her study course:

1. a description of the study course in accordance with the Regulations on the development of study course / module descriptions at the RTA approved by the RTA Study Council,
2. the content of the study course in accordance with the methodological recommendations for creating and maintaining the content of the study course on the website ekursi.rta.lv approved by the RTA Study Council
3. tasks for students’ independent work in accordance with the methodological

recommendations for organization of students' independent work approved by the Study Council,
4. requirements/materials of examinations/tests.

To support doctoral studies, RTA has prepared methodological materials available on the website:

1. information on doctoral study programmes implemented by RTA (programme parameters, content, admission requirements, job opportunities).
2. recommendations for the use of library funds in doctoral study programmes,
3. basic principles of ethics and use of publications,
4. conditions for the development of a doctoral thesis,
5. research themes for doctoral students,
6. doctoral theses defended at RTA,
7. Promotion Councils of RTA,
8. normative documentation regulating doctoral studies.

The RTA library is locate in the building of Faculty of Engineering, put into operation in 2014. Its structure consists of a reading room, a subscription to study and branch literature, a collection and cataloguing sector, a bibliography and information sector, and two individual work rooms.

In 2016, the RTA library was re-accredited. The long-term goal of the RTA library is to create a basis for the operation of the RTA library as a scientific structural unit, preparing the required materials and human resources.

RTA library users are offered such databases as iFinance, EBSCO, ScienceDirect, Scopus, Web of Science, ASTM Compass collection, Digital collection of the National Library of Latvia, etc. The libraries of RTA also regularly use trials of various databases. The use of several databases is ensured remotely. In addition to the Electronic Catalogue, the library creates a database of works developed by the RTA lecturers and its bibliographic records are supplemented with hyperlinks to journals.rta.lv, which is a full-text database of RTA open access scientific articles. RTA has established the latest generation data transmission network to ensure scientific activities (Latvian Academic Core Network) to participate in the unified European academic network and improve information systems. Its creation ensures international competitiveness of science and education and their integration in the global science and education processes, which ensure that students and academic staff have access to the up-to-date world-class information.

To enable the library users to find information independently, the library's website has a section of e-resources with compilation of hyperlinks with access to databases, scientific articles of RTA and other higher education institutions, and free access resources. The RTA library provides all traditional services, including also in e-environment. The electronic catalogue reflects the information about all books and magazines in the library's collection(see https://www.rta.lv/biblioteka). For the resources available for the implementation of the study programme in the library, see Appendix 3.3.1.1.

Course books and scientific literature is updated at RTA in accordance with the procedure designed for literature supply, which includes the procedure for requesting the latest literature at RTA.

RU Centre for Distance Learning maintains the virtual library http://ecet.ecs.uni-ruse.bg/else/index.php?lang=bg. The university library is the largest library of scientific literature in the northeast of Bulgaria. The oldest collection of books was created in 1946. The library has a high level of digitalisation. Bibliographic collection – 437281 volumes, including 352426 books, 48054 periodicals, currently available for borrowing – 260 titles. 15 databases of scientific articles and information are available, 4 are open access, e-books, electronic copies of periodicals.

In order to ensure publicity of scientific and methodological activities and open access, RTA has a publishing house that specializes in electronic publications (see books.rta.lv).

The RTA library also makes use of different database trials on a regular basis, and access to several databases is also provided remotely.

The RU also has a university publishing office, which provides a broad range of publishing services https://www.uni-ruse.bg/information/publishers.

RTA and Angel Kanchev Ruse University intend to participate in doctoral research. RU is a modern laboratory equipment related to material testing - microscopy, mechanical properties, etc., as well as the use of library resources.

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).

Taking into account that the Programme is a joint programme of RTA and UR, the information given in sections 3.2.1 and 3.2.2 overlap. In order to avoid duplication of information, please evaluate the both sections jointly.

RTA has purposefully carried out modernization of the material and technical base for the engineering programmes, including attracting project funding. The sub-activities 3.1.2.1.1 “Modernization of premises and equipment of higher education institutions to improve the quality of study programmes, including providing the opportunities to acquire educational programmes also for persons with functional disorders” “Construction of new Faculty of Engineering and laboratories at Rezekne Higher Education Institution, and purchase of equipment”, project implementation period 15.04.2010 – 31.10.2015 (project number 010/0117/3DP/3.1.2.1.1/09/IPIA/VIAA/028). As a result of the project, 4 million euro worth laboratory equipment was purchased and EUR 5.8 million was invested in the construction of the new building of the Faculty of Engineering. The following laboratories were created and equipped:

1. equipment for the Physical Process Laboratory;
2. equipment for the Laboratory of electrical engineering, electronics and electric drive;
3. Computer network and telecommunications training room;
4. equipment for the Laboratory of mechanical research of materials;
5. training room for Flow mechanics, pneumatics and hydraulics;
6. mechatronics training room;
7. training room for ecology and environmental protection;
8. equipment for the Laboratory of chemical processes;
9. equipment for the Laboratory of microbiology and biotechnology;
10. equipment for the Laboratory of eco-technologies;
11. training room for CAD/CAE/CAM;
12. mechanical workshop equipment;
13. equipment for sample preparation room;
14. equipment for the Laboratory of engineering geology and soil mechanics;
15. equipment for gas cylinder and compressor room;
16. equipment for the Laboratory of ensuring environmental health and human living conditions;
17. equipment for student creative workshop.

18. In the summer of 2014, there was opened the modern building of the Faculty of Engineering with modern equipment to facilitate the study and research process, in compliance with the European standards for education and science.

Operational Programme's "Growth and Employment" specific objective 8.1.1 "Increasing the number of updated STEM, including medical and creative industry, study programmes" within the project "Modernisation of the Study Programmes of Laser Technologies, Mechatronics, and Mechanical Engineering at the Rezekne Academy of Technologies", agreement on the implementation of a European Union fund project No. 8.1.1.0/17/I/011. Project costs are EUR 96 4917.00. Project implementation from 16.03.2018 until 31.12.2018. In the framework of the project, new equipment and devices (3D laser scanning microscope, magnetron sputtering system, laser equipment for cutting, welding, engraving, etc.), materials, tools in the field of laser technology were purchased, powerful computer equipment was bought, information and communication technology solutions were introduced into the study process (web conferencing equipment, simultaneous translation systems), the building of the Centre for Physical Processes and Laser Technologies was built. Information is available only in Latvian. http://lazers.rta.lv/lv/rezeknes-tehnologiju-akademija-pabeigts-studiju-programmu-modernizacijas-projekts/

The table 3.3.2.1 lists the most important equipment and devices of the Laser Centre.

The material and technical provision of the Faculty of Engineering of RTA is sufficient for the implementation of the doctoral study programme Laser Technologies, sufficient to carry out research and scientific work in laboratory conditions for both doctoral students and academic staff.

The material and technical base of UR corresponds to the implementation of the doctoral study programme Laser Technologies. A virtual tour around UR is available here https://www.google.bg/maps/@43.8545067,25.9701809,3a,75y,147.01h,94.04t/data=!3m7!1e1!3m5!1sxDhz3mhvo24AAAQfDoHQkQ!2e0!3e2!7i13312!8i6656.

Development of doctoral theses in engineering is material- and resource-intensive. Although the doctoral students of RTA and UR are provided with everything required for research work and dissertation development, there is planned cooperation with other research institutions in Latvia and abroad, too.

In Latvia, it is planned to ensure cooperation through joint research on certain processes, such as making SEM or other high-resolution images and analysis thereof, defining composition of materials, etc. It is planned to carry out it at RTU, LU and DU.

There is also an agreement with the Laser Centre of Mittweida University on the use of the necessary material and technical base for doctoral students.

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

The study program is licensed in 2021, enrollment of students is planned starting from 2022.

The sources of funding for the study program will be the state budget funding and student tuition fees. Tuition fee is approved by the RTA Senate's decision for each subsequent study year. The cost of a study place in the doctoral study programme Laser Technologies is determined taking into account the basic cost of the study place, the level of the study programme, its duration, form, as well as the structure of the academic staff and field of studies, namely, 1 630.11 (basic cost of a study place) * 1.7 (minimum study cost coefficient) * 3 (study level coefficient)=EUR 8 313.56

In general, the tuition costs for one full-time Latvian or EU student per year are estimated at EUR 8 313.56, which does not exceed the costs of European states for the preparation of one student in a similar speciality.

The calculations of RTA show, that direct costs are EUR 6 235.17 for one reference student per year; indirect costs (expenses for ensuring the operation of RTA, including the RTA library, land tax, lease of premises, rent, building operation costs, phone subscription and service costs, utilities, routine maintenance, special programmes, etc.) for 1 reference student per year are EUR 2 078.39, forecasting 3 and more students in one group.

Financial resources are used in accordance with estimates that are prepared by structural units and approved by Rector of RTA, as well as reviewed by the Council of the Faculty. The tuition fee is primarily used for ensuring the education process, co-funding projects, guest lecturer wages.

More information in the general description of the study direction in point 2.3.1.

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 planning issues of the RTA academic staff are subject to the Activity and Development Strategy of RTA 2016-2023, Academic Staff Development Plan of Rezekne Academy of Technologies 2018-2023. The issues related to the planning of the academic staff of the RTA are also subject to the Regulations on Academic Positions at RTA, the Regulations on the Lecturer of RTA, Regulations on Planning, Accounting, Control and Payment of Methodological Developments and Scientific Research, accounting procedure, Procedures for Planning and Accounting of the Amount of Study Work of Academic Staff of RTA, Procedures for Evaluating the Quality of Work of Academic Staff of RTA, and other documents. The most important criteria for the selection of academic staff are scientific and professional competence. RTA implements a professional development program *Innovations in Higher Education*, where every year RTA teaching staff is offered up-to-date seminars on the latest trends in higher education and science.

The involvement of the teaching staff in the implementation of the Programme has been carried out

taking into account the following criteria:

- scientific qualification (publications, participation in conferences, projects, rights of the expert of LCS, completed contract works);
- pedagogical qualification (supervision of doctoral and master's theses; development of study programmes, study courses, conducting classes, preparation of study materials, qualification improvement, conducting classes in foreign higher education institutions);
- organizational competencies (management of collegial institutions, participation in their work; organization of international conferences; editorial boards of scientific publications; management of an institutional unit, consultant);
- motivation of the teaching staff to work in a team with doctoral students.

Information about the academic staff is provided in the staff CVs (Annex 11 and other annexes - CV of Imants Zarembo).

RTA and UR will involve in the implementation of the Programme the academic staff having high academic and research competence. RTA and UR are taking measures for the growth and improvement of the academic staff, facilitating the improvement of the staff’s qualification:

1. application of technologies, including digital resources and innovations, in the study process,
2. acquisition of foreign languages at C1, B2 levels to ensure the internationalization and Study process,
3. in the didactics of higher education institutions and innovations in the issues topical to the higher education.

Guest professors and guest researchers will be invited to the study programme with lectures and seminars exactly on the sharing of gained research experience with doctoral students and current issues in research. The guest professors and researchers with whom RTA the consortium cooperates in research projects will be invited as a priority, as well as purposefully seeking an expert of the specific topic.

Academic staff also take advantage of the opportunities to improve their qualifications at the leading universities abroad. For example, within the framework of professional development Dr.sc.ing. Andris Skromulis is currently doing an internship in USA, at the University of Colorado Boulder, Department of Chemistry for a year (September 2021 – September 2022). The scholarship is provided by the Baltic-American Freedom Foundation.

The appendix includes confirmation that the requirements for academic staff involved in the programme, to have a doctoral degree, as well as about experts approved by the Latvian Council of Science (LCS).

The academic staff having doctoral degree:

1. Dr.sc.ing. E.Teirumnieks (expert of LCS), leading researcher, RTA elected;
2. Dr.sc.ing. L.Lazovs (expert of LCS), leading researcher, RTA elected;
3. Dr.sc.ing. A.Teilāns (expert of LCS), Prof., RTA elected;
4. Dr.sc.ing. P.Grabusts (expert of LCS), Prof., RTA elected;
5. Dr.sc.ing. S.Kodors (expert of LCS), Assoc.prof., RTA elected;
6. Dr.sc.ing. A.Skromulis, researcher, RTA elected;
7. Dr.sc.soc. S.Murinska, Assist.prof., RTA elected;
8. PhD Ivaylo Balchev, guest Assist.prof., RTA;
9. PhD Roussi Minev, Assoc.prof., RU elected;
10. PhD Tsanko Karadzhov, guest prof., RU;
11. Dr.sc.ing. Nikolay Petrov, guest lecturer, RU;

12. Dr.sc.ing. Imants Zarembo, guest lecturer, RTA.

Out of 12 teaching staff involved in the study process:
8 (67%) - is the elected academic staff;
4 (33%) - guest lecturers.

The qualification of the teaching staff fully complies with the requirements of the laws and regulations and ensures the achievement of the learning outcomes of the study programme. The teaching staff involved in the study program has all the necessary competencies and skills to work with doctoral students, including the supervision of doctoral theses. Teachers are ready to provide both academic and research excellence to achieve the goals of the program. The qualifications and work experience of the teaching staff see in CV`s.

12 teaching staff are involved in ensuring the study process. All with a doctoral degree. Many with academic experience in foreign universities, including regular updating of academic competencies through ERASMUS+ mobility. Lecturers of cooperation partners are also involved in ensuring the study process, for example, Dr. Jork Schille from Hochschule Mittweida, Germany. At present, a competition has been announced for the position of a foreign lecturer within the framework of the SAM project, with the aim of strengthening international capacity and integrating highly qualified lecturers into the doctoral study program. It is planned to attract guest lecturers to strengthen the program, using the opportunities provided by ERASMUS+.

The study process, which involves foreign lecturers, takes place in English. Also in cases where there are foreign (do not know Latvian) doctoral students, the study process takes place in English.

In order to strengthen the laser technology, including the doctoral study program, RTA together with the University of Latvia, Latvia, Lund University, Sweden, Westfaelische Wilhelms-Universität Münster, Germany and Daugavpils University, Latvia, prepared a project application Horizon Teaming for Excellence. The project was prepared for the HORIZON-WIDERA-2022-ACCESS-01-01-two-stage call. Applicant name: Center of Excellence in Photonics and Knowledge Transfer PHOTONICS-LV. This includes internships in the institutions of cooperation partners, use and development of joint infrastructure resources, including consultations, etc. The project is in 2 rounds. An invitation to prepare and submit a project application for round 2 has now been received. This must be done by 8 September 2022. RTA and all universities involved in the project hope for a successful 2nd round. This will allow the development of laser technology at the highest level among the partners and photonics in general. It is planned to continue inter-institutional cooperation in any case.

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 Programme will start its operation in the autumn semester of 2021, there have been no changes in the teaching staff after licensing.

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).

Number of publications of lecturers involved in the implementation of the programme in WoS and Scopus databases (2020-2021):

Teaching staff member	SCOPUS in 2020	SCOPUS from 2021 until November 2021
Andris Skromulis	1	0
Artis Teilāns	0	4
Pēteris Grabusts	1	3
Lyubomir Lazov	0	16
Edmunds Teirumnieks	0	10
Sergejs Kodors	2	2
Roussi Minev	0	0
Sandra Murinska	0	1
Ivaylo Balchev	0	7
Tsanko Karadzhov	0	10
Nikolay Angelov	0	9

The number of publications of the academic staff involved in the programme varies from year to year. Nevertheless, there is an increase in the total number and quality of publications. The total number of publications and the notes on their inclusion in the databases can be found in the appendix with the list of publications in the study field, as well as in the CVs of the lecturers.

10 the most important publications in SCOPUS and WoS:

1. Angelov, N., Teirumnieks, E., Lazov, L. (2021) Influence of pulse duration on the process of laser marking of CT80 carbon tool steel products. Laser Physics 31 045601. Impact Factor 1,333. https://doi.org/10.1088/1555-6611/abe5af
2. Lazov, L., Teirumnieks, E., Karadzhov, T., Angelov, N. (2021) Influence of power density and frequency of the process of laser marking of steel products. Infrared Physics & Technology 116 103783. https://doi.org/10.1016/j.infrared.2021.103783
3. Lazov, L., Teirumnieks, E., Draganov, I., Angelov, N. (2021) Numerical modeling and

simulation for laser beam welding of ultrafine-grained aluminium. *Laser Physics* 31 https://doi.org/10.1088/1555-6611/abf5d3

4. Balchev, I., Atanasov, A., Lengerov, A., Lazov, L., (2021) Investigation of the influence of the scanning speed and step in laser marking and engraving of aluminum Journal of Physics: Conference Series, Volume 1859, Issue 19, Article number 012002, 21st International Conference and School on Quantum Electronics: Laser Physics and Applications, ICSQE 2020, DOI:10.1088/1742-6596/1859/1/012002
5. Balchev, I., Nurgaliev, T., Kostadinov, I., Lakov, L., Aleksandrova, M., Avdeev, G., Valcheva, E., Russev, S., Genkov, K., Milenov, T. (2021) RF magnetron sputtering of $Bi_{12}TiO_{20}$ thin films on various substrates. Journal of Physics, Vol.1859, Issue 1, ISSN 17426588, doi: 10.1088/1742-6596/1859/1/012060
6. Teirumnieks, E., Balchev, I., Risham S.G., Lazov, L. (2020) Antibacterial and anti-viral effects of silver nanoparticles in medicine against COVID-19—a review. Laser Physics 31, pp. 1-9. Impact Factor 1,333. https://doi.org/10.1088/1555-6611/abc873
7. Skromulis, A., Breidaks, J., Teirumnieks, E. (2017) Effect of Atmospheric Pollution on Air Ion Concentration. In: Energy procedia 113, pp. 231–237. ISSN 1876–6102 (SCOPUS)
8. Kodors, S., Lacis, G., Sokolova, O., Zhukovs, V., Apeinans, I., Bartulsons, T. (2021) Apple scab detection using CNN and transfer learning, Agronomy Research, Volume 19, Issue 2, pp. 507 – 519, DOI:10.15159/AR.21.045
9. Kodors, S. (2019) Detection of Man-Made Constructions Using LiDAR Data and Decision Trees, Baltic J.Modern Computing, Vol.7, No.2, pp.255-270, https://doi.org/10.22364/bjmc.2019.7.2.05 (Web of Science)
10. Vella, P.C., Dimov, S.S., Minev, R., Brousseau, E.B. (2018) Technology maturity assessment of micro and nano manufacturing processes and process chains. Journal of Engineering Manufacture, Volume 232, Issue 8, pp. 1362 – 1383, ISSN 09544054, Doi:10.1177/0954405416668922

The academic staff, who are the experts of the Latvian Council of Science:

1. sc.ing. E.Teirumnieks (Engineering sciences and technologies – Environmental engineering and power industry. Until 01.09.2024.),
2. sc.ing. L.Lazovs (Engineering sciences and technologies – Other engineering sciences and technologies, including food and beverage technologies. Until 06.10.2024.),
3. sc.ing. A.Teilāns (Engineering sciences and technologies – Electronics, power electronics, information and communication technologies. Until 19.12.2021.),
4. sc.ing. P.Grabusts (1. Natural Sciences – Computer Sciences and Informatics. 2. Engineering sciences and technologies – Electronics, power electronics, information and communication technologies. Until 26.03.2022),
5. sc.ing. S.Kodors (Engineering sciences and technologies – Electronics, power electronics, information and communication technologies. Until 06.10.2024

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

In the last 6 years, the academic staff involved in the Programme has actively participated in both

scientific and non-scientific projects. All projects involving academic staff make a significant contribution to the increase in academic competences, the transfer of project results and implementation thereof in the study and research process with students, which improves the quality of both lectures and research. Establishing cooperation contacts with new cooperation partners – both Latvian and international, is essential for projects. This enables development of not only own competencies, but also to ensure the development of new joint projects.

Edmunds Teirumnieks:

1. Grant of the Scientific Council of Rezekne Academy of Technologies for 2016. Project No. 13.15/9: "*Development of Composite Carbon Fibre and Fibre Plant Materials for the Production of High-Strength Parts*"*;* Project manager. Funding 1900.00 EUR.
2. Administration of the Latvian Environmental Protection Fund. Project guideline "Multisectoral projects", activity "Celebration of Latvia's environment and natural values in honour of the Latvian State centenary". The Project *Latvia's sustainability dimensions – educated people and preservation of natural values*. Project No.: 1-08/238/2016. Project partners (7): Rezekne Academy of Technologies, Rezekne county municipality, Ludza county municipality, Livani county municipality, Madona county municipality, association "Association of Latvian Innovators", association "Biomass Technology Centre". Project manager. Funding 46621.00 EUR.
3. Grant of the Scientific Council of Rezekne Academy of Technologies for 2017. Project No. 13.15/9: *New functional composite materials from carbon fibre and fibre plants*. Senior researcher. Funding 2200.00 EUR.
4. Investment and Development Agency of Latvia (LIAA). ERDF co-funded project*Optimization Tool for Laser Treatment Process*. KC-PI-2017/97 Product developer, senior researcher, project manager, 2018 – 02.03.2020. Funding 333333.00 EUR.
5. Grant of the Scientific Council of Rezekne Academy of Technologies for 2018. Project No. 16.7/1: "*Increasing the Impact Resistance of Composite Materials*"; Project manager. Funding 2700.00 EUR.
6. Grant of the Scientific Council of Rezekne Academy of Technologies for 2018. Project No. 16.7/6: *Material Impact Resistance Testing Bench II*. Leading researcher. Funding 2900.00 EUR.
7. Grant of the Scientific Council of Rezekne Academy of Technologies for 2018. Project No. 16.7/14: "*Robotic Arm for Grabbing Soft and Fragile Objects*". Leading researcher. Funding 2180.00 EUR.
8. ERDF project *Establishment of a mechanical engineering competence centre*1.2.1.1/16/A/003 research project No.1.5. "Development of a high-efficiency wood chip gasifier". Leading researcher, 01.09.2018 – 31.12.2018. Funding 50000.00 EUR.
9. ERASMUS+ Key Action 2 Strategic Partnership project "Improving the professional skills in green constructions through online training". Project No. 2017-1-LV01-KAS202-035483. 04.12.2018 – 31.12.2018. Researcher. Funding 164148.00 EUR.
10. ERASMUS+ Key Action 2 Strategic Partnership project "Web–based Laser Safety Modules for Vocational Education/Training". Project No. 2018-1-LV01-KAS202-046957. Leading researcher, 01.03.2019 – 31.01.2020. Funding 169 321.00 EUR.
11. ESF Project "The reduction of fragmentation of the study programmes and strengthening the sharing of the resources in the study fields "Management, administration and real estate management" and "Mechanics and metalworking, heat power industry, heat engineering and mechanical engineering" No.8.2.1.0/18/A/016. Expert. 01.05.2019 – 30.06.2019 and 02.09.2019 – 31.10.2019. Funding 646999.00 EUR.
12. ESF Project "The reduction of fragmentation of the study programmes and strengthening the sharing of the resources in the study fields "Management, administration and real estate

management" and "Mechanics and metalworking, heat power industry, heat engineering and mechanical engineering" No.8.2.1.0/18/A/016. Expert in development of study course materials. 02.12.2019 – 29.02.2020. Funding 646999.00 EUR.

13. ESF Project "The reduction of fragmentation of the study programmes and strengthening the sharing of the resources in the study fields "Management, administration and real estate management" and "Mechanics and metalworking, heat power industry, heat engineering and mechanical engineering" No.8.2.1.0/18/A/016. Expert in development of licencing materials. 03.02.2020 – 30.04.2020. Funding 646999.00 EUR.
14. Rural Support Service project "Innovative solutions for the treatment and processing of industrial hemp" No. 18-00-A01612-000026. Leading researcher. 02.03.2020 – 31.12.2022. Funding 70000.00 EUR.
15. ESF Project "The reduction of fragmentation of the study programmes and strengthening the sharing of the resources in the study fields "Management, administration and real estate management" and "Mechanics and metalworking, heat power industry, heat engineering and mechanical engineering" No.8.2.1.0/18/A/016. Expert in development of accreditation materials. 01.05.2021 – 30.06.2021. Funding 646999.00 EUR.

Lyubomir Lazov:

1. Erasmus+ KA2 project, 2017-1- LV01-KA202- 035483, Project Title: Improving the professional skills in green constructions through online training. Coordinator. Funding 164148.00 EUR.
2. Erasmus + KA2 project, 2018-*1-LV01-KA202-046957, Project Title:* Web-based Laser Safety Modules for Vocational Education/Training. Coordinator. Funding 169321.00 EUR.
3. Erasmus + KA2 project, 2017-*1-TR01-KA204-045870,* PROVIDING LEARNING SKILLS ABOUT GENERATING SOLUTIONS OF REFUGEE PARENTS FACING TO EDUCATIONAL PROBLEMS OF THEIR CHILDREN, Researcher. Funding 133897.00 EUR.
4. Project "Laser processing optimization tool", project identification No.KC-PI-2017/97, LIAA, 2018, expert. Funding 333333.00 EUR.
5. Erasmus+, Project № 2017-2-RO01-KA105-037797, Ethnicity and Integration in Multicultural Europe (ETNIC). Researcher. Funding 50300.00 EUR.
6. Erasmus+, 2018-3-RO01-KA105-061436 „Tsunami: Waves Of Integration'' (TSUNAMI). Researcher. Funding 23700.00 EUR.
7. Project - 2016-3-SK02-KA105-001174, "Dragon Dreaming – participatory methodology in Youth Work". Researcher. Funding 15000.00 EUR.
8. Stärkung des Kompetenzaufbaus im Wissenschaftsmanagement zur Initialisierung von deutsch-lettischen Lasertechnologietransferprojekten (LTTP_DE-LV), 2019-2021, Deutschland, Bundesministerium für Bildung und Forschung, zur Fördermaßnahme: Europäischer Forschungsraum im Förderbereich: ERA Fellowships - Science Management, Förderkennzeichen: FKZ 01DT20018. Expert

Artis Teilāns:

1. 2019.-2022. Application of in-depth machine learning and data mining to the study of plant-pathogen interactions: apple and pear scab pathos. Project no. lzp-2019 / 1-0094. Researcher. LZP funding 299307.00 EUR.
2. 2020. Research funded by the Ministry of Education and Science, Republic of Latvia, project ARTSS, project No. VPP-COVID-2020/1-0009. Researcher. Latvia State budget 497 500.00 EUR.
3. 2016.-2017. State Land Administration and Rezekne Academy of Technologies Contract "IT expertise for Remote data sensing for State Land administration cadastres". Contract No. 7.6.3/76-2016. Project Manager. Funding 489.00 EUR.

4. 2014 -2015 Contract work “IT research” between Lattelecom and Rēzekne Academy of Technology. Agreement No.LTC-14-000096. Project Manager. Funding 8608.37 EUR.

Pēteris Grabusts:

1. 2016 – 12.2016, scientific grant project of RTA „Establishment of Oral History Archive of Rezekne Academy of Technologies”. Senior researcher. Funding 2900.00 EUR.
2. 2019 – 2020. LZP-2019/1-0094 Application of deep learning and datamining for the study of plant pathogen interaction: the case of apple and pear scab”. Researcher. LZP funding 299307.00 EUR.

Sergejs Kodors:

1. 2020 – NOW. LZP-2020/2-0115 “E-mentor as a Transformation Tool for Ensuring Zero-Waste Food Consumption in Educational Institutions”. Researcher. LZP funding 100 389.00 EUR.
2. Contractual research. *Laser scanning data processing through machine learning algorithms and GIS.* Researcher. VZD funding 2183,98 EUR.
3. 09/2020– 12/2020. VPP-COVID-2020/1-0009 ARTSS: Promising technologies for sustainable and secure services Researcher. Latvia State budget 497 500.00 EUR.
4. 01/2019 – NOW. LZP-2019/1-0094 Application of deep learning and datamining for the study of plant pathogen interaction: the case of apple and pear scab”. The Chief Contractor, RTA work group coordinator. LZP funding 299307.00 EUR.
5. 2018, “Effects of structural and social change on municipalities in Germany and the Baltic States (CliMBinG)”, Baltisch-Deutsches Hochschulkontor. Researcher. AHK funding 1604,65 EUR.
6. Scientific grant project of RTA *Evaluation of tourism products in Rezekne county (quality audit)* No.Nr.13.15/4, management of the sub-module *Visualization of accommodation and leisure facilities and software development*. Researcher. Fnding 2700.00 EUR.
7. Pilot project *Expert and research service for remote sensing data processing of State Land Service buildings*, Rezekne Academy of Technologies and State Land Service. Expert, researcher. VZD funding 592.00 EUR.

Roussi Minev:

1. 2018-2021. ESF Project “The reduction of fragmentation of the study programmes and strengthening the sharing of the resources in the study fields “Management, administration and real estate management” and “Mechanics and metalworking, heat power industry, heat engineering and mechanical engineering” No.8.2.1.0/18/A/016. A new joint doctoral study program “Laser Technologies” in Rezekne Academy of Technologies and Ruse University. Expert, researcher.Funding 646999.00 EUR.

Nikolay Angelov:

1. Erasmus+ KA2 project, Nr. 2017-1- LV01-KA202- 035483, Improving the professional skills in green constructions through online training. Researcher. Funding 164148.00 EUR.
2. ERASMUS+ KA2 – Cooperation for Innovation and the Exchange of Good Practice; KA202 – Strategic Partnerships for vocational education and training; Project Nr. 2018-1-LV01-KA202-056957 WEB-BASED LASER SAFETY MODULES FOR VOCATIONAL EDUCATION/TRAINING. Researcher. Funding 169 321.00 EUR.

Sandra Murinska:

1. Author of the distance learning study course in the project *Improvement of Professional*

Competence of Employed Persons (2020), European Union (EU) funds in the project in the field of adult education, study course *Media Studies and Communication.*

2. Researcher in the project *Life with Covid-19: Evaluation of Overcoming the Coronavirus Crisis in Latvia and Recommendations for Societal Resilience in the future,* Researcher in the work package: Professional and social media and their audiences, activists and volunteers, journalism and health communication during the Covid-19 crisis, 01.07.2020 – now.
3. Scientific leader in the project "Development and Introduction of a Communication Competencies Model for Enhancing and Maintaining a Business Mentor Network", ERASMUS+ Programme cooperation for innovation and the exchange of good practices strategic partnerships in the field of education, training and youth, 2019-1-LV01-KA203-060414. From 01.10.2019 until now.
4. The expert in the field of media in the project "Sales Labs for employability competencies development". No: LLI-184; programme LAT-LIT. 01.09.2017-31.05.2019.
5. Researcher in the project “Innovative methods for implementing interdisciplinarity in career counselling". ERASMUS+ project, 01.01.2017 - 01.09.2017.
6. Researcher in the project "Media (i)literacy and political manipulation - position and opposition in the context of the development and / or preventing the development of a healthy society of direct democratic consciousness – advantages and disadvantages of Bosnia and Herzegovina and Latvia", 2015-2016

Ivaylo Balchev:

1. Project DFNI-D02/9/2014 "Development of biophotonics methods as a basis of oncology theranostics". Position: physicist, Financed by the National Research Foundation of Bulgaria, 2014-2016
2. Project DN 18/2017 “New methods for obtaining graphen and graphen−oxide by modification of amorphic and nano−dispersed carbon steel”. Position: physicist, Financed by the National Research Foundation of Bulgaria, 2017-2019
3. Postdoctoral research aid Nr. 1.1.1.2/16/I/001 research application "Analysis of the parameters of the process of laser marking of new industrial materials for high-tech applications, Nr. 1.1.1.2/VIAA/3/19/474". Position: Postdoc, Financed by the European Regional Development Fund, 2020-2023. Funding 132000.00 EUR.

Tzanko Karadzhov:

1. Erasmus + KA2 project, Nr. 2017-1- LV01-KA202- 035483, Improving the professional skills in green constructions through online training. Researcher. Funding 164148.00 EUR.
2. Erasmus + KA2 – Cooperation for Innovation and the Exchange of Good Practice; Strategic Partnerships for vocational education and training; Project Nr. 2018-1-LV01-KA202-056957, “Web-Based Laser Safety Modules for Vocational Education/Training”. Researcher. Funding 169 321.00 EUR.

Imants Zarembo:

1. Lzp-2021/1-0134 "Development of autonomous unmanned aerial vehicles based decision-making system for smart fruit growing". Project manager, leading researcher. LZP funding 299999.70 EUR.
2. VPP-COVID-2020/1-0009 “Advanced Resilience Technologies for Secure Service”. (01.07.2020- 31.12.2020). Researcher. VPP “COVID-19 seku mazināšanai” funding 497 500.00 EUR.
3. Lzp-2019/1-0094 "Application of deep learning and datamining for the study of plant-pathogen interaction: the case of apple and pear scab". (01.01.2020 - 31.12.2022). Researcher. LZP funding 299307.00 EUR.

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 planning of cooperation of the teaching staff and ensuring the interconnection of study courses in the programme at several levels:

First of all, inter-institutional cooperation of the teaching staff, coordinated **by the Study Programme Council.** In accordance with the Regulation of the Advisory Council of the Joint Doctoral Study programme, the Council will evaluate and update the content of the study programme according to the development trends in the field, societal needs, workload of doctoral students, study progress and graduation, satisfaction of doctoral students with the corresponding study programme, support provided by the higher education institution in studies, the research environment and its compliance with the objective of the study programme.

The Council shall establish common requirements for the implementation of the programme, final examinations, and shall ensure that the parts of the programme create a coherent in terms of content and consecutive joint programme. The Council shall establish the quality system of the programme and supervise its operation, involving teaching staff and doctoral students in this process, ensure the mobility of teaching staff.

Secondly, the cooperation of the teaching staff in implementation of the study courses. The cooperation of the teaching staff in the study courses taught by several lecturers is particularly important. There are three study courses of this type in the study programme. For example, there are three members of the teaching staff of RTA and UR who teach the study course “Scientific writing and communication, intellectual property”(3 CP). Such a volume of the study course is deliberately planned so that the content of the course is not fragmented into several study courses. Therefore, it requires a coordinated and purposeful cooperation in the team of lecturers. Before the start of the study course, communication between the lecturers is planned during the implementation of the study course. A consolidated evaluation scheme has been developed for the study course.

Thirdly, the cooperation of teaching staff in the development of joint scientific research. All the teaching staff members employed in the study programme have experience in the preparation of joint publications, including preparation of joint publications of lecturers and students. This experience is strengthened at the International Scientific and Practical Conference of the Faculty of Education of RTA “Environment. Technologies. Resources”, which is organised once every two years, where students and teaching staff share their experience and present their research results.

Fourthly, **cooperation in scientific projects.** A review of the involvement of the RTA teaching staff in scientific projects is available in the CVs of the participating staff.

Even before the doctoral study programme Laser Technologies was licenced, docents already cooperated and still cooperate at the level of bachelor’s and master’s study programmes. This is reflected in joint publications, projects, summer schools, etc.

When designing the study courses, the docents took into consideration the circumstance that

subjects need to supplement each other, and the primary emphasis is on successful design and defence of doctoral theses.

There are currently 2 doctoral students studying in the programme. Interest from the master study programme Laser Technologies was significantly greater, however, since there are currently no state-funded places in this doctoral study programme, graduates of the master programme have not chosen to begin studies using personal funding.

The number of academic staff involved in the programme is 11 lecturers.

We believe that considering that this is a doctoral study programme focused on the training of potential high-level academic staff, and the studies in the programme have only just begun, then, as Latvia’s and international experience shows, there are usually fewer students in the first academic year. Later, the ratio of lecturers and doctoral students changes.

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	Annex 1.docx	1.pielikums.docx
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)	Annex 2.docx	2. pielikums.odt
Statistics on the students in the reporting period	Annex 3.docx	3. pielikums.docx
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	Annex 4_.ods	4.pielikums_.ods
The curriculum of the study programme (for each type and form of the implementation of the study programme)	5.pielikums_studiju_plans_ENG.docx	5.pielikums_studiju_plans_LV.docx
Descriptions of the study courses/ modules	Annex6.zip	Pielikums6.zip
Description of the organisation of the internship of the students (if applicable)		
III - Description of the Study Programme - 3.4. Teaching Staff		
Confirmation that the academic staff of the doctoral study programme includes not less than five doctors, of which at least three are experts approved by the Latvian Council of Science in the branch or sub-branch of science in which the study programme intends to award a scientific degree (if applicable)	Annex 7.docx	7.pielikums.docx
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)	Annex 8.docx	8.pielikums.pdf