

APPLICATION

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

Study field	<i>Mechanics and Metal Processing, Heat Power Engineering, Heat Technology, and Mechanical Engineering</i>
Title of the higher education institution	<i>Transporta un sakaru institūts</i>
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**TRANSPORTA
UN SAKARU
INSTITŪTS**

Self-evaluation report

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

Self-evaluation report	2
Study field	5
I - Information on the Higher Education Institution/College	5
II - Description of the Study Direction (1. Management of the Study Direction)	17
II - Description of the Study Direction (2. Efficiency of the Internal Quality Assurance System)	45
II - Description of the Study Direction (3. Resources and Provision of the Study Direction)	60
II - Description of the Study Direction (4. Scientific Research and Artistic Creation)	88
II - Description of the Study Direction (5. Cooperation and Internationalisation)	109
II - Description of the Study Direction (6. Implementation of the Recommendations Received During the Previous Assessment Procedures)	117
Annexes	119
Other annexes	121
Aviation Engineering	122
Study programme	125
III - DESCRIPTION OF THE STUDY PROGRAMME (1. Indicators Describing the Study Programme)	125
III - DESCRIPTION OF THE STUDY PROGRAMME (2. The Content of Studies and Implementation Thereof)	134
III - DESCRIPTION OF THE STUDY PROGRAMME (3. Resources and Provision of the Study Programme)	151
III - DESCRIPTION OF THE STUDY PROGRAMME (4. Teaching Staff)	153
Annexes	160

I - Information on the Higher Education Institution/College

1.1. Basic information on the higher education institution/ college and its strategic development directions, including the following information:

Short description of the Institute

The Transport and Telecommunication Institute (henceforth *TTI*) is the only private university of the technical type in Latvia, which offers the full cycle of higher education in transport and logistics, aviation, management, computer sciences and electronics.

The history of the Institute is dated back to 1919, when in Kiev there was opened an Aviation Technician and Mechanic School, which was later transferred to Petrograd (Saint-Petersburg). However, in 1945 the School was relocated to Riga, where in 1967 it was renamed the Riga Institute of Civil Aviation Engineers (RICAЕ). In 1992 the Institute came under the jurisdiction of the Latvian State and was renamed Riga Aviation University (RAU). In August 1999 the Cabinet of Ministers passed a decision to liquidate RAU as a state university.

On September 6, 1999 the joint stock company *Transport and Telecommunication Institute* was registered and the day became known as the TTI Foundation Day. Nowadays, in accord with the TTI Constitution, September 6 is the TTI Celebration Day.

TTI received the certificate of its registration as the educational establishment on November 21, 2001 (registration No. 3343801782). On January 25, 2002 TTI was accredited for the indefinite period (accreditation page No. 032).

So far the total number of the graduates of the Institute has exceeded 7500 people. Students that pursue their education at TTI come from Latvia, Russia, Kazakhstan, Uzbekistan, Moldova, Ukraine, Azerbaijan, India and other countries.

Education is offered in 3 languages – Latvian, English and Russian. Following the amendments to the Law on Higher Education, introduced on June 21, 2018, admission of students to study programs administered in Russian was stopped on January 1, 2019. However, current students continue to pursue their education in the Russian language till December 31, 2022.

Multidimensional research activities have been conducted at TTI. The Transport and Telecommunication Institute was registered as a research institute in the Scientific Institute Register on February 27, 2006 (registration certificate No. 432062).

TTI vision is to be the leading private technical University in the Baltic Sea region

TTI mission is to create and disseminate knowledge and make a positive difference to our community and the wider Baltic Sea region.

Implemented study directions and the program numbers at TTI

The Transport and Telecommunication Institute implements academic and professional study programs in 5 directions across 2 departments (see Figure 1):

- Information Technologies, computer hardware, electronics, telecommunications, computer management and computer science – 5 Bachelor’s programs, 3 Master’s and 1 doctoral program;

- Mechanics and metalworking, thermal power engineering, heat engineering and machinery – 2 Bachelor’s programs;
- Transport services - 2 Bachelor’s programs and 1 Master’s program;
- Economics – 1 Bachelor’s program and 1 Master’s program;
- Management, administration and real estate management – 1 Bachelor’s program and 2 Master’s programs.*Fig.1: TTI study directions attached as Appendix.*

General information about branches of the Institute

TTI has one branch, which was opened in 2003 in Daugavpils, the second largest city in Latvia (the registration certificate was issued on May 23, 2003; registration No. 2744802383). Since September 9, 2005, the Latgalian branch has been situated in the old building of the Red Cross Hospital (which was built in 1913), which has received the status of an architectural monument of local importance.

The study facilities include 2 two-storey buildings with the total area of 1128,3m². Study rooms and offices are equipped with modern technologies to ensure high quality training and easy access to information for all students. In 2019, the Institute organized 24 workplaces equipped with new computers in two computer rooms. The methodological and informative provision for the study process is uniform throughout the Institute, including the branch (see Subsection 3.3. in Section II).

The Latgalian branch implements the following programs: Bachelor of Science in Computer Science, Bachelor of Social Sciences in Economics, the professional Bachelor’s program in Transport and Business Logistics and the Master’s program in Information System Management.

With the decline in the number of potential students, which results from the demographic situation in the country, the migration of Latgale population and the human brain drain to other countries, the number of students has rapidly been decreasing in the last few years. Therefore, the branch currently only provides part-time studies consistently with a specific study schedule. The studies are organized in 5 modules per semester, specifically, on Friday afternoon from 3:35pm to 9:30pm, on Saturdays from 8.45am until the end of classes (all day), on Sundays from 8.45am until the end of classes during the first half of the day, which is usually until 12pm to enable students to return home and prepare for the work week. This allows to attract students living far from Daugavpils. The total number of students in September 2020 was 74 individuals.

Student numbers at the Institute during the evaluation period

Despite the demographic crisis and the decline in the total number of applicants, the TTI development strategy and implemented approach to the study program management have contributed to the provision of high-quality and up-to-date study programs, which was demonstrated by the increasing number of students in the TTI implemented study directions prior to the current academic year until 2019 (Figures 2 and 3).

The decrease in the number of students in academic year 2019/2020 is related to the amendments to the Law on Higher Education Institutions of the Republic of Latvia, introduced on June 21, 2018, which stipulate that institutions of higher education whose language of instruction in study programs does not comply with the provisions of Section 56 of Paragraph 3 of this Law have the right to continue the implementation of study programs in the respective language until December 31, 2022. After January 1, 2019, admission of students to study programs with a language of instruction that does not meet the requirements of Section 56 of Paragraph 3 of this Law is not permitted. Thus, the last intake of students who wished to pursue their education in Russian at TTI was in 2018/2019.

The outcomes of the academic year 2020/2021, in turn, were affected by the restrictions imposed as a result of the worldwide pandemic caused by Covid-19.

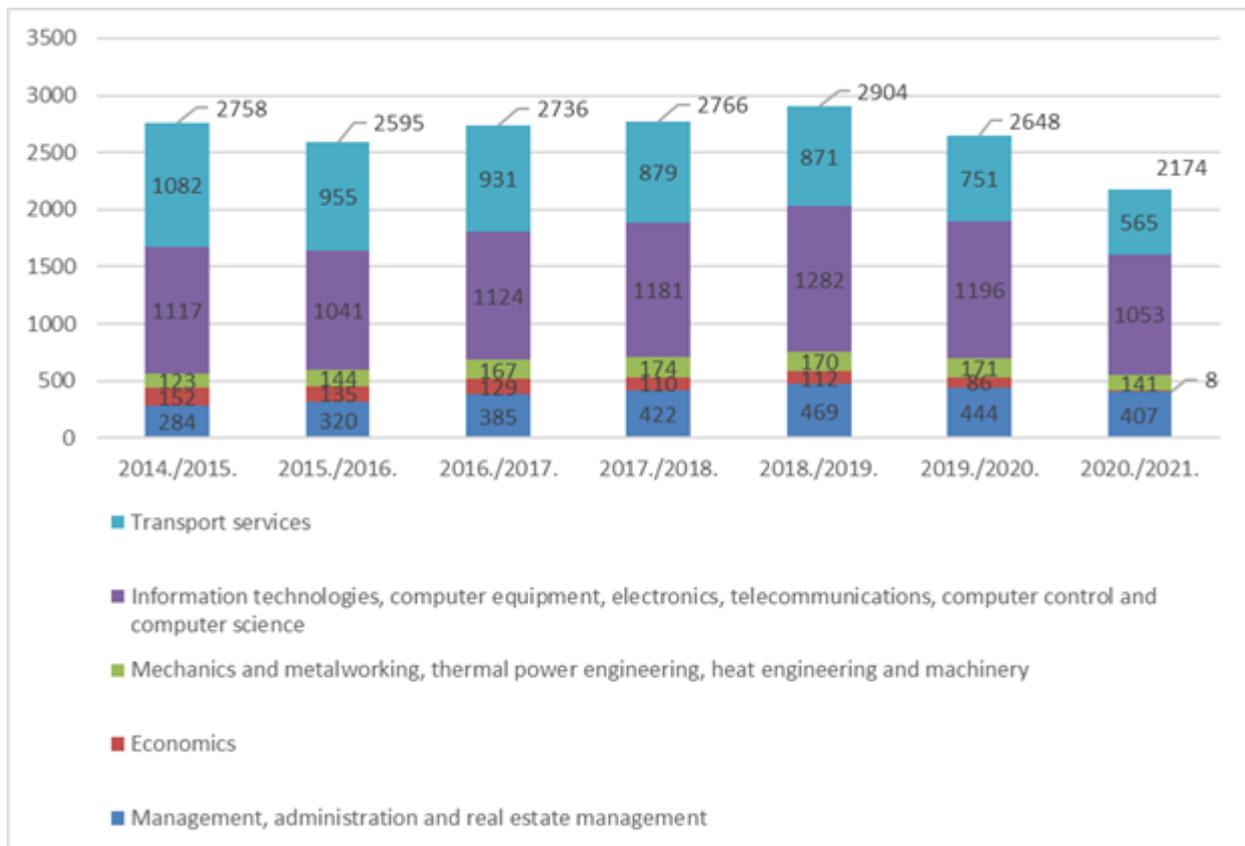


Fig.2: Number of students in study directions implemented at TTI over the reported period

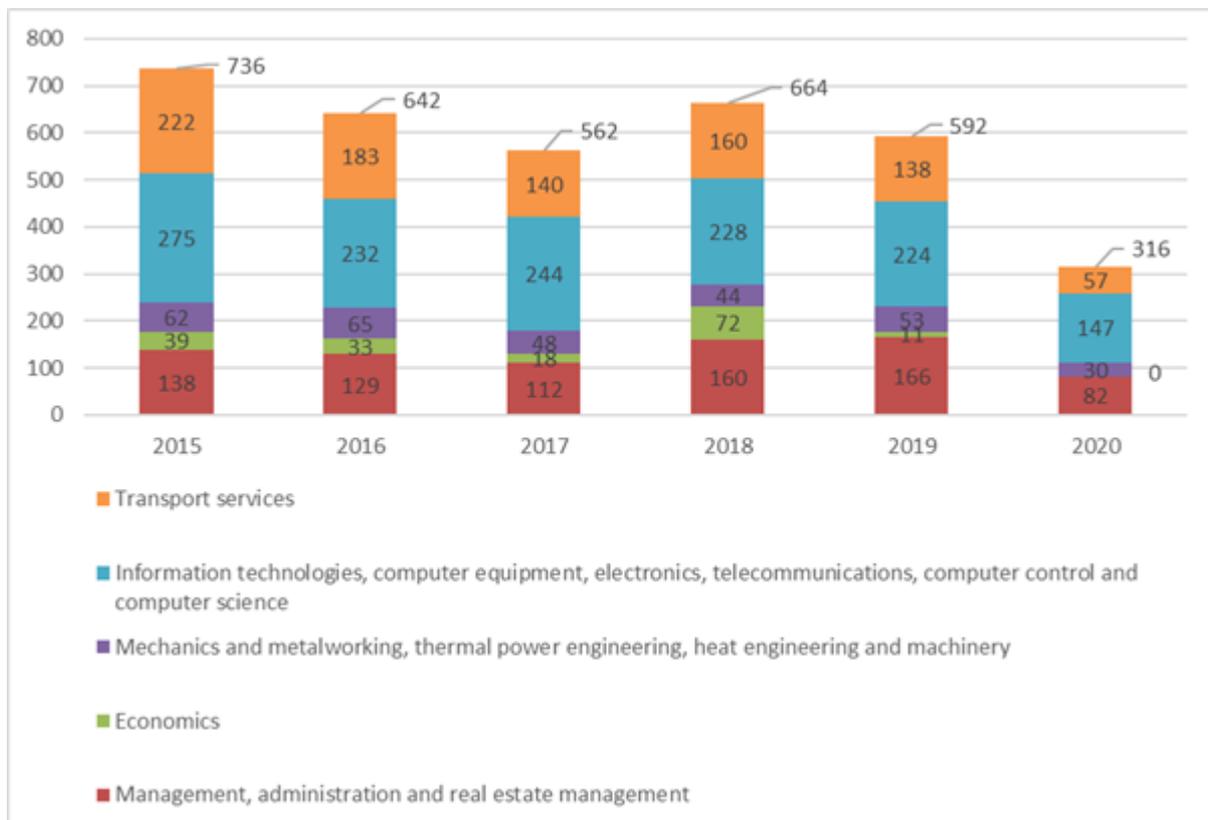


Fig.3: Number of matriculated students in study directions implemented at TTI during the reported period

The strategic TTI aim is to make TTI a modern international technical university with a competitive set of higher education programs, a research and innovation plan, and a lifelong learning offer that meets the needs of all our target groups - students, employees, partners, our

society and the region.

In its development strategy for 2020-2025, TTI has identified five strategic priorities: international involvement, education, research and knowledge transfer, business and society involvement, personnel.

The aim of *international involvement* is to increase the number of foreign students and increase the level of student preparedness by strengthening the TTI position as a leading private university in the Baltic Sea Region that offers higher education in computer science, transport, logistics and aviation. Establish a strong and deep strategic partnership with a British university, thereby enhancing the set of TTI study programs and research projects.

The aim of *education* is not only to develop study programs in computer science, transport, logistics and aviation, to attract an international audience by providing studies in a flexible format in English, but also to offer a wide range of lifelong learning opportunities.

The aim of *research and knowledge transfer* is to train graduates that meet the demands of the industry and of the changes in business operations, business organizations and public life of the next industrial revolution. As for the *research* area, there will be set up an appropriate number of targeted, multidisciplinary research clusters addressing key societal challenges that might have a national or international impact.

The *business and society involvement* involves strengthening partnerships with employers in the region so that the TTI study programs are based on the needs of partner companies and provide internship opportunities for TTI students. It also focuses on encouraging partners to contribute to the enhancement of the TTI research programs and share the essential information so that research results have an impact on business and bring positive changes to society.

The aim of *staff development (personnel)* is to attract and develop excellent staff as well as to provide all employees with opportunities and support for personal development and high performance.

The full Strategy of the Transport and Telecommunications Institute for 2020-2025 is available on the TTI website in Latvian and English at <https://tsi.lv/wp-content/uploads/2020/07/TSI-Strategy-2020-2025.pdf>

1.2. Description of the management 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.

Description of the TTI governing body

The general structure of the Transport and Telecommunication Institute was approved on June 11, 2020 at the TTI Senate sitting. The information is published in Latvian and English on the TTI website at <https://tsi.lv/lv/par-mums/struktura-un-vadiba/>.

Description of the main TTI decision-making bodies

The TTI activities are regulated by the Constitution of the Transport and Telecommunication

Institute, approved by the Cabinet of Ministers Regulation No. 238 on 23/04/2003 and amended on 29/07/2008, by the Cabinet of Ministers Regulation No. 444, Law on Higher Education and other external and internal legislation. According to it, decision-making at TTI is ensured by the Constitutional Assembly, Senate, Audit Committee, Academic Arbitration Court, Board, Rector, Vice-Rectors, Student Self-Government, Faculty Councils and Study Direction Councils.

The highest decision-making body of TTI in strategic and financial matters is the Supervisory Board of the Joint Stock Company Transport and Telecommunication Institute appointed by the founders. In turn, the Management Board of the Joint Stock Company ensures the implementation of the decisions of the Supervisory Board as well as the management and control of the operational activities of the Joint Stock Company.

The highest representative, governing body and decision-making body in academic and scientific matters is the Constitutional Assembly. The Constitutional Assembly adopts and amends the TTI Constitution, elects and revokes the Rector, the Audit Committee, the Academic Arbitration Court and the Senate (in accordance with the Constitutional Assembly Regulations). The Constituent Assembly consists of 50 persons, of whom 30 people (i.e. 60%) hold elected academic positions, 10 people (i.e. 20%) are representatives of general staff and 10 people (i.e. 20%) are student representatives.

The Senate is a collegial management and decision-making body of the TTI staff, which approves the rules and regulations that regulate all areas of TTI activities. According to the by-laws of the Senate, the Senate comprises the following permanent committees: the Development Committee, Study Committee, Regulatory Enactment Committee and Competition Committee. The Senate consists of 20 senators, 75% of whom are elected academic staff; the percentage of students is not to be below 20%; others are representatives of scientific and administrative structural units.

In accordance with the by-laws of the Audit Committee, the Audit Committee is elected by the TTI Constitutional Assembly from among all permanent employees and representatives of the students' self-government, except for the administrative staff. The Audit Committee has the right to inspect the TTI financial and business documentation, to evaluate its compliance with the legislation of the Republic of Latvia and to report the results to the Board.

In accordance with the by-laws of the Academic Arbitration Court, the Academic Arbitration Court consists of representatives of the students' self-government and academic staff. The Academic Arbitration Court reviews the TTI administrative acts, applications of the academic staff or their actual actions in pertinence to the restrictions of academic freedom and rights provided by the Constitution, and make decisions that are binding to the TTI staff.

In accordance with the TTI Constitution, the Rector carries out general administrative activities in academic and scientific fields of the TTI specialization. In coordination with the TTI Board, the Rector represents the Institute in financial matters. The Rector is responsible for the quality of education and science as well as the promotion of staff development and academic freedom.

Effective management and supervision of business operations are conducted by the Vice Rector for Academic and Scientific Affairs and the Vice Rector for Studies as well as academic, research and administrative structural units under their supervision.

The students' self-government is an elected and independent body representing students' rights and interests. It operates in accordance with the by-laws of the Students' Self-government and represents students' interests at the Constitutional Assembly, in the Academic Arbitration Court, Senate, Faculty Councils and Study Direction Councils. In the Senate, students' representatives have a veto right on issues pertaining to students' interests.

In accordance with the Faculty Regulations, the Faculty Council is a collegial body management institution consisting of the head of the faculty, representatives of the permanent staff of the faculty, external employers and representatives of the students' self-government. The Council is elected at the general meeting of the faculty. The Dean recommends the employers to be elected to the Faculty Council. The Council is chaired by its chairman; it organizes the dean's election, ensures the methodological foundation for the implemented study programs, external co-operation (within the scope of activities of the faculty) and planning of the further development of study programs. The Council reviews and tackles issues related to the planning of the faculty activities.

Study Direction Councils (following the regulations of the Study Direction Council) evaluate the compliance of study programs with the requirements of legislation and the labor market, discuss assessments provided by external experts and coordinate plans aiming at the elimination of shortcomings, discuss and coordinate study plans and study program development plans. The composition of the Study Direction Council is approved by the Rector's order.

Participation of external partners in decision-making

External partners are involved in the activities of the Study Direction Council, Faculty Council as well as Alumni Association and the International Scientific Advisory Council.

The Study Direction Council includes cooperation partners from relevant higher education institutions.

Employers are included into the Faculty Council. The Faculty Council reviews and tackles issues related to the planning of faculty activities.

Founded on January 30, 2016, the TTI Alumni Association promotes cooperation between the Institute and its alumni by creating a positive environment for the exchange of experience and business contacts, offering opportunities for raising qualifications, promoting and supporting TTI, and thus, supporting education processes at the Institute.

The International Scientific Advisory Board is composed of leading international experts and researchers in the scientific fields relevant to the TTI research program. The Board members are approved by the order of the TTI Rector. The Board evaluates the TTI research activities and advises on global and strategic research directions.

Participation of structural units in decision-making

The TTI structural units include faculties, research and study laboratories, administrative departments and units, which operate in accordance with regulations approved by the Senate.

The faculty comprises units of one scientific or one professional direction or of several directions and is chaired by the Dean. The Dean is elected by the Faculty Council.

The involvement of structural units in decision-making and budget planning at TTI proceeds in accordance with the financial management plan and is monitored and analyzed by the heads of the Financial Responsibility Centers.

The budget is formed based on the needs of responsibility centers, and its resources are allocated consistently with the approved plan. The financial plan provides for a separate development fund, which is aimed to support research activities. Annual activities and the budget plan are developed considering the needs of structural units and the results of the current year.

The budget plan for the unit is drawn up by its head upon assessing the efficiency of use of resources considering both technical and human resource aspects and in collaboration with this unit's staff as well as attracting and consulting personnel of other units. The head of the unit agrees

upon this plan with his/her immediate supervisor, considering the hierarchical management scheme of the Institute.

Along the similar lines is the annual performance plan drawn up. In this plan, the head of the unit reviews information on the current work processes (which are more relevant to the core functions of the unit) and on strategically sound projects that contribute to the development of the unit and increase its efficiency. In turn, the performance of the faculty, the budget planning and control are conducted by the dean in accordance with the by-laws of the faculty.

Therefore, the detailed planning of the budget includes specific responsibilities, as units must conduct their activities within the approved budget resources. To implement new projects and innovations, TTI sets up working groups and organizes discussions and seminars, thus encouraging the involvement of staff and managers in decision-making.

Appendix 2: The list of TTI internal regulations

Appendix 3: Management structure of the higher education institution

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, as well as the stakeholders involved in the development and improvement of the quality assurance system and their role in these processes.

The quality policy is the declaration of the TTI Board pertaining to the quality of aims and principles, which the Board follows when organizing the development of educational products and study processes. The quality policy is documented and approved in the quality manual. The quality manual is the main document of the TSI quality management system. The current (fourth) version of the quality manual was approved on April 15, 2021. The quality policy is based on the TTI Strategy.

The quality policy is available on the TTI website in Latvian and English (at: https://tsi.lv/wp-content/uploads/2021/08/tsi-qm-v5_eng.pdf).

The planning process for the quality policy implementation is shown in the figure below (see Figure 4).



Fig.4. Scheme of TTI quality policy implementation

The further planning procedure is shown in Fig. 5.

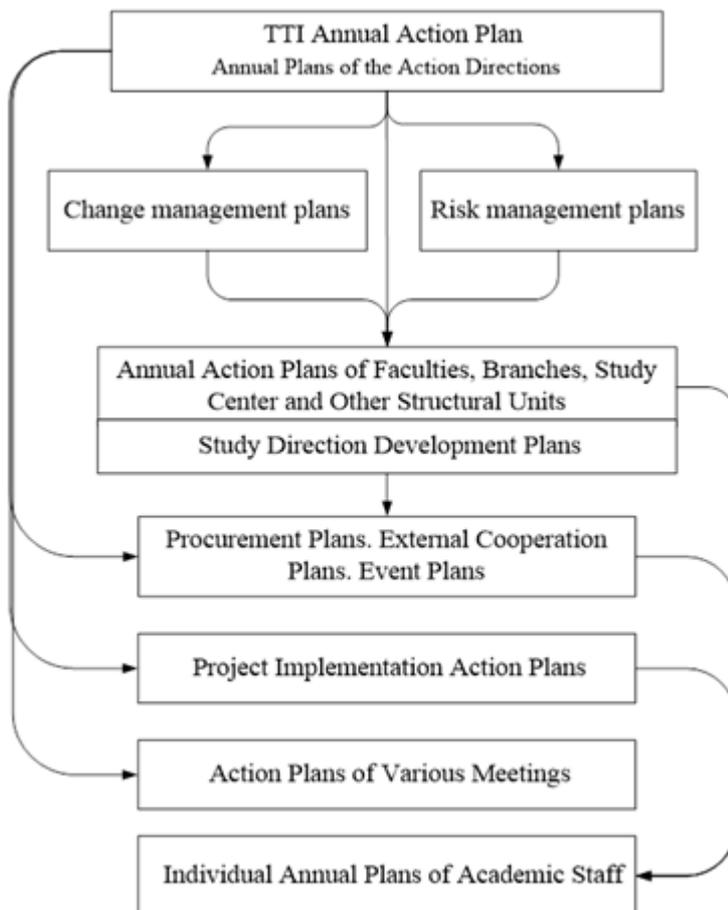


Fig.5. Scheme of the planning process

Procedures for quality assurance in higher education

The quality assurance of the TTI education services is based on the quality management system designed in accordance with the requirements of the ISO 9001 standard. It consists of processes whose structure is illustrated in Figure 6.

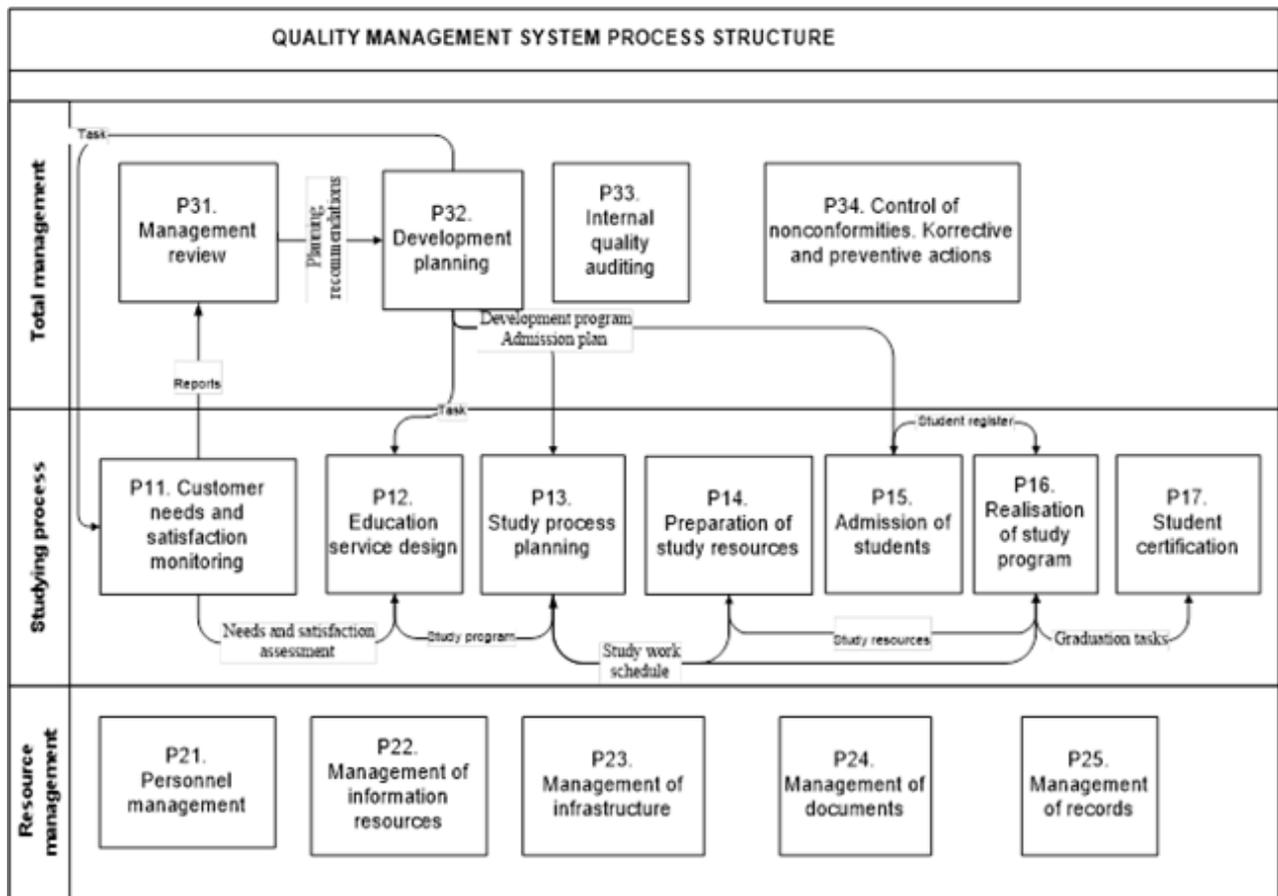


Fig.6. Structure of the quality management processes

Consistent with ISO 9001:2015 Quality Management System Requirements, the TTI quality assurance and enhancement processes are conducted at different levels.

The lower level assesses learning outcomes (examinations, tests, final examinations). The next level focuses on the control of lesson processes (whether resources and methods meet relevant requirements). The third level is characterized by the control and audit of management processes. At the fourth level the Board evaluates the compliance of educational products and services with the market and employer demands, legislation as well as their transformational trends. At the highest, fifth, level, resources and opportunities are analyzed and development strategies are designed (see Figure 7).



Fig. 7. TTI quality assurance and enhancement processes

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 21 of the Law on Institutions of Higher Education 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 evidence for the full compliance, partial compliance or non-compliance.

1.	The higher education institution/ college has established a policy and procedures for assuring the quality of higher education.	Complies The developed and implemented quality management system meets the requirements of the ISO 9001:2015 standard. It determines the field of the quality policy and the structure of quality management processes. For more information, see Subsection 1.3. in Section I.
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2.	<p>A mechanism for the creation and internal approval of the study programmes of the higher education institution/ college, as well as the supervision of their performance and periodic inspection thereof has been developed.</p>	<p>Complies</p> <p>The procedures for the development, internal approval, implementation of amendments and periodic examination of study programs are stipulated in the Regulations on Study Directions and Study Program Management.</p> <p>The management of the development and implementation of collective study programs is ensured by the Study Direction Boards. Regulations on Study Direction Councils was approved by the Senate on May 21, 2019. Students, graduates, employers and external experts are involved in the development of study programs, annual evaluation and program enhancement by participating in Study Direction Councils, Faculty Concils, Senate Committees, Senate and completing questionnaires. Students, graduates and employers are engaged in the development of study programs and study directions within the framework of the program self-assessment procedure.</p> <p>The periodic review of the program takes place during annual self-assessment. The course of the annual self-assessment, deadlines and persons responsible for these matters are approved by an order in September each year.</p> <p>For more information, see Subsection 2.2. in Section II.</p>
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<p>3. The criteria, conditions, and procedures for the evaluation of students' results, which enable reassurance of the achievement of the intended learning outcomes, have been developed and made public.</p>	<p>Complies</p> <p>Lecturers inform students about the knowledge assessment criteria and methods during the first class. The assessment methods and criteria of learning outcomes are included in the course description and are available to students in the e-learning system. Study programs that include internships are designed in such a way that during their internships students consolidate the knowledge acquired in courses and develop practical skills.</p> <p>To assess graduation theses, internship reports and final examinations, there have been established committees that include representatives of employers. The committee members are informed about the basic principles of assessment.</p> <p>The degrees and professional qualifications awarded to students upon successful completion of their studies are regulated by national standards of higher education. The Regulations on the Award of Professional Bachelor's Degree, Professional Master's Degree and professional qualifications at the Transport and Telecommunication Institute describe the procedures for organizing final examinations and determine duties, actions, terms for both students and staff.</p> <p>Assessment criteria and methods for final examinations are included into the Methodological Guidelines for Writing Graduation Theses as well as into the Regulations for the Award of Academic Bachelor's and Master's Degrees and Regulations for the Award of Professional Bachelor's Degree, Professional Master's Degree and Professional Qualifications.</p> <p>Learning outcomes achieved in prior education or professional experience are recognized in accordance with the TTI Regulations on the Evaluation and Recognition of Prior Learning and Professional Experience. The procedures are included into the Final Examination Regulations and Regulations on Study Procedures, which additionally describe the system of assessment of learning outcomes.</p> <p>Recognition of learning outcomes achieved through participation in the ERASMUS + Programme is regulated by the TTI ERASMUS + Programme Scholarship Instructions.</p> <p>Each student receives an ID card created in the TTI internal information system Intranet. This card contains information on the student's academic progress, student's plan for the entire study period and assessment outcomes, which enables the student to control his/her own study plan and the achievement of the expected learning outcomes.</p> <p>For more information, see Subsections 1.6. and 3.3. in Section II.</p>
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4.	Internal procedures and mechanisms for assuring the qualifications of the academic staff and the work quality have been developed.	<p>Complies</p> <p>Descriptions of academic positions are approved by the Regulations on Election to Academic Positions. The Institute has introduced the procedures and criteria for periodic attestation of academic staff.</p>
5.	The higher education institution/ college ensures the collection and analysis of the information on the study achievements of the students, employment of the graduates, satisfaction of the students with the study programme, efficiency of the work of the academic staff, the study funds available, and the disbursements thereof, as well as the key performance indicators of the higher education institution/ college.	<p>Complies</p> <p>Information on student achievements is available in the TTI internal information system. The Study Department collects and analyses information on academic progress indicators, the results of which are regularly reviewed at the Rectorate meetings. Information on student satisfaction is collected through surveys and analyzed at department, faculty, and Institute management levels. During annual attestation the efficiency of academic staff is evaluated. The criteria include indicators of methodological output, student feedback and participation in the Institute management processes. Training aids used in the implementation of study programs are described and evaluated during self-assessment of study programs. Key Performance Indicators (also KPI) of the Institute have been determined. The performance of the Institute and its structural units is periodically evaluated in accord with KPI. Regulations on Student, Graduate and Employer Surveys have been developed. For more information, see Subsections 1.6., 2.1., 2.4., 3.1., 3.2., 3.5. in Section II.</p>
6.	The higher education institution/ college shall ensure continuous improvement, development, and efficient performance of the study direction whilst implementing their quality assurance systems.	<p>Complies</p> <p>Every year the Senate approves reports on self-assessment of study directions and makes decisions on the compliance of study programs and study directions with the requirements of state accreditation. Every study direction has its own development program, which is consistent with the Institute Development Strategy. For more information, see Subsections 1.2. and 1.4. in Section II as well as Appendix 6.</p>

II - Description of the Study Direction (1. Management of the Study Direction)

1.1. Economic and/or social grounds for the creation of the study direction and the relevant study programmes, the assessment of the interrelation among the study programmes, as well as the analysis of the significance (singularity) of the study programmes in comparison with other similar study programmes in Latvia and abroad.

General description of the direction

The study direction *Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery* includes study programs that correspond to the thematic area of machinery (motor vehicles, vessels and aircrafts) of the Latvian Education Classification.

The accredited TTI study direction *Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery* gives the right to implement one first-level and one academic Bachelor's study program:

- academic Bachelor's program *Aviation Engineering* (the former name *Aviation Transport*), education classification code 43525, licensed on July 21, 2011;
- first level (college type) professional higher education program *Technical Maintenance of Aviation Transport*, education classification code 41525, licensed on July 16, 2008.

For the most optimal resource management within this study direction and taking into account the lack of interest in the first-level professional higher education program *Technical Maintenance of Aviation Transport* (every year has been marked by difficulty to enrol a sufficient number of students to create one full student group), the decision has been made to discontinue its implementation and after April 2022, when the last students of the program are to graduate, to close it. Therefore, the program is not submitted for the assessment within the given study direction.

The socio-economic rationale for the development of the study direction is found in the government's economic policy documents

The basic principles of the development of the study direction and study programs are based on the values of the Institute and the overall development strategy of the Institute as well as in compliance with the requirements of regulatory enactments and priorities set in national and international policy planning documents. The implementation of the study direction and study programs proceeds on the basis of several European Union and Latvian guidelines and policy planning processes, including Bologna, on higher education for the next periods.

- The documents of the *Bologna Policy Forum (2018)*[1] set out the most relevant EU guidelines for higher education, concluding that higher education plays a key role in the future prosperity, peace and progress of the EU. In order for citizens to thrive in an increasingly competitive and knowledge-based economy, higher education strategies need to foster innovation, internationalization and digitalisation in order to ensure Europe's global competitiveness.
- *The renewed EU higher education program* (European Commission, 30/05/2017)[2] covers 4 priority areas: adapting the skills acquired within higher education to the needs of the labor market; wider access to higher education, increasing its social inclusion and popularity in society; fostering the innovation capacity of higher education; increasing the efficiency and effectiveness of higher education.
- *Sustainable Development Strategy of Latvia until 2030* (Saeima of the Republic of Latvia, 10/06/2010)[3].

Consistent with the document, Latvia's long-term competitiveness will depend on the link between the education system, changes in the labor market and the ability to train professionals for work in changing conditions throughout their lives. In this light, *Quality and Accessible Lifelong Learning* has been identified as one of the priorities. The implementation of the TTI study program ensures the acquisition of knowledge and competences by various population groups that can pursue their studies in full-time, part-time and distance learning modes. The Institute's has had long-term experience in developing distance learning (the first distance learning program was launched in 2011). The students' study outcomes that were attained outside formal education or via professional experience, might be recognized. TTI is a Lifelong Learning Center that offers a variety of study courses for adult education, including those in the field of aviation. The courses included in the study programs are offered to course listeners, too. Overall, TTI offers study courses that would be useful for a professional career or continuing studies at the next levels of education.

- *National Development Plan for 2021-2027 (NAP2027)* (Saeima of the Republic of Latvia, 02/07/2020)[4].

In its development, the Institute takes into account the NAP2027 priority *Knowledge and Skills for Personal and National Growth*, incorporating it into its strategic objectives: development and performance of science, increasing the number of researchers and scientific publications, implementation of doctoral studies in accordance with international standards, research-based studies, international cooperation and internationalization, implementation of modern and effective university governance, greater engagement of business organizations in strategic decision-making, increase of salaries of teaching staff and a higher proportion of foreign academic staff, wider availability and higher quality of adult education, recognition of non-formal education competences, development of digital and new technology skills.

- *Education Development Guidelines for 2021-2027* (project)

"Highly qualified, competent and excellence-oriented instructors and academic staff". The implementation of the study direction is ensured by qualified staff who continuously enhance their qualifications, including the pursuit of scientific and research activities. The program is also implemented in English and attracts foreign lecturers, thus facilitating the exchange of experience.

"A modern and high-quality educational offer focused on the development of highly valued skills in the labor market. Cooperation with representatives of economic sectors and employers as well as active engagement in the processes of education internationalization are of central importance for the modernization and improvement of the quality of education." The program recruits lecturers who work in the leading companies in the field. The elected teaching staff also include professionals who permanently work in companies specializing in the specified field. The development of the entire study direction at TTI is ensured by the involvement of employers' representatives. Thus, following the employers' recommendation and via interfaculty cooperation, in 2017 there was licensed an interdisciplinary Master's program *Aviation Management*. Representatives of employers were involved not only in the development of the program (the director of the program was a representative of employers), but also in continuous marketing activities of the program and study course teaching. Furthermore, the enhancement of the study direction *Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery* proceeds in cooperation with companies specializing in the field; the director of the program *Aviation Engineering* holds a leading position in a company. Such engagement of industry representatives and employers allows to implement and improve programs in accordance with the needs of the industry and current trends.

"Linking HE to the reform of the content and approach of general education curricula, to develop new conditions for commencing studies in HE and to implement the renewal of the content of study

programs". In order to reduce student drop-out, especially in STEM study programs, and to increase the attractiveness of the programs, TTI organizes pre-sessional courses in mathematics and English for secondary school students. When foreign students enroll in engineering study programs, they have to pass an examination in mathematics/ physics.

"With digitalisation of different sectors as well as the emergence of new technologies and knowledge, the higher education sector should transfer new knowledge and skills to citizens in a more flexible way, i.e. to citizens or entrepreneurs who are already active in the labor market and who already have one or more higher education degrees but who do not have the knowledge of the latest trends". TTI also offers training in Remote Control Aircraft Systems (RCAS) for the professional development of state employees and the TTI students of the academic program.

"Development of partnerships that are important for the development of education, which includes the provision of internationalization and international cooperation for the development of modern and high-quality education". The Transport and Telecommunication Institute actively works on internationalization processes and the attraction of foreign students. Study programs, including *Aviation Engineering*, are conducted in English. In the academic year of 2020/2021, thirty nine percent of students enrolled in the study programs of the direction are foreign students. The established cooperation with a foreign university not only allows to offer high quality education to local and foreign students, but also promotes the transfer of up-to-date knowledge, good practice and standards of excellence to the study programs implemented by TTI. Although the established cooperation with the British university does not provide for the development of joint programs in accordance with the legislation of the Republic of Latvia, it offers studies within the framework of a double diploma program. The compliance of the quality assurance systems of the programs of both higher education institutions was determined and compared. Such cooperation ensures the transfer of the best practice, provides access to relevant teaching materials of the partner institution and envisages the involvement of the academic staff of the partner institution in teaching processes in the future.

- *Digital Transformation Guidelines for 2021-2027*(project)[5].

The development direction *Digital Skills and Education* determines the actions that need to be taken: to create digital learning content for the high quality implementation of distance learning; to promote young people's interest in ICT professions; to develop high-level digital skills as transversal skills within the framework of vocational and higher education contents, including cyber security, big data handling, acquisition of industry-specific digital technologies, public administration services, etc. The study program uses an interdisciplinary approach. The acquisition of digital skills, including the acquisition of industry-specific digital technologies, is integrated into the content of the program as a transversal key competence. Considering Latvian and global tendencies of digitization, the study program uses several digitization tools, for example, Moodle and video conferencing system BigBlueButton (for providing online lectures). Due to COVID-19 restrictions, since March 2020, the entire study process has been organized online remotely. Digital content has been created for the high quality implementation of distance learning in the programs. Considering this experience, innovative training forms have partially been included into the Institute's structure of governance approved in 2020.

Overall, it can be concluded that the development of the study direction proceeds in accordance with the priorities set in European and Latvian policy planning documents on higher education, as the development of this study direction aims at strengthening research activities and ensuring knowledge transfer from higher education to science and businesses, wide internalization and cooperation with employers, enhancement of digital skills, etc.

Succession of study programs

The programs implemented at the Transport and Telecommunication Institutes are designed and implemented in accordance with the principle of succession within the specific study direction and over the scope of the entire Institute. Upon graduation from the Bachelor's program, students of the study direction *Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery* are eligible to pursue their studies in a Master's program, reaching EQF Level 7. TTI offers these students to continue their Master's studies in the professional Master's program *Aviation Management* within the study direction *Management, Administration and Real Estate Management*, which was licensed in 2017 as an interdisciplinary program, or else in the study program *Master of Social Sciences in Transport and Logistics* of the study direction *Transport Services*. In accordance with the TTI strategy, the Institute is already developing a Master's program in aviation engineering. Such a program will ensure the implementation of the principle of succession within the study direction *Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery*.

TTI implements one doctoral program *Telematics and Logistics*, which opens its doors to graduates of all Master's programs implemented at the Institute. The doctoral program covers the research topics of all study directions implemented at the Institute.

In order to make the program more attractive in the international market, the title of the TTI Bachelor's program *Aviation Transport* was changed to *Aviation Engineering*. This name is better suited for English translation and more accurately describes the program's affiliation with this specific branch of science.

General comparison of study programs

In order to ensure the compliance of the program with the operations of EU higher education institutions, and to yield program comparison, this program was compared with study programs offered by other Latvian and foreign higher education institutions. The comparison included the study duration, degrees, program structure and program implementation methods (see Appendix 4).

Taking into account the fact that this area is highly narrow, aviation-related study programs in Latvia, which are professional programs, are implemented in only two other universities - Riga Technical University and Riga Aeronavigation Institute. All three higher education institutions have their programs include theoretical courses that prepare students for taking the theoretical examinations for obtaining the relevant EASA Part-66 aircraft maintenance licenses. This enables program graduates to compete successfully in the international market.

The main difference is related to the academic nature of the TTI program, as a result of which the program is not linked to the profession standard for the aircraft maintenance engineer. This feature allows the program to be expanded to include courses that are much more in line with the latest industry trends and courses focusing on the development of academic and critical thinking skills.

To conduct the comparison of the TTI study program with foreign study programs, there were selected Lithuanian and British study programs. There are relatively few higher education institutions in Europe offering studies in aircraft maintenance programs that focus on the EASA Part-66 requirement for theoretical modules required for the acquisition of aircraft maintenance licenses.

The analysis of the subjects of the reviewed study programs can be concluded with statement that the TTI program *Aviation Engineering* is the only program that allows students to take not only appropriate aircraft maintenance courses for EASA Part-66 modules, but also enrol in specialized subjects that broaden students' vision in aviation, learn about other areas in aviation and realize the importance of these areas in the common aviation system.

The overall conclusion is such that the graduates of the TTI Bachelor's study program have the necessary theoretical knowledge and practical skills to successfully continue their studies in Latvia and abroad. The attained level of knowledge, skills and competences allows graduates to find jobs both in their home country and abroad in accordance with the acquired education and to develop their careers in the areas of their specialization.

Appendix 4. Comparisons of the TTI programs implemented within the given study direction with the study programs of other universities

[1] *The European Higher Education Area in 2018: Bologna Process Implementation Report*
https://eacea.ec.europa.eu/national-policies/eurydice/content/european-higher-education-area-2018-bologna-process-implementation-report_en

[2] "Atjaunināta ES augstākās izglītības programma". Statement of the European Commission (COM(2017)0247), 2017,
<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52017DC0247>

[3] *Sustainable Development Strategy of Latvia until 2030 (approved by the Saeima of the Republic of Latvia, 10/06/2010*
(<https://www.pkc.gov.lv/lv/valsts-attistibas-planosana/latvijas-ilgtspejigas-attistibas-strategija>)

[4] "National Development Plan of Latvia for 2021-2027",
https://www.pkc.gov.lv/sites/default/files/inline-files/NAP2027_apstiprin%C4%81ts%20Saeim%C4%81_1.pdf

[5] *Digital Transformation Guidelines for 2021-2027*, <http://tap.mk.gov.lv/lv/mk/tap/?pid=40496916>

1.2. Aims of the study direction and their compliance with the scope of activities of the higher education institution/ college, the strategic development directions, as well as the needs and the development trends of the society and the national economy.

Objectives of the study direction and their relevance to the TTI action areas and the directions of strategic development

The aim of the implementation of the study direction *Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery* is to train highly qualified aviation engineering specialists, ensuring the development of a competitive career in the Latvian and international labor market.

The aim of the study direction pertains to the TTI Strategy for 2020-2025 (https://tsi.lv/wp-content/uploads/2021/01/tsi-strategy_short_corr-21jan-lv_compressed.pdf), which advances the goal of "ensuring the provision of the study program offers that would meet the interests of the international target audience and reflect the strengths of TTI in computer science, transport, logistics and aviation, and be based on the current and future needs of the industry, which will impact the changes in business operations, business organization and society brought about by the 4th Industrial Revolution."

The TTI strategy is mostly based on the Latvian National Development Plan for 2014-2020, whose

tasks include ensuring the availability of higher education, implementing support measures for higher education export, promoting the competitiveness and consolidation of higher education, etc.

The TTI Strategy for 2020-2025 identifies five areas of strategic priorities: international involvement, education, research and knowledge transfer, business and community involvement, personnel. Training of competitive specialists is impossible without the continuous development of these areas.

In the first place, the study direction is subject to the priority *Education*, which aims to provide research-based and partnership-based educational services in computer science, transport, logistics and aviation that meet labor market demands and forecasts and represent good international practice.

An important link between the study direction and the TTI strategy is formed by internationalization of the study process, which sets the goal of increasing the number of foreign students at the Institute, especially in computer science, transport, logistics and aviation. As can be seen in Section 5.2 below, the number of foreign students increases every year and reached the level of 45% of all the students in the program prior to the pre-Covid -19 pandemic period. In order to boost the program attractiveness in foreign markets, the name of the program has been changed.

The second goal of the internationalization of the TTI Strategy is to establish a strong strategic partnership with a British university, thus enhancing the quality of our study programs and expanding the network of mobility and research partners. In 2020, consistent with its internationalization strategy, TTI established a strategic partnership with the University of the West of England (UWE, Bristol), which is a high ranking university of engineering and technology in the UK. Although the partnership was concluded only in the summer of 2020, the program *Bachelor of Science in Computer Science* has been taught as a double diploma program since September 2020. The implementation of the double diploma Master's program *Aviation Management* is to be commenced from September 2021. The program *Aviation Engineering* is the next program which is to be implemented as a double diploma program as soon as the international evaluation of the program is completed and the accreditation is received with the new program name and enhanced program contents. Cooperation is expected to encompass the improvement of teaching methodology, the use of shared teaching materials, research cooperation, etc.

It is important for the study direction to implement the goals of the priority *Research and Knowledge Transfer*, to provide a research environment that enhances research outcomes meeting international criteria and leading to high-quality scientific publications and transfer of research outcomes to study programs and the national economy, to offer opportunities to TTI Bachelor and Master's students to engage in research activities. The TTI research program identifies 3 strategic research areas, one of which focuses on smart solutions in transport and logistics, including research in aviation (see Chapter 4) ([https://tsi.lv/research/research-at-tsi / research-directions /](https://tsi.lv/research/research-at-tsi/research-directions/)).

Training of competitive specialists requires the organization of the study process according to the latest development trends in education, labor market and industries.

In order for the study direction and its study programs to be competitive and for the program graduates to be in demand on the labour market, the Institute Board and the Study Direction Council, which involves students, regularly cooperate with employers, industry associations and other organizations by engaging them in the development of the study process.

In order to gain a broader perspective on the industry development trends and on the demand for program graduates, the Study Direction Council (SDC) involves independent experts with relevant expertise from various local and international companies. Academic staff of all faculties and student representatives of the program are also involved in the SDC activities, which ensures

interdisciplinarity of study courses. As far as possible, representatives of graduates are invited to participate in SDC activities due to their study experience and work history in various companies. Their recommendations on the modernization of the study process and its relevance to the current trends on the market are a valuable source of information. A graduate of another TTI study program - *Aviation Management*, who graduated in 2020 and who is currently working for Odessa Airport, was involved in the evaluation of the contents of the study program *Aviation Engineering*. As a result of the program evaluation, the program was supplemented with new courses and the contents of some courses were enhanced by including new themes and more recent sources of relevant literature and regulatory documents. The opinions of employer and graduate experts, working in the industry and who participated in the evaluation of the study program contents, are provided in Appendix 5.

Thus, the development of the study direction is based not only on the strategic aims developed by TTI, but also on its evaluation by the public. Clearly, the aim of the study direction is in line with the TTI development strategy and research program.

The main customer and recipient of specialists is the aviation industry, which is why the current situation in the labor market is important.

Development prospects of the aviation industry in the world and in Latvia

The aviation industry is a driving force with an exponential impact on the economic growth and job creation and is an important pillar of the EU and national economies, fostering innovation, trade and workplace quality and having a significant direct and indirect impact on citizens' gains. The growth and availability of traffic and the diversity of air connections contribute to the economic development, proving that economic activities in the air transport sector serve as a catalyst for the economic growth.

Analyzing current developments in the aviation industry in the world, Europe and Latvia, the evaluation of the current state and forecasts of further development must be divided into two very different time periods – prior to the Covid-19 pandemic and after its onset.

Prior to the pandemic caused by Covid-19, the aviation industry had been developing successfully on the global and local scope, including Latvia. In 2018 within the scope of the European Union, air transport, tourism and the economic sectors affected by air transport provided 9.8 million jobs and the economic turnover of EUR 672 billion. Aviation accounted for 4.2% of total employment in the EU countries and accounted for 4.2% of total GDP (EU-28, including the UK). Each person directly employed in aviation and tourism in the EU ensured 3.8 jobs in other related sectors.

The aviation industry in the European Union directly employed approximately two million people per year in the following subsectors (source: *Aviation: Benefits Beyond Borders*, Air Transport Action Group, 09/2020):

- Airlines: 397 000 (19% of the total)
- Airport operators: 135 000 (7%)
- Other staff at the airport: 1.1 million (56%)
- Civil aviation: 320 000 (16%)
- Air navigation service providers: 43 000 (2%)*

In 2018, air transport in the 27 countries of the European Union was forecast to continue to grow by around 2.1% per annum over the following two decades. This growth, in turn, must contribute to growth and job creation in the aviation and economic sectors affected by air transport. Oxford Economics projected that by 2038, employment in air transport-related sectors in the European Union would have increased to 12 million jobs (the increase of 23% in comparison to 2018) and GDP

to EUR 889 billion (the increase of 32%).

The International Air Transport Association (henceforth - *IATA*) estimated that 7,8 billion air passengers would have travelled by 2036, almost twice as many as in 2017 (4 billion passengers).

During the pre-Covid-19 pandemic, the Latvian aviation sector experienced a positive development trend, too. In 2019, the national carrier *JSC Air Baltic Corporation* served more than 5 million passengers for the first time in its history, which was an increase of 22% in comparison to 2018. The number of passengers served by *SJSC Riga International Airport* in 2019 reached 7.8 million, which was an increase of 10.5% in comparison to 2018. This strengthened Riga's position as a regional air traffic center and promoted *Riga Airport* as an important Northern European air traffic hub. Furthermore, the demand for *JSC Air Baltic Corporation's* regular domestic flights on the route Liepāja - Rīga - Liepāja continued to grow, which was important for ensuring the region's accessibility and for promoting the region's economic development. In 2019, *Liepāja Airport* served 14,082 passengers (including 13,835 passengers in regular traffic, which was the increase of 48.5% in comparison to 2018).

According the indicators of Objective 2 *Ensure Latvia's International Accessibility* of the action direction *Excellent Business Environment* of the *Latvian National Development Plan for 2014-2020*, in 2020 *Riga Airport* was forecasted to serve 8.5 million passengers, but in 2030 -12 million air passengers.

Table 2. Number of passengers served at Riga Airport (million people)

Indicators	2011	2017	2018	2020*	2030*
Forecast: Number of air passengers served per year	5,10	6,1	7,06	8,5	12

* Source: *Latvian National Development Plan for 2014-2020*

Tables 3 and 4 below show the economic indicators of the Latvian aviation sector in 2019 and the macroeconomic impact of this sector.

Table 3. Indicators of the aviation sector in 2019

Indicators	Number of companies	Net turnover, EUR million	Number of employees
Private companies	14	298	1 119
State and municipal companies	6	600	3 534
Total (excluding subsidiaries)	20	898	4 653

Table 4. Macroeconomic impact of all aviation companies in 2019

Impact level	Share in Latvia's Total Added Value in 2019, % (Extrapolated from the results of the 2017 research on the economic impact of the aviation sector)
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Direct impact (aviation sector output)	0,99
Indirect effects (supply chains of goods and services)	0,55
Induced effects (consumption of aviation employees)	0,30
Catalytic effects (tourism, postal services, courier services, etc.)	1,65
Aggregate macroeconomic impact	3,5

* Source: Latvian Aviation Association study on the impact of Covid-19 on the Latvian aviation industry, SIA "Ardenis", 2020

Overall, the aviation industry in the world and in Latvia experienced a dynamic growth prior to the onset of the Covid-19 pandemic. This trend was expected to continue in the long run, which is why the demand for aviation professionals was expected to increase, especially for those professionals with specific and advanced knowledge, including engineers and managers of different levels.

The negative impact of the coronavirus on the aviation industry

At present, aviation can be claimed to be one of the sectors hardest hit by the Covid-19 pandemic. *Statistica.com* forecasts that the Western European MRO (Aircraft Maintenance and Repair Organisation) market will be around \$ 13.8 billion in 2021, experiencing a recession throughout the year. The International Air Transport Association (IATA) predicts that the global air traffic will decline by 66% this year. In Europe, IATA expects a plunge of the total passenger numbers by 70% this year.

The reduction in air transportation affects the employment figures in the sector. Global employment in the aviation sector is projected to decrease by approximately 4.8 million in 2021, including in the following sub-sectors:

- Airlines: 1,3 million
- Airport operators: 220,000
- Other employees at the airport 3,2 million
- Civil aviation: 151,000

In Europe, the total number of job losses is estimated at 191,000 people (source: *Supporting European Aviation*, Aviation Intelligence Unit, Think Paper № 8, 01/2021).

Due to the rapid spread of Covid-19, on March 12, 2020, the Latvian government declared a state of emergency in the country. Security measures and restrictions imposed by the government due to the emergency situation as well as measures taken by other countries to limit the spread of Covid-19 have had a negative impact on the Latvian economic development, including the transport sector. Specifically, there has been a decline in demand for Latvian goods and services on export markets; there have been disruptions in international supply chains; there has been a plunge in the volume of transport and passenger transport services; there has been a decline in demand on the domestic market.

The pandemic was found to have had a significant negative impact on 83 percent of the net turnover of aviation companies included in the 2020 survey conducted by *Ardenis*, LLC. The

average change in net turnover of the analyzed companies in 2020 compared to the first half of 2019 constituted a decrease of 45%. This study also showed the changes in the number of employees in the Latvian aviation sector affected by Covid-19 and the forecast of its recovery.

Table 5. Changes of the number of employees in the Latvian aviation sector caused by COVID-19 and the recovery forecast

Aviation subsectors	In the 1st half of 2020 in comparison to the 1st half of 2019,%	Reaching the level of 2019: recovery period
Air passenger transportation	- 42	2021-2022
Air freight	- 29	no data
Airfield maintenance	- 30	2022-2023
Ground handling and related services	- 17	
<i>Freight service</i>	- 15	2021-2022
<i>Fuel delivery</i>	- 25	no data
<i>Aircraft maintenance</i>	- 17	2022
<i>Catering services</i>	- 20	2022
<i>Cleaning</i>	no data	2022
<i>Management of commercial areas</i>	- 0	no data
Aeronautical navigation	- 8	2024
Training	- 20	2021

Source: *Study of the Latvian Aviation Association on the Impact of Covid-19 on the Latvian Aviation Industry*, Ardenis, LLC, 2020

At present, it is difficult to accurately predict the impact of Covid-19 on the transport sector, including the aviation sector, as the duration and severity of the restrictive regimes are crucial. The sooner the virus is stopped and the restrictions are lifted, the sooner the entire economy, including transport, will begin to recover. Nevertheless, the aviation sector as a whole is expected to recover relatively quickly.

The end of the current crisis will be marked by the creation of new business and employment opportunities. The European Organization for the Safety of Air Navigation (EUROCONTROL) has developed three scenarios for air traffic recovery. The first scenario, which is the most optimistic, predicts that following a rapid recovery in the industry and given the onset of vaccination against Covid-19 in 2021, air traffic in 39 EUROCONTROL member states could reach 177,956 flight units in 2024 in contrast to 167,000 flights in 2019, which would be an increase of 6,5% in contrast to 2019.

According to the second scenario, the vaccine is projected to become effective only from 2022, which is why there would be a 6,5% decrease in flights between 2024 and 2019, resulting in

156,002 flight units in 2024. The third, scenario, the most pessimistic one, forecasts that the recession in the aviation sector is going to continue for a considerably longer period of time, resulting in 123,365 flights in 2024 and leading to a drop of 26% in flight numbers as compared to the figures of 2019.

As for IATA forecasts, global air traffic is expected return to pre-coronavir pandemic levels around 2024.

Employment, education and innovation opportunities in aviation

The main customer and recipient of the specialists trained under the study direction, which is currently undergoing accreditation, is the aviation industry in Latvia and in the region; therefore the situation and the prospects of further development in the national and international aviation labor market affect the identification of the program development opportunities. Jobs in the EU aviation sector depend on the sector's ability to deliver significant growth through structural reforms. It is also very important to maintain the leading role of aviation through a well-educated, skilled and experienced workforce.

According to the informative report of the Ministry of Economics of the Republic of Latvia on *Medium and Long-term Labor Market Forecasts*, the number of people with higher education in the labor market will continue to gradually increase in the long run. Consistent with the forecast, there will be an annual increase of 1%, excluding the aging of the workforce.

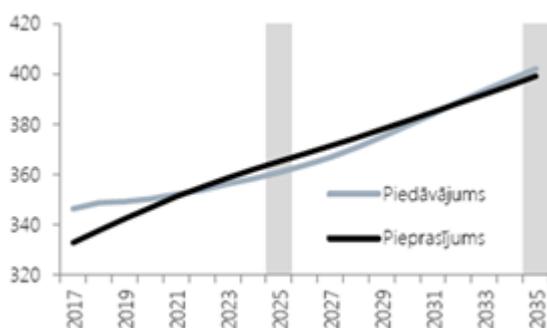


Fig. 8. “Sufficiency of the Latvian labour force by the supply-demand ratio of higher education in 2025, as a percentage of demand versus supply with higher education”, thousands (source: *Informative Report on Medium and Long-term Labor Market Forecasts*, Ministry of Economics, 2018)

The report also provides information on medium- and long-term forecasts of changes in the number of employees in economic sectors by occupational groups. According to these forecasts, the share of highly qualified employees, including managers, is going to increase by 3,9% in 2025 and by 5,0% in 2035 as compared to 2017.

The aviation industry is an attractive employer in terms of employee pay and personal motivation. According to a research report by the European Parliament, air transport workers generally earn more than workers in other transport sectors or support sectors. The figure below shows that on average 61% of those employed in the air transport sector in the European Union earned more than EUR 18 000 a year in 2010 compared with 39% of the employed in the transport sector as a whole.

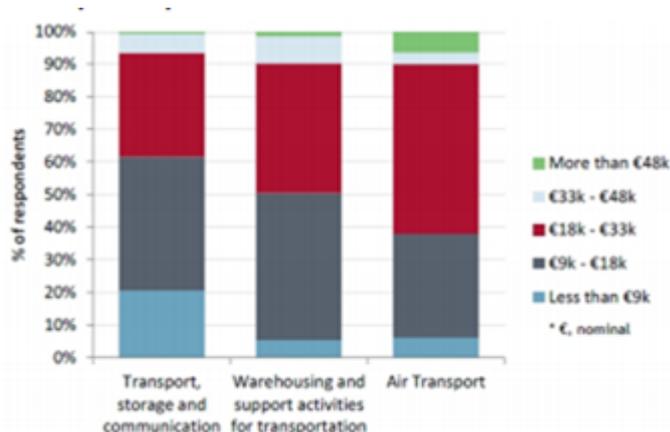


Fig.9. Income of air transport workers compared to other sectors (EU-28) (source: “*Employment and Working Conditions in EU Civil Aviation*”, European Parliamentary Research Service, 04.2016)

As for the remuneration aspect, the situation in Latvia is similar to that of the EU. As shown in the figure below taken from the *Jazz Communications* study on *Assessment of the Economic Impact of the Latvian Aviation Sector on the Economy* conducted in 2019, the average monthly gross wage in air transport was the highest among all other transport sub-sectors and almost 2.3 times higher than the average gross wage salary in the country (EUR 2282 versus EUR 1004).

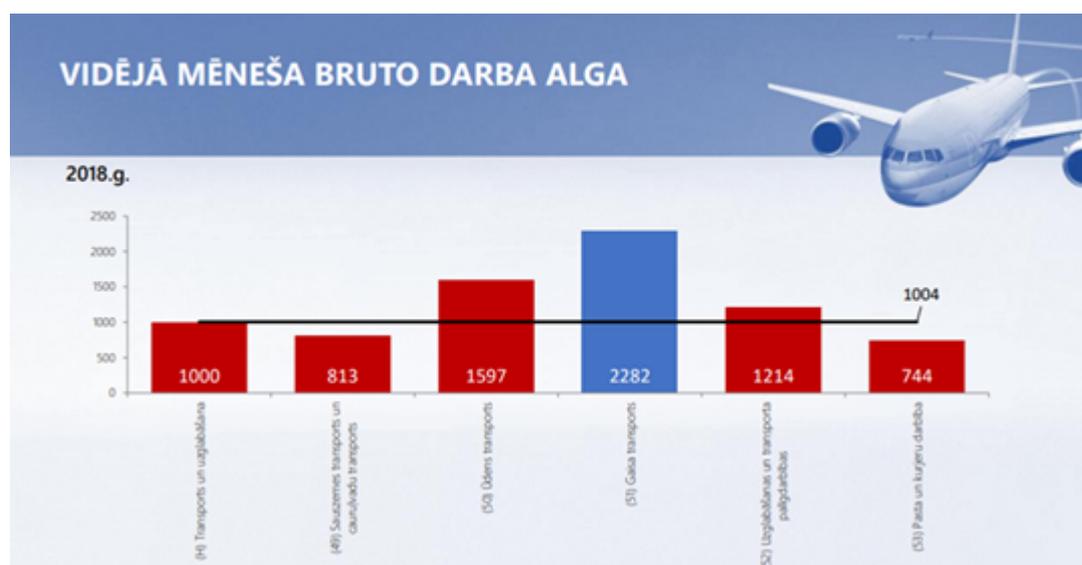


Fig.10. Average gross monthly salary

Partnerships between research institutions, universities and the industry in pertinence to education facilitate the movement of professionals between these sectors, which would ultimately be very beneficial for the development of the entire aviation sector. Aviation professionals will need to acquire new skills and competences in the future, some of which are not yet widely available, such as those of drone specialists and flight data analysts, and therefore, priority should be given to the training of such new professionals (source: *Aviation Strategy for Europe*, European Commission Communication COM (2015) 598 final, 07/12/2015, p. 10).

So far, the development of research and innovation in the transport sector in Latvia has been rather fragmented and limited. Of Latvia's total research expenditure, which in 2018 was EUR 186,2 million or 0.64% of GDP, about 7,4% was invested in the transport and logistics sector. The Latvian science and research system is too dependent on the availability of the EU structural funds (39% of research funding in 2014-2018 was provided from foreign sources, mainly from the EU funds); and the resulted cyclical fluctuations do not ensure stable and sustainable continuity of research

processes, which is why it is crucial to increase the state budget and business investments, including the amount of investments of state capital companies and private merchants.

The development of research and innovation is necessary to create new knowledge, data, ideas and technological solutions and to train specialists for the development of the transport sector. It is important to understand that the human capital is developed when research is commissioned. This, in turn, develops academic staff whose competences, professional and research experience yield the study and education quality. In order to promote purposeful development of research in the transport sector, it is essential to develop cooperation between policy makers, industry companies and organizations as well as scientific institutions and to define national priorities for research in transport, which will require long-term funding (source: *Transport Development Guidelines for 2021-2027; Appendix 3 Outcomes of the Initial (Ex-ante) Assessment, project Draft after Public Consultation*, Ministry of Transport, 2020, p. 17).

As mentioned above, the aviation sector developed very rapidly prior to the Covid-19 pandemic, which was partially driven by globalization tendencies, economic developments and liberalization of transportation. As a result, the role of managers in the aviation sector became even more important due to the specific nature of the sector and specific professional requirements for competences, knowledge and skills essential for organizing business operations in aviation and for ensuring aviation safety.

According to a study published by the *Airport Council International Europe* (ACI Europe) in 2015 on the economic impact of European airports, the direct and indirect impact of the aviation sector (including the induced and catalytic impact) on the Latvian economy is measurable at EUR 770 million or 3,3% of GDP and 31,500 jobs. When calculating the employment figure, the authors of the study took into account both the number of people employed in Latvian aviation companies (airports, airlines, ground handling service providers, etc.) (4,200 employees) and in companies related to the industry, such as travel agencies, aviation fuel producers, air freight and logistics companies and people employed at aviation training institutions. In 2016, 5,281 people were directly employed in Latvian aviation companies (+ 25,7% compared to 2014), while the industry related enterprises employed 34,823 people. In October 2019, SJSC *Riga International Airport* alone employed 1,250 people, of which 70 were heads of structural units of various levels, with the number of employees having been increased by 150 employees during the two-year period.

According to the passenger forecasts identified in the *Latvian National Development Plan for 2014-2020*, in 2020 the Latvian aviation sector was expected to demand 8,090 employees (10,248 employees in 2030), while the industry-related companies were forecasted to require 42,970 employees (49,227 employees in 2030).

Table 6. Number of employees and managers employed in the aviation sector in Latvia (forecast)

Year	2016	2020*	2030*
Number of employees	5 281	8 090	10 248
Managers	311	476	603

Source: *Latvian National Development Plan for 2014-2020*

Thus, in the medium- and long-term perspective there will be a stable and even increasing demand for aviation specialists in Latvia on the international scale, and consequently, there will be a need

for their training and qualification enhancement.

Table 7. The planned number of graduates in study programs related to the transport and logistics sector

Policy Outcome 5 (FP5). Promoting innovation and training of highly qualified professionals in the sector (National Development Plan of Latvia for 2021-2027, European Green Course)					
Performance indicator	Unit of measure	Base year	Base year value	Target value 2023	Target value 2027
1. Number of graduates in study programs related to the transport and logistics sector, incl. number of trained aircraft pilots	Numbers	2019	1394	1500	1600

Source: Transport Development Guidelines for 2021-2027, project - draft after public consultation, Ministry of Transport, 2020, p. 32

Furthermore, there is envisaged a stable demand for employees trained at the Transport and Telecommunications Institute, specifically, for specialists who have the knowledge of the aircraft and aircraft engine design, aircraft mechanical and avionics systems, aircraft safety, diagnostics and repair issues, etc. By 2031, the global market for aircraft engines is projected to grow to \$56,6 billion. Consequently, the aviation industry might encounter a shortage of qualified aircraft and engine maintenance professionals during the post-pandemic recovery. This forecast creates a positive ground for the development of educational institutions offering training in aircraft maintenance and induces them with some responsibility over the entire period of the industry development because timely recruited and properly trained aircraft technical maintenance professionals may play a major role in the recovery of the industry.

Appendix 5. Opinions of industry experts

1.3. SWOT analysis of the study direction 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 direction 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 direction for the next assessment period shall be provided.

In order to ensure successful implementation of the study direction, the strengths and weaknesses, opportunities and threats (SWOT) of the study direction *Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery* were assessed, and the main development directions were outlined.

Table 8. The analysis of TTI strengths, weaknesses, opportunities and threats (SWOT)

S - strengths	W - weaknesses
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<ul style="list-style-type: none"> • TTI represents a strong aviation brand with a long tradition of implementing aviation programs, as it was founded on the basis of the former Institute of Civil Aviation Engineers (RCAI). • TTI education services are certified in accordance with the standard ISO 9001: 2015. A quality management system of study programs has been implemented. • In the international assessment of Latvian scientific institutions in 2019, TTI received ratings on a scale from 3 to 4, which points to the TTI recognition as a strong scientific institution in engineering sciences and technologies. • TTI has a theoretical and practical training base that meets all professional requirements, is equipped with modern aviation stands, devices and tools, as well as 2 aircraft are available for student classes (AN-2 and Cessna). • TTI has information technology infrastructure that meets today's requirements. TTI has accumulated valuable experience in digitising study processes and distance learning. • TTI has a modern electronic library and subscription to international databases (Academic Complete, Science Direct, SCOPUS). • A strategic partnership agreement has been concluded with a British university - the University of the West of England (UWE, Bristol) - in accordance with which the two universities are expected to cooperate in delivering joint double diploma programs, in enhancing teaching methodology and the use of shared teaching materials and in research activities. • TTI has qualified academic staff: 90% (17) of the elected academic staff who teach in the program have a doctoral degree (overall, the academic staff of TTI with a doctoral degree constitute 77%); 31% (or 10) of the academic staff of the program are permanently employed in companies operating in the industry. • TTI has an Academic and Professional Aviation Center (TTI/APAC) certified in accordance with the EASA Part-147 requirements, which offers training programs to aviation professionals worldwide and provides TTI graduates with the opportunity to apply for B1 or B2 licenses (EU Regulation No. 1321/2014 Part-66) • Teaching is also conducted in English (lectures, practical classes, etc.), which provides students with the opportunity to learn and practice the common international professional language of communication - English and which attracts qualified foreign academic staff. • There has been established cooperation and a wide range of contacts with employers, entrepreneurs, state institutions and other higher education institutions in Latvia and abroad. • TTI actively participates in various associations and societies: Latvian Aviation Association, European Conference of Transport Research Institutes (ECTRI), Latvian Association of Remotely Piloted Aircraft Systems (LARPAS), Association of Women in Transport, etc. 	<ul style="list-style-type: none"> • Decline of knowledge of natural sciences and mathematics among high school graduates. • Lack of a Master's program in Aviation Engineering • Insufficient number of scientific activities in aviation conducted at TTI • Some study courses have a relatively small number of lecturers who could replace the basic teaching staff • Insufficient dynamics of renewal of the permanent academic staff of TTI • Most students combine work and studies in order to afford their education, which negatively impacts the learning outcomes. • The salaries of the teaching staff are lower than those of aviation practitioners, which makes it difficult to attract practitioners to the academic environment. • Although the cooperation with the companies specializing in the industry is productive, an insufficient number of theses is written on themes suggested by the companies. • There is a low level of student participation in the ERASMUS mobility program and a low number of visiting lecturers, although the mobility indicators of TTI academic staff are relatively high. • In Latvia, companies are not used to supporting students with scholarships.
O - opportunities	T - threats

<ul style="list-style-type: none"> • Implementing the agreement on the strategic partnership with the University of the West of England (UWE, Bristol, UK), negotiations are currently underway on the implementation of the study program <i>Aviation Engineering</i> in the format of a double diploma. • Students have an opportunity to continue their education in higher-level programs, improving their competences in aviation management (studies in the Master's program <i>Aviation Management</i>), or in transport and logistics (studies in the Master's program <i>Master of Social Sciences in Transport and Logistics</i>), and TTI doctoral program <i>Telematics and Logistics</i>. • TTI deploys a wide range of opportunities that promote scientific research in aviation: <ul style="list-style-type: none"> ◦ grant program for doctoral students for research in the digital aviation; ◦ participation in the annual scientific conference of the Riga Aviation Forum, where researchers from three universities - TTI, RTU and RAI – deliver their talks; ◦ TTI implements many interdisciplinary projects that strengthen the aviation study direction: the project ERASMUS+ KA2 <i>SPREAD YOUR WINGS</i> and project ALLIANCE of HORIZON 2020, etc. • Considering the intention to extend or conclude new ERASMUS cooperation agreements with Vilnius Gediminas Technical University (Lithuania), University of Žilina (Slovakia), Estonian Aviation Academy (Estonia), University of IT and Management (Poland) this year, there is an opportunity to participate in the mobility program in the field of aviation. • Taking into account the TTI's long-term experience in the implementation of distance learning, it is feasible to implement the programs of this study direction in the form of distance learning. • In order to stimulate students' interest in aviation and aviation programs, TTI organizes and participates in various annual marketing events (TTI Aviation Day, aviation shows and festivals throughout Latvia, etc.). • Medium and long-term labor market forecasts predict that the demand for engineering specialists, including aviation, will increase. • TTI has signed cooperation agreements with almost all the largest aviation enterprises in Latvia. This provides an opportunity to involve employers in roundtable discussions and to constantly monitor and renew the program, considering the requirements of employers pertaining to the skills and competences of specialists-in-training. • There is an opportunity to focus on attracting Western European and Asian students, because tuition fees are competitive compared to competing Western European countries. Prior to the Covid-19 pandemic, the number of TTI foreign students tended to significantly increase every year as a result of active marketing activities. • TTI has an opportunity to attract additional financial resources by participating in the implementation of projects of the European Union funds. • The importance of lifelong learning is growing throughout a person's life due to the need to acquire new knowledge, skills and experience in order to improve or change one's qualification in accordance with the requirements of the labor market. 	<ul style="list-style-type: none"> • Prolongation of the Covid-19 pandemic, which may affect students' ability to start/continue their studies • Insufficient level of students' knowledge of English when commencing studies in the foreign language • Unavailability of state budget funding for covering tuition fees of students pursuing their studies at private universities • Decrease in the number of potential students due to the demographic situation in the country, migration and outflow of human intellectual potential to other countries of the world • There is a difference in opportunities for private and state higher education institutions in accessing state and EU funds and in funding human resources and research programs. • Limited opportunities of companies to offer internships for students during their studies
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TTI is planning to implement the opportunities indicated in this SWOT analysis consistent with the development plan for the TTI study direction *Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery for 2021-2026*, in which these opportunities are outlined.

In order to maintain the strengths, the material and technical base and e-learning environment need to be enhanced in accordance with the needs and current developments, whereas the teaching staff need to be motivated to maintain and improve their qualifications and professionalism but new lecturers should be recruited.

According to the demands of the labor market and the outcomes of student surveys, it is necessary to continue to ensure the acquisition of knowledge, skills and competences that would allow graduates to succeed in the aviation sector in a wide range of positions in the future.

In order to reduce weaknesses, avoid threats and deploy opportunities, the Engineering Faculty of TTI implements the following measures to improve the study direction:

- the teaching staff continue to carry out scientific research, provide consultations and specialized training to cooperation partners, thus improving cooperation and using partners' material and technical base;
- after receiving the international assessment and accreditation of the study direction (with the new name of the program - *Aviation Engineering*), TTI is planning to offer the program as a double degree program with the University of the West of England, thus creating a new factor of attractiveness of the TTI study programs;
- although the students of the program have the opportunity to continue their education in a Master's program, thereby expanding their competences in aviation management or transport and logistics, TTI has already been developing a new Master's program in Aviation Engineering, which is expected to be licensed in the autumn semester of 2022;
- in order to reduce the threat of a decrease in the number of potential students, the Institute pursues active advertising and marketing activities both in Latvian schools and abroad, organizes Olympiads, Open Days and other events aimed at stirring candidates' interest in studies at TTI. Young foreign students are tested in the English language and, if necessary, are offered additional training courses. If young students have insufficient knowledge of mathematics or other core subjects, they are offered additional consultations;
- the Institute cooperates with companies operating in the sector and offers a discount-loyalty system to cover or reduce student tuition fees;
- TTI promotes doctoral studies for academic staff by co-financing doctoral studies. TTI attracts foreign lecturers via the EU-funded projects;
- in order to promote research in the field of aviation, various activities have been implemented in recent years:
 - the TTI annual international conference *Reliability and Statistics in Transportation and Communication (RelStat)* has a special section dedicated to aviation;
 - currently 12 doctoral students are studying at TTI, whose research themes are related to aviation. These doctoral students work in aviation companies, which allows the Institute's lecturers to create a link between theory and practice;
 - participation in the annual scientific conference of the Riga Aviation Forum, where highly qualified researchers from three universities - TTI, RTU and RAI - deliver their talks;
 - Close cooperation with associations, especially the Latvian Aviation Association and the Association of Women in Transport, etc.;
- in order to promote the scientific activities of the TTI academic staff and researchers, the Institute has developed and approved an incentive system that encourages staff to prepare

publications for scientific journals, participate in research projects, deliver talks at conferences, etc.;

- implementation of the involvement of academic staff in scientific activities proceeds through ESF funding (eg post-doctoral studies, COST projects, etc.).

As mentioned earlier, the draft of the *Latvian Transport Development Guidelines for 2021-2027* envisage that in 2023 Latvia will have trained 1,500 transport and logistics graduates, whereas in 2027 the number of anticipated graduates should reach 1,600 people. This means that in the medium and long term there will be a stable and growing demand for transport on the Latvian and international scope, including aviation specialists, and there will be a demand for relevant training and professional development of such specialists. Furthermore, there is envisaged a stable demand for employees trained at the Transport and Telecommunications Institute, specifically, for specialists who have the knowledge of the aircraft and aircraft engine design, aircraft mechanical and avionics systems, aircraft safety, diagnostics and repair issues, etc. By 2031, the global market for aircraft engines is projected to increase to \$56,6 billion. As a result, the aviation industry might encounter a shortage of qualified aircraft and engine maintenance professionals during the post-pandemic recovery. This forecast creates a positive foundation for the development of educational institutions providing training in aircraft maintenance and induces them with some responsibility over the entire period of the industry development because promptly recruited and properly trained aircraft technical maintenance professionals might play a major role in the recovery of the industry. Obviously, this fact opens up good opportunities for the implementation of educational activities at the Transport and Telecommunications Institute, including the study program of *Aviation Engineering*.

Appendix 6. Development Plan of the Study Direction

1.4. The structure of the management of the study direction and the relevant study programmes, and the analysis and assessment of the efficiency thereof, including the assessment of the role of the director of the study direction 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 direction.

General Management Terms of the Study Directions

In accordance with the Regulation on Management of the Study Directions and Study Programs, it is the faculty that is responsible for the management of the study direction. The institutions included in the TTI structure participate in the management of the TTI study directions. The structure of the TTI study directions management is given in Appendix 7.

Visualisation of the study direction management processes is provided in the figure 11 (attached as Appendix).

Such structure of the study process and study program management processes is efficient because the main role in the structure is assigned to the collegial bodies, such as the Faculty Council and the Senate, which evaluate the efficiency of performance of the study programme directors and the heads of the study directions.

According to the scheme of the study direction management process (Figure 11), the Senate participates in processes 1, 2, 4, 5 and 12, while the Study Direction Council and Faculty Council

participate in processes 1, 3, 11 and 12.

The collegial bodies periodically request the deans and the heads of the study directions to submit reports on the compliance of the Directions with the accreditation requirements and the aims of the development of the Institute. These bodies also evaluate the efficiency of the management of study programs and study directions as well as make decisions regarding the enhancement of this efficiency.

The head of the study direction is approved in accordance with the Study Direction and Study Program Management Regulations. The head of the study direction ensures the review and evaluation of the study direction and its development planning, external evaluation of the study direction as well as the promotion of cooperation between the directors of the study programs implemented within the study direction and the academic staff.

The programs included in the study direction are managed by the study program directors, who act in accordance with the Study Direction and Study Program Management Regulations. The director of the study program plays a major role in the development and subsequent implementation of the program. The study program director's main tasks are the following:

- ensure the development of the study program in accordance with the current requirements set for the field of science and the laws and regulations that govern the study process;
- analyse a place of the study courses in the study program and control interdisciplinary relations;
- develop methodological guidelines for the final examinations for students graduating from the program (state examination questions, requirements for the objectives and contents of the thesis, criteria for its assessment);
- follow the updating of the descriptions of study courses and avoid duplication of study courses;
- ensure preparation of the annual self-assessment report of the study programs;
- cooperate with the dean and the head of the study direction and adjust the study plan for the next academic year according to the achievement of the planned learning outcomes;
- take the necessary steps to ensure the accreditation of the study direction in cooperation with the head of the study direction;
- analyse and summarise the results of the survey of students, graduates and employers, eliminate the identified deficiencies and ensure the improvement of the program;
- participate in the assessment and comparison of the scope and content of the study courses previously acquired by the students of TTI or other higher education institutions within the framework of a specific study program;
- engage in advertising campaigns in cooperation with the Marketing Department.

The Study Direction Council (SDC) acts as support for the development of the study direction and study programs. It operates in accordance with *the Regulation on the Study Direction Council* approved by the TTI Senate (https://tsi.lv/wp-content/uploads/2020/12/studiju-virziena-padomes-nolikums_eng.pdf). The SDC evaluates the necessity of the development of the study direction and study program in accordance with the contemporary labour market trends in Latvia and the EU, makes proposals for the engagement of independent experts (employers) for evaluation of the topicality and content of the program, discusses and coordinates the development plans of the study direction and study programs, discusses proposals for participation in the projects related to the development of joint programs with the Latvian and foreign higher education institutions and implementation of joint programs, coordinates interfaculty cooperation and adjusts joint matters related to the implementation of the study direction with all the faculties participating in teaching courses within

the given study direction.

The SDC composition is approved by the rector's order, engaging therein the relevant dean, the head of the study direction, directors of the study programs, chairman of the Faculty Council, senior academic staff from other faculties involved in teaching relevant study courses, employers and students.

In accordance with the TTI Regulations on the Faculty, the Faculty Council is a collegial institution of the faculty management. The Faculty Council consists of the dean of the faculty, representatives of the permanent staff of the faculty, representatives of the Students' Self-government - not less than 20% of the total composition of the Council, employers and experts of the study direction.

The Faculty Council discusses and adopts proposals for the development of new study programs, reviews the study direction and study program development plans, reviews the program directors and deans' reports on the study programs and study directions.

The following structural units are involved in the provision of the study process and the implementation of the study directions and study programs:

- Faculties organize the preparation of study directions and study programs for licensing and accreditation and perform periodic self-assessment and improvement of the study directions and study programs.
- Study Department plans the study process (lesson scheduling, lecturer work, etc.) and records study achievements
- Distance Learning Department ensures the development and publication of distance learning course materials and organises the study process for the distance learning students
- Teaching staff of the Faculties include the academic staff and guest lecturers, who prepare and improve the description and content of study courses, prepare study materials, update literature, determine assessment criteria, deliver lectures, conduct seminars and workshops, administer examinations, consultations, perform other academic duties
- Library provides students and academic staff with academic and scientific literature.
- IT Department organizes studies in the remote format.

The Faculty of Engineering provides the management of the TTI study direction *Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery*. The head of the study direction is Juris Kanelis, Ph.D., Assistant Professor.

Issues pertaining to the development of the study direction strategy are addressed and discussed by the Faculty Council.

Appendix 8 contains the composition of the Study Direction Council *Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery*.

1.5. 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 the study period, professional experience, and the options for the students to have their previously acquired formal and non-formal education recognised within the study direction by providing specific examples of the application of these procedures.

Description of the student admission requirements and system

Admission to TTI is based on the Admission Rules approved by the TTI Senate for a particular academic year. Admission Rules for the 2021-2022 academic year approved by the TTI Senate on 20 October 2020 (available at: https://tsi.lv/wp-content/uploads/2020/12/uzn%CC%A7ems%CC%8Canas-noteikumi-2021-2022_jk-2_eng.pdf). Admission Rules have been developed and admission proceeds in accordance with external laws and regulations - the Law on Higher Education Institutions, Cabinet Regulation No. 846 of 10 October 2006 Regulations on Requirements, Criteria and Procedures for Admission in Study Programmes, Cabinet Regulation No. 543 of 29 September 2015 *Provisions for the Substitution of a Foreign Language Centralised Examination in the General Secondary Education Programme for a Foreign Language Examination by an International Testing Institution*, as well as other external laws and regulations and the TTI Constitution.

Admission to later stages of studies at TTI is based on Cabinet Regulation No. 932 of 16 November 2004 Procedure for the Commencement of Studies in Later Stages of Studies, Cabinet Regulation No. 505 of 14 August 2018 *Regulations for the Recognition of Competences and Vocational Education and Training Acquired Outside Formal Education or Professional Experience and the Study Results Achieved in the Previous Education*, the TTI Regulations on the Recognition of Competences and Vocational Education and Training Acquired Outside Formal Education and the Study Results Achieved in Previous Education, the TTI Procedure for the Commencement of Studies at Later Study Stages and other external laws and regulations.

The admission terms and procedure for citizens and non-citizens of the Republic of Latvia as well as foreigners holding a permanent residence permit in Latvia, are determined in accordance with the general procedure and Paragraph 7 of Cabinet Regulation No. 846 of 10 October 2006 *Regulations on Requirements, Criteria and Procedure for Admission to Study Programmes*. The right of foreign nationals without a permanent residence permit to study at a higher education institution is governed by the requirements of Sections 83, 84 and 85 of the Law on Higher Education Institutions. Foreigners applying for distance learning do not need permanent or temporary residence permits (students at the Transport and Telecommunication Institute are asked to appear in person on one occasion only - to defend their final thesis).

Applicants who wish to study in English must present a document certifying their knowledge of English, which is a certificate of the centralized English examination (with a result of not less than 55%). As an attachment to their application, foreign applicants have to attach a document issued by an international testing institution during the last five years that certifies their language proficiency in the relevant study program at least at level B2 or a university certificate of passing the English language entrance examination at least at level B2. The mentioned document is not to be attached if foreigners acquired secondary education or higher education in the language of implementation of the relevant study program, in which case foreign applicants have to submit a certificate issued by the relevant educational institution.

To ensure a higher quality of knowledge of the admitted students, foreign applicants wishing to study in undergraduate programs are required to pass examinations in the specialization subject/s. In the study program *Aviation Engineering* the examination must be taken in physics.

The admission rules set out the document submission procedure, deadlines, competition process, appeal and contesting procedure of the decisions related to admission, the procedure for entering into the study agreement and matriculation, the rights and obligations of the applicant and TTI. The appendices to the admission rules contain precise information about each study program for which enrolment is planned in a given academic year, including admission requirements, documents to be submitted, etc. The admission rules are approved by the TTI Senate and published on the TTI website at www.tsi.lv and may be viewed by anyone interested (available at:

https://tsi.lv/wp-content/uploads/2020/12/uzn%CC%A7ems%CC%8Canas-noteikumi-2021-2022_jk-2_eng.pdf). The website of the School contains up-to-date information on the study programs, enrolment period, tuition fees, discounts and scholarships.

The Study Department offers prospective students consultations on the admission process, including admission requirements, contesting admission results, rights and obligations of the applicants. The Study Department provides services via e-mail, telephone and face-to-face meetings. Similarly, consultations on admission requirements, for example, entrance examinations and their specifics, are provided by the heads of the study programs, thereby ensuring that applicants are fully informed and prepared for admission to TTI.

TTI announces the admission results as stipulated in the admission rules and organises signing of the study agreements with the successful candidates. After signing of the study agreements and fulfilment of obligations by applicants, TTI ensures the matriculation of these applicants.

The procedure for admission and registering applicants in the first study without applying it to admission in later stages of studies is described in *Procedure for Admission and Registration of Applicants* (approved by order 01-12.1/62 on 29/10/2020, available in the TTI Record-Keeping System). The document sets out stages, deadlines and performers and outlines the scheme of the admission process which separately indicates the processes that apply to the admission of foreign students only.

Opportunities for recognition of previously acquired formal and non-formal education within the study direction

TTI ensures fair recognition of previous education and professional experience so that applicants can apply for studies at later stages. This process is implemented taking into account the fact that students are mobile both within the higher education system and between education systems.

Recognition of the study results achieved in previous education or professional experience is governed by the following documents:

- external laws and regulations: Law on Higher Education Institutions - Sections 59.2 and 59.3; Cabinet Regulation No. 505 of 14 August 2018 *Rules for Recognition of Competences Acquired outside Formal Education or Professional Experience and of Study Results Achieved in Previous Education*"
- internal regulations: *Rules for Recognition of Competences Acquired outside Formal Education or Professional Experience and of Study Results Achieved in Previous Education*" (available at: https://tsi.lv/sites/default/files/editor/Dokumenti/Oficialie_Dokumenti/regulations_on_recognition_of_learning_outcomes_obtained_during_non-formal_education_or_competencies_acquired_during_professional_experience_and_learning_outcomes_achieved_in_previous_education.pdf)

To make a decision on the recognition of knowledge, skills and competences acquired outside formal education or through professional experience and on the recognition of study results achieved in previous education, TTI has established a commission ensuring the involvement of the director of a relevant study program. The establishment of one commission for all thematic areas of education allows for the implementation of a uniform approach throughout the Institute, which prevents from forming different interpretations and ensuring equal treatment of persons.

To have the study results attained in professional experience recognized, in addition to the application, applicants also submit certificates from workplaces and certificates on their previous education. The certificates must indicate both the length of service and detailed job responsibilities.

Upon considering the submitted documents and in accordance with the internship program, the commission makes a decision in its meeting on whether applicants must submit an internship report within two months and defend it before the commission.

So far, no student has used the opportunity to recognize knowledge, skills or competences acquired outside formal education or acquired through professional experience in the study direction *Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery*. This may be due to the specifics of the program.

So far, the professional experience at the Institute has been recognized in 7 cases.

2018	In the professional Bachelor's program <i>Robotics</i> , 1 student had the production internship recognized in the amount of 26 CP
2019	In the professional Master's program <i>Aviation Management</i> , 4 students had Internship 2 recognized in the amount of 20 CP In the professional program <i>Electronics</i> , 1 student had the production internship recognized in the amount of 26 CP
2020	In the professional Bachelor's program <i>Transport and Business Logistics</i> , 1 student had the production internship recognized in the amount of 26 CP
By 1 March 2021	In the professional Bachelor's program <i>Transport and Business Logistics</i> , 2 students had the production internship recognized in the amount of 26 CP

Recognition of the studies for later stages is regulated by Section 47 of the Law on Higher Education Institutions and requirements of Cabinet Regulation No. 932 of 16/11/2004 *Procedure for Commencing Studies at Later Stages*. The procedure for commencing studies at later stages is defined in the TTI *Procedure for Commencing Studies at Later Stages* (available at: https://tsi.lv/sites/default/files/editor/Dokumenti/Oficialie_Dokumenti/rules_of_procedure_for_starting_studies_at_later_stages.pdf). It is possible to commence studies at later stages in a study program at TTI at the same or lower level:

- by transferring from another higher education institution;
- by transferring to another TTI study program;
- by resuming studies after ex-matriculation;
- by continuing studies in higher education programs in order to acquire a Bachelor's degree or the second-level professional education after receiving the first-level professional higher education;
- following the recognition of knowledge, skills and competences acquired outside formal education and through professional experience or else attained in previous education and following the recognition of obtained credits.

In the Admission Regulations of 2021/2022 academic year, the program *Aviation*

Engineering is included under the old name “Aviation Transport”, with such a name the program will also be included in the Admission Regulations of 2022/2023. Following the decision on the accreditation of the program under the new name, amendments will also be made to the relevant Admission Regulations.

Only the name of the program is changed to "Aviation Engineering", applying the same admission requirements as the program with the previous name "Aviation Transport", ie: secondary education, foreign applicants - must pass a test in physics and english.

1.6. 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 assessment system of the students' achievements and study results is stipulated in the external laws and regulations: the Law on Higher Education Institutions and the Law on Education, and in several internal regulations:

- Study Regulation;
- Rules of Study Procedure;
- Regulation on Awarding a Professional Bachelor's Degree, Professional Master's Degree and Professional Qualification;
- Regulation on Awarding Academic Bachelor's and Master's Degrees;
- Regulations on Final Examinations;
- Rules for Grading the Final Examination Papers;
- Internship Regulation;
- Methodological Guidelines for Designing the Final Examination Thesis and Methodological Guidelines for Internship.

Different study methods and forms are used in the study process. The main criteria for the selection of training methods include the necessity to ensure the acquisition of required information and development of critical attitudes as well as the general need to attain the expected learning outcomes (specific knowledge, skills and competences).

When grading the students' attainments, the following basic principles of grading, which are set in the national standards of higher education, are observed:

- openness in the grading of knowledge and skills: when commencing a course, students have access to information on the set of requirements necessary for positive grading;
- compulsory grading: students have to obtain positive grading confirming the successful acquisition of the contents of the program, including tests and final examination (test or exam) with 'almost satisfactory' (4 points) or 'passed';
- grading review options: a procedure for reviewing the acquired grade;
- variety of testing types used in grading: different types of testing are used for grading the outcome of the study program acquisition: tests, exercises, case studies, projects, etc., described in the methodological materials of the course in the e-learning environment *Moodle*.

The procedure for grading of the students' achievements and study results is included in the description of each study course. The course description is created by the head lecturer, and he/she also defines the grading system of his/her course. Criteria for passing the course include active participation in discussions and seminars, group work, practical assignments, laboratory work, exams, case studies, test, etc. The course grading system specifies how many per cent of the total assessment is formed by each grading criterion. The final examination in the overall assessment of the course can form 10% -50%.

Lecturers introduce students to the knowledge assessment criteria and methods in the first lessons. Students can access the description of study courses with the methods and criteria of assessment of learning outcomes in the e-learning environment Moodle.

Students' knowledge is assessed in the final examination of a study course and via ongoing evaluation of the acquired knowledge over the entire duration of the study course. Students are offered various types of knowledge assessment: examinations, tests, independent work, practical work, laboratory work, reports, reports in seminars or conferences and other type of work according to the specifics of the study course which promotes proper acquisition of knowledge of the study course.

The types and criteria of assessment used in the study course are specified in the description of the study course. To obtain the right to take the final examination of the course, students have to meet the requirements specified in the course description. If students have not fulfilled the requirements of the study course, lecturers have the right not to admit these students to the final assessment of this course, be it an examination or test.

The choice of the type of knowledge assessment (written, oral or combined) depends on the specifics of the study course and the lecturer's individual approach to the assessment of students' knowledge.

The grading methods of students' achievements and the assessment of study results are specified in the *Regulations of Study Procedure* (available at: https://tsi.lv/wp-content/uploads/2021/05/studiju-kartibas-noteikumi_en.pdf). The outcomes of program acquisition taking place via final examinations at all levels is graded in a 10-point system, the lowest positive grade being "4".

If conflict situations arise in the process of passing the examination, upon receiving a request of the student, the dean appoints a commission to resolve this academic conflict. The decision of the commission is final.

The TTI internal information system Intranet has a personal card made for each student, containing all information about the student's course of study, such as agreements, invoices, study plan for the entire study period, assessment of the study results, and allowing the student to control the implementation of the study plan and reach the study results prescribed in the program. Student can access their cards and grades remotely.

The internship procedure and assessment are specified in the *Regulation on the Organisation of Internship of TTI Students* (available at: https://tsi.lv/wp-content/uploads/2021/05/rules_on_the_procedure_for_the_organisation_of_the_internship_of_students.pdf).

Studies are completed by a final or state examination, including the defence of the Bachelor's or Master's thesis. Criteria and methods of assessment of final examinations are included in the *Methodological Materials for the Development of the Final Thesis* and in the *Regulation on Awarding*

Bachelor's and Master's Degrees (available at: <https://tsi.lv/wp-content/uploads/2020/12/nolikums-akademisko-gradu-pieskirsanu-eng.pdf>).

Regulations on Final Examinations (available at: <https://tsi.lv/wp-content/uploads/2020/12/final-examinationrules.pdf>) regulate the final examination process for awarding academic degrees, professional degrees/professional qualifications in all study programs implemented by TTI. The final examination papers are evaluated by the state/final examination commissions. After the defence of each thesis, a review of the thesis reviewer and an opinion of the supervisor is read. The final grade of the thesis is determined in a closed session of the commission as a result of the discussion based on the assessment of the commission members, taking into account the assessment of the reviewer and the thesis supervisor by a simple majority vote. In the event of a tie, the vote of the chairman of the commission prevails. The member of the commission who is the supervisor of the thesis being evaluated does not vote.

The analysis of students' achievements is carried out twice in the academic year after the end of each semester at the meetings of the faculty, the rector's office and academic meetings.

Attitudes of students towards study courses being attended are evaluated at the end of each semester by conducting an anonymous questionnaire about the quality of studies. The questions of the questionnaire offer to evaluate the following aspects: understandability and content of the lectures, competence and personal characteristics of the teaching staff, level of requirements, possibility to receive a consultation outside the study time, etc. The results obtained are discussed at the relevant departmental meetings, methodological and administrative meetings. Following the results of the meetings, measures aimed at improving the study process are developed.

In accordance with the Procedure for Submission and Review of the Appeal contained in the Study Regulation, the student may contest the assessment of any examination undertaken during the study process or the decision of the examination commission.

1.7. Description and assessment of the academic integrity principles, the mechanisms for the 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 Transport and Telecommunication Institute has developed *the Code of Ethics* (available at: https://tsi.lv/sites/default/files/editor/Dokumenti/Oficialie_Dokumenti/ethical_charter.pdf). The Code of Ethics defines the basic principles of ethics and conduct for administrative, scientific, and research staff, as well as students, creating a favourable, respectful and responsible working environment at the Institute. The Code of Ethics includes core principles and standards of conduct to be complied with by students and employees in their attitude to the Institute, their work and in relations with their colleagues, clients and business partners.

The general principles of ethics are the principles of honesty and justice, responsibility and loyalty, respect and collegiality.

Specifically, the TTI Code of Ethics defines basic ethical principles for students:

- Honestly complete the selected program, obtain theoretical and practical knowledge and skills;

- Do not permit a discriminating attitude towards other students or employees, comply with the principles of honest competition, creating constructive dialogue for the settlement of disputes and conflict situations, and respect the opinion of other persons;
- Be honest in study work, do not permit plagiarism and other kinds of fraud;

and for the academic staff:

- Honestly and responsibly perform their work duties;
- Adhere to the respectful culture of mutual relations;
- The academic staff shall serve as an example for adherence to moral norms;
- Do not permit a discriminating attitude towards students and employees;
- Assess the work of students in a timely manner, fairly and in a reasoned manner and to respect the opinion of students;
- Admit errors and shortages made during the study process or assessment of students' work and settle disputes by direct and open negotiations;
- Avoid the imposition of personal likes or dislikes during the assessment of students works;
- Academic staff shall take care to ensure academic and professional honesty, without creating conditions for the manifestation of academic dishonesty, to follow up the development process of students' papers, do not permit plagiarism, copying and other unfair use of intellectual property or fraud;
- Respect the results of individual work of other colleagues and do not use them for personal purposes.

The Ethical Commission is established on the basis of an order which shall assess complaints regarding a failure to comply with the core principles of professional ethics and conduct.

Students are introduced to the principles of academic integrity, adherence thereto during their studies, and any sanctions for non-compliance with these principles from the beginning of the study process in the first introductory lecture. The Personnel Department introduces employees to the Code, while employees confirm becoming acquainted with the Code with their signature. The Code of Ethics of the Institute is available to all students, employees of the Institute as well as the public on the Institute's webpage.

TTI conducts regular student surveys, and students have an opportunity to express their views anonymously on the professional level of lecturers and on adherence to the Code of Ethics. These results are taken into account when planning the improvement of lecturers' work quality.

TTI acts in accordance with the principles and rules of good faith and responsible conduct described in the *TTI Plagiarism Control Regulations* (available at: <https://tsi.lv/wp-content/uploads/2021/05/plagiata-kontroles-noteikumi-proj-mms-eng.pdf>). The regulations set out the procedures for identifying plagiarism in the papers of TTI students, including self-plagiarism, and the criteria on the identification of violation and on the applicable sanctions.

For a long time, TTI used the Unified Computer Plagiarism Control System developed by the University of Latvia, which did not allow for full and high-quality checking of all students' papers and final theses for plagiarism, taking into account the rapid increase in the number of students studying and submitting final theses in English. At the beginning of 2020, TTI purchased a new anti-plagiarism program and since the end of May, all TTI faculty members and students have been using Turnitin®, the world's leading tool for correcting papers and preventing plagiarism.

Turnitin® is integrated into the TTI e-learning system Moodle and provides a full service for submitting, correcting, determining the originality (plagiarism) of content and returning submitted papers. Upon submitting their papers to Moodle, students immediately receive the assessment of the Turnitin® system on similarities of their papers with other sources.

As of May 2020, all theses of the TTI programs are checked by Turnitin®, but a year later, after the approval of the new version of the Plagiarism Control Regulations, TTI started to check other papers for plagiarism, including all study course papers, written examinations of study courses and specific tests of study courses.

The Plagiarism Control Regulations set out the procedures for determining the signs of plagiarism in each of these types of tests and course papers and the applicable sanctions and appeal procedures.

In 2020, during the defense of theses in the study program Aviation Engineering, plagiarism was detected in 2 theses. As plagiarism was found in the theoretical parts of the theses, the grade for the defense of the Bachelor's theses was reduced by one point for both students.

1.8. Specify the websites (e.g. the homepage) on which the information on the study direction 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.

Full information on the study programs implemented at the Institute is published on the TTI website at www.tsi.lv in accordance with the accreditation pages of the study direction, program licenses and information included in the National Education Information System.

For each program, the name of the program, obtained degree/qualification, program volume in credit points, type and form of studies, language of implementation, program director and contact information, admission requirements, program annotation, learning outcomes, possible career areas, program structure in the form of study courses, tuition fee, graduate references and other program-specific information are listed on the program website.

Because almost all programs will have been implemented in Latvian, English and Russian by the end of 2022, all information on the TTI website is published in three languages, except for registration, accreditation pages, certificates and similar documents that are not translated.

The director of each study program is responsible for publishing the study program information on the TTI website, whereas the Academic Quality Assessment Department is responsible for the compliance of the published information with the information available in the official registers.

II - Description of the Study Direction (2. Efficiency of the Internal Quality Assurance System)

2.1. Assessment of the efficiency of the internal quality assurance system within the study direction 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 direction and the relevant study programmes.

The TTI Quality Management System covers the processes of higher education service provision

and scientific activities. It has been designed, implemented and certified in accordance with the requirements of the ISO 9001: 2015 standard. The operation of the Quality Management System ensures the quality of the study process and results in all types of studies and in all programs of the Institute as well as the compliance of research and other types of scientific activity with certain requirements.

Study direction management includes the following quality management processes:

P11. Research of consumer demands and satisfaction

P12. Development of educational services

P13. Planning of the study process

P14. Preparation of study subunits

P15. Admission and registration of students

P16. Implementation of the study program

P17. Study attestation.

The operations of the TTI quality management system for the quality assurance of study direction products and services include:

- development, implementation and periodic updating of internal guidance documents;
- planning and conducting internal quality audits;
- control over study directions and study program development, implementation and evaluation processes;
- identification, recording and analysis of non-conformities identified during the audits;
- analysis of complaints and recommendations made by students and other stakeholders;
- development, implementation and evaluation of corrective works;
- research of satisfaction by the TTI students, graduates, employers and university staff, analysis of survey data;
- research of the standards and other regulatory requirements in the field of education and quality management, monitoring of changes, conformity assessment;
- preparation of reports on the state and efficiency of the management system and presentation to the rectorate and the board.

Table 9. List of the main documents of the quality management system relevant to the study direction management

Processes (indices)	Title of the relevant guidance document
P11	Regulations for the Student, Graduate and Employer Questionnaires.
P12	Regulation on Management of the Study Directions and Study Programs. Regulation on Management of Study Courses. Regulation on Teaching and Methodological Activities. Regulation on the Faculty.
P13	Study Regulation. Rules of Study Procedure. Doctoral Study Regulation.

P14	Regulation on the TTI Branch. Procedure for Inviting Foreign Professors for Short-Term Academic and Scientific Activities at TTI.
P15	Admission Rules
P16	Rules of Study Procedure. Regulation on Internship. Regulation on the Organisation of Distance Learning.
P17	Regulations on Final Examination. Regulations on Awarding Academic Degrees and Professional Qualifications.

The procedure for performing internal quality audits (inspections) is described in Table 10.

Table 10. Procedure for Performing Internal Quality Audits (Inspections)

Explanations	Form of recording
<p>1. Decision on the performance of audits: In the decision of the Board or in the instruction of the Chairman of the Board. The decision on the extraordinary audit should include details of the inspection terms, the sub-bodies to be inspected, the objectives of the audit (processes to be audited) and appointment of the head auditor.</p>	Internal Annual Audit Plan; Instruction of the Chairman of the Board
<p>2. When coordinating the audit programme, audit deadlines may be moved at the initiative of the heads of the sub-divisions being audited, if appropriate.</p>	Audit Program
<p>3. In preparation for the audit, the head auditor shall distribute the tasks among the members of the audit team (where such a team has been established). The auditors examine the governing documents regulating the work of the sub-divisions to be audited and formulate a list of questions. These questions are formulated on checklists. The auditors should be familiarised with the procedures for conducting quality audits and the rules for completing checklists in the courses for raising qualification.</p>	Control Sheets
<p>4. Before the audit, the heads of the audited entities should familiarise the staff with the auditors and ensure the cooperation of the staff with the auditors. The auditors must have access to the data pertaining to the processes being audited. If there are any obstacles to the audit, the auditor shall immediately report to the head of the sub-division and, where appropriate, to the chairman of the board.</p>	Entries in the Control Sheets

<p>5. The auditors shall discuss the identified non-conformities with the staff and the head of the structural unit. Non-conformities shall be recorded in the minutes. The corrective actions agreed with the heads of subdivisions shall also be included herein.</p>	<p>Non-Compliance Protocols. Entries in the Non-Conformity Registry (LOTUS)</p>
<p>6. After coordinating the identified non-conformities and planned corrective actions with the auditee, the head auditor shall summarise the work of the auditors' task group and submit it to the chairman of the board not later than one week after the end of the audit.</p>	<p>Annual Report</p>
<p>7. The chairman of the board shall discuss the results of the audit with the head auditor and (where appropriate) the members of the board and the heads of the audited subdivisions. Following the outcome of the discussions, the chairman of the board may make changes and additions to the composition and content of corrective actions. These decisions shall take the form of orders from the chairman of the board.</p> <p>8. All documents relating to the audit shall be forwarded by the chairman of the board to the head of the Quality Management System.</p>	<p>Orders of the chairman of the board, minutes of board meetings</p>
<p>9. The corrective actions and their effectiveness shall be checked in accordance with the Procedure for Handling the Non-Conformity Register.</p>	<p>In the Non-Conformity Register (LOTUS)</p>

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 procedures for the development of new study programmes within the study direction (including the approval of study programmes), the review of the study programmes, the aims, and regularity, as well as the stakeholders and their responsibilities. Description of the mechanism for obtaining and providing a feedback, including with regard to the work with the students, graduates, and employers.

The procedure for designing, approving, revising and modifying the TTI study programs as well as the responsibilities of the respective employees and structural units are specified in the *Regulation on Management of Study Directions and Study Programs* (available at: <https://tsi.lv/wp-content/uploads/2020/12/studiju-virzienu-un-studiju-programmu-nolikums-eng.pdf>)

in accordance with the effective Cabinet Regulations (Cabinet Regulation No. 795 of 11 December 2018 Regulations on Licensing of the Study Programmes).

The procedure for the development, assessment, registration and modification of the study course description and course teaching and methodological materials included in study programs are specified in the *Regulation on Management of Study Courses* (available at: https://tsi.lv/sites/default/files/editor/Dokumenti/Oficialie_Dokumenti/study_course_management_regulations.pdf).

Collective management of the study program design and implementation is carried out by the Study Direction Councils (SDC), which operate in accordance with the *Regulation of Study Direction Council* (available at: https://tsi.lv/wp-content/uploads/2020/12/studiju-virziena-padomes-nolikums_eng.pdf). The deans of faculties and heads of study directions are responsible for the SDC organisation.

In conformity with the student-centred education principles, the TTI students are involved in designing study programs, annual assessment and program improvement by acting in the Study Direction Councils, Faculty Councils, Senate Commissions, Senate via filling out the survey questionnaires. Graduates, employers and external experts also express their opinion on the program in surveys.

Supervision over the implementation of the study program and its quality is ensured by the director of the study program by assessing the study process, study results, analysing the results of student surveys, changes in labour market trends and topical issues in the sector and the world. To analyse and summarise the results of the survey of students, graduates and employers and organise the elimination of the identified deficiencies and improvement of the program.

New study programmes are developed in accordance with the TTI development strategy. Their necessity, usefulness and relevance to the development strategy are assessed by several TTI structural units and collegial bodies, including the Study Quality Council, Faculty Council, Rectorate and Senate.

The design, approval and implementation of the study program involves several stages:

Program development application, which includes justification of the program topicality, summary, and graduates' employment forecast;

- Developing program content, by including the program planning, course descriptions, and independent expertise;
- Preparation, examination and approval of the licensing document package in the Senate;
- Submission of the licensing document package to an agency included in the European Quality Assurance Register for Higher Education, expert visit and receipt of the licence;
- Marketing activities, announcement of admission and student admission;
- Preparation and placement of the study materials in the e-learning environment Moodle in accordance with the *Regulations on Study Course Management*;
- Accreditation of a study program/study direction in an agency listed in the European Quality Assurance Register for Higher Education.

After the accreditation, in accordance with the Rector's order, an annual self-assessment report is prepared for the study programs and study directions, which includes an overview of the activities undertaken for the improvement of the study direction and which is approved by the Senate of the Institute. The task of the annual self-assessment process is to check the preservation of compliance of the study programs and study directions (content and resources) for the accredited study direction; check the validity and permissibility of the changes made in the study program and the

respective study plans according to the effective regulations as well as assess the conformity of the study programs with the higher education institution strategy and the requirements for the quality and efficiency of the study programs.

The self-assessment of the study direction and study programs is prepared by the program director and the head of the study direction. Self-assessment reports are reviewed by the Study Council and approved by the Senate.

During the self-assessment of the study programs, proposals and decisions regarding the inclusion of changes in the study program plans and the need to coordinate changes in the study programs with the AIC Study Direction Accreditation Commission are discussed as well as a decision on the usefulness of the program conformity measures, development of new study courses and the modernisation of the existing courses, and provision of resources thereto. These proposals and decisions are discussed and approved by the Senate as recommendations for the changes and development of the study programs.

Procedures for organising surveys at TTI are described in the document *Regulations for Organising Surveys of Students, Graduates and Employers* (approved at the meeting of the TTI Senate on 29/10/2019, available in the TTI Record-Keeping System).

The students' electronic survey with further analysis of the survey data is organised once a year at the beginning of the spring semester in two stages. Part 1 of the survey focuses on the assessment of the study programs and study process, while Part 2 is devoted to the assessment of the quality of study courses and the lecturers' work.

The results of the surveys are reviewed during the Rectorate, Faculty Councils, Study Direction Councils and are summarised in the annual self-assessment report of the study direction. Thus, the study program with the study courses is updated every year according to the students' assessment. Students' survey results are used by:

- teaching staff: for the assessment of their professional skills and for the enhancement of their study courses;
- study program directors: for the enhancement of the content of study programs and courses;
- deans: for the assessment of performance of the teaching staff and planning activities for the improvement of the professional qualification of the teaching staff,
- rector and academic and scientific vice rector: for determining remuneration of the teaching staff and enhancement of the quality of the studies at the overall level of the Institute.

In recent years, 30-35% of the students complete survey questionnaires.

Following the questionnaire, students are informed of the survey results, impact of their responses, the actions taken and planned and the changes brought about by the recommendations made in the questionnaires. Students receive information during a specially organised general meeting.

Once a year, the Institute organizes the survey of graduates, but once every two years, the Institute organizes the survey of employers, the results of which are used for the analysis and assessment of the content and implementation of study programs at the Faculty Council. This information is taken into account for the creation of annual self-assessments and program development plans of the study programs for further improvement of the study programs. Surveys and direct interviews are used for identification of employers' views. Interviews are carried out by the Corporate Client Department in meetings with representatives of various companies and round table discussions. Questions about the employment of the TTI graduates in the relevant company are asked during these meetings, and the company representatives are asked to assess the relevance of the knowledge and skills of graduates that were acquired at the Institute to the work duties in the

business environment.

Based on the responses of graduates and employers, education provided in the programs implemented at the Faculty is generally in line with the requirements of the labour market.

Appendix 9. Data of the Student, Graduate and Employer Surveys

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 direction and the relevant study programmes are communicated by providing the respective examples.

The procedure for submitting and reviewing student complaints and proposals is set out in the *TTI Regulations for the Admission and Examination of Student Complaints and Proposals* (available at: https://tsi.lv/sites/default/files/editor/Dokumenti/Oficialie_Dokumenti/regulation_on_the_procedure_for_receiving_and_considering_complaints_and_proposals_of_students.pdf) and the requirements for filing and reviewing appeals are additionally prescribed in by the *Rules of Study Procedure* (available at: https://tsi.lv/wp-content/uploads/2021/05/studiju-kartibas-noteikumi_en.pdf).

In accordance with the internal procedure, students may submit complaints and recommendations to the Study Department, which ensures that complaints and recommendations are registered and forwarded to the responsible department and official in accordance with the *Procedure for the Acceptance and Examination of Requests*.

Complaints and recommendations can be submitted by students in person or by e-mail by sending them to the Study Department e-mail or by filling in an electronic form on the TTI Intranet or else by sending them by post.

Complaints and recommendations received by the Customer Service Centre are registered in the section *Complaints and Recommendations* of the Register of Applications, which is later supplemented with the information on the result of examination of the application and the decision taken. Complaints and recommendations are processed within 7 business days.

The Customer Service Centre communicates the decision taken in writing to the person submitting the complaint or recommendation (for information) and the appropriate official (for execution). The registered complaints and recommendations are regularly reviewed and analysed by the Quality Department staff. Where complaints indicate significant deficiencies in the quality assurance system for education services, they are recorded in a register of non-conformities, and the development and implementation of corrective actions is organised in accordance with the rules for maintaining this register.

TTI has not received many students' complaints because problematic situations are usually handled and resolved via negotiations.

In the academic year 2019/2020, 2 students submitted complaints. In one case, after the examination of the complaints, the facts set out in the complaint were not confirmed and a proper reply was prepared for the complainant. The second complaint was about the mark of the final examination. Discussions were held with the student; protocols of the defense of the thesis were

reviewed and discussions were held with the program director. As a result, the complainant withdrew the complaint.

2.4. Provide information on the mechanism for collecting the statistical data, as developed by the higher education institution/ college. Specify the type of the data to be collected, the collection frequency, and the way the information is used to improve the study direction.

In order to ensure continuous review and improvement of the study programs and study courses and to identify the strengths and weaknesses of the study process, the Transport and Telecommunication Institute implements the following actions:

- Analysis of data and information on the student composition (home countries), student performance, drop-outs and reasons for this, which shall be discussed at academic and collegiate meetings and included in self-evaluation reports;
- Analysis of the questionnaire results on the students' and graduates' satisfaction with the implementation of the study program (content, quality of the lecturers' performance, objectivity of the assessment system, availability of information, career opportunities), which is discussed at academic and collegiate meetings and included in self-assessment reports;
- Analysis of the graduate employment discussed at the academic and collegiate meetings and included in self-assessment reports;
- Analysis of hospitality results, which are discussed at academic and collegiate meetings;
- Analysis of the effectiveness of the academic staff (in relation to their election, according to the results of the surveys, at the end of each academic year the research achievements are evaluated);
- Analysis of available study tools and their costs;
- Analysis of the TTI key performance indicators.

According to the results of the data analysis, the necessary improvements for the implementation of study programs and organisation of the study process are determined.

2.5. Description and assessment of the integration of the standards set forth in Part 1 of the ESG. Specify which of the standards are considered a challenge and which require special attention.

Analysis of the ESG standards showed that all requirements of the ESG standard comply with the international standard ISO 9001: 2015 *Quality Management System Requirements*. For this reason the TTI management decided on the general implementation of this standard in the study process and scientific performance management system. This task was successfully fulfilled, and currently the TTI management system has been certified according to ISO 9001: 2015.

Owing to the implementation and functioning of the quality management system conforming to ISO 9001: 2015, TTI fully complies with the ESG requirements for managing the overall management process (including the defined Quality Policy and Aims). Resource development and maintenance

processes function in accordance with the *Standards and Guidelines for Quality Assurance in the European Higher Education Area*.

There was a need to further study the qualification management procedures for academic staff, as the Law on Higher Education Institutions contains a number of provisions that exceed the information provided in the standard ISO 9001: 2015. Management of the educational process is regulated at all stages of the development and implementation of educational products. Control over the study results is also sufficiently regulated.

Some effort had to be made to adapt the ESG requirements for forming feedback to education service users and in work with the student complaints. These procedures were developed separately and in addition to the standard processes of the quality management system.

In addition to the ESG requirements, the TTI quality management system includes a regular quality audit procedure as well as a related corrective action procedure to address non-conformities identified during the audit.

The closing procedure for the management cycle is Management Review - a periodic analysis of the condition of the management system. This is a requirement of the ISO 9001: 2015 standard, which provides a systemic approach to handling quality management problems.

Table 4. Evaluation of standards of Part 1 of ESG

Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG, 2015). Requirements	Assessment of the current situation
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<p>1.1. Quality Assurance Objectives</p>	<p>Quality policy is a declaration of the TTI management on quality objectives and principles that management follows when organising the development of educational products and study processes. The Quality Policy is documented and approved in conjunction with the Quality Manual (approved on 29.10.2018, Order No. 01-12.1 / 57A). The Quality Manual is the main document of the TTI Quality Management System. The TTI Quality Management System covers the processes of higher education service provision and scientific activity. It has been designed, implemented and certified in accordance with the requirements of the ISO 9001: 2015 standard. Quality policy is based on the TTI development strategy. Quality policy is implemented based on a plan within the framework of quality management processes:</p> <p>Processes of the TTI quality management system fall into three groups.</p> <ol style="list-style-type: none"> 1. Processes of educational services cycle: <ul style="list-style-type: none"> P11. Researching consumer demands and satisfaction P12. Development of educational services P13. Planning of the study process P14. Preparation of study subunits P15. Admission and registration of students P16. Implementation of the study program P17. Study certification P.18. Scientific activity 2. Human, material and information resources management processes: <ul style="list-style-type: none"> P21. Management of staff development training P22. Managing the information resources fund P23. Managing infrastructure and production environment P24. Document handling management P25. Record-keeping 3. General management processes implemented by the rectorate to ensure the continuous improvement of quality and raising the efficiency of the management system: <ul style="list-style-type: none"> P31. Data analysis on quality issues P32. Planning of development P33. Internal quality audits P34. Corrective actions. <p>Planning and implementation of the quality policy takes place at different levels.</p> <p>At the lowest level, learning outcomes (exams, tests, final examinations) are assessed. Lesson processes are controlled on the next level (conformity of resources and methods to requirements). Third level - control and audit of management processes. At the fourth level, the management assesses the compliance of educational products and services with market and employer requirements, legislation and trends of changes. At the upper, fifth level, resources and capabilities are analysed and development strategies are designed.</p> <p>All quality assurance processes are regulated in the TTI regulations and rules.</p>
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<p>1.2. Development and approval of programmes</p>	<p>Regulation on the Study Directions and Study Programmes (approved by the TTI Senate on 21.05.19) summarise the procedures for designing, approving, and making changes to programmes.</p> <p>Study direction councils are responsible for the collective management of study program development and implementation. Regulation on the study directions Councils was approved by the Senate on 21.05.19. Students, graduates, employers, external experts are involved in designing the study programs, annual evaluation and program improvement, acting in the Study Direction Councils, Faculty Councils, Senate by filling out the survey questionnaires).</p> <p>Study programme learning outcomes are formulated, published and validated during licensing/accreditation, according to the specified EQF / LQF level. The mutual conformity between the study program goals, planned learning outcomes and content is assessed annually during the self-accreditation process of the study directions and study programs.</p> <p>The structure and content of the study program is designed so that the results of individual study courses ensure achievement of the overall study results of the study programs.</p>
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<p>1.3. Student-centred learning, teaching and assessment</p>	<p>A flexible study process that provides students with the opportunity to study, taking into account everyone's interests and opportunities, and to actively participate in the improvement of the study content.</p> <p>The students are offered various forms of study: full-time, part-time with an option of studying on Saturdays or once a month on a modular basis (Friday-Sunday), and distance learning, ensuring study access to different study groups with different learning abilities.</p> <p>Students have an opportunity to create an individual study plan from another higher education institution.</p> <p>Study course descriptions and study course learning materials are available to students in the e-learning environment, which allows one to adapt the study process to the individual needs of the student.</p> <p>Different study methods are used in the study process: lectures, seminars, practical work, case studies, projects, meetings with industry specialists, etc., thus ensuring the students' interest in studies.</p> <p>Students are provided with tutor guidance and individual consultations.</p> <p>Depending on the specifics of the study course, teaching staff use different teaching methods.</p> <p>Lecturers inform students about the criteria and methods of the knowledge assessment during the first classes. Methods and criteria for the assessment of learning outcomes are included in the study course description available to the students in the e-learning system.</p> <p>Commissions for the evaluation of course papers, internship reports and final examinations have been created, and representatives of employers have been invited to participate therein. The commission members are aware of the basic principles of evaluation.</p> <p>Students may submit their complaints to the management of the institution regarding the content and organisation of studies; the procedure for submitting and reviewing the student complaints and proposals is prescribed in the TTI Regulations for Acceptance and Review of Student Complaints and Proposals, while the requirements for the filing and review of appeals are additionally prescribed in the Rules of Study Procedure.</p> <p>The Institution ensures the participation of students in the organisation of the study process. Students are represented and actively participate in all TTI collegial institutions - Study Directions Councils, Faculty Councils, Senate, Constitutional Assembly. Student surveys are conducted every year to assess the teaching staff's teaching methods and quality of the study programs.</p>
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<p>1.4. Matriculation of students, course of studies, recognition of qualifications and certification</p>	<p>Matriculation of students at TTI is determined by the Admission Regulations, which are approved by the Senate and published on the TTI website by 1 November of the current year. According to these regulations, students are admitted to study programs.</p> <p>TTI has developed the Registration and Admission Procedure of Applicants, describing all registration and admission procedures, with a particular focus on foreign students.</p> <p>The Admission Committee is set up for the admission of students for each admission year.</p> <p>At the beginning of studies, the Student Service shall acquaint students with the Code of Ethics, and other internal regulations shall be presented to the students at the Organisational Meeting.</p> <p>The study programmes are implemented in accordance with the study plan approved annually by the rector. A list of classes is made for each semester and is publicly available to students and the faculty staff.</p> <p>The Studies Department evaluates and recognises study courses acquired at other higher education institutions in accordance with the procedure established by TTI, in accordance with the Regulations on Admission to the Later Stages of Studies.</p> <p>Learning outcomes achieved in the previous education or professional experience are recognised in accordance with the Regulations on the Recognition of Competences Acquired Outside Formal Education or in Professional Experience and Learning Outcomes Achieved in the Previous Education</p> <p>Recognition of learning outcomes achieved during the ERASMUS+ program is governed by the TTI ERASMUS+ Programme Scholarship Contest Manual.</p> <p>In TTI internal information system Intranet has a student card opened for each student. This card is an identity card, which reflects all the information about the student's study progress, his/her study plan for the entire study period and the assessment of study results, allowing the student to control the implementation of the study plan.</p> <p>Regulations describing the entire "study life" of a student are provided in the Study Regulations, Regulations on Study Procedures and Regulations on the Organization of Distance Learning.</p> <p>The degrees and professional qualifications obtained as a result of the completion of a study program are regulated by the national standards of higher education. The Regulation on Professional Bachelor's, Professional Master's and Professional Qualification and the Regulation on Awarding Bachelor's and Master's Degrees at the Transport and Telecommunication Institute describe the procedure for organising final examinations, define the duties, activities and terms of the students and employees.</p> <p>The interests of students are ensured by the Students' Council operating in accordance with the Regulation on the Students' Council.</p>
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<p>1.5. Teaching staff</p>	<p>In accordance with the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG), the TTI has established and maintains a clear, open and fair procedure for the recruitment of staff and the working conditions that demonstrate the importance of learning. The lecturers are provided with opportunities to develop their professional competence; their scientific activities are promoted. This strengthens the link between science and education. Innovations in teaching methods and use of new technologies are supported.</p> <p>Academic staff of TTI are formed in accordance with the Law on Universities of the Republic of Latvia and with the TTI Constitution and is based on the number of students and study workload at the faculties. Selection of lecturers is based on the lecturers' education, scientific degree, scientific activity, work experience, ability to teach their study courses. An open lecture is organised for each selected applicant.</p> <p>The election procedure for academic positions, such as the professor, associate professor, assistant professor, lecturer and assistant is regulated by the Regulation on the Election of Academic Staff of the Transport and Telecommunication Institute by a Contest Procedure. The academic staff of TTI is elected by the Senate.</p> <p>Professors and associate professors are evaluated and elected in accordance with the criteria set by the Cabinet of Ministers, Council of Professors in the relevant field, the TTI Transport Engineering Council of Professors. Also, in the autumn of 2019 a Joint Professors' Council was formed with other Latvian higher education institutions in the field of economics and management science.</p> <p>The procedure by which foreign professors are invited to TTI for teaching or research activities is determined by the Procedure for Inviting Foreign Professors (Specialists) for Short-Term Academic and Scientific Activities at TTI.</p> <p>The Institute promotes scientific activities of its lecturers. The TTI research staff is elected to the positions of the leading researcher, researcher and research assistant in accordance with the TTI Regulation on the Election of Research Staff in Academic Positions.</p> <p>Lecturers actively participate in scientific conferences and publish their research results in scientific articles.</p> <p>TTI has developed the Program for Organising Professional Development Planning for Academic Staff. Lecturers improve their professional competences by participating in scientific and academic conferences, mobility activities (giving lectures in partner universities), etc.</p> <p>In order to evaluate the performance of the academic staff, TTI organizes assessment of performance of academic staff every year in accordance with the Procedure for the Academic Staff Certification for the Current Academic Year.</p> <p>The quality control of the academic staff includes a survey of students on the quality of teaching and study courses as well as the analysis of the results obtained at the end of the academic year.</p> <p>Lecturers use e-resources and information technologies, library resources in the study process, which makes the study process more interesting for students.</p>
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<p>1.6. Teaching resources and student support</p>	<p>TTI is a private institution founded by a legal person. The annual budget of the Institute is approved by the Shareholders' Council. The Institute has set financial accountability centres (FAC) - faculties and other structural units. Each FAC has an annual budget, which is based on FAC applications for funding needed to run it.</p> <p>The tuition fee paid by students is the main source of funding for the study process. Tuition fee is set to ensure high-quality studies, so that students consider the tuition fee to be appropriate for the quality of their studies and can pay for their studies.</p> <p>The Institute has an effective tuition fee discount system to support student loyalty and contribution to the operations of the higher education institution. The Institute provides the teaching materials and technical facilities necessary for the study process, which consists of study rooms and their equipment, library resources, laboratories, e-learning environment. The 2021 budget includes funds to replenish the library's collection in the amount of EUR 9,000. TTI provides studies in the auditoriums and modern laboratories with a study and research area of 9,638 m² and a sports and recreation area of 2,879 m². Infrastructure of the building is adapted for people with disabilities (including lifts, internal and external staircases, hygiene facilities).</p> <p>Students are provided with access to e-resources: the e-learning environment Moodle and TTI in-house information system Intranet. Wireless network covers almost all campus premises. E-resources have been developed in the language of studies so that they can also be used by foreign students. A special internet resource online.tsi.lv has been created for distance students, faculty and administration.</p> <p>Informative and consultative assistance is provided in a centralised way by the Student Service. The Corporate Client Department consults and provides information about the internship opportunities and labour market offers, ensures cooperation with employers. Special support measures are taken for the adaptation of first-year and foreign students.</p> <p>Information about students' satisfaction with the study resources is obtained via student surveys, which include questions about teaching materials and technical resources.</p>
<p>1.7. Information management</p>	<p>The TTI Information System Intranet stores information on study programs, study plans and courses, each student and course listener, their study progress and achievements, lecturers and planning of lectures. The data available in the Intranet system is collected and analysed, as well as used for efficient management and development of the study direction and programs. Annual student surveys help in identifying satisfaction with the provision of existing systems and, where necessary, making improvements, including improvement of the internal student information system and computer software.</p>

<p>1.8. Public awareness</p>	<p>The TTI website www.tsi.lv provides up-to-date information on TTI activities, specifically, studies, events and planned activities in Latvian, English and Russian.</p> <p>The section of the website http://www.tsi.lv/en/studies-programmes describes each program, providing essential information about the program (admission requirements, expected learning outcomes of the program, degree/qualification to be awarded, employment of graduates).</p> <p>The self-assessment reports of study directions from previous years and the self-assessment reports to be submitted for accreditation are available at the TTI website at https://tsi.lv/lv/par-mums/oficialie-dokumenti/</p> <p>Every year TTI organizes open days for potential students and participates in the annual exhibition School, education exhibitions and visits secondary schools.</p> <p>The Marketing and Sales Department regularly updates information about the Institute.</p>
<p>1.9. Programme monitoring and regular review</p>	<p>Every year, in accordance with the requirements of <i>the Regulations for the Accreditation of Higher Education Institutions, Colleges and Studies</i> and <i>the Regulation on Management of the Study Direction and Study Programs</i>, TTI prepares self-assessment reports where the heads of the study directions and program directors in collaboration with employer and student representatives evaluate the relevance of content of the study program to the needs of the national economy, taking into account current issues in the field, evaluate students' satisfaction with the program, study courses and the lecturers' qualification and resources. For this purpose, surveys and recommendations of students, graduates and employers are used.</p> <p>Once a year lecturers update their courses included in the study program. Quality of the study courses is controlled by the faculties.</p> <p>Accreditation of study programs implemented at the faculty has taken place 3 times. The last accreditation of the study direction <i>Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery</i> took place in 2012, when all programs were assessed as sustainable.</p> <p>In accordance with the decision of the meeting of the Study Accreditation Commission of 12 June 2013, the study direction was accredited until 11 June 2019, with the extension specified in the Amendments to the Law on Higher Education Institutions until 30 June 2022.</p>
<p>1.10. Cyclic external quality assurance</p>	<p>In 2005, the European Commission assessed TTI's ability to effectively implement the European Credit Transfer System by awarding the ECTS Label. The TTI Quality Management System is certified by the international certification body TUV Rheinland in 2017. The monitoring audits thereof are conducted annually.</p>

II - Description of the Study Direction (3. Resources and Provision of the Study Direction)

3.1. Provide information on the system developed by the higher education institution/ college for determining the financial resources required for the implementation of the

study direction and the relevant study programmes. Provide data on the available funding for the relevant study programmes, as well as the sources of the funding for the scientific research and/or artistic creation activities and their use for the development of the study direction. Provide information on the costs per one student (for each relevant study programme of the study direction) by specifying the headings indicated in the calculation of costs and the percentage of the funding among the indicated headings.

As a higher education institution with private capital, TTI supports its operations with its own revenues. Own revenues form up to 95–98% of the total financing, with the other financing of up to 2–5% coming from the implementation of various Latvian and EU funded projects. The main item of expenses is salaries and other personnel expenditure forming up to 65% of the total cost of TT, but in 2020 this figure reached 73%.

Due to the fact that most of the TTI total funding comes from tuition fees and most of its total costs are staff expenditure, the decrease in the number of students and the decline in staff professionalism and loyalty may have the destabilizing effect on the TTI financial position. Consequently, TTI, as an institution with private capital, implements various activities and measures aimed at achieving the set objectives persistently and purposefully and carries out planning of its activities, control and analysis of the implementation of the plan.

In accordance with the financial management and accounting policy of the Transport and Telecommunication Institute, TTI budgeting is performed both in the short term (per calendar year) and in the long term (up to 5 years), separately forming the budgets of financial responsibility centres. Two approaches to budgeting are used: top-down and bottom-up. The primary approach is the top-down approach because it allows to identify priority areas and directions of action as well as to allocate funding in accordance with the TTI strategic vision of development and set performance indicators for each direction of action.

In accordance with the Financial Management and Accounting Policy, the Engineering Faculty has been designated as a separate Financial Accountability Centre (FAC). A separate budget is established for the faculty based on defined directions of operation in accordance with the TTI strategic vision; monthly reports on budget implementation are submitted to the Dean of the Faculty, and explanations are given on the reasons for significant deviations and risk mitigation. The general budget of the faculty includes direct income and direct expenses. The main source of funding for the faculty and therefore the study program is the revenue obtained from the tuition fees and related supplementary service fees, which are covered by the funds of natural and legal persons. The amount of the tuition fee and additional service fees is reviewed annually, taking into account market trends and cost prices, and is approved by an order of the Board.

Table 12. Tuition fees from the studies in the program during the reference period

Student category	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022
Citizens of Latvia and Europe	2500	2500	2500	2600	2600

CIS countries and Central Asia	2500	2700	2700	2800	2800
Citizens of other countries	2500	2700	2700	3000	3000

Cost price is one of the management tools of an organisation which can be used for the analysis of its operations and decision-making. A finance module has been developed for calculating the cost of TTI study programs, with built-in activity based costing (ABC) that is used to assign cost to each activity (service or process) and allows to precisely determine the cost of the activity. The finance module allows deans not only to receive information about the cost of a program, but also to make planning and forecasts using the conditions of different scenarios. All programs implemented at the faculty, including the program Aviation Engineering, are cost-effective. The results of implementation of the study programs indicate that resources used in the program implementation have been necessary and have been used efficiently.

Table 13. Student costs

Item	2016	2017	2018	2019	2020*
Average number of students	158	162	155	161	132
Total revenue, EUR	296 975	318 112	308 886	330 345	307 562
Total expenses, EUR	271 933	239 405	231 649	223 446	224 857
Average revenue per 1 student, EUR	1 880	1 964	1 993	2 052	2 330
Average expenses per 1 student, EUR	1 721	1 478	1 495	1 388	1 703
Profit/loss per 1 student, EUR	159	486	498	664	627

* operational data on 20/01/2021

An analysis of cost items shows that the major items of expenditure are salaries and taxes, infrastructure, advertising and marketing costs. Salaries and taxes make up 63% to 65% of the costs on average and are highly dependent on the qualifications of the staff involved in the study process. In 2019 and 2020, highly qualified lecturers were invited to teach in the program. The second largest cost item is infrastructure costs, which account for 8-9% of the total cost on average. Infrastructure costs have significantly decreased in recent years as a result of investments in TTI infrastructure and energy efficiency.

Additional marketing and advertising activities were carried out between 2015 and 2017, which resulted in the increased number of students. In 2019, advertising and marketing costs accounted for approximately 5-6% of total costs, but in 2020 advertising and marketing activities were revised, the outcome of which was a major shift to Internet channels. In the future, the share of these costs will change in accordance with the adjustments made to the strategic development plan.

The positive financial results of the last years allowed to allocate additional funds to the

implementation and development of study programs and for the use of study materials and scientific infrastructure. In 2019, the share of these cost items was 10% of the total costs, and it was planned to further increase the share of these costs. However, in 2020, with the onset of the pandemic, several measures had to be abandoned, thus reducing costs to 4% of total costs.

Since a set of structural changes have been made to reduce the administrative burden and the financial management of resources has been successful, it is important to reduce administrative costs and interest payments.

Table 14. Expenditure structure of the Faculty

Item of expenditure	Periods				
	2016	2017	2018	2019	2020*
Salaries and taxes	56%	60%	63%	65%	73%
Other staff expenses	2%	2%	1%	1%	1%
Study program development and implementation expenses	6%	6%	8%	8%	3%
Teaching materials, scientific infrastructure expenses and other similar expenses	2%	2%	3%	3%	3%
Advertising and marketing expenses	13%	11%	7%	5%	3%
Infrastructure expenses	10%	9%	8%	8%	6%
IT expenses	2%	2%	2%	2%	1%
Depreciation and amortization	4%	4%	5%	5%	7%
Interest payments	3%	2%	1%	1%	1%
Other taxes	2%	2%	2%	2%	2%

Every year, the TTI budget allocates funds to promote the research activities of faculties and their lecturers, specifically, to pay for publications and conferences, exchange visits as well as for international cooperation activities and membership fees. The budget for these purposes is planned based on the development and professional growth plans of each faculty and faculty staff. The library budget allocates financial resources to the acquisition of study literature and scientific literature and expansion of library resource funds on the basis of orders submitted by the Financial Responsibility Centres. These orders in turn meet the objectives set out in the development plan of

the Financial Responsibility Centres.

Every year the Student Council of the Transport and Telecommunication Institute, which is an elected and independent body representing the rights and interests of students at TTI, draws up its annual operational plan, including a detailed expenditure budget, during budget planning stage to ensure the fulfilment of its functions. Similarly to other TTI Financial Responsibility Centres, the Student Council budget is planned and approved for the calendar year. The approved budget of the Student Council complies with the requirements of the Law on Higher Education Institutions.

3.2. Provide information on the infrastructure and the material and technical provision required for the implementation of the study direction and the relevant study programmes. Specify whether the required provision is available to the higher education institution/ college, availability to the students, and the teaching staff (the specific equipment required for the relevant study programme shall be indicated in Part III, Chapter 3 below the respective study programme).

General infrastructure and material and technical provision of the Institute

The study program in Riga is implemented on the study premises with a total area of 13,567.10 m², located on 1 Lomonosova Street. Currently, the TTI auditorium fund includes 12 lecture halls, 10 computer classes, and more than 20 classrooms for practical and laboratory classes. The study and research area is 9638 m², the sports and recreation area is 2879 m².

The study premises have undergone a modern reconstruction using the Institute funds. From 2011 to 2016, during the TTI project Information and Communication Technologies as a Single Academic Resource at the Transport and Telecommunication Institute (Agreement No. 2010/0180/3DP/3.1.2.1.1/09/IPIA/VIAA/023), building construction works were carried out, and the building infrastructure was adapted for persons with functional disabilities: lifts were purchased and installed; the internal and external stairs were adapted for persons with disabilities; sanitation facilities were renovated and adapted for persons with disabilities.

As of January 2017, TTI students have access to a fully renovated and equipped gym that offers classes in a variety of sports. Students can choose sports activities according to their interests as well as practice sports in additional sessions.

During the project *Modernisation of STEM Study Programs at the Transport and Telecommunication Institute*, contract No. 8.1.1.0/17/I/009, classrooms of 656 m² on the 2nd floor were renovated (auditorium No. I - 170 seats, No. II - 216 seats and No. III - 170 seats). Renovations included repairs, insulation, heating, improvement of ventilation and air conditioning systems, power and fire protection, acoustic solutions, and furnishing the auditoriums. Outdated servers were also replaced - servers with study data and servers supporting the study process (providing e-mails to students and the distance learning system *Moodle*), the Multimedia Lab was updated (video lectures and other materials for on-site, off-site and distance learning departments were recorded), the Library fund was expanded. In April 2019, the Library's electronic reading room (72 m²) with 30 user sites was opened. The e-library has workstations with 15 desktop computers, as well as 15 working sites for personal smart devices. An individual electrical connection is provided for each working site.

Table 15 shows the TTI study areas on 1 Lomonosova Street in Riga.

15.tabula. TTI's study areas

No.	Auditorium No.	Number of places per auditorium	Auditorium type
1.	01.	21	Practical training room
2.	02.	25	Computer classroom
3.	03.	24	Laboratory
4.	101.	25	Laboratory
5.	105.	24	Practical training room
6.	126.	36	Practical training room
7.	130.	250	Auditorium
8.	220.	52	Auditorium
9.	221.	92	Auditorium
10.	222.	70	Auditorium
11.	223.	100	Auditorium
12.	224.	24	Practical training room
13.	225.	60	Auditorium
14.	226.	15	Computer classroom
15.	227.	30	Computer classroom
16.	230.	68	Auditorium
17.	303.	21	Computer classroom
18.	304.	24	Computer classroom
19.	305.	22	Computer classroom
20.	306.	25	Computer classroom
21.	503.	25	Computer classroom
22.	505.	23	Computer classroom
23.	703.	60	Auditorium
24.	710.	30	Practical training room

25.	903.	60	Auditorium
26.	904.	15	Practical training room
27.	905.	24	Practical training room
28.	906.	40	Practical training room
29.	I	170	Auditorium
30.	II	216	Auditorium
31.	III	170	Auditorium
32.	L1	15	Laboratory
33.	L2	10	Laboratory
34.	L3	10	Laboratory
35.	L4	10	Laboratory
36.	L5	10	Laboratory
37.	L6	10	Laboratory
38.	L7	10	Laboratory
39.	L8	24	Laboratory
40.	L9	12	Laboratory

The TTI physical IT infrastructure consists of

TTI computer network, located in the study blocks in Riga and Daugavpils, which are connected with IPsec VPN. More than 500 computers and other network devices are connected to the TTI computer network

- TTI data centre infrastructure located on 1 Lomonosova street in Riga and on 43 Varšavas street in Daugavpils: 25 physical servers, RAID, Hyper-V virtual server infrastructure with more than 25 virtual servers, backup power system, cooling, data backup infrastructure
- IT hardware and systems monitoring system Nagios (Centreon), Zabbix, MS SCCM with more than 500 monitored devices and services
- Computer network security is ensured by PaloAlto's New Generation network screen
- 3CX phone infrastructure maintenance and support for 100 connections
- Video conferencing system for online lectures
- E-mail system maintenance - employees use an Exchange server which offers calendar and contact management and provides a convenient tool to work with electronic mail; students are provided with Office 365 cloud service;
- MS Active Directory-based maintenance of an electronic identity management infrastructure (one username and password for all centrally maintained IT systems)
- Maintenance of a file server

- Maintenance of computerised workstations and computer classrooms (450 computers, 125 printers, scanners and other devices)
- Maintenance of classroom equipment - 35 rooms with stationary equipment, 25 projectors, also including preventive maintenance of the equipment
- Classrooms provide the necessary support for video recordings of the lectures, online lectures and lectures in classrooms with sophisticated multimedia equipment
- Self-service copy/print/scan system
- A software server that enables students to work remotely with the software used by TTI.

An IT support service is available to ensure the uninterrupted availability of IT resources throughout the learning process.

A secure wireless computer network is available in all TTI buildings. Students can connect to a wireless computer network that is protected by the PaloAlto New Generation Firewall.

Virtually all lecture halls are equipped with visual display equipment, and all lecture halls are equipped with high-power stationary video projectors or large television sets. There are 9 computer rooms equipped with computers intended for the study process.

All classrooms are equipped with a student registration system for classes, which allows to automatically register students attending lectures and control attendance.

TTI students and teaching staff already use a well-developed IT infrastructure and virtual study environment. TTI students and teaching staff have access to the TTI internal information system *Intranet*, which contains the register of study programs and study courses, list of classes, student ID cards summarizing the entire course of studies and providing access to the assessment of students' knowledge.

Provision of the study process in the remote mode

The Transport and Communication Institute has been using one of the most popular open source training management systems *Moodle* for the e-study environment for several years. This e-environment allows for the preparation and publishing of study materials which are made available to students. Access to the *Moodle* system can be obtained from mobile applications, which expand the possibilities of using this system. A separate module is designed for distance learning.

BigBlueButton, an open source web conferencing system linked to *Moodle*, is used for remote lecturers. This system is designed for online learning and supports real-time audio, video, slide, chat and screen sharing. In addition, teachers can record their own lectures and later play their content, sharing it with students. In turn, the online classroom function of the system allows to register the participants of the lecture, thus giving an opportunity to control the students' participation in the lesson. Some instructors use the Kahoot mobile app to make their lessons more interactive and more dynamic using tests.

Currently, all classes are organized remotely according to the class schedule, which is available to students in the personal online office and in the specialized mobile phone application.

The management of the Institute and faculties regularly discuss the organization of the study process in video conferencing mode using the *GoToMeeting* platform.

Laboratory classes take place in specialized classrooms.

Aviation-related programs are implemented on the basis of the TTI Academic and Professional Aviation Center (APAC), which in 2009 was certified as a maintenance training organization in accordance with Section 147 of Appendix IV of Regulation (EU) No. 1321/2014. APAC, as a structural unit of TTI, is located in the Institute study building, occupying the premises in the basement of the

building, where the classrooms and laboratory rooms are located. TSI/APAC laboratories are equipped with simulators, workstations with modern equipment and tools necessary for the training of aviation specialists.

The aviation laboratory includes

- Rooms 03-04: Production equipment, tools and devices for lessons on aircraft repair work
- Room 105: Aircraft system stands
 - Anti-Skid Brake System AL37 (anti-skid system simulator)
 - Digital Engine Instrument E60 (digital simulator of aircraft engine tools)
 - Hydraulic Landing Gear System AL14 (simulator of aircraft wheel hydraulic lowering system)
 - Ice&Rain Protection System AS61 (system of ice and rain protection simulator)
 - Hydraulic Training System HS-2000
- Aircraft *Cessna-152* and its structural elements
- Room 101: Aircraft A320 simulator
 - VMT – Virtual Maintenance Trainer
 - VPT – Virtual Procedure Trainer
 - CBT – Computer Based Training.
- Training aerodrome: Aircraft *An-2* and technical maintenance equipment.

Electronics Laboratory (L3). The given laboratory is equipped with the assembly fields for the implementation of analog and digital electronics electrical circuits. Separate components of electrical equipment (semiconductor diodes, transistors, integrated chips) and functional units of electrical systems (amplifiers, auto-generators, etc.) are studied experimentally. A universal specialized stand allows to study the electronic system of a vehicle. All experimental studies are performed using digital sets of modern measuring instruments.

Laboratory of Physics and Electrical Machinery (L5). The laboratory is equipped with PHYWE teaching equipment, which allows to learn the basic laws of physics according to specific areas: mechanics and molecular physics, electricity and magnetism, wave processes and optics. Working with equipment facilitates the development of skills essential for running modern experiments in physics, using computer processing methods of measuring results. The universal laboratory stand of the K&H MFG electric machine allows to study the principles of design and operation of modern electric motors.

Academic activities proceed using the **Applied Software Systems Laboratory**, a multidisciplinary research laboratory that provides TTI students, lecturers and researchers with access to software products, some of which are unique. The software range is wide, ranging from simulation modelling tools, such as PTV VISSIM & VISUM - software for modelling transport flow, AnyLogic - universal modelling software, Aris, BPWin, Business Object - business process modelling software, to software for data processing and mathematical calculations, such as R, SPSS, STATISTICA, MatLab, Matematika, etc. The main goal of the laboratory is to provide access to software for students, researchers and lecturers as well as to provide consultations on the application of software tools. In addition, the laboratory is used for scientific projects and contract research.

TTI offers its students to use *Office365*, which provides full storage of *Microsoft Office OneDrive* files at no additional cost. While students are studying at TTI, they have access to all the software they need for successful studies. Students can install *Microsoft Office* programs, such as *Word, Excel, PowerPoint, OneNote*, on five computers (*PC or Mac*) and on five mobile devices (e.g. smartphone,

laptop and tablet). A student can use *OneDrive* for automatic device synchronisation of up to 1TB.

The TTI Computer Technology Department is a structural unit of TTI whose objective, among others, is to implement the aspect of the TTI strategy pertaining to modern information technology infrastructure. The Computer Technology Department develops and runs TTI electronic services. Not only does the Department execute users' orders for new services or replacements, but also initiates new changes.

To enhance the infrastructure as well as information and technical equipment necessary for the implementation of study programs, the organisational structure of the Institute was changed, the result of which was direct subordination of the IT Department to the TTI Board. Such changes have significantly reduced the decision-making time for fixing IT problems and have boosted the role of the structural unit in the Institute business processes. The physical IT infrastructure is planned according to the requests of the structural units after assessing the load of the existing infrastructure at the time of the TTI budgeting.

In order to attain the above objectives, the Computer Technology Department receives an annual budget approved by the Institute Management Board. Most of the funding is invested in long-term assets, including system software. About 50% of the IT annual budget is spent on long-term investments in network and server infrastructure, hardware and software.

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 direction 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 direction, 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 options for the subscription to the databases.

The schedule of classes for students and lecturers is available on the TTI internal information system *Intranet*. Students can see their grades for course work and the final grade for the study course.

The TTI internal information system *Intranet* creates an ID card for each student, which contains the student's personal information (contact information, agreement information, finances), lesson schedule, study plan for the entire study period with the grades for course work and the final grades for courses. The TTI teaching staff also have access to the lesson schedule on the *Intranet*.

The e-learning environment or the *Moodle* platform is used as a tool for organising the study process in each study course. The compulsory methodological teaching kit for each course to be placed on *Moodle* is defined in the *Regulation on Study Course Management* (available at: https://tsi.lv/sites/default/files/editor/Dokumenti/Oficialie_Dokumenti/rules_on_the_procedure_for_the_organisation_of_the_internship_of_students.pdf) and consists of the following items:

- a study course description
- tasks for independent work planned in the study course
- samples of independent work (if available)
- self-test assignments, exam questions
- other study materials used for independent study (lecture materials, presentations, various supplementary materials, etc.).

The Regulation on Study Course Management determines the procedure for discussion and evaluation of the outcomes of study course descriptions and methodological materials, for the decision on the suitability of study course teaching materials and the readiness of study courses for the inclusion in the study course register.

The e-learning environment promotes the exchange of study materials, communication between students and the teaching staff, submission of tests, etc.

Students and the teaching staff can get acquainted with the internal and external laws and regulations, methodological guidelines for developing final examination tasks, internship programs and other internship documents, application forms etc., as well as the latest information on student life and upcoming events. E-studies are available 24 hours a day from anywhere with the Internet access.

The e-learning environment provides academic staff not only with a place to publish study materials and to conduct assessment and examinations but with a platform for the development of professional knowledge since materials of pedagogical seminars, projects, etc., are available here.

The TTI *Regulation on Methodological Activities* (available at: https://tsi.lv/sites/default/files/editor/Dokumenti/Oficialie_Dokumenti/regulation_on_teaching_-_methodical_work.pdf), which set out the requirements and regulations for the organisation of methodological activities at the Institute. The Regulations specify and regulate the activities which aim to establish, maintain and develop the methodological foundation of the Institute study programs: the development of a new study program, implementation of change to a study program, preparation of a methodological teaching set for the study course, the development of distance learning courses, the design of teaching materials, the updating of teaching materials, open lessons and methodological seminars.

TTI Library: general information

The legal basis for the operation of the library of the Transport and Telecommunication Institute is the laws and regulations in force in the Republic of Latvia, the Constitution of TTI, the Regulation on the Use of the library, the internal regulations of the Institute and the bylaws of the TTI library. According to the *bylaws of the TTI Library* (approved at the Senate meeting on 19/02/2019, available in the TTI record-keeping system), the Library's primary goal is to ensure the availability of the collection, electronic resources, and information systems to students, staff, and any Library user.

The Regulation on the Use of the Library (available at: https://tsi.lv/sites/default/files/editor/Dokumenti/Oficialie_Dokumenti/library_term_of_use.pdf) regulates the procedure for servicing the library's users, lays down the duties, rights and responsibility of the library's users, describes the use of information resources (printed matters, unpublished materials, electronic publications), facilities, systems and equipment, and other matters related to the library.

The library was registered in the Register of Libraries of the Ministry of Culture of the Republic of Latvia under No. BLB1920 on 17 May 2007.

The library's main location is on 1 Lomonosova street and it has the following two service points:

- The Library Study Collection and Research Collection
- Electronic reading room

The key library statistical indicators (for the year 2020):

- Number of users – 1050
- Number of visits – 2252
- Number of remote visits –8553
- Number of issued resources (printed resources) – 563
- Number of issued resources (e-resources) - 8588

The library facilities are in good technical and visual condition. The total area of the library is 308 m². Of these, the available space for users is 117 m² and storage space is 171 m².

The library working hours are optimal, based on user flow measurements and according to the study plan schedule. Thus, library services are provided to both full-time and part-time students.

The library's electronic reading room (72 m²) with 30 user spaces was opened on 24 April 2019 and since then has been implementing the concept of the *Library as a learning place*. The comfortable and ergonomically designed room offers students the opportunity to use its equipment and access e-resources throughout the day for high-quality learning and well-spent time outside the studies. The e-library has workstations with 15 desktop computers, as well as 15 work sites for personal smart devices. An individual electrical connection is provided for each work site.

Regular opening hours of library service points:

	Collections	E-reading room
Monday	10.00 - 18.00	8.00 - 21.00
Tuesday	10.00 - 18.00	8.00 - 21.00
Wednesday	10.00 - 19.00	8.00 - 21.00
Thursday	10.00 - 19.00	8.00 - 21.00
Friday	10.00 - 16.00	8.00 - 21.00
Saturday	10.00 - 14.00	8.00 - 17.00

The library employs three qualified members of staff: the library manager and two librarians. The librarians work shift hours. The library is open to users six days a week, providing optimal library opening hours.

User support and services

The library provides services to the Institute students, academic and general staff, and any user in the country in accordance with the *Regulation on the Use of the Library*. *The Regulation on the Use of the Library* is available to any user on the library's premises as well as on the library's website at <http://lib.tsi.lv>.

Basic free library services are available to all library users, who can also use paid services consistent with the following approved pricelist:

- Providing textbooks for reading at home
- Lending books from scientific collections
- Library and e-library services
- Self-service copying/printing of materials (paid service)
- Interlibrary loan services
- Consultancy on the use of digital resources
- Consultancy on the search for thematic information in electronic resources
- Assigning ISBN/ISSN numbers
- Purchase of books published by TTI (paid service)
- 19-user computers
- Wireless Internet connection.

In 2020, due to the spread of the COVID-19 infection, the State of Emergency announced in Latvia twice and a series of restrictions imposed by the State of Emergency, the library's working hours were significantly reduced. Since 13 March 2020, the library has mostly been open three days a week from 10:00 to 17:00. The number of visitors to the reading room was limited to the maximum of four readers at a time. These restrictions significantly affected the number of full-time visits to the library, which decreased by 58% from 5,384 visits in 2019 to 2,258 in 2020. Due to the existing restrictions, the library has been providing and promoting its remote services, such as the use of the library's electronic resources 24/7, participation in remote classes on the use of library e-resources led by library staff, receipt of remote inquiries, provision of consultations and inquiries by phone or e-mail, deliver of scanned materials of specific journal articles or book chapters from the library collection by e-mail. Naturally, in 2020 the number of remote visits to the library and the use of e-resources increased. Thus, compared to 2019, the number of users who received remote services, such as written or telephone consultations or inquiries, increased by 34% in 2020. In 2019, there were 205 remotely served users, while in 2020, their number was 274 users. The number of uses of the library's electronic resources tripled in 2020 compared to 2019; specifically, in 2020, there were 8,985 access instances in contrast to 2,795 in 2019.

All students, including distance learning students, have access to the library's electronic services and e-resources on the library's website <http://lib.tsi.lv> without any time constraint from anywhere with the Internet connection.

Provision of information resources

The library of the Institute centrally enables the study process at TTI and scientific research activities by providing quality information resources and services in accordance with the goals and tasks set by the Institute, as well as examples of good practice in the modern library sector.

The compilation of information resources in the library takes place in close cooperation with the representatives of the faculties, taking into account the recommendations of the academic staff and evaluating the statistics of the use of information resources.

The library's collection of information resources consists of

1. Collection - 31,439 units, of which
 - books - 26,483 units
 - e-books - 2,791 units, of which 89 units are aviation
 - periodicals - 2,165 units, of which 210 units, or 9,8 %, are on aviation
2. Subscribed databases

- Academic Complete (E-book database with some 180,000 book titles, of which some 3,000 books are on aviation).
- Science Direct (Elsevier database with collections in natural and technical sciences, life sciences and medicine, humanities and social sciences, containing full texts from several thousand journals and books published by Elsevier, including dozens of titles on aviation)
- SCOPUS (Elsevier database of multidisciplinary scientific publications and bibliographic citations, containing information on 21,000 journals, 86,000 e-books and 6,8 million conference proceedings, as well as 27 million patents).

Provision of accessibility

- The library provides access to an electronic catalogue containing records of the printed and electronic resources in the Library's collection. Access to the catalogue is provided from the library web page at <http://lib.tsi.lv>. Users of the premises of the Institute and its branch are provided with unlimited access to the available remote services and electronic resources, including research databases. TTI students and staff also have access to the above services and electronic resources from external computers; the access is ensured through VPN (*Virtual Private Network*) connection with the TTI servers. The guidelines how to establish the connection can be found on the library's web page.
- Users can remotely access their virtual account, create lists of requested information resources, check the history of issued resources, extend the loan period of and order information resources for further use at home.
- Authorised users are provided with remote access to a wide range of scientific e-books from anywhere with the Internet connection. The library holds 2,791 e-books. They can be read online or downloaded to the user's smart device. The books are available in e-pub and pdf formats. These books were purchased in 2018 as part of the STEM project. Eighty nine books from the influential scientific literature publishers *Elsevier* and *Taylor&Francis* were selected and purchased especially for aviation programs.
- The database of publications published by the TTI academic staff has been created and is regularly updated at: http://research.tsi.lv/index.php?option=com_jresearch&view=publicationslist&Itemid=64&lang=en/.
- The manual for the use of the electronic book collection and electronic resources is available on the library website.
- Users have the opportunity to remotely contact library staff and ask questions about using e-books and e-resources.
- A list of scientific electronic resources with their descriptions and online links has been posted on the library portal.
- In the study course Introduction to Speciality, all first year students are introduced to the terms and conditions of using the library and its collections, including electronic resources.
- The library regularly organises training for students and academic staff, including training for foreign lecturers, on how to work with electronic resources representing the largest databases of publishing organisations. Since the beginning of 2020, these classes have been held remotely on the *Big Blue Button*. In total, 5 training sessions were organized in 2020, which were attended by 40 people.

Principles of the creation of library collections

In the 2021 budget, the funds to replenish the library stock are distributed as follows (Total: EUR 9000):

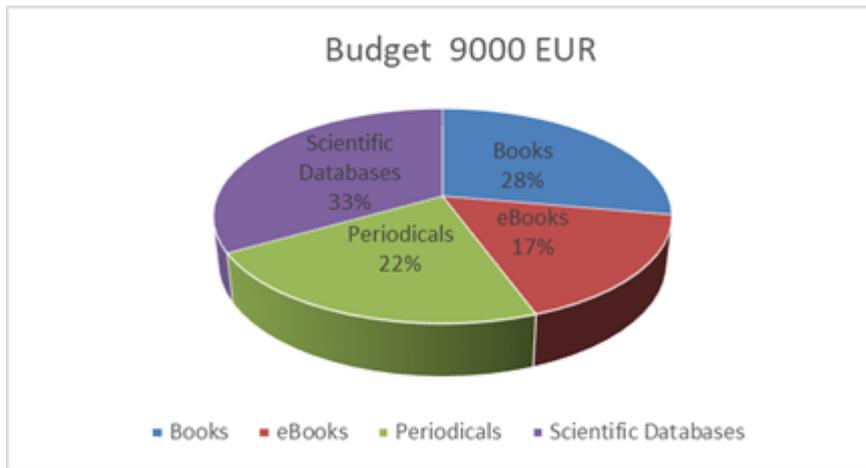


Fig. 12. Budget breakdown by type of resource for the TTI library in 2021 (forecast)

- In cooperation with the TTI Library Council, there was developed a collection acquisition policy, which, in accordance with the TTI Development Strategy, determines the priority direction for the resource acquisition.
- At the beginning of the calendar year, the faculties fill in a uniform-format request for the acquisition of books and e-books. There was developed a process scheme for carrying out the book procurement procedure in TTI consistent with the quality control system and is currently available.
- Of the total budget for books and e-books in the amount of EUR 4,000, approximately 40%, or EUR 1,600, will be allocated to the purchase of new aviation books.
- Since 2018 requests for purchasing e-books have also been accepted.
- Regular consultations with the academic staff and TTI management are held on the renewal and replenishment of the library collection, including electronic resources.
- Every October, faculties are invited to review the list of subscribed periodicals and to make proposals for subscriptions to periodicals for the following year.
- Information on the latest resources purchased by the TTI library is posted on the TTI Library portal and is sent electronically to all TTI staff members and students.
- Users are regularly offered trials of scientific databases.

Students of the study direction have the opportunity to use the library collection, which is mainly made up of resources published after 2000. Of the total collection (a total of 1725 units), 1071 book titles are on aviation, which is 6,65 of the collection. Furthermore, 89 e-books (3,5% of the e-book collection) and the following 7 printed journals (including scientific ones) are available to students of the study direction:

- *IEEE Aerospace and Electronic Systems Magazine*
- *Aviation Maintenance*
- *Air Traffic Technology International*
- *CAT Magazine. The Journal for Civil Aviation Training*
- *ICAO Journal*
- *ICAO Training report*
- *Jane's Airport Review*

To provide academic staff, researchers and students with high quality scientific resources and remote services, within the framework of the project *Modernisation of STEM Study Programs at the Transport and Telecommunication Institute* in November 2018 the library migrated to a new library information system *Accessit Libraries* and purchased more than 2790 electronic books of which 89 books were on aviation. With the implementation of the project, students have access to the

following remote services:

- The library information system *BIS Accesit Libraries* offers new technological solutions. For example, it has an integrated catalogue that allows students to locate resources in a variety of formats and access both e-books and database content.
- The e-book collection consists of 2015-2018 editions from influential publishers such as *Springer, Elsevier, Ashgate, Taylor & Francis*,
- The e-book collection consists of scientific books and textbooks, research reviews and scientific conference materials in English.
- E-books can be read both online and as downloaded resources to the user's computer for a limited period of time – up to one semester, which makes it possible to read these resources when no Internet connection is available.

Since January 2020 three subscribed scientific databases have been available to the students of the study direction.

The *Academic Complete* e-book database contains a collection of books in engineering (Civil Engineering) with more than 50,000 book titles, including more than 3,000 books on aviation.

The *Elsevier* collections contain several thousand different types of electronic full-text resources (scientific journals and books), dozens of which are thematically related to aviation, enabling TTI academic staff, researchers and students to use high quality reliable scientific information for academic and research purposes.

The bibliographic citation database *Scopus* is offered to support the work of researchers working in the study direction.

In addition to the subscribed scientific databases, students of this study direction are advised to use the following open-access scientific databases and resources:

- *Civil Engineering database*
- *CORE*
- *Directory of open access Books (DOAB)*
- *Directory of open access Journals (DOAJ)*
- *Cooge Scholar*
- *Index Copernicus*
- *Open Aire c.*

Students of the study direction have access to the information about the following OpenAccess aviation journals:

- *Advances in Aerospace Science and Technology (Scientific Research Publishing)*
- *Chinese Journal of Aeronautics (Elsevier)*
- *Journal of Flow Control, Measurement & Visualization (Scientific Research Publishing)*
- *Modern Mechanical Engineering (Scientific Research Publishing)*
- *Open Engineering (Degruyter)*
- *Open Journal of Fluid Dynamics (Scientific Research Publishing)*
- *World Journal of Mechanics (Scientific Research Publishing)*

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

The teaching staff with high qualifications and the relevant knowledge and competences are involved in the implementation of the study direction and in the achievement of set objectives.

The application and selection procedure for the academic staff at the Institute is governed by the *Regulation on the Election of Academic Staff by a Contest Procedure* (available at: https://tsi.lv/wp-content/uploads/2020/12/nolikums-par-akademiska-personala-ievelesanu-konkursakartiba_en.pdf).

The number of academic staff positions is determined in accord with the list of positions of a specific faculty and its budget. The planned change in the position list of the academic staff for the next budget year is approved by the dean of the respective faculty. Unplanned changes may be implemented only with the consent of the Board.

The selection/election of the academic staff is carried out in several stages:

- Information on vacancies in the faculty or the need for new vacancies
- Submission of an application to the Personnel Department which is prepared by the dean of the faculty and agreed on with the Vice-Rector for Academic Affairs and the Rector on the need to organize a competition for a vacant academic position
- The dean together with a specialist of the Personnel Department determine the requirements, knowledge and competences that are necessary for the performance of the academic position and that are included in the advertisement.
- The Personnel Department announces the competition by publishing the advertisement, depending on the requirements and the vacancy status, on the TTI website or specialised job advertisement portals (e.g. CV-online).
- The Personnel Department accepts the candidates' application documents and carries out the initial evaluation of the applicants' documents for compliance with the established requirements.
- Depending on the vacancy requirements and status, applicants' pedagogical skills are evaluated by the faculty, for example, by asking candidates to conduct an open lecture after which the dean provides a statement of opinion, a recommendation.
- Evaluation of the provided information and professional abilities of the applicant by an expert nominated by the Senate Competition Commission and the presentation of this evaluation to the members of the Senate Competition Commission
- Voting of the members of the Senate Competition Commission and recommendation to the Senate regarding the election/non-election of the candidate to the academic position
- Elections are held in the Senate, the most suitable candidate is selected and a job offer is made

The competency, professional skills and self-motivation level of potential employee are evaluated during the recruitment process.

Competitions for academic and research positions are advertised publicly - on the TTI web page, in the specialised job advertisement portals with which TTI has a contract (CV-online), if necessary, on the portal *Latvijas Vēstnesis*, the European Commission portal *Euraxess*, etc., giving a chance to all the interested parties to apply for employment at TTI within one month of the date of publication of the vacancy. Other recruitment methods, such as disseminating information through social media sites (Facebook, LinkedIn, etc.), may be used to attract candidates from specific fields or with a narrow specialisation.

Applicants' application documentation, previous research and pedagogical qualifications and an

open lesson, prepared and conducted by the candidate and attended by the students, after which the dean of the faculty provides a statement of opinion, are evaluated.

For the detailed evaluation of the documents submitted by the candidate, one expert is appointed from the TTI academic staff who is competent in the respective field.

During the meeting of the Senate Competition Commission, which assesses the adequacy of the candidate's scientific, pedagogical and organisational competences, the evaluation of experts and the dean of the faculty are heard, and personal interviews are conducted with the candidate. The Commission, by its decision, directs the most suitable candidates to the Senate for election to the academic position.

Within three days of the receipt of the Senate decision on the election of a candidate to an academic position, the Personnel Department informs the candidate on the Senate decision, whereas within five working days the Department prepares the necessary amendments to the agreements for the elected lecturers or concludes the employment agreements. In the case of the election of a professor or associate professor, a package of documents with an extract of the Senate minutes is handed over to the candidate for its submission to the relevant Council of Professors.

The qualifications and competences of the academic staff have constantly been developed by the improvement of pedagogical skills, the development of English and professional training in the field.

The knowledge of the national language of the teaching staff is fully in line with Cabinet of Ministers Regulation No. 733 07/07/2009 *Regulations Regarding the Amount of Knowledge of the Official Language and the Procedures for Examination of the Knowledge of the Official Language and the Amount of the State Fee for the Examination of Fluency in the Official Language* and with the level of knowledge specified in Appendix 1 of the Regulations. This requirement does not apply to guest lecturers from abroad who teach courses in the official languages of the European Union. The TTI Personnel Department verifies the state language skills when selecting staff and compiling documents in the preparation process for the academic position elections.

Guest lecturers and external instructors are also invited to teach specific study courses on a contractual basis; their competences are assessed in a similar way to those of the elected academic staff. In order to improve the content of the study programs, foreign visiting lecturers are invited to teach TTI study courses. The procedure for inviting foreign visiting lecturers is stipulated in the *Procedure for Inviting Foreign Visiting Lecturers for Short-Term Academic and Scientific Activities at TTI* (approved on 27/11/2012, Order No. 01-174-V, available in TTI record-keeping system).

TTI fulfills the requirement of the Law on Higher Education Institutions for the number of foreign visiting lecturers. Over the last two years the number of foreign visiting lecturers at the Institute has been 8%. Appendix 17 provides a list of foreign visiting lecturers during the reporting period in the study direction.

The process of recruitment and evaluation of lecturers is transparent, effective and one of the preconditions for high quality of the study process.

3.5. 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 qualification (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.

One of the five pillars of the *TTI Development Strategy for 2020-2025* is staff development. Staff development directions are stipulated in the *TTI Personnel Policy* (available at: <https://tsi.lv/wp-content/uploads/2021/05/tsi-personala-politika-eng.pdf>), specifying the measures for the enhancement of professional qualifications and for the development of the academic staff within the program of organization of professional development planning for TTI academic staff (approved on 15/04/2014, Order No. 01-12.1/35, available in the TTI record keeping system). The program includes targets, content and forms of professional development planning for TTI academic staff.

The following targets for the professional development of academic staff have been set:

1. Mastering of new knowledge, skills and teaching methods, and the ability to use them in practical work;
2. Development of professional skills and the overall personality development.

The regular evaluation of competences of academic staff and the evaluation process includes the following:

- Preparation of annual action plans for the professional teaching and methodological development of academic staff and their implementation in accordance with the program and TTI senior management decisions
- Planning of the financial resources required for the enhancement of the qualifications of academic staff
- Assessment of the professional growth potential of the academic staff of the faculties and the preparation of proposals on nominating the most promising lecturers
- Compiling individual plans for lecturers and proposals of the dean on the implementation of the required professional development measures during the academic year;
- Organisation of annual academic staff attestations.

The following forms for the professional development of academic staff are mostly used:

- Preparation and publication of scientific publications in international peer-reviewed journals
- Talks by TTI academic staff at international or interuniversity conferences, seminars, participation in national or international projects and experience exchange programs
- Promotion of academic staff mobility by organising cooperation with other universities of a similar profile in Latvia and other countries (including the ERASMUS+ program)
- Participation of lecturers in conferences organised by TTI (RelStat, MIP, RaTSiF), and the publication of their articles in international journals and journals issued by TTI
- Participation of young lecturers in methodological workshops for mastering new teaching methodologies and pedagogical skills
- Lectures by the most experienced professors at workshops for the improvement of pedagogical skills of young lecturers
- Mastering of programs on innovations in the higher education system, university didactics or the management of education by lecturers without higher pedagogical education
- Training/internships at international training centres, foreign universities or research institutes
- Internships with leading employers in the industry and work in research laboratories outside

the Institute

- Doctoral studies and the development and defence of the PhD dissertation
- Development of foreign language skills necessary for professional activities of lecturers.

Opportunities offered for the enhancement of qualifications in the reporting period

- During the reporting period, methodological seminars were regularly organized for lecturers, where the teaching staff were introduced to topical themes, such as the development of study course in e-learning environment *Moodle*, a seminar block on distance learning methodology, use of Case Study methodology in the study process, pedagogical rhetoric for new lecturers, preparation and publication of scientific articles, detection of plagiarism in student papers, mapping of study results, a seminar block on library e-resources, etc. In 2020, due to the State of Emergency and remote learning, the seminars mostly focused on the effective use of the *Moodle* system (creation of the final examination mark, development of tests), blended learning, training on digitization tools, etc. The seminars were led by the TTI leading lecturers, Professor Mišņevs, Associate Professor Pticina, Savrasovs, and Professor Pupcevs of the European Humanities University (Lithuania), etc.
- Within the framework of the project *Boosting Strengths of the Academic Staff of the Transport and Telecommunication Institute in the Areas Strategic Specialisation 8.2.2.0/18/A/011*, all academic staff were offered an opportunity of 200-hour internship in Latvian companies and Latvian branches of foreign companies, which ensured the connection between the internship and the taught courses. In 2019-2020, 27 lecturers used this internship opportunity (including 11 lecturers teaching in the study direction). The lecturers held internship positions in the following companies: Riga International Airport, LGS, Air Baltic Corporation, Accenture, Sky Port, Wings 4 Sky Group, Kuehne+Nagel, Havas Latvia, Airline Support Baltic, X Infotech, RunWay, SAF Tehnika, RoboLogic, etc. The skills acquired during the internship were used to improve specific study courses.
- Since TTI has long-term experience in attracting foreign students, the level of the English language knowledge of lecturers has been monitored and opportunities for improvement have been offered. To assess their foreign language skills, in 2016, all lecturers were provided with an opportunity to have their level of English proficiency evaluated. If necessary for the development of foreign language skills, the institution offers English language training. Such training was organised in 2014 and then in the academic year 2019/2020, the academic staff were provided with the opportunity to enhance their English proficiency within the framework of the project *Boosting Strengths of the Academic Staff of the Transport and Telecommunication Institute in the Areas Strategic Specialisation 8.2.2.0/18/A/011*. Nineteen lecturers used the opportunity to improve their English language skills, and 6 of them were the teaching staff of this program.
- TTI supports and promotes participation of its academic staff in the Latvian and international professional associations, unions and clusters, which ensures a connection with the professional environment. Currently the teaching staff is represented in the following associations: Latvian Aviation Association, Latvian Association of Remotely Piloted Aircraft Systems (LARPAS), Society "Women in Transport" , Latvian Logistics Cluster, Latvian Association of Transport Development and Education, European Conference of Transport Research Institutes (ECTRI), Latvian Cluster of Goods Supply Chains, Informatics Europe, Latvian Association of Information and Communication Technology (LIKTA), Latvian Association of Electrical and Electronics Industry (LETERA), Latvian Simulation Society, Latvian Society of Operation Research.
- All lecturers have the opportunity to participate in guest lectures and discussions organized by the Institute in order to increase their professional competences. The most significant lectures in recent years have been the following:

- On 11 December 2020, there was held an online discussion *Aviation: Adapting to the New Reality* during which experts talked about new challenges and development opportunities in aviation. The discussion topics included airport operations and requirements for training of aviation specialists. Amongst the participants of the discussion were Artūrs Saveljevs, Member of the Board of Riga International Airport, Ivars Pavasars, Head of Training Center of Riga International Airport, Artūrs Kokars, Member of the Board of Latvian Aviation Association, Ilja Podkolzins, Chief Executive of Airline Support Baltic, Vyacheslav Čeglatonev, Commercial Director of Odessa International Airport, Ukraine, and Gleb Golovchenko, Executive Director of RIVC-Pulkovo, Russia (information about the event is available at this site: <https://tsi.lv/lv/covid-19-krize-konkurences-vidi-aviacija-ir-sagriezusi-kajam-gaisa>, <https://www.youtube.com/watch?v=qmrmebj4tAU> & feature =youtu.be).
- On 27 September 2019, there was organized a guest lecture *World and Latvian Space Industry Review* led by Kirill Bystrov, co-founder of TimeTag.Space, representative of the Latvian Association of Space Industry (LAIK). The main topics of the discussion focused on the future of the space industry and opportunities offered by Latvia's membership in the European Space Agency (ESA).
- On 18 January 2018, there was a guest lecture *A Need for Holistic Management Approach in Today's Aviation Industry* led by Konstantinos Kalligiannis, the Managing Director of K.K. Aviation Ltd.
- On 11 December 2017, during the presentation of the Master's Program in Aviation Management in the conference room of the Riga International Airport VIP Terminal, Rigas Doganis, a world-class aviation expert and author of many books, gave a guest lecture on *Future Perspectives and Challenges for Global Aviation Development*, which brought together representatives from various sectors, including Riga International Airport and Liepaja Airport. During the lecture R. Doganis talked about current developments in the aviation industry and revealed the key to the success of Europe's largest low-cost airline, Ryanair
- On 13 October 2016, professor Michael Schenk, director of the Fraunhofer Institute for Manufacturing Operations and Automation (Fraunhofer-Institut für Fabrikbetrieb und-Automation Service, Magdeburg, Germany), gave a guest lecture on *How to Bring INDUSTRY 4.0 Technologies to Logistics Networks* in which prof. Schenk presented the Industry 4.0 Concept that in 2011 was declared a key component of the national development strategy in high technologies by the German government .
- TTI supports and encourages participation in scientific and teaching methodological conferences. Scientific conferences are described in some detail in section 4.4. The annual conference *Problems of Modern Education* provides an opportunity for TTI lecturers to share their experience with representatives of Latvian and foreign higher education and research institutions, representatives from businesses and municipalities on all issues of methodological and scientific activities related to the modern educational process which is based on information and communication technologies. Due to the constraints imposed by COVID-19, the conference has not taken place for the last two years.
- TTI supports doctoral studies of the teaching staff. In the previous period, two lecturers, who are currently teaching in the program, completed their doctoral studies and obtained doctoral degrees, having defended their doctoral dissertations in aviation. Yunusov defended the thesis *Improving Models and Techniques for Diagnosis of the Engine Flow Aspect of the Gas Turbine in Monitoring Systems of Aircraft Propulsion Equipment*, whereas I. Alomar defended the thesis *Alternative Control Methods for the Movement of Land Vehicles at Airports*. The topic of O. Zervina's doctoral research is *Linguistic Analysis of Startup Companies in the Context of Air Transport Industry Management*.

- Special seminars and science weeks are organised to improve professional
 - On 24 May 2019, TTI organized the forum *The Next Generation Aviation Professionals*, which was attended by leading aviation representatives from Germany, Latvia, Canada, Kazakhstan, Poland and Sri Lanka. In addition to the plenary speakers, who presented their vision on the development of the aviation industry in Europe and Latvia, a round table was organized on the following themes: *Who should be an aviation specialist today?* and *What skills will he need tomorrow?*
 - On 15 May 2019 there was organized an open seminar *Implementation of Management Decisions in Practice*, the aim of which was to reveal the importance of management skills in the growth and development of any company, be it a private enterprise or public administration. The main topics included management decision-making and implementation, project management in organizations, international project management, leadership as the main cornerstone of company management, etc.
 - In 2017-2018, TTI organised a series of open seminars on *Science for Business*.

The first seminar, which took place on 8 December 2017, focused on the topic *From Data to the Added Value: Views and Solutions* and was marked by talks of the representatives of Accenture, TTI lecturers, doctoral and Master's students.

The second seminar on 26 April 2018 was devoted to the topic *Digitalisation in Logistics and Transport* and was attended by outstanding scientists from Latvia and Germany, including Hon. - Prof. Dr.-Ing. Klaus Richter and Dipl.-Vw. Kay Matzner of the Fraunhofer Institute for Factory Operation and Automation IFF (Germany) (information is available at: http://www.tsi.lv/sites/default/files/editor/26_april_workshop_agenda_2.pdf).

The third seminar on 7 December 2018 explored the topic *From Data to the Business Added Value* and was attended by the employees of Deloitte Latvia, who shared their experience with students and academic staff

- On 16-20 October 2018, for the first time there was organized a *Science Week* which consisted of several events, such as the seminar *SCI-BI: Digitalisation in Logistics and Transport*, the closing conference of the ALLIANCE project *Sustainable Urban Interchanges: Trends and New Prospects* and the international conference *18th International Multi-Conference Reliability and Statistics in Transportation and Communication (RelStat-2018)*.
- On 23-25 October 2017, TTI held an online seminar on Pedagogy for TTI Teaching Staff. A. Pupcevs, president of the Senate of the European Humanities University (Lithuania), delivered a lecture on *Distance Education as a Priority in the Development of a Modern University*, which focused on improving the quality of distance education with modern methods and technologies.
- On 11 May 2017, there was a workshop on the *Latest Equipment for Non-destructive Testing Methods for Small Components of Aviation Equipment*. The seminar was attended by an expert working non-destructive testing issues as well as by the representatives of *Olympus* (France) and leading Latvian aviation institutions and companies, including the State Agency *Civil Aviation Agency*, the State Border Guard, cargo airline *RAF-Avia*, aviation spare part import and export company *KS Avia*.
- On 14 September 2016 there was held a workshop *Cooperation in Aviation and Space Exploration*, organized in collaboration with Kazcosmos and the National Space Research and Technology Centre of Kazakhstan.
- TTI offer all its teaching staff the opportunity to visit foreign universities within the Erasmus+ program, to conduct classes, attend lectures of foreign academic staff, learn new methods and share experiences.

- The Institute supports lecturers' participation in projects (see Section 4.2) as well as promotes the use of opportunities provided by various projects aiming at enhancing lecturers' competence in various fields. For example, within the project *Spread Your Wings*,
 - in 2018, TTI professors A. Medvedevs and J. Stukajina visited Kazimiero Simonavičiaus Universitetas in Lithuania to exchange experience and develop teaching methods.
 - On 14-18 January 2019, the Transport and Telecommunication Institute hosted a *Digital Academy*, an intensive educator qualification improvement programme aimed at enhancing the lecturers' digital competencies needed to create online training courses.

Within the framework of the project *Enhancing Excellence and Innovation Capacity in Sustainable Transport Interchanges* (ALLIANCE):

- For two years, in July 2017 and July 2018, TTI hosted a summer school on decision-making methodology, business models for transport terminals, best practices in transport company management, etc. The lecturers, participating in the summer schools and developing their competence, were D. Pavlyuk and N. Spiridovska.

The opportunities offered on the enhancement of qualifications of the TTI academic staff have significantly improved the quality of studies. By applying the tools of professional development and by supporting scientific activities, the newly acquired knowledge and experience are transferred to the content of study courses, on the one hand, and on the other hand, students are offered topical themes for scientific papers. For example, within the framework of research projects, the academic staff together with students form scientific groups that carry out innovative research and prepare publications.

In order to motivate employees to take initiative and responsibility and to evaluate the performance of the academic staff, the academic staff are attested annually in accordance with the *Academic Staff Attestation Procedure* (available in the TTI Record Keeping System) consistent with which the key assessment criteria are contributions to scientific research, academic (pedagogical) activities, scientific organizational and administrative activities. The obtained evaluation results are used to determine the level of remuneration, which acts as an incentive for employees to attain higher results.

The evaluation criteria are reviewed and, if necessary, adjusted annually to ensure their compliance with the priority orientations for the academic and scientific activities set by the Institute. As a result of the attestation, junior lecturers are included in the TTI staff reserve list, and they are subject to a special motivation system which is different from the common system of academic staff evaluation.

The evaluation of the quality of the academic staff is carried out considering regular student surveys and these evaluations are also taken into account in the annual evaluation of the academic staff.

In March 2019, TTI conducted an electronic survey of job satisfaction and engagement of employees, including the academic staff. In the survey, employees expressed their views on work content, work environment, communication and development issues. As the survey was successful, in the future such surveys will be conducted on a regular basis. The results of the surveys, taken together with the performance indicators of the planned work, are used to improve the internal communication, management and operational processes of the Institute.

3.6. Provide information on the number of the teaching staff members involved in the implementation of the relevant study programmes of the study direction, as well as the

analysis and assessment of the academic and research workload. Provide the assessment of the incoming and outgoing mobility of the teaching staff over the reporting period, the mobility dynamics, and the issues which the higher education institution/ college must tackle with regard to the mobility of the teaching staff.

The qualification of the academic staff involved in the realisation of the study direction corresponds to the specifics of the study programs and the implementation conditions, as well as the requirements of the regulatory enactments.

The academic staff are professionals in their field of science and have proven their competence in research of their respective fields.

In accordance with the Law on Higher Education Institutions, Cabinet of Ministers Regulation No. 445 *Regulations on the Teaching Staff Remuneration, TTI Regulation on the Remuneration of Academic Staff* (approved at the meeting of the TTI Senate on 17/09/2019 and available in the TTI record-keeping system) and the job descriptions for academic positions, the teaching load comprises student education, including teaching, conducting and supervising studies, organizing and supervising classes, tests and examinations; it also incorporates scientific research, including conducting and managing research in the relevant sub-branch of science, managing the doctoral studies and research, participation in conferences, preparation of publications, etc.; it also contains both organizational and methodological activities, including the organization of study activities, development and evaluation of study programs, participation in activities on the enhancement of performance quality of the Institute, training of young scientists and lecturers. All members of the academic staff elected to academic positions carry out academic, scientific, organizational and methodological activities.

According to Cabinet of Ministers Regulation No. 445 and the *TTI Regulation on the Remuneration of Academic Staff*, full-time academic staff are assigned annual workload that includes teaching hours, which is the reflection on the pedagogical activities, whereas the rest of the academic workload comprises scientific, organizational and methodological activities (see the table below). In addition to the workload hours listed in the table, research work is conducted in projects carried out outside main working hours of staff and is separately remunerated.

Table 16. Workload of academic staff

Academic position	Workload in hours (per year)		
	Teaching load	Other academic load	Total
Professor	500	400	900
Associate professor	550	350	900
Assistant professor	600	300	900

Lecturer	650	250	900
Assistant	700	200	900

Depending on the academic position, the relationship between these duties changes.

In 2020, the Institute had 51 lecturers elected to academic positions. Research activities were conducted by 77 internal researchers, expressed in full-time equivalent (FTE) as 31. Of the academic staff, 27 members (professors, associate professors, docents, lecturers) were additionally elected as researchers (leading researchers, researchers, research assistants). The full-time equivalent of scientific activity tends to increase every year, which indicates a more active involvement of academic staff in research. This is also facilitated by the strategy of scientific human resources, which is reflected in the TTI Development Strategy for 2020-2025.

Twenty representatives of the elected academic staff participate in the implementation of the study direction, including 6 professors, 4 associate professors, 8 assistant professors and 2 lecturers.

The division of their academic and research activities is as follows:

Table 17. Academic and research workload of academic staff

Academic position	Number of academic staff	FTE academic activities	FTE research activities
Professor	6	2.36	3.7
Associate professor	4	1.79	2.21
Assistant professor	8	3.3	2.48
Lecturer	2	0.95	0.34

It is evident that professors and associate professors are more engaged in scientific activities and less in the implementation and management of the study process, whereas assistant professors and lecturers are more involved in teaching.

TTI also emphasizes the importance of promoting the development of academic staff by engaging faculty members in research activities and encouraging them to pursue doctoral studies, the outcome of which is an increase in academic positions. Specifically, in 2020, 4 members of the academic staff were elected as associate professors for the first time, whereas 4 lecturers became assistant professors. In 2019, 3 members of the academic staff were elected as associate professors for the first time; 1 lecturer was elected to the position of an assistant professor. In 2018, 1 member of the academic staff was elected as a professor for the first time, while 1 person as an associate professor. In 2017, 2 members of the academic staff were elected to become associate professors.

Currently, 8 TTI lecturers are studying for a doctoral degree, who will be able to apply for the position of an assistant professor after obtaining a doctoral degree.

Care has also been taken to improve the quality, not just quantity, aspects of performance of research staff. In order to balance academic and research activities, motivate academic and teaching staff to enhance the quality of academic and scientific performance, the Transport and Telecommunication Institute has included a detailed payment system for both academic and

scientific activities in its *Regulation on the Remuneration of Academic Staff* (approved at the meeting of the TTI Senate on 17/09/2019 and available in the TTI record-keeping system).

In order to ensure that the knowledge and skills that are taught at the Institute are meaningful and useful on the labour market, in addition to the permanent staff, the Institute recruits the teaching staff who carry out their duties as lecturers on a contractual basis for a fixed period. They include industry experts, lecturers elected at other higher education institutions, etc.

A significant number of the TTI academic staff, who teach in the program *Aviation Engineering*, continuously work in various companies in the industry. For example, the assistant professor Bulekov is a technical director of *MRO Part-145 Wings 4 Sky Group*, the assistant professor Alomar certifies staff and is a general director, technical maintenance chief advisor of *Terra Avia*, the associate professor Lācāne is a LGS employee, the assistant professor Smoļņinovs is a researcher with *Aviatest LNK* (maintenance of tests of aircraft unit endurance).

TTI also involves foreign lecturers in academic and research activities, not only as guest lecturers, but also in the elected academic positions, such as associate professor Alomar Iyad, Ph.D. in Engineering.

Guest lecturers are mainly invited for academic work and less for research. However, they are highly ranked lecturers with specific knowledge or professional experience in their respective areas of specialization, which is why they provide high quality lectures and classroom management.

Professionals with practical work experience in the respective field are also involved in the implementation of the study programs of the study direction - mainly in the study courses related to specific industry courses - A. Saveljevs, Member of the Board and Commercial Director of Riga International Airport, will teach the course *Fundamentals of Aviation Business*, M. Mikstāns - *Aircraft Ground Handling*, M. Ivanovs, quality management systems manager of *Flight Consulting Group - Flight Management*.

Eighteen members of the academic staff teaching in the program (90%) hold a doctoral degree. Of the invited lecturers, there are 2 persons with a doctoral degree, while the rest have a Master's degree in the respective field.

The teaching staff involved in the implementation of the study direction and the programs, plan their pedagogical load according to the study plan of each semester and academic year.

The professional qualification of the academic staff fully corresponds to the requirements of the implementation of the study programs of the study direction; the competence of the academic staff is attested by:

- qualification of the academic staff, its compliance with the requirements specified in regulatory enactments;
- scientific output, topicality of scientific work and cooperation with scientific institutions in Latvia and abroad;
- professional competence as evidenced by the professional and academic experience; the postgraduate students they have educated; the developed study materials, scientific publications; participation in projects and their management, participation in the development or management of study programs, cooperation with Latvian and foreign higher education institutions; work with foreign students; development of study courses, self-assessment of professional activity, etc.

Appendix 10. Biographies of the academic staff (Curriculum Vitae in the *Europass* format).

Appendix 11. Academic staff involved in the implementation of the study direction and their

degree/qualification; electoral status at the higher education institution/college; study programs and study courses in whose implementation they are participating.

Assessment of incoming and outgoing faculty mobility in the reporting period, mobility dynamics, difficulties faced by a higher education institution in faculty mobility

Using ERASMUS+ mobility opportunities, TTI promotes the development of the academic staff the outcome of which is supplementing the content of the study programs with innovative methods, attraction of foreign guest lecturers and the internationalization of the study direction. In order to ensure full-fledged cooperation, cooperation agreements have been concluded with other higher education institutions of the European Union where similar study programs are implemented.

The basic condition for an Erasmus+ guest lecturing visit is the following: the lecturer must provide academic activities of at least eight academic hours, which can be both lectures and seminars. Prior to arriving at the host institution, guest lecturers contact it to develop a lecture plan with appropriate content.

The number of outgoing lecturers is limited by the number of mobility sets and the amount of funding allocated. There is a need to transfer classes during this trip due to the heavy workload of lecturers, which causes difficulties. During the reporting period, the lecturers of the study direction gave guest lectures 22 times within the framework of the Erasmus+ program.

Appendix 12. Statistics on the incoming and outgoing mobility of the academic staff during the reference period

3.7. 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.).

During the matriculation process, each student receives a handbook with the useful information on how and where to find answers to their questions, who to contact to obtain required information.

TTI technical support is provided by the IT department. A centralised study process and information structure support - *helpdesk* - has been set up to receive applications, process them and give guidance to support staff. Table 9 describes the support staff.

Table 9. Description of support staff

No.	Speciality	Task	Quantity	Notes
1	Operating systems engineer	Support of users, study process, IT services	2	Monday-Friday: from 8:30 a.m. till 8:30 p.m. Saturday:from 8:30 a.m. till 6:00 p.m. Sunday: according to the lecture schedule of module training Applications sent to the email are accepted around the clock.

2	Computer technology engineer	Maintenance of computer hardware	1	
3	Computer systems administrator	Support of IT structure functioning	1	

As the study process at the Institute is also organised for full-time evening groups and part-time off-site sessions, which include Saturday classes or modular form training on Sundays, the *helpdesk* is available on weekday evenings and on weekends.

Questions related to the study process are supported by the Study Department and the Faculty Office, which also provide feedback for communication with students. The working hours of the Study Department are from 8:30 a.m. till 6:30 p.m. on weekdays and from 8:30 a.m. till 4:00 p.m. on Saturdays. Thus, the Study Department is open to both evening students who arrive at the Institute after work and part time students on Saturdays.

TTI students can apply for tuition fee discounts. Discounts are granted to students for good and excellent progress, active participation in the Student Council, scientific activities and other criteria.

The Association *Apeirons* has recognised TTI as an organisation friendly for people with disabilities. This has been achieved by adapting the building and study rooms for persons with disabilities (see Part II of Section 3.2). Heads of departments and teaching staff take an individual approach to such students in each situation in the study process. Although the lift is specially adapted, it is often lecturers who go to the student to provide individual consultation or to administer course tests in the ground floor hall.

TTI pays special attention to foreign students. Already at the time of enrolment, the prospective student is offered the opportunity to complete a questionnaire in the electronic system *Admission* that includes questions about whether the student will need to be picked up at the airport and whether he or she will need to be provided with a hotel room with “yes” and “no” as the possible answers. TTI does not have its own hotel, but it has concluded cooperation agreements with several hotels (SIA RIGAAPARTMENT.COM, AS 1Home Group, SIA DODO Hotels) guaranteeing the accommodation for TTI foreign students. Foreign students are provided with the addresses and contact information of these hotels. At the airport, students are welcomed by a TTI student - volunteer. TTI students are entitled to a tuition fee discount for performing such duties.

The organisation of work with foreign students at TTI is the responsibility of the Foreign Student Coordinator, whose responsibility it is to give advice on the study process organisation, behavioural and ethical issues at TTI, entry and accommodation in Latvia (places of residence, hotels, shops, pharmacies, medical institutions, the Office of Citizenship and Migration Affairs, etc.); to organise the integration of foreign students into the TTI study process and student life; to provide communication between TTI administration, departments, the Student Council and national regulatory authorities in order to offer support to foreign students to successfully complete their studies at TTI; together with the assistants of the deans of the faculties and the lecturers, to control the progress of the study process of foreign students (including attendance of classes, control of the study performance); to provide assistance to foreign students in the organisation of their compulsory internship (finding a place of internship, internship applications, preparing and registering an internship agreement, etc.), etc.

The first week of the semester is devoted to the adaptation of foreign students, when they are introduced to the structure of TTI, departments and staff (dean and assistant dean), academic

culture, information about available IT resources, library, and a guided tour of the capital.

The TTI Corporate Clients Department, which oversees an information database about companies that provide internship opportunities, offers students both internships and information about the latest job offers. The latest job offers are posted and available to students in the TTI e-learning environment *Moodle*. Each spring, the TTI Corporate Clients Department organises Career Days for TTI students, including guest lectures by professionals from various disciplines on successful integration into the labour market, news and current affairs in IT, logistics, and aviation, and the aspiring entrepreneurs are given the opportunity to listen to tips for starting their own business.

II - Description of the Study Direction (4. Scientific Research and Artistic Creation)

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

Correspondence of the scientific research of the study direction to the aim of the Institute

Research at the Transport and Telecommunication Institute operates in accordance with the strategy approved in 2015, *Transport and Telecommunication Institute Strategy and Research Programme 2015-2020* (available at: http://www.tsi.lv/sites/default/files/editor/transport_and_telecommunication_institute_research_programme_final_website.pdf). The aim of the research strategy is to create an education and science environment which ensures continuous academic staff training and carrying out research and development along the TTI priority development directions.

The research program of the Transport and Telecommunication Institute identifies 3 strategic research areas: information and communication technologies (telematics), intelligent solutions in transport and logistics, and the digital society and economy. All research direction include research in aviation.

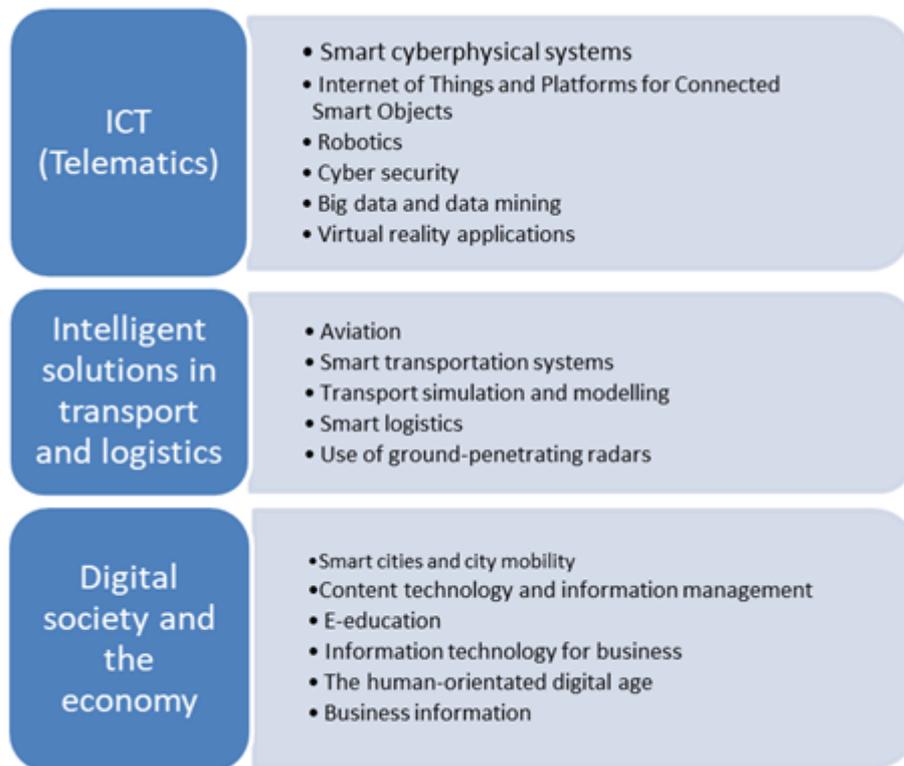


Fig. 5 TTI research directions

The aim of the study direction *Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery* is to provide students with sustainable high quality education in engineering, ensuring competitive career development in Latvian and international labor market, and to train internationally recognized and highly qualified aviation specialists using research results.

The research of the study direction *Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery* fully complies with the TTI and study direction goals “to provide study programs that meet the interests of the international target audience and reflect TTI strengths in computer science, transport, logistics and aviation, based on the current and future needs of industry, which are being affected by changes in enterprises, business organization and society brought about by the 4th Industrial Revolution”, and takes into account the objectives of the research and knowledge transfer priority of the TTI strategy aiming at “ensuring a research environment and research outputs in accordance with international criteria, which are used in the transfer of high-quality scientific publications and research outcomes to educational programs and the national economy, thus, enabling Bachelor's and Master's students to participate in TTI research activities”.

TTI supports research in all fields of engineering for which the Institute has the appropriate capacity. The directions of scientific research correspond to the aim of the study field to be accredited.

Aviation is a specific area of scientific research because, on the one hand, the aviation industry is very tightly regulated and regulated, and all innovation goes through a long and detailed examination process, but on the other hand, innovation is what allows the industry to develop and provide products and services that are in line with modern trends and what ensures the rapid development and transformation of related processes.

TTI conducts applied research in aviation, implementing the following scientific activities:

- Initiation and participation in projects through international, regional and local co-financing

and support programs

- Initiation and participation in projects aimed at developing, updating and developing new study programs in the field of aviation
- Cooperation with industry by conducting applied research to solve specific problems of companies in the industry and develop innovations.

The academic staff involved in the study direction are involved in research related to participation in the following projects:

- The HORIZON 2020 program project *Enhancing Excellence and Innovation Capacity in Sustainable Transport Interchanges (ALLIANCE)* (led by Prof. I. Jackiva), whose goal was to establish an advanced science and higher education institute in the field of transport in Latvia. The project focuses on intermodal passenger and freight transport systems, including aviation, taking into account legal and organisational aspects and links with other areas, such as spatial planning and economic development, defining smart and sustainable transport solutions, and incorporates decision strategies, methodologies and methods to analyse and evaluate the impact of these solutions on transport, the economy and society as a whole.
- Participation in COST projects has enabled many young scientists to gain new knowledge and practical experience for the successful development and defence of their doctoral theses.
- The ERASMUS+ program projects enable research and administrative staff to become familiar with the principles of management and research implementation in projects, while at the same time improve the study process and attract young researchers to projects. The ERASMUS+ program offers ample opportunities to improve the quality of the education process and thus prepare the next generation of academic and research staff. Projects under the ERASMUS+ program are focused on innovation solutions in education, knowledge sharing, creation of joint Master's programs, etc., for example, *Spread Your Wings (SYW)* of prof. J. Stukalina.
- The INTERREG EUROPE program project *Smart Logistics and Freight Villages Initiative (SmartLog)* (led by Prof. I. Kabashkin) focused on improving transport corridors and reducing travelling times of goods by planning and investing in ICT solutions.

General organization of research activities at the Institute

The research organisation of TTI is formed in accordance with the Law on Scientific Activity. The highest collegial body in research is the Scientific and Doctoral Council, which makes strategic decisions in research by appointing research staff by secret ballot. The day-to-day management of scientific activities is carried out by the Research Administration Division under the supervision of the Vice-Rector for Academic Affairs and Research.

The International Scientific Advisory Board established by the TTI is a consultative body that makes recommendations on the development of science, education and innovation at TTI. Its operation is governed by the *Statutes of the International Scientific Advisory Board* (approved by the Senate on 25 June 2015, available in the TTI record-keeping system). The Council consists of *Prof. Dr Nicos Komninos (Greece)*, Univ.-Prof. Dr.-Ing. habil. Prof. E. h. Dr. h. c mult. Michael Schenk (Germany), Prof. Dr Andres Monzon De Caceres (Spain) (available at: <http://www.tsi.lv/en/content/international-zinatniska-konsultativa-padome>). A progress report is presented to the Council each year. The Council evaluates the research activities of TTI and advises on the strategic development directions and priorities of research. It acts as ambassadors of the Institute at an international level, advising on available funding opportunities that could be used by TTI and advising on how to realise these potential opportunities in reality.

The quality management of the research activities, the rules for the organisation, provision and implementation of research activities at TTI and the quality control of research outcomes are

governed by the *Research Quality Manual* (approved on 29 October 2018, Order No. 01-12.1/57A, available in TTI's record-keeping system).

Annual monitoring of the research is provided by summarising the scientific outputs of the faculties at the beginning of each calendar year. The dean of the Faculty submits a special report form to the Research Unit. The data is compiled in the TTI Scientific Activity Report, which is prepared by 1 April of the current year for the previous calendar year.

At the structural unit level, research activities are monitored by their heads. Supervision of scientific activities is included in job descriptions of supervisors of all scientific and academic structural units.

Both external funding and TTI internal resources are used for research. Funding is included in the budget of the Research Administration Division.

At the beginning of each academic year, in September, the dean of the Faculty submits a plan for the academic research of the teaching staff to the Research Administration Division, which includes the plan in their budget.

The types, amount and procedure of payment for the scientific activity are specified in *the TTI Remuneration Rules for Academic Staff* (approved on 17 September 2019 in the TTI Senate sitting, protocol No. 01-7/1, available in TTI record-keeping system), defining the following types of separately payable research work for academic staff, such as supervision of doctoral thesis, review of the papers of TTI Scientific Conference's (RelStat/MIP/RatSif) participants, review of abstracts and articles for the TTI *RelStat* conference, publications in journals and conference proceedings included in the cited databases *WoS*, *SCOPUS* ***, publications in journals and conference proceedings included in the cited databases *ERIH*, *Engineering Village2*, *EBSCO****, review of articles based on the outcomes of the *RelStat* conference (participation with a report), review of articles for the TTI journal *Transport & Telecommunication*, patent registration.

In accordance with the financial capacity of the TTI and the topicality of the research direction, TTI supports the participation of academic staff in scientific conferences by granting paid leave.

The Scientific Research Department is responsible for informing the academic staff of the Institute and for providing any kind of communication in pertinence to scientific research activities. The academic staff are introduced to the following types of information:

- information on the opening of project programs, research co-financing funds and other instruments to support research activities
- information on external and internal scientific activities:
 - information is sent by e-mail (recipients are identified according to the planned activity)
 - information is published on the TTI website: <http://www.tsi.lv/en/content/zinas>; <http://www.tsi.lv/en/news>.

The content of a particular publication is considered when determining the publication section.

- The TTI website publishes up-to-date information on all scientific activities at the Institute: <http://www.tsi.lv/en/content/reasearch-tsi>.

On 29 November 2018, TTI research activities were certified according to the requirements of the ISO Standard 9001:2015.

In the last international assessment of scientific institutions, the Transport and Telecommunication Institute received a high rating as the best one among private higher education institutions. TTI was evaluated by the Engineering and Technology Group and received ratings on a scale of 3 to 4. This

means a good level scientific institution that plays an important role at the national level and with a high level of international cooperation. The high rating of "4" was received for the economic and social impact, which is important for any scientific institution.

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.

Research is an integral part of the study process. Linking research with the study process is characterised by research activities of academic staff, which creates preconditions for improvement and updating of study course content in preparation for lectures, design of practical tasks, seminars, project work and graduation thesis topics, etc., as well as for developing the students' research skills.

The equipment and special software purchased for research are available in the TTI laboratories. The opportunities provided by a laboratory are actively used by students in the development of their Bachelor's, Master's and doctoral theses. Many scientific projects engage students in collecting and processing research data.

Leading TTI professors are involved in the TTI doctoral program *Telematics and Logistics*. They also teach in the Bachelor's program in aviation. The research themes of doctoral students correspond to the priority research areas of TTI in aviation. In addition, the doctoral program uses the Industrial Doctoral approach, when a doctoral thesis is developed on a topic useful and necessary for the development of a specific company.

The TTI doctoral program focuses on the following areas relevant to aviation: artificial intelligence and its elements, intelligent systems, digitization, etc. The outputs of doctoral students' activities are integrated not only in the field, but are also used for continuous improvement of study courses, especially those in which rapidly developing technologies are acquired - ICT, IT, etc.

Currently, doctoral theses are being developed on the following topics in the field of aviation:

- Integrated logistics support as a factor in the international competitiveness of aviation technology (supervisors – professors A.Medvedevs and J.Tolujevs)
- Research and analysis of passenger purchasing behaviour and revenue increase possibilities for non-aviation airport services (supervisor – professor I. Jackiva)
- Study of economic efficiency of data-driven fault diagnosis and prognosis techniques in aviation maintenance repair organization (supervisor – associate professor D. Pavlyuk)
- Development of the *Riga Airport* in accordance with the concept *Airport City* (supervisor – professor I. Jackiva)
- Methodology for building an effective data migration mechanism in the process of implementation of information systems at enterprises of technical service and operation of aircraft (supervisors – professor B.Mišņevs and associate professor I.Pticina)
- Models of decision support systems for inventory management during maintenance and repair of aviation systems based on historical data on hidden defects at all stages of its life cycle (supervisor - professor I.Kabaškins)
- Modelling of maintenance management processes in the ecosystem of aircraft operation using prediction in its technical condition at various stages of the life cycle (supervisor - I.Kabaškins)

- A linguistic analysis of innovation project proposals in the context of the air transport industry management (supervisors – professor Y. Stukalina, associate professor D. Pavlyuk, etc.).

TTI doctoral students, who are mainly representatives of the aviation industry, middle and senior managers, actively participate in the development of study programs, teach and disseminate knowledge. For example, the study course *Digital Technologies in Aviation* of the study program *Aviation Engineering* has been codeveloped and taught by Pivovarov Maksim, who is a TTI doctoral student and head of the IT department of *S7 Technics*, and who has worked on this course with his supervisor professor B. Mišņevs.

During the last 6 years, doctoral theses on the following aviation research topics have been defended:

1. Sergey Yunusov, *Improving Models and Techniques for Diagnosis of the Engine Flow Aspect of the Gas Turbine in Monitoring Systems of Aircraft Propulsion Equipment*, 2014
2. Jörg Kundler, *The Methodology of Maintenance and Technical Service Model Development for Air Traffic Control Service Providers*, 2014
3. Dmitry Pavlyuk, *Study of European Airports' Efficiency on The Basis of Spatial Stochastic Frontier Analysis*, 2015
4. Marina Rebezova, *Logistics and Optimization of Ancillary Aviation Services on Air Transport*, 2017
5. Iyad Alomar, *Alternative Control Methods for the Movement of Land Vehicles at Airports*, 2019.

S. Yunusov, I. Alomar and D. Pavlyuk teach in the program *Aviation Engineering*.

Appendix 13. List of projects involving the Faculty members as leaders or participants of projects.

As part of the ERASMUS+ KA2 *Spread Your Wings* 2017-1-PL01-KA203-038782 (professor J. Stukalina) project, TTI has developed an innovative course *Development of Sustainable Aviation* (2CP), including multimedia teaching materials.

The goal of the COST action project 15221 *Advancing Effective Institutional Models Towards Cohesive Teaching, Learning, Research, and Writing Development* – to improve the centralised support model of the Institution's main academic and educational work directions. Within this project, prof. J. Stukalina visited Masaryk University in Brno (Czech Republic) in 2018 with a scientific mission. The outcome of the scientific mission included a presentation at the RelStat-2018 conference, and a scientific article and seminar for the academic staff of the faculties. As part of the project, O. Zervina, who is a lecturer and PhD student at the TTI, completed a training course in a summer school at the *Goethe-Universität Frankfurt am Main* in 2019.

COST Action TU1306: *Fostering Knowledge about the Relationship between Information and Communication Technologies and Public Spaces* supported by strategies to improve their use and attractiveness (CYBERPARKS), supervisor prof. I. Jackiva. The Action's main objective is to create a research platform for developing a relationship between Information and Communication Technologies (ICT) and the production of public open spaces, and their relevance to sustainable urban development. An outcome of the project was the establishment of long-term cooperation with an important partner in Spain – *DeustoTech*. Within the framework of this project, in 2017, a guest researcher in AI from *DeustoTech* worked at TTI for 3 months, which was followed by *DeustoTech* professors' exchange visit to TTI which was marked by their guest lectures on BigData, Machine Learning and AI. Subsequently, TTI professor I. Jackiva and associate professor D. Pavlyuk read guest lectures in Spain.

COST Action CA16222: *Wider Impacts and Scenario Evaluation of Autonomous and Connected Transport*, supervisor prof. I. Jackiva. The focus of this COST action is on future mobility trends and impact on travel patterns, such as car sharing, travel time or choice of residence, and other

important issues to be explored in different deployment scenarios as well as social, ethical, institutional and business implications.

Within the framework of this project and RelStat annual conference, in 2019, TTI organized a seminar which provided the TTI academic and research staff and students with the opportunity to attend talks of well-known European scientists, including a presentation *An Overview of ACT Training and Education* of OF.DR. BERT VAN WEE, professor in transport policy at Delft University of Technology, the Netherlands scientific director of TRAIL Research School, and a presentation *Germany Paradigm Changes In Mobility: What Do We Know And How Is The Future Looking Like* of UNIV.-PROF. DR. CONSTANTINOS ANTONIOU, full professor, chair holder of the Department of Civil, Geo and Environmental Engineering, chair of Transportation Systems Engineering at Technical University of Munich, etc. (available at <http://relstat2019.tsi.lv/>).

Academic staff conduct applied research in collaboration with industry representatives and industry organizations.

Traffic Impact Assessment for Development Scenarios at Riga Airport, 05/07/2018 – 06/09/2018, professor I. Jackiva, Dr.sc.ing.. The project was implemented by an order of *Riga International Airport*. The aim of the project is to perform modeling and analysis of infrastructure load in the registration and security control area of Riga Airport during peak hours. The project was multidisciplinary, involving aviation and computer science specialists. The modeling was performed using the specialized *PTV Vissim* software, a special traffic flow modeling software package developed by *PTV Planung Transport Verkehr, AG* and included in the TTI R&D infrastructure. The results of the project, which were transferred to Riga International Airport, helped to analyze the actual load on specific airport infrastructure and to forecast load changes, providing the possibility to use the obtained data in long-term infrastructure development and sustainability development plans.

Development of the digital management system for aircraft maintenance and repair inspection *MIRROR*, 2018 - 2019, supervisor, professor M. Savrasov, Dr.sc.ing., Vice Rector. The project was commissioned by *S7 AirSpace Corporation* and implemented in collaboration with it. The aim of the project was to develop an innovation data management system for aircraft maintenance and repair. The project implemented such innovations as the use of augmented reality for information visualization, digitization of processes and operations in aviation, etc. The project was multidisciplinary and involved the TTI scientific staff of various specialization, including including aviation lecturers, who solved the following tasks: analysis of existing information management solutions in MRO organizations; development of the main technical and technological processes in information generation and exchange; development of recommendations for a standard data format for designing the system of aircrafts *Airbus A320-200*; *Airbus A320-neo*; *Boeing 737-800* during maintenance, etc.

Such and similar projects allow TTI to gain unique experience in implementing multidisciplinary projects to solve current business problems, while research staff, faculty students and academic staff, by participating in relevant projects and research activities, exchange knowledge, gain in-depth understanding of various TTI research priority areas and specialization.

Industrial Research for the Development of a Firefighting Complex, 2019 -2020, assistant professor Sergey Yunusov. Students were involved in the project, which is why a more detailed description is provided in Section 4.5.

In addition to participating in research consortia for implementation of projects and preparing project program applications, TTI research staff also develop their own initiatives and act as leaders in the preparation of applications by forming new consortia. *Drone Information Data Processing for*

Safe Operations and Dispatch in Aerospace (ORIENTER, H2020-SESAR-2016-1program): TTI (coordinator); LAGOLION, Ltd., Israel; ESC Aerospace, s.r.o., commercial center Data Group (Dati Grupa), LTD, State Enterprise ORO NAVIGACIJA, Air Navigation Service Provider of Lithuania. The aim of the ORIENTER project is to develop the concept of an information management system that would implement the effective use of the principles of centralized operation and transmission of drones.

There are some projects that are submitted but not yet approved for the collaborative program of the Ministry of Education and Science of the Republic of Latvia and the State Committee for Science and Technology of the Republic of Belarus:

Development of an Intelligent Location System for Unmanned Aircraft Vehicles (UAV) Based on In-flight Optical Terrain Images. The aim of the project is to create a system that will increase the sustainability of UAV operations in industries and areas where the availability of the stable satellite navigation signal may be difficult and/or the on-board navigation system needs adjustments by developing an intelligent UAS positioning system based on in-flight optical image.

Development of an Information Support System for the Life Cycle Costs of Small Unmanned Aircraft Systems (UAS). The project will develop a modern Product Life Management (PLM) concept for the management of small UAS life cycle costs of innovative companies. This will include the development of appropriate mathematical models and an information model for estimating the value of a small UAS life cycle, which are basically codifiers and their scope, collecting and analysing information on estimating the value of a UAS life cycle. An experimental system model will be developed.

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.

TTI implements student and staff mobility activities. As of today, TTI has concluded the following agreements with foreign scientific institutions (Table 19).

Table 19. Cooperation agreements with foreign scientific institutions

Organisation	Type of collaboration	Period (from - to) / permanently	Field of science	Outputs and outcomes of the collaboration ¹
University of the West of England Bristol	Strategic Partnership Agreement	permanently	Civil Engineering	<ul style="list-style-type: none"> · Shared research activities · Double-degree

<p>Otto-von-Guericke University of Magdeburg (Germany)</p>	<ul style="list-style-type: none"> · Collaboration Agreement for joint scientific and academic activities and Erasmus mobility · Wide set of research and academic collaborations · Joint PhD workshop organization 	<p>permanently</p>	<p>Civil Engineering</p>	<ul style="list-style-type: none"> · 2 TSI PhD reviews · Collaboration in Conference and workshop organizations (5 for period) · Joint research projects · SCI-BI project · Key joint publications (more than 10)
<p>The University of Thessaly (Greece)</p>	<ul style="list-style-type: none"> · Collaboration Agreement for joint scientific and academic activities · Wide set of research and academic collaborations 	<p>2014-present</p>	<p>Civil Engineering</p>	<ul style="list-style-type: none"> · 4 Submitted project proposals (H2020) · Alliance H2020 Project · COST Actions · Researcher trainings (Two-sided STSE) · Key Joint publications (15 for 2016-2018) · New Course in PhD and MSc programs · Joint supervision of PhD students · 2 Joint Summer Schools in Riga for PhD and graduate students (2017, 2018) · Joint Vocational training schools in Greece for PhD and graduate students (2016-2018)
<p>University of Deusto (Spain)</p>	<ul style="list-style-type: none"> · Collaboration Agreement: ERASMUS program for Msc and PhD students, professors mobilities 	<p>2016-present</p>	<p>Computer and information sciences; Civil Engineering</p>	<ul style="list-style-type: none"> · 2 Invited Professors from Deusto took part in TSI PhD and MSc programmes · Incoming\Outcoming visiting researchers and professors

Tallinn University of Technology (Estonia)	<ul style="list-style-type: none"> · Collaboration Agreement for joint scientific and academic activities; · Joint project collaboration · Joint PhD workshop organization 	permanently	Civil Engineering	<ul style="list-style-type: none"> · EDU-Rail Project (transport sector) · SmartLog Project (logistic & transportation) · SCI_BI project · Participation TSI hosted Conferences (more than 25 presentations)
Vilnius Gediminas Technical University (VGTU) (Lithuania)	<ul style="list-style-type: none"> · Research and academic collaboration · Joint PhD workshop organization 	permanently	Civil Engineering	<ul style="list-style-type: none"> · Mutual Conference Participation · Guest editing for TSI hosted Conference Proceedings · SCi-Bi project and Workshop · PhD STSE (3 visits) · TSI professors participated as reviewers for VGTU PhD
Keio University (Japan)	<ul style="list-style-type: none"> · Visiting research · Collaboration for joint scientific and academic activities 	permanently	Civil Engineering	<ul style="list-style-type: none"> · TSI - KEIO Joint Research Workshop organization in Riga (e.g. Drones topic) · Support in Postdoc Proposal · Conference participation · Project Integrated Model for Energy Generation, Distribution and Management
University of Murcia (Spain)	Researcher and academic mobility	permanently	Civil Engineering	<ul style="list-style-type: none"> · iSecret project · joint project proposals
Kaunas Technological University (Lithuania)	<ul style="list-style-type: none"> · Researcher and academic mobility · Conference participation 	permanently	Civil Engineering	iSecret project

University of Economy in Bydgoszcz (Poland)	Joint Project (iSecret)	permanently	Civil Engineering	iSecret project
Wroclaw University of Technology (Poland)	<ul style="list-style-type: none"> · Scientific and academic activities · Mobility-program activities · Cross-participation in conferences 	permanently	Civil Engineering	Erasmus+ Program
Kyiv National Economic University named after Vadym Hetman; Department of Strategic Management (Ukraine)	TSI participation in organizing committee of the International scientific-practical conference	permanently	Civil Engineering	Scientific conferences
University of Economics and Innovation (WSEI-Lublin) (Poland)	Researcher and academic mobility	permanently	Civil Engineering	Mutual research visits (4)
St. Petersburg State University of Civil Aviation (Russia)	<ul style="list-style-type: none"> · Scientific and academic activities 	permanently	Civil Engineering	<ul style="list-style-type: none"> · Key joint publications · Textbook publishing
Wyższa Szkoła Informatyki i Zarządzania z siedzibą w Rzeszowie, eng. University of Information Technology and Management in Rzeszow, Poland	<ul style="list-style-type: none"> · Joint Project (SYW) · Researcher and academic mobility 	from 2016	Civil Engineering	<ul style="list-style-type: none"> · innovative course „Development of Sustainable Aviation” · Research activities
Kazimiero Simonavičiaus Universitetas, Lithuania	<ul style="list-style-type: none"> · Joint Project (SYW) · Researcher and academic mobility 	from 2016	Civil Engineering	<ul style="list-style-type: none"> · innovative course „Development of Sustainable Aviation” · Research activities

Академия Гражданской авиации. Казахстан	<ul style="list-style-type: none"> · Researcher and academic mobility 	from 2010	Civil Engineering	<ul style="list-style-type: none"> · PhD STSE · TSI professors participated as reviewers and members of PhD council
Samara State Technical University (Russia)	<ul style="list-style-type: none"> · Scientific and academic activities 	permanently	Civil Engineering	<ul style="list-style-type: none"> · Organizing committee of the International scientific and applied conference
PUBLIC RESEARCH INSTITUTES				
Fraunhofer Society (Germany)	<ul style="list-style-type: none"> · Collaboration Agreement for joint scientific and academic activities · Wide set of research and academic collaborations · PhD programme collaboration (PhD reviews; double supervisions etc.): · Conference and workshop organizations · Research projects 	permanently	Civil Engineering	<ul style="list-style-type: none"> · Prof. Michael Schenk, Director of Fraunhofer Institute for Factory Operation and Automation IFF (Fraunhofer-Institut für Fabrikbetrieb- und automatisierung, Magdeburg, Germany) is Member in TSI Research Advisory Board · 2 Submitted project proposals (ERASMUS KA2) · Joint Alliance H2020 Project · SCI-BI project · Key joint publications · 8 Short Time Scientific Exchanges (STSE) · Joint PhD workshop organization (in Germany, in Latvia) · Scientific Workshop "Industry 4.0"

Transport Research Centre Polytechnic University of Madrid (UPM) (Spain)	<ul style="list-style-type: none"> · Scientific and academic activities · Joint Project proposals Horizon 2020 program · Cooperation through ECTRI activities 	permanently	Civil Engineering	<ul style="list-style-type: none"> · Prof. Andrés Monzon, Transport Research Centre Director is Member in TSI Research Advisory Board · Prof. Andrés Monzon participated twice as plenary speaker in annual RelStat Conferences · PhD from UPM visited TSI for 4 months as invited researcher · 3 joint H2020 project proposals · Adoption and use of new technologies or new approaches · KIC proposal preparation.
DeustoTech (Spain)	<ul style="list-style-type: none"> · Scientific and academic activities · Cooperation within ECTRI activities 	2016-2018	Civil Engineering	<ul style="list-style-type: none"> · Participation in COST Action 1306 · Postdoc from DeustoTech visited TSI for 4 months as invited researcher · Joint Proposal for Teaming program
Transport Research Centre (CDV) (Czech Republic)	<ul style="list-style-type: none"> · Cooperation agreement · Cooperation within ECTRI activities 	2016-present	Civil Engineering	1 Submitted project proposal (H2020)
The Centre for Research & Technology, Hellas (Greece)	<p>Joint project proposals for the Horizon 2020 program</p> <p>Cooperation through ECTRI activities</p>	permanently	Civil Engineering	4 Submitted project proposals (H2020)

Most of these partners are actively involved in research. TTI has prepared several proposals under the ERASMUS+ program.

By participating in joint projects within the framework of the EU funded programs, the study

program lecturers have the opportunity to gain new knowledges and skills, create and develop innovative and scientific ideas and find their potential applications, as well as promote the transfer of knowledge and experience from foreign partners for developing TTI research ideas in Latvia.

The participation of the academic staff involved in the implementation of the study direction is provided in Appendix 13.

Future plans for the development of international cooperation in research:

- Publications of lecturers involved in the study direction in internationally reviewed editions
- Participation in international scientific conferences
- Participation in the implementation of activities of international projects enhancing the internationalisation and international competitiveness of higher education
- Activities to support international mobility and cross-border cooperation. Concluding agreements within the Erasmus+ program for the implementation of international activities in higher education
- Ensuring the scientific and professional development of academic staff and exchange of international experience within the EU Erasmus+ funding. Compilation of examples of good practices
- Integration of engineering, IT and social sciences study directions to provide higher added value and competitive education service using human and infrastructure TTI resources
- To develop new directions for innovations, scientific and applied research and to enhance study programs:
 - Digitalization in aviation
 - Unmanned aircraft systems
- Strategic partnerships with Latvian universities, scientific institutions and the business sector for the development of study process management
- Cooperation agreements for the improvement of the study program in accordance with the demands of the labour market
- Collaboration with employers, entrepreneurs, company managers and industry professionals for commercialization of research outputs
- In cooperation with employers and industry associations, developing lifelong learning in compliance with the market demands and individual interests and needs.

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 direction by providing examples and the summary of the quantitative data on the activities in the field of scientific research and/or artistic creation relevant to the study direction over the reporting period, for instance, the publications, participation in conferences, activities in the field of artistic creation, participation in projects by the academic staff members, etc., by listing the aforementioned according to the relevance.

Research activities of the academic staff are mainly related to the specialisation of lecturers within the program, specifically, with lectures that they teach. The research carried out by the academic staff is an important contribution both to the development of their representative field and to the

development of the study program and study content. Through research, lecturers bring the most up-to-date findings in their courses. The academic staff prepare scientific articles, participate in conferences and workshops, develop textbooks and methodological materials.

Five members of the academic staff participating in the implementation of the study program are experts of the Latvian Council of Science – professors Igor Kabashkin, Irina Jackiva, Alexander Grakovsky and associate professor Dmitry Pavlyuk (Construction and Transport Engineering) and Yulia Stukalina (Social Sciences - Economics and Business).

In order to systematise the publications of TTI lecturers, an open software integrated registration system of TTI lecturers' publications has been developed. The system is developed on the basis of web technologies that provide access to system resources through the Internet. Its task is to store data on publications of lecturers of the Transport and Telecommunication Institute in a structured way. The resource is available at: <http://research.tsi.lv/>.

Appendix 14. List of scientific publications of the academic staff implementing the study direction for the reference period.

Members of the academic staff actively participate in research in accordance with their specialisation by engaging in scientific and practical projects that strengthen their scientific capacity.

The procedure for the management of scientific projects is stipulated in the Project Management Regulations. It consists of 4 phases: (1) the initial phase, during which the initiative application for the preparation of the project application is created, (2) the project initiation phase according to the established plan, (3) the project implementation phase, including the execution of activities as well as control, monitoring and correction of activities, and (4) the project closure phase.

The information on the academic staff involved in the implementation of the study direction is provided in Appendix 13.

The teaching staff are members of the editorial boards of local and international journals and other publications:

Profesors I. Kabaškins is a co-editor and member of the international editorial board of the scientific journal *Journal of Air Transportation*, USA, University of Nebraska at Omaha; chief editor of two scientific journals *Transport and Telecommunication*, Latvia, and *Research and Technology – Step into the Future*, Latvia; member of editorial boards of the following scientific journals: *Transport*, Lithuanian Academy of Science, Lithuania, *Technological and Economic Development*, Vilnius Gediminas Technical University, Lithuania, *Sustainable Spatial Development*, Riga Technical University, *Journal of Aviation Technology and Engineering*, Purdue University, USA, *Baltic Journal of Modern Computing*, Estonia-Latvia-Lithuania, *Regional Review*, University of Daugavpils, Latvia, etc.

Professor I. Jackiva is the editor-in-chief of the journal *Research and Technology – Step into the Future* (TTI). Professor I. Jackiva is also a member of the editorial board of several international journals: *Transport* (ISSN 1392-1533); Lithuanian Academy of Science (WoS, SCOPUS), *Maintenance and Reliability*, Polish Maintenance Society, Poland, (SCOPUS), *Transport and Telecommunication* (TTI, Latvia) (SCOPUS), *Economics of Development*, Kharkiv National University of Economics (Ukraine), *Mathematics in Engineering, Science and Aerospace* (ISSN: 2041-3165 (print) 2041-3173 (online)), *Sustainable Development of Transport and Logistics* (ISSN2520-2979); and a guest editor of *Lecture Notes in Networks and Systems*, volumes (2019, 2020, 2021), Springer, *Lecture Notes in Intelligent Transportation and Infrastructure* (2019), *TRANSBALTICA XI: Transportation Science and Technology*, Proceedings of the International Conference TRANSBALTICA, May 2-3, 2019, Vilnius,

Lithuania, etc. Professor I. Jackiva was a guest editor of the book *Advances in Air Traffic Engineering* (<https://link.springer.com/book/10.1007%2F978-3-030-70924-2>).

Yet more professors are on the editorial boards of various journals, for example, professor Y. Stukalina is on the editorial board of the international scientific journal *Business, Management and Education* (Vilnius Gediminas Technical University, Lithuania).

Research activities of the academic staff and students are facilitated by international scientific conferences, methodological conferences and forums organised by TTI, the main ones being:

- The international conference *Reliability and Statistics in Transportation and Communications* (RelStat) has been organized by TTI for 20 years. The aim of the conference is to provide an international forum for scientists and professionals in academia, industry and government to focus on the latest research findings, present and discuss their ideas, theories, technologies, systems, tools, applications, work progress and experience in all theoretical and practical issues emerging in transport, information and communication technologies. For the fourth year in a row, selected articles from the RelStat conference have been published in the conference special edition, Springer Lecture Notes in Networks and Systems (indexed by SCOPUS) (available at: https://tsi.lv/wp-content/uploads/2020/10/relstat-2020_abstracts_v3.pdf).
- The student scientific conference *Science and Technology – A Step into the Future* (RaTSiF) takes place twice a year. The aim of the conference is to bring together young researchers from TTI and other higher education institutions, based on common interdisciplinary research interests, with the aim of achieving new and high-quality outputs, addressing existing and future challenges. The conference provides an opportunity for young researchers to participate in an interdisciplinary scientific conference and collaborate with experienced scientists (available at: <https://tsi.lv/research/publications/research-journals/research-and-technology-step-into-the-future-scientific-research-journal-on-line-editions/>).
- International scientific and methodological conference *Actual Problems of Education* (2003-2019)
- On 21 May 2020, the scientific conference of the *Riga Aviation Forum (RAF)* took place for the first time. The conference organizers, in cooperation with its main supporter *airBaltic*, raised the issues of sustainable aviation development as the guiding principle of the conference. *The Latvian Aviation Association* in cooperation with the Transport and Telecommunication Institute and other scientific organizations, undertook to promote the development of innovative research in Latvian aviation by organizing an annual scientific conference dedicated to the aviation industry. The best papers were published in the *Aviation Journal of Vilnius Gediminas University*, which is indexed in international scientific databases, such as SCOPUS, WoS and others.
- On 11 December 2020, TTI organized an online discussion *Aviation: New Realities*, in which experts spoke about new challenges in aviation and answered questions about the development prospects in aviation, the need and benefits of training in this field. The discussion topics included airport operations and requirements for training of aviation specialists. The participants of the discussion represented *Riga Airport, Latvian Aviation Association, Airline Support Baltic, Odessa International Airport, ПИВЦ-Пулково*.

TTI publishes the following internationally cited journals:

- *Transport and Telecommunication* is the TTI indexed and peer-reviewed scientific research journal, ISSN 1407-6160, ISSN 1407-6179. Articles published in the journal *Transport and Telecommunication* include are included in the following databases: SCOPUS (from 2008, Vol.

9, No. 1), Elsevier Database; Web of Science - Emerging Sources Citation Index, Engineering Village, De Gruyter Open; The Summon; Transportation Research Board; ProQuest; ProQuest Engineering Journals; ProQuest Illustrata: Technology; ProQuest SciTech Journals; ProQuest Technology Journals; CNKI Scholar (China National Knowledge Infrastructure); EBSCO Discovery Service; Google Scholar; Primo Central (ExLibris); SCImago (SJR), and many other scientific databases.

- Research and Technology - Step into the Future (ISSN 1691-2853) (journal for young researchers)

Scientific activities of the TTI academic staff are financed both from the revenue of the Institute and by raising funds from different funds by applying and participating in various projects.

Research carried out by academic staff ensures the transfer of knowledge from scientific research to the educational and administrative field, thus enhancing the quality of studies. In order to promote research activities, an effective motivation system has been implemented at the Institute. Specifically, scientific research of the academic staff is included as an assessment component in the annual evaluation of the academic staff. During this assessment, the quality of work outcomes of the academic staff is evaluated by determining the performance quality coefficient. Scientific qualification is evaluated according to the following criteria: publications included in the quoted databases Web of Science (WoS), SCOPUS, publications in other international peer-reviewed publications, other publications, presentations at TTI conferences, another international scientific conference with the publication of an article, abstract or presentation, the Latvian Council of Science expert status, patent application, participation in the preparation or realization of project applications of different levels.

The obtained assessment outcomes are used to stimulate the academic staff to attain better results, including the involvement of the academic staff in scientific research. Each year, the assessment criteria are reviewed and, if necessary, adjusted to reflect the priorities set for academic and research activities of the Institute.

Other measures used at TTI to develop research activities and boost the participation of the academic staff in them are the following:

1. In order to increase the number of scientific publications of the academic staff in internationally cited databases, the remuneration policy of the TTI academic staff includes a separate payment for:
 1. the publication in a scientific journal included in the quoted databases WoS, SCOPUS and included in the first quartile of international rankings of journals Q1 ***,
 2. the publication in a scientific journal included in the quoted databases WoS, SCOPUS ***,
 3. the publication in a scientific journal included in the quoted databases ERIH, Engineering Village2, EBSCO ***.
2. Research activities of the academic staff are facilitated by the opportunity to participate in conferences organized by TTI, which offers to the TTI lecturers a significant fee discount. These conferences are the international conference Reliability and Statistics in Transportation and Communication and the international scientific and pedagogical conference Actual Problems of Education. The TTI academic staff also have an opportunity to participate in international scientific conferences and seminars organized by the TTI partners in Latvia and abroad.
3. TTI publishes the scientific journal Transport and Telecommunication, indexed in more than 35 bibliographic databases. It is a good opportunity for the academic staff to share their research findings with the readership of the journal.

4. TTI organizes special seminars and science weeks, which are attended by outstanding Latvian and foreign scientists and which encourage the participation of the TTI academic staff.
5. TTI implements the international mobility program for the academic staff, including the Erasmus + program, which offers opportunities to visit foreign universities, to acquire new teaching methods and to share experience.
6. TTI participates in the implementation of international projects and engages its academic staff in these projects considering the scientific and professional interests of the academic staff. This provides opportunities for the academic staff to acquire new knowledge and skills, to develop innovative scientific ideas and to find practical application for them. This also facilitates the transfer of knowledge and best practices of foreign partners.
7. TTI has been developing research infrastructure as well as material and technical basis for conducting scientific research.
8. As intangible motivation, TTI uses awards and honorary diplomas that are awarded during the annual celebration of the TTI Day on September 6. They are awarded to the best young scientists for the contribution to the development of innovative methods and technologies, student's involvement in scientific activities, implementation of scientific results, high scientific productivity (publications), development of interdisciplinary approaches, etc. In 2018, two top doctoral students were paid to attend a conference.

Such scientific policy, implemented at the Institute, is effective and encourages the engagement of the academic staff in scientific research.

4.5. Specify how the involvement of the students in scientific 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 direction in scientific research and/or artistic creation activities by giving examples of the opportunities offered to and used by the students.

The involvement of students in research projects during the implementation of the study program is achieved by the development of the coursework and final tests included in the study courses. Students are engaged in research to acquire new and useful knowledge, professional skills, competences and to build bridges between knowledge and practice. The themes of students' research activities are topical and related to different branches of the national economy.

In 2020, a student of the program Aviation Engineering, whose supervisor was S. Yunusov, participated and won an award in the international competition of young researchers *TRA VISION 2020*.

Additionally, the engagement of Bachelor's students in aviation research is ensured by the following activities: their involvement in research and applied projects, events related to innovation development and knowledge transfer (Innovation & Knowledge Transfer), and in scientific events, such as conferences, seminars and workshops.

Students' participation in TTI projects ensures the development of additional competences and skills: application of the acquired knowledge in practice, research activities, analysis, experimental work skills. The involvement of students proceeds at all stages of the project - from the development of the idea and project application to the implementation of the project activities and the use of the project outcomes. The structural unit responsible for disseminating information on

opportunities to participate in research is the Research Administration Division, which prepares and transmits information on the current and planned research initiatives to the Faculty staff for informing students. The information is also passed on to the TTI Student Self-Government for distribution in the internal student environment.

An example is the project ERASMUS+ KA2 *Spread Your Wings* 2017-1-PL01-KA203-038782 (Professor J. Stukalina), within which an innovative course *Development of Sustainable Aviation* (2 CP) was created (part of which is available on the distance learning platform). The course included the development of multimedia teaching materials. TTI students participated in all stages of the project, specifically, they participated in summer schools of all project partners, the topics of which focused on sustainable development in the aviation sector, airport development, new technologies, employment opportunities and working conditions in air transport, etc. These schools were the following: First International Aviation School (University of Information Technology and Management) from 01 October 2018 to 05 October 2018, Second International Aviation School (Kazimieras Simonavičius University) from 19 November 2018 to 23 November 2018, Third International Aviation School (Transport and Telecommunication Institute) from 14 January 2019 to 18/1/01. Senior year students were directly involved in the development of outputs based on the outcomes of participation in the projects of these summer schools.

Also, students participated in the summer schools organized within the framework of the project *Enhancing Excellence and Innovation Capacity in Sustainable Transport Interchanges (ALLIANCE)* in July 2017 and 2018.

An example of student participation in the development of innovations is a project implemented by TTI in collaboration with companies in the field. The aim of the project was to create an innovative firefighting complex. Within the the voucher project *Carrying out Industrial Research for the Development of a Firefighting Complex* (2019 -2020), the head of which was the assistant professor Sergey Yunusov, Dr.sc.ing., TTI developed an innovative mobile firefighting complex for Jaunslikums.lv, which included the development of an aviation bomb and a technical solution for dropping it to hard-to-reach and dangerous places and objects to increase the efficiency of firefighting and its localization. In addition to the leading lecturers of the program, S.Yunusov, K.Nečvals, the project participants included students. Under the guidance of TTI laboratory scientific staff and leading lecturers, the students performed the following tasks in the project:

1. Using the skills and competences acquired in the courses *Aircraft Design*, *Mechanical Systems Modeling* and *Technical Drawing* students performed design of aviation complex parts and components in the CAD environment, developing aircraft body, stabilization and control systems, as well as computer modeling for the placement and fixing of the system on carriers - helicopter.
2. Using the skills and competencies acquired in the course *Aerodynamics and Flight Dynamics*, students performed theoretical calculations to determine the static and dynamic characteristics of the system - flight stability, controllability, balancing, critical aerodynamic properties of the device that affect operational efficiency (range planning and landing accuracy along the trajectory).

Since 2002, TTI has been organising a student scientific conference *Science and Technology - A Step into the Future (RatSif)*, which provides an opportunity for young researchers to participate in an interdisciplinary scientific conference and collaborate with experienced scientists.

The aim of the conference is to bring together young scientists from TTI and other higher education institutions, based on common interdisciplinary research interests, in order to obtain new high-quality outputs, addressing issues that already exist and will arise in the future.

These conferences are held twice a year - in December and April. It is mandatory for students of all academic and professional Master's study programs implemented at TTI to present their theses at this conference. The conference is also open to TTI undergraduate students and new researchers, as well as Ph.D. students and students from other Latvian and foreign universities. For the time being, students of the Bachelor's program *Aviation Engineering* are rarely represented at the conference. Typically, it is one presentation per year initiated by thesis supervisors.

The program of the scientific conference includes lectures of Latvian and foreign scientists delivered at plenary sessions and presentations of other participants in the conference sections (available at: <https://tsi.lv/lv/aizvadita-ikgadeja-konference-ratsif-2021/>).

Bachelor's students together with their supervisors participate in the TTI international conference *Reliability and Statistics in Transportation and Communication (RelStat)*:

- Vorontsov K., Lacane M.A., "ILS Localizer Accuracy Depending on Ground Obstacles Located Nearby"- Reliability and Statistics in Transportation and Communication: Selected Papers from the 20th International Conference on Reliability and Statistics in Transportation and Communication, RelStat'20, 14-17 October 2020, Riga, Latvia
- Gorbunovs A., Lacane M.A., Use of GLS Landing System and Calculation of Possible GBAS Ground Facilities Siting"- Reliability and Statistics in Transportation and Communication: Selected Papers from the 20th International Conference on Reliability and Statistics in Transportation and Communication, RelStat'20, 14-17 October 2020, Riga, Latvia

Students' participation in scientific seminars and workshops provides them with information on the latest developments, trends and challenges in the aviation industry. For example, on 11 May 2018, TTI organized a seminar on the latest equipment for non-destructive testing methods for small components of aviation equipment. The seminar was attended by an expert dealing with non-destructive testing issues. The participants of the seminar included the representatives of *Olympus* (France), State Agency *Civil Aviation Agency*, State Border Guard, cargo airline *RAF-Avia*, aviation spare parts import and export company *KS Avia*. Within the framework of the event, which was attended by the students of the *Aviation Transport* program, there were held a workshop and a seminar which provided students with a unique opportunity to get acquainted with the most up-to-date technical diagnostic systems for aviation equipment. Students were introduced to the working principles of the best diagnostic techniques using non-destructive testing and monitoring methods. They also had an opportunity develop initial skills and abilities to apply the earlier acquired working principles to real cases in aircraft maintenance by participating in following thematic seminars: *Current Application for Aeronautic Inspection, Corrosion Solution for Aircraft Inspection Using the "Roller FORM" system, Current Array Screw and Weld Inspection, Visual Inspection Using Advanced Videoscope with Defect Measurement Capabilities, Aircraft (Airframe and Engine) Application for Boeing & Airbus ECA & Bond Testing, Composite Inspection by BOND MASTER 600 system*.

Every year TTI organizes a *Science Day*, which aims to promote science and research to TTI students and society. The promotion of science in business is also emphasized.

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 study direction subject to the assessment, by giving the respective examples and assessing their impact on the study process.

The Transport and Telecommunication Institute uses innovative solutions in its study process, methodological and scientific activities. The use of distance learning allows the Institute to extend access to students from remote areas and to offer additional opportunities to full-time students provided by distance learning. For example, some sections of the innovative course *Development of Sustainable Aviation* is already available on the distance learning platform.

New approaches are used for training of Master's and doctoral students, taking advantage of the opportunities offered by international research projects.

For two years, in July 2017 and 2018, TTI organized multidisciplinary and multicultural seminars - summer schools - as part of the ALLIANCE project *Enhancing Excellence and Innovation Capacity in Sustainable Transport Interchanges* (<http://alliance-project.eu/>). Each year, 25 postgraduate transportation, logistics and management science students from Latvia, Germany, Greece and Lithuania participated in the summer schools.

Within the framework of the project *Spread Your Wings 2017-1-PL01-KA203-038782*, implemented in cooperation with Polish and Lithuanian partners, international aviation schools were organized in the member states.

- 1-5 October 2018. The international aviation school was held at the University of Information Technology and Management (Rzeszow, Poland). TTI lecturers S. Junusovs and A. Medvedevs as well as Bachelor's students of the program *Aviation Engineering*. The school program included discussions on issues related to the sustainable development of the aviation sector.
- 19-23 November 2018. The second phase of the international aviation school was held at Kazimirs Simanovičs University in Vilnius, Lithuania, in which issues related to the sustainable development of the aviation industry were discussed. The participants included the TTI professor J. Stukalina and the students of the program.
- 23-27 September 2019. The third phase of the international aviation school was implemented at the Transport and Telecommunication Institute. The aviation school was attended by the TTI professor J. Stukalina, S. Yunusov and the students of the program. During the aviation school, students gained knowledge of the environmental impact of aviation and methods to control and reduce aircraft emissions, the role of sustainable aviation fuel (SAF) in mitigating climate change caused by aviation, on employment opportunities and real-life working conditions in air transport, etc.

The aim of the project *Learning with ICT (LEARN IT)* was to develop technologies that will help increase the effectiveness of learning while maintaining a high level of concentration tailored to individual learning rhythms. This project resulted in the creation of a Learning Lab. Students of all levels participated in the project. As part of the distance learning of mathematics at Khan Academy, TTI students took an intensive course in mathematics on solving practical arithmetic, algebra, geometry and trigonometry problems.

The project *Implementation of Software Engineering Competence Remote Evaluation for Master's Program Graduates (iSecret)* resulted in an effective experimental framework for defining and evaluating learning outcomes in Master's degree programs in ICT, which were used by TTI lecturers to develop their competences.

TTI uses an innovative method of organising joint seminars - guest lectures for TTI Faculty staff and business representatives, such as guest lectures by Rigas Doganis on Future Perspectives and Challenges for Global Aviation Development for TTI staff and representatives of *Riga International Airport*, *Liepaja Airport* and other companies, or an open seminar series on *Science for Business*.

The academic and scientific staff working in aviation jointly developed the UL/RPAS remote pilot/operator training. The course combines theoretical and practical aspects designed to teach

how to operate the most innovative unmanned systems in the industry (DJI). When developing the course, recommendations and regulations of the *Latvian Civil Aviation Agency*, demands of the industry and the European Union recommendations for the development of unmanned systems were considered.

The Transport and Telecommunication Institute is one of the partners of the enterprise *Aviation Research Center*, which works on the provision of services for testing of aviation units and development of research infrastructure at *Riga International Airport*. Other partners include *Riga International Airport*, *Riga Technical University* and *D and D Center*.

II - Description of the Study Direction (5. Cooperation and Internationalisation)

5.1. Provide the assessment as to how the cooperation with different institutions from Latvia and abroad (higher education institutions/ colleges, employers, employers' organisations, municipalities, non-governmental organisations, scientific institutes, etc.) within the study direction contributes to the achievement of the aims and learning outcomes of the study direction. Specify the criteria by which the cooperation partners suitable for the study direction 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 employers.

The aim of the study direction is closely related to the involvement of cooperation partners. Without cooperation partners there would be no sustainable development of the study direction, there would be no student training consistent with the requirements of the labor market.

The main criteria for initiating cooperation are the following: the reputation of the partner, compliance with the specifics of the industry, the common scientific and research interests of teaching staff and the benefits of all cooperation partners. The choice of cooperation partners of employers is determined by the demand of organizations for specialists in the relevant field. These are public and private organizations, various institutions and companies in Latvia and abroad.

TTI organizes cooperation with employers and professional organizations. Cooperation agreements with the following companies have been signed: *SmartLynx Airlines*, *Riga International Airport*, *Latvian Air Traffic*, *Havas Latvia*, *Airline Support Baltic*, *Eriva*, *Flight Consulting Group*, *UAV Factory*, *Airline Support Baltic*, *Atlas Aerospace*, *RAF-AVIA*, *GM Helicopters*, *Wing4Sky*, *Latvian State Border Guard*, etc.

Appendix 15. Signed cooperation agreements with other institutions.

The key areas of cooperation are as follows:

1. Cooperation with employers and their organisations at the level of the Faculty Council and the Study Direction Council, ensuring involvement in the improvement of study directions and programs. For example, employers are involved in the Engineering Faculty Council and the Study Direction Council (see Section 1.4 and Appendix 8).
2. Employers' representatives are included in the State Examination Commissions. Although the relevant regulations of the Cabinet of Ministers on the standard of academic education do not require mandatory involvement of industry and professional organizations or employers'

representatives in such commissions, as it is the case in professional programs, the Final Examination Commission of the *Aviation Engineering* program also includes employers. From 2016 to 2018, the chairman of the Commission was Ilya Podkolzins, accountable manager of *Airlines Support Baltic*. From the academic year 2020/2021, the chairman of the Commission is Alexandre Degtiar, production manager of *Airline Support Baltic*. One of the members of the commission is Jevgenijs Prostaks, technicians schedule compliance supervisor of

3. Employers are involved in delivering guest lectures. This is accomplished centrally by inviting specialists of the field to teach professional study courses and by organizing specific guest lectures of companies. The following guest lectures for students of the study direction took place during the academic year 2019-2020:
 - *Drones, Aviation, Career Opportunities* by Jevgenijs Šņikovs, head of the unmanned aircraft department of UAV Factory
 - *Operational Activities at the Airport* by the operations director and station manager of HAVAS Latvia
 - *Cyber Attacks in the Transport Sector (from Fantasy to Reality)* by Rolands Bruģis, information security manager of Riga International Airport and Sanita Šaitere, personnel project manager of Riga International Airport
 - *Get to Know Drones* by a representative of AV Factory,
4. Specialists of leading companies in the industry are invited to teach specific professional courses in the study program. Not only does this measure provide students with the acquisition of practical knowledge necessary in the field, it also helps to promote opportunities for cooperation with the Institute.

In the academic year 2018/2019, the course *Aviation Engine Construction* (6 CP) was taught by Alexandre Degtiar, production manager of *Airline Support Baltic*.

Currently, the study course *Fundamentals of Aviation Business* is taught by Saveljevs, member of the board and commercial director of *Riga International Airport*, who has a Master's degree in Airport Planning and Management from Cranfield University in Great Britain. By continuing to closely cooperate with this university, he also contributes to the promotion of TTI. Thanks to this collaboration, TTI has the opportunity to consult with Romano Pagliari, Lead Professor in Airport Planning and Management (MSc) of the University of Crenfield, who is one of the top experts in aviation management. In the spring semester of 2020, Romano Pagliari, as a guest lecturer, taught the course *Airport Management*.

5. Within the framework of the study course of the program *Introduction to Specialty*, study excursions to the leading companies of the industry, such as *Riga International airport, Airline support Baltica*, etc., are organized for the first year students.
6. Cooperation with professional associations such as the *Latvian Aviation Association, ECTRI, Latvian Transport and Education Association*, Participation in working groups organized by ministries (for example, a working group of experts for developing professional standards)
7. Collaboration with employers ensures that the employees of corporate clients are eligible for a discount on the tuition fees in the TTI study programs.
8. The academic staff of the Institute provide consultations and professional training in cooperation with companies, including those in the field of aviation.
 - In the spring of 2019, the employees of *Riga International Airport* were taught a study course of 36 academic hours on intercultural communication *Journey into the Unknown or Crossing Borders*
 - The heads of branches, directions and divisions of the *Siberia Airlines* were provided with consultations and training in the amount of 20 and 24 academic hours on such issues as the

manager's competences, leadership, stress resistance, time management, project management, creating an effective team, etc. In 2019, three groups completed the training, whereas in March 2021, one group (20 people). As the work takes place remotely this year, cities are represented throughout Russia, where the Airline's branch managers work.

- TTI aviation lecturers (A. Medvedevs, I. Alomar, M. Lācāne, A. Bulekovs, S. Yunusov, K. Neechvals, etc.), who are basically all doctors of science in their respective field, teach APAC study modules to partner institutions. According to the EASA requirements, third country instructors if they wish to teach modules had to pass the examinations in the relevant EASA Part-66 Modules as Kazakhstan is currently transitioning to the EASA requirements. Under the agreement with the Alma-Ata Academy of Civil Aviation, signed in December 2020, TTI APAC is currently advising their academic staff (14 people) on preparing their future instructors for the exams.
 - In the autumn semester of 2020, training for remote pilots/operators of unmanned aircraft systems (UAS/RPAS) was completed by the NAF (10 people) and the State Police (13 people) employees, but in the spring - by the State Revenue Service (5 people) and the State Police (5 people) personnel.
9. Career days are organised every year to promote cooperation with the employers' organisations, their involvement in the training of future professionals, and to increase the competitiveness of TTI students in the labour market. During these days, presentations are delivered by employers, in which the employers' representatives talk about career opportunities in their organisations and provide practical advice on how to succeed in the labour market. During the last Career Days in October 2020, there was organized a discussion, involving academic staff, students and industry representatives, on the development of the aviation industry, education and career opportunities. In this discussion, employers were represented by *Flight Consulting Group, Riga International Airport, SmartLynx, UAV Factory*.

Cooperation agreements have been signed with the following universities and scientific institutions: Vidzeme University College, Riga Aeronautical Institute, Latvia University of Life Sciences and Technologies, University of the West of England (Bristol, United Kingdom), Belarus State Academy of Aviation (Belarus), Beijing Institute of Technology (China), Tartu Aviation College (Estonia), Aviation University of Georgia (Georgia), Academy of Civil Aviation (Kazakhstan), Saint Petersburg State University of Civil Aviation (Russia), Kazimieras Simonavičius University (Lithuania) and National Aviation University (Ukraine).

There are many forms of collaboration, such as the review of doctoral theses and consultation, joint participation of academic staff and doctoral students in research, conferences and seminars, joint scientific publications, etc.

TTI has its own Promotion Council in Construction and Transport Engineering, which includes the defense of aviation-related doctoral theses. Three members of the study direction are involved in the TTI Council of Professors in Transport Engineering Sciences. Several TTI professors are also involved in the Council of Professors of other universities, for example, Professor Kabaškins is engaged in the Council of Professors of the Information Systems Management University, etc. In cooperation with the School of Business Administration Turība and the BA School of Business and Finance, there has been established a Joint Council of Professors in Economics and Business.

The lecturers and students of TTI and other higher education institutions cooperate in scientific and academic conferences, seminars, preparation of scientific publications.

TTI implements the Erasmus+ mobility program with study programs in other countries. In total, the Institute has signed 40 bilateral cooperation agreements with higher education institutions in 15

countries, including 12 agreements specifically in the field of aviation, which provide students with the opportunity to study at partner universities within the framework of the exchange program and which provide lecturers with the opportunity to go on exchange trips to partner universities to conduct lectures and attend seminars on the latest developments in science.

Partner universities are selected on the basis of the available information on equivalent study programs and the language of study. One of the main conditions is the coordination of study subjects during the student exchange programme, so that the subjects can be recognised and added to the Diploma Supplement of the respective TTI study program. This ensures a fully-fledged study process, complemented by experience abroad.

The signed Erasmus+ collaboration agreements with institutions, which implements similar study programs related to aviation at the Engineering Faculty:

1. Giustino Fortunato Telematic University, Italy
2. Vilnius Gediminas Technical University, Lithuania
3. National Defence University, Poland
4. Silesian University of Technology, Poland
5. University of Žilina, Slovakia
6. Madrid Technical University, Spain
7. The University of Leon, Spain
8. Anadolu University, Turkey
9. Beykoz Vocational School of Logistics, Turkey
10. Istanbul Arel University, Turkey
11. University of Turkish Aeronautical Association, Turkey
12. Erzincan University, Turkey

On the basis of the described above, it can be concluded that the cooperation with the employers, employers' organizations, higher education institutions and scientific institutes implemented within the framework of the study direction ensures the attainment of the aims of the study direction and study outcomes.

5.2. Specify the system or mechanisms, which are used to attract the students and the teaching staff from abroad and provide a description of the dynamics of the number of the attracted students and the teaching staff.

System for attracting foreign students and number of foreign students

According to the TTI Development Strategy, one of the main components of which is the internationalization of the Institute, TTI focuses on wider attraction of quality students, development of international partnership, etc., and purposefully implements the policy of attracting foreign students in the following way:

1. A new strategic partner has been selected to attract applicants from India, Jordan, Vietnam and Turkey - the international company *MSM* (M Square Business Solutions Inc.). The company is a leader in the selection and recruitment of personnel in the these regions and provides quality selection of applicants, their examination and consults applicants on study opportunities and conditions at TTI. Over time, as a result of successful cooperation, the

range of countries covered by this company may expand further.

2. TTI uses services of agents to attract applicants from different countries. TTI has terminated its cooperation with several recruitment agencies, whose applicants had a high drop-out rate after admission, and has stopped concluding new contracts with agents from Pakistan. In 2021, one of the TTI goals is to improve cooperation with agencies from the USSR countries and to find strategic partners representing the TTI market. The number of agencies currently active (excluding countries referred to in paragraph 1) is the following:

Uzbekistan -	22
Kazakhstan -	10
Pakistan -	5
Russia -	3
Ukraine -	3
Azerbaijan -	2
Tajikistan -	2
Sri Lanka -	2
Armenia -	1
Belarus -	1
Kyrgyzstan -	1

3. Participation in international education exhibitions. For example, in 2020, TTI participated in exhibitions in Russia in person, whereas in Kazakhstan and Uzbekistan - online.
4. Seminars for potential students in cooperation with agencies. Such seminars are organized both when visiting foreign countries and online, using modern technologies and various platforms.
5. Digital advertising campaigns on social networks. After evaluating the popularity of social networks in each country, TTI carries out digital advertising campaigns, for example, on distance learning. This type of campaign has great success in Kazakhstan and Russia.
6. PR activities in foreign markets. When visiting foreign countries, TTI uses the opportunity to publish information about the visit, seminars and general information about studies in Latvia and TTI in local media.

TTI pays great attention to the selection and admission of foreign students. Various measures have been taken to attract the most promising students to the Institute and to address the risks associated with illegal immigration. The procedure for admission of applicants has been revised and improved by implementing the criteria for qualitative selection of foreign students for admission to TTI. Foreign applicants wishing to study in undergraduate programs must pass examinations in accordance with the additional admission requirements provided for in the study program. Applicants applying for the program *Aviation Engineering* are required to pass physics and English tests.

The total number and share of foreigners studying in the programs of the study direction *Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery* is given in Figures 14 and 15.

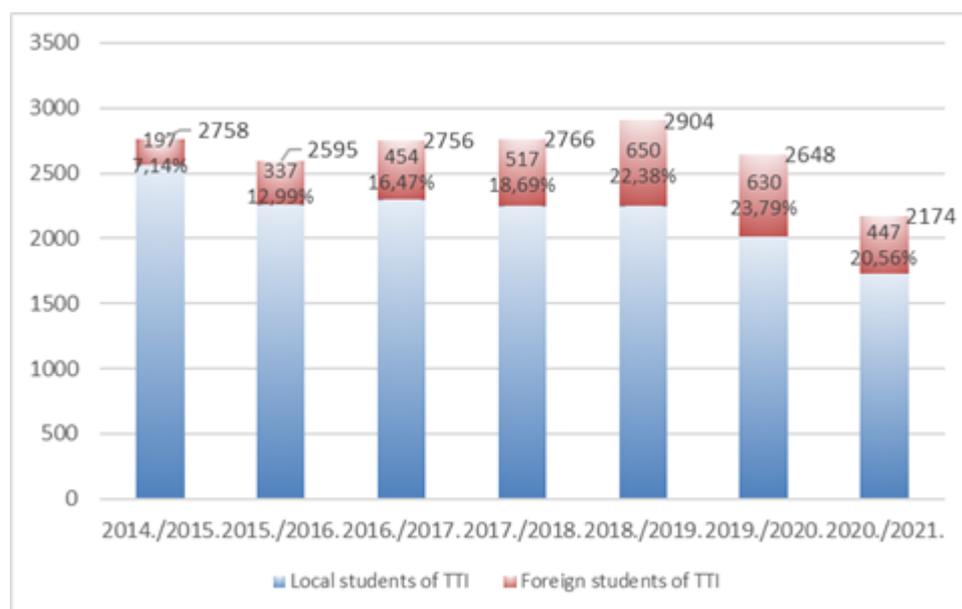


Fig. 14. Number and share of foreign students from the overall number of TTI students

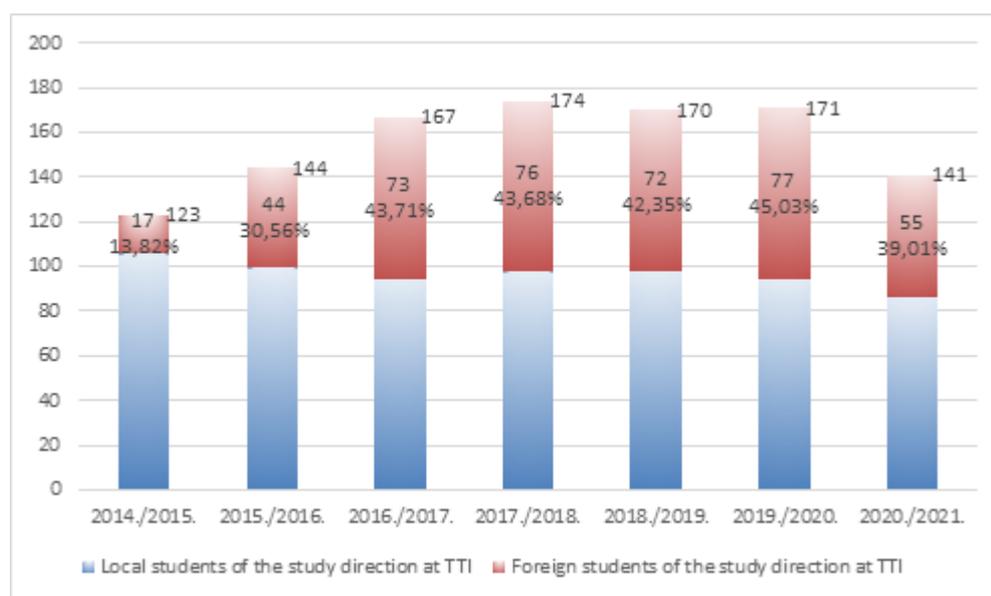


Fig. 15. Number and share of foreign students in the study direction among the students of the program

The share of foreign students in this study direction is higher than at the entire Institute. This indicates a well-implemented marketing policy.

Until now, foreign students were able to study in English and Russian at TTI, and many foreigners, mostly from the former post-Soviet Republics, took the opportunity to study in Russian. However, due to amendments to the Law on Higher Education Institutions, which prohibits higher education institutions from admitting students to studies in Russian, the last intake of students to programs in Russian was in 2019.

The breakdown of foreign students admitted as of September 2020 by country of residence is given in Table 20. For some countries the data of the previous year are provided in brackets for comparison.

Table 20. Breakdown of foreign students by country of residence (as of October 2020)

Home country of a foreign student	Number of students in 2020/2021. (compared to 2019/2020)
India	80 (150)
Uzbekistan	49 (108)
Russian Federation	48 (93)
Kazakhstan	14 (67)
Pakistan	14 (42)
Ukraine	11 (13)
Germany, Republic of Belarus, Lithuania, Tajikistan, Azerbaijan, Turkey, Arab Republic of Egypt, Italy - 6- 3 students	
Algeria, Austria, Belgium, Bulgaria, France, Estonia, Mongolia, Kyrgyzstan, Nigeria, Spain, Sri Lanka, Switzerland - 2- 1 students	

The highest number of students in the study program *Aviation Engineering* is from India and Kazakhstan.

System for attracting foreign teaching staff

For internationalization of activities and increase of competitiveness on the national and international scale, as well as for the enhancement of study quality, TTI attracts foreign teaching staff using own resources and the financial resources of European Structural Funds. Foreign lecturers are invited to give guest lectures or teach study courses in accord with the Erasmus+ cooperation agreements and individual inter-university cooperation agreements. TTI announces recruitment on the European Commission's portal *Euraxess* and uses other types of attracting foreign lecturers, which tend to be various. Foreign lecturers are usually invited to teach specialized and highly professional courses of the program, therefore, while selecting lecturers, the Faculty management gets acquainted with the latest publications in the specific field and establishes cooperation with the authors of specific research.

The human resources policy, including the engagement of foreign lecturers in teaching activities at the Faculty, is implemented in accordance with the development plan of the Engineering Faculty, which envisages a continuous increase in the number of foreign lecturers.

Foreign lecturers have been invited to teach in the program within the framework of the European Social Fund project *Strengthening the Academic Staff of the Transport and Telecommunication Institute in the Areas of Strategic Specialization* (No. 8.2.2.0/18/A/011). In the autumn semester of 2020, the guest lecturer Rathan Babu Athota from India, who is studying for a doctorate in aerospace engineering at the University of Catalonia (Universitat Politècnica de Catalunya), gave online lectures within the study course *Theory of Heat Engines*.

In the spring semester of 2019, Romano Pagliari, a leading lecturer in Airport Planning and Management (MSc) at the University of Crenfield, taught the open course *Airport Management*. Although the course was delivered in the *Aviation Management* program, it was attended by leading lecturers of the Institute as well as students of others programs, including the *Aviation Engineering* program.

5.3. In the event that the study programme entails a traineeship, provide a description of the traineeship options offered to the students, as well as the provision, and work organisation. Specify whether the higher education institution/ college provides assistance in finding traineeships.

Although the state standard of academic education does not provide for internships in academic study programs, the program *Aviation Engineering* includes internships in the amount of 10 CP. The procedure for the organisation of internships in the professional study programs of the Transport and Telecommunication Institute is determined by the *TTI Regulations on the Organisation of Internships at TTI* (see Appendix 18.1), which also describe the parties' engagement in organising the internship and their responsibilities.

The internship is organised in accordance with the study plan and the calendar plan of the internship, in order for students to acquire practical work skills, deepen and strengthen theoretical knowledge, skills and know-how acquired during the study process.

The internship is implemented in accordance with the internship program, developed by the program director and approved by the dean. Appendix 18.2 contains the information on the internship program of the program *Aviation Engineering*.

The provision of internship for the study program is stipulated in the cooperation agreements between TTI and major aviation companies. Specific cooperation agreements have been concluded on the provision of internships for students of the program *Aviation Engineering* with the companies Airline Support Baltic, Wing 4 Sky Group, Riga International Airport (see Appendix 19 on Collaboration Agreements on the Provision of Internships) in accord with which companies' staff act as internship supervisors.

The placement of a student in an internship program is formalised by a Rector's order, prepared by the Study Department and stating the enterprise in which the student is going to have an internship and the terms of the internship.

At the end of the internship, students prepare a report on the internship outcomes, developed in accordance with the *Methodological Guidelines for Internship*, attaching the internship diary to the report. Internship documents are available to students in the TTI e-learning environment *Moodle*.

Students' accomplishments in meeting the goals and completing the tasks of internship as well as the internship report are evaluated by a differentiated test.

Appendix 18. Internship documentation

5.4. In the event that joint study programmes are implemented in the study direction, provide the justification of the creation of the joint study programmes and a description and assessment of the selection of the partnering higher education institutions by including information on the principles and the procedures for the creation and implementation of these joint study programmes. In the event that no joint study programmes are implemented in the study direction, provide a description and assessment of the plans of the higher education institution/ college for the creation of

such study programmes within the study direction.

One of the goals of TTI Strategy is to develop a strong strategic partnership with a British university, thus, improving the quality of study programs and expanding the network of mobility partners and research. Although the partnership with the University of the West of England (UWE) was concluded only in the summer of 2020, the program of Bachelor of Science in Computer Science has already been established and is being implemented as a double degree program. The Master's program *Aviation Management* as a double diploma program is planned to be taught from September 2021. The *Aviation Engineering* program is the next program to be implemented as a double degree program once the international evaluation phase of the program has been completed and accreditation has been obtained with the new program title and improved program content.

II - Description of the Study Direction (6. Implementation of the Recommendations Received During the Previous Assessment Procedures)

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 direction, 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 direction and the relevant study programmes.

The study program was accredited by the decision of the Accreditation Commission of the Ministry of Education and Science of 19 December 2012 on study programs outside the study direction and in accordance with the Cabinet of Ministers Regulations No. 821 of 3 October 2006 *Procedure for Accreditation of Higher Education Institutions, Colleges and Higher Education Programs*. Later on, with the relevant decision of the Accreditation Commission of the Ministry of Education and Science of 31 January 2014, the study program *Aviation Transport* was included in the study direction *Mechanics and Metalworking, Thermal Power Engineering, Heat Engineering and Machinery*.

In the previous accreditation of the study direction, which took place in 2012, experts provided recommendations on the enhancement of the study direction, which is why TTI developed a plan for the implementation of expert recommendations.

Appendix 20. Execution of the plan for the implementation of expert recommendations.

Following the recommendations provided during accreditation:

- 1) laboratories were established, their equipment was purchased and constantly improved and specially teaching aids were prepared for the acquisition of study courses included in the programme,
- 2) representatives of the aviation industry have been invited to teach the program, moreover the academic staff elected by TSI has done internships in industry companies - GK TA organizations

- 3) foreign lecturers are involved in teaching the programme, and the academic staff elected by TSI has increased their experience in ERASMUS + and other international cooperation programmes,
- 4) employers are widely represented both in the Council of the Study Field and participate in various seminars, where the development of the study direction and programme are discussed.
- 5) the academic staff independently improves their English language skills. The first students were admitted to study in English in 2014/2015 academic year. Currently, the programme teaches aviation English in depth, and individual training courses are taught only in English - Digital Technologies in Aviation,
- 6) considering that there are only 3 higher education institutions in Latvia that implement study programs in the field of aviation - TSI, RTU, RAI, academic and scientific cooperation takes place between these higher education institutions.

The implementation of the recommendations allowed increasing the quality of studies in the programmes implemented in the study direction, at the same time, allowing starting full-fledged training of students in English.

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

During the reporting period, significant changes were made to the program that exceed 20% of the program volume, and a specialization was opened - operation of aircraft flights, which is confirmed by the decision of the Study Accreditation Commission of the Ministry of Education and Science of the Republic of Latvia of 7 August 2015.

We have not received any recommendations in the protocol of the Study Accreditation Commission of the Ministry of Education and Science of the Republic of Latvia.

The adjustments which are made in the program are more described and detailed in the Section 1.1 of the Study program description.

Annexes

I. Information on the Higher Education Institution/ College		
List of the governing regulatory enactments and regulations of the higher education institution/ college	Appendix 2. TTI Internal Regulation List.pdf	2.pielikums. TSI Iekšējo normatīvo dokumentu saraksts.pdf
Information on the implementation of the study direction in the branches of the higher education institution/ college (if applicable)		
Management structure of the higher education institution/ college	Structure eng.JPG.JPG	3.pielikums.Pārvaldības struktūra.JPG
II. Description of the Study Direction - 1. Management of the Study Direction		
Plan for the development of the study direction (if applicable)	Appendix 6. Development Plan of the Study Direction.pdf	6.pielikums. Studiju virziena attīstības plāns .pdf
Management structure of the study direction	Appendix 7. STUDY DIRECTION MANAGEMENT SCHEME .pdf	7.pielikums. Studiju virziena pārvaldības struktūrschema.pdf
II. Description of the Study Direction - 3. Resources and Provision of the Study Direction		
Basic information on the teaching staff involved in the implementation of the study direction	Appendix 11. Academic staff involved in the implementation of the study direction.xlsx	11.pielikums. Mācībspēku saraksts.xlsx
Biographies of the teaching staff members (in Europass Curriculum Vitae format)	Eng.zip	LV.zip
Summary of the statistical data on the incoming and outgoing mobility of the teaching staff over the reporting period	Appendix 12. Teaching staff mobility.pdf	12.pielikums. Statistikas dati par macībspēku mobilitāti ERASMUS.pdf
II. Description of the Study Direction - 4. Scientific Research and Artistic Creation		
List of the publications, patents, and artistic creations of the teaching staff over the reporting period	Appendix 13,14.zip	13.14.pielikums. Publikācijas projekti.zip
II. Description of the Study Direction - 5. Cooperation and Internationalisation		
List of cooperation agreements	Appendix 15. Cooperation Agreements.pdf	15.pielikums. Sadarbības līgumu saraksts.pdf
Statistical data on the teaching staff and the students from abroad	Appendix 17. Teaching staff and the students from abroad.zip	17.pielikums. Ārvalstu mācībspēku un studentu skaita dinamika.zip
Statistical data on the mobility of students (by specifying the study programmes)	Appendix16. Students mobility.pdf	16.pielikums. Erasmus studentu mobilitāte.docx
Description of the organisation of the traineeship of the students	Appendix 18. Intership.zip	18.pielikums. Prakses dokumentācija.zip
Information on the agreements and other documents confirming the traineeship of the students in companies	Appendix 19.Cooperation agreements on ensuring internship placement.zip	19.pielikums. Prakses līgumi.zip
II. Description of the Study Direction - 6. Implementation of the Recommendations Received During the Previous Assessment Procedures		
Overview of the implementation of the provided recommendations	Appendix 20. Overview of the implementation of recommendations .pdf	20.pielikums. Ekspertu rekomendāciju izpilde.pdf
Description of the Study Programme - Other mandatory attachments		
Confirmation signed by the rector, director or the head of the study programme or the study direction of the higher education institution/ college which states that the official language proficiency of the teaching staff involved in the implementation of the relevant study programmes of the study direction complies with the regulations on the level of the official language knowledge and the procedures for testing official language proficiency for performing professional duties and office duties.	Confirmation.zip	Apliecinājums valsts valodas prasme.zip
III. Description of the Study Programme - 1. Indicators Describing the Study Programme		
Compliance of the joint study programme with the provisions of the Law on Institutions of Higher Education (table)		
Statistics on the students over the reporting period		
III. Description of the Study Programme - 2. The Content of Studies and Implementation Thereof		
Compliance of 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 (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		
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 Study Direction - Other mandatory attachments		
Sample of the diploma to be issued for the acquisition of the study programme.		
Description of the Study Programme - Other mandatory attachments		
Document confirming that the higher education institution/ college will provide the students with the options to continue the acquisition of education in another study programme or at another higher education institution/ college (a contract with another accredited higher education institution/ college), in case the implementation of the study programme is discontinued		
Document confirming that the higher education institution/ college guarantees to the students a compensation for losses if the study programme is not accredited or the licence of the study programme is revoked due to the actions of the higher education institution/ college (actions or failure to act) and the student does not wish to continue the studies in another study programme		
Confirmation of the higher education institution/ college that the teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of a related foreign language according to European language levels (see the levels under www.europass.lv), if the study programme or any part thereof is to be implemented in a foreign language.		
If the study programmes in the study direction subject to the assessment are doctoral study programmes, a confirmation that at least five teaching staff members with doctoral degree are among the academic staff of a doctoral study programme, at least three of which are experts approved by the Latvian Science Council in the respective field or sub-field of science, in which the study programme has intended to award a scientific degree.		

If academic study programmes are implemented within the study direction, a document confirming that the academic staff of the academic study programme complies with the provisions set out in Section 55, Paragraph one, Clause three of the Law on Institutions of Higher Education		
Sample (or samples) of the study agreement		
If academic study programmes for less than 250 full-time students are implemented within the study direction, the opinion of the Council for Higher Education shall be attached in compliance with Section 55, Paragraph two of the Law on Institutions of Higher Education.		
Description of the Study Direction - Other mandatory attachments		
Electronically signed application form for assessment of a study direction	Iesniegums TSI mehānikas virziena novērtēšanai 0208 eng.doc	Iesniegums TSI mehānikas virziena novērtēšanai 0208 lv.edoc

Other annexes

Name of document	Document
1.pielikums. Senata lemums par akreditācijas dokumentu apstiprināšanu	1.pielikums. Senāta izraksts.pdf
Appendix 1.Extract of minutes of the sitting of the senate	Appendix 1. Extract of minutes of the sitting of the senate.pdf
4.pielikums. Programmas salīdzinājums ar citu augstskolu studiju programmām.pdf	4.pielikums. Programmas salīdzinājums ar citu augstskolu studiju programmām.pdf
Appendix 4. Comparison of the TTI program with other programs.pdf	Appendix 4. Comparison of the TTI program with other programs.pdf
Appendix 5. Opinions of industry experts.zip	Appendix 5. Opinions of industry experts.zip
Nozares atzinumi.zip	Nozares atzinumi.zip
8.pielikums.SVP sastavs.pdf	8.pielikums.SVP sastavs.pdf
Appendix 8. COUNCIL OF THE STUDY DIRECTION .pdf	Appendix 8. COUNCIL OF THE STUDY DIRECTION .pdf
9.pielikums. Studentu, absolventu un darba devēju aptauju dati	9.pielikums. Aptaujas.zip
Appendix 9.Data of the Student, Graduate and Employer Surveys	9.piel.Aptaujas.zip
1.att. TSI īstenotie studiju virzieni	1.att. TSI īstenotie studiju virzieni.docx
Fig.1: TTI study directions	Fig.1 TTI study directions .docx
11. att. Studiju virziena vadības procesu shēma	11. att. Studiju virziena vadības procesu shēma.docx
Fig. 11. Scheme of TTI study direction management processes	Fig. 11. Scheme of TTI study direction management processes.docx

Aviation Engineering

Title of the higher education institution	<i>Mechanics and Metal Processing, Heat Power Engineering, Heat Technology, and Mechanical Engineering</i>
ProcedureStudyProgram.Name	<i>Aviation Engineering</i>
Education classification code	<i>43525</i>
Type of the study programme	<i>Academic bachelor study programme</i>
Name of the study programme director	<i>Monta Aleksandra</i>
Surname of the study programme director	<i>Lācāne</i>
E-mail of the study programme director	<i>Lacane.A@tsi.lv</i>
Title of the study programme director	<i>Dr.sc.ing.</i>
Phone of the study programme director	<i>27528086</i>
Goal of the study programme	<i>The aim of this Bachelor's study program is to prepare internationally competitive specialists in aviation engineering, ensuring the acquisition of theoretical knowledge and practical skills in aircraft maintenance in the fields of mechanics and avionics, and to prepare graduates for further studies in higher level programs and further self-education.</i>
Tasks of the study programme	<ul style="list-style-type: none"> <i>• To provide knowledge of the foundation of natural sciences and engineering sciences as well as the foundation of aircraft maintenance in the fields of mechanics and avionics via specialized courses.</i> <i>• To develop students' technical and critical thinking skills which are necessary for the identification, assessment and effective solution of aeronautical engineering problems.</i> <i>• To develop advanced professional ethics and communication skills.</i> <i>• To develop research skills enabling students to successfully and professionally participate in research projects as well as to continue their studies in a Master's program.</i> <i>• To develop skills for independent development and self-education ensuring continuous professional development.</i>

Results of the study programme	<p><i>Students:</i></p> <ul style="list-style-type: none"> • demonstrate understanding and knowledge of the themes specified for EASA Part-66 Category B1 or B2 specialists; • are able to recognize, evaluate and analyze aeronautical engineering problems, to identify and explore possible solutions and to make informed decisions on actions to be taken; • are able to select and apply appropriate methods, tools and equipment for the implementation of solutions in aeronautical mechanical or avionic engineering; are familiar with the design, operations and functions of basic engineering equipment; have basic skills to use such equipment; • demonstrate understanding and application of knowledge of the fundamentals of natural science and engineering sciences in aircraft maintenance; • understand the legal requirements and responsibilities of aircraft maintenance professionals, on the one hand, and regulatory documents and regulations governing these requirements, on the other hand; • are able to select and apply appropriate techniques and resources, advanced technologies and IT tools, including forecasting and modeling tools, to address aircraft maintenance technology challenges and take into account their limitations; • understand the specifics of the aviation industry and its role in the overall transport system; • demonstrate understanding of professional ethics and sustainability of aviation in the international environment and of the impact of engineering decisions on society and the environment, while being aware of own responsibilities in the process; • are able to work independently or in a team in order to initiate, research, plan, manage and successfully complete tasks; • manage their personal and professional development by identifying gaps / deficiencies in knowledge, awareness and skills that are necessary for taking required actions in this regard.
Final examination upon the completion of the study programme	<i>Defence of the Bachelor's thesis</i>

Study programme forms

Full time studies - 4 years - latvian

Study type and form	<i>Full time studies</i>
Duration in full years	<i>4</i>
Duration in month	<i>0</i>
Language	<i>latvian</i>
Amount (CP)	<i>160</i>
Admission requirements (in English)	<i>Secondary education</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Bachelor of Engineering in Aviation Transport</i>
Qualification to be obtained (in english)	<i>--</i>

Places of implementation

Place name	City	Address
Transport and Telecommunication Institute	RĪGA	LOMONOSOVA IELA 1, LATGALES PRIEKŠPILSĒTA, RĪGA, LV-1019

Full time studies - 4 years - english

Study type and form	<i>Full time studies</i>
Duration in full years	4
Duration in month	0
Language	<i>english</i>
Amount (CP)	160
Admission requirements (in English)	<i>Secondary education Foreign applicants must take a test in physics and english</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Bachelor of Engineering in Aviation Transport</i>
Qualification to be obtained (in english)	--

Places of implementation

Place name	City	Address
Transport and Telecommunication Institute	RĪGA	LOMONOSOVA IELA 1, LATGALES PRIEKŠPILSĒTA, RĪGA, LV-1019

Full time studies - 4 years - russian

Study type and form	<i>Full time studies</i>
Duration in full years	4
Duration in month	0
Language	<i>russian</i>
Amount (CP)	160
Admission requirements (in English)	<i>Studējošie netiek uzņemti</i>
Degree to be acquired or professional qualification, or degree to be acquired and professional qualification (in english)	<i>Bachelor of Engineering in Aviation Transport</i>
Qualification to be obtained (in english)	--

Places of implementation

Place name	City	Address
Transport and Telecommunication Institute	RĪGA	LOMONOSOVA IELA 1, LATGALES PRIEKŠPILSĒTA, RĪGA, LV-1019

III - DESCRIPTION OF THE STUDY PROGRAMME (1. Indicators Describing the Study Programme)

1.1. Description and analysis of changes in study programme parameters that have taken place since the issue of the previous accreditation certificate of study direction or the license of study programme if study programme is not included in the accreditation page of the study direction

During the reporting period, significant changes were made to the program that exceed 20% of the program volume, and a specialization was opened - operation of aircraft flights, which is confirmed by the decision of the Study Accreditation Commission of the Ministry of Education and Science of the Republic of Latvia of 7 August 2015.

A total of 21 students were admitted to the specialization, of whom 3 students have graduated, the rest were either exmatriculated, chose another specialization of the program or changed the study program.

The organization of the study process for the specialization of operation of aircraft flights was adjusted to the needs of this specialization. This was due to the need for fully specific and specialized study courses (on aircraft management, etc.) and the need for a specific and expensive material and technical (aircraft) base enabling to organize the acquisition of practical piloting skills for future pilots. Practical pilot training also involves very serious safety and health requirements.

Because TTI does not have its own aircrafts suitable for flying, the acquisition of pilots' practical aircraft control skills was organized at TTI cooperation partners, but this, together with the need for specific theoretical training courses, created additional difficulties in ensuring a planned study process. Therefore, TTI no longer plans to maintain the pilot training specialization in its study program. Students wishing to study commercial aircraft piloting in addition to the academic Bachelor's program are advised to apply to TTI cooperation partners for this training and enrol in it independently of TTI study program.

During the reporting period, changes were made in the study plan of the study program.

Table 21. Changes in the study plan

Changes	Aviation Transport	Aviation Engineering
Combined and integrated study courses	Repair of Aviation Engineering 6CP Aircraft Maintenance 6CP	Aircraft Maintenance Provision 4 CP Organization of Aircraft Maintenance 2 CP Aircraft Maintenance Planning 4 CP
	Aircraft Engine Construction 5 CP Control System of Aircraft EnginesGa 6 CP	Aircraft Engine Design and Control Systems 6 CP
	Aircraft Electrical Airborne 6 + 4 CP	Aircraft Electrical Equipment I 4 CP Aircraft Electrical Equipment II 4 CP

Practice	Practice 4CP	Training Practice 4 KP Operational Practice I 2 CP Operational Practice II 4 CP
Replaced study courses	Airport Management 2 CP	Basics of Aviation Business 2 CP
	Standardization and Quality Control 2 CP	Compliance Monitoring Systems 4 CP
	Heat Engine Theory 4 CP	Piston Engine 2 CP
	Professional English for Aviation 6 CP	Aviation English 4 CP
New study courses		Flight Management 2 CP Aeronautical Service 2 CP Remotely Piloted Aircraft Systems (RPAS) 2 CP Digital Technologies in Aviation 2 CP Engineering Modelling and Simulation 2 CP
Removed study courses	Aviation Safety Systems 2 CP Electrical Measurement Methods and Tools 4 CP Digital Telecommunication System Technologies 4 CP Informatics and Information Technologies 2 CP Mathematics 2 CP	

The *Aviation Transport* program focused on aircraft maintenance and offered two specialties. Respectively, the core study courses were Repair of Aviation Engineering in the amount of 6 CP and Aircraft Maintenance in the amount of 6 CP. Additionally, Practice in the amount of 4 CP was included.

In order to align the program with the EASA requirements and to systematise students' theoretical knowledge and complement it with practical knowledge, the new *Aviation Engineering* program includes core maintenance courses - Aircraft Maintenance Provision (4 CP) and Organization of Aircraft Maintenance (2 CP). Theoretical knowledge is supplemented with Practices, the total amount of which has been increased from 4 CP to 10 CP.

Following discussions with industry, the program has included the study course on Aircraft Maintenance Planning, which is particularly important for ensuring the aircraft continuing airworthiness and sustainable development of the industry.

To provide students with a broader vision of the field, the program has included the following new state-of-the-art study courses: Flight Management, Aeronautical Service, Remote Control Aircraft Systems (RPAS), Digital Technologies in Aviation as well as Engineering Modeling and Simulation.

The course on Aviation Safety Systems was recognized as a non-essential subject, which is why some of its components have been included in the study course on Introduction to Specialty. The course on Standardization and Quality Control has been replaced by Compliance Monitoring Systems, which is more aligned with real-life aircraft maintenance activities. The program has also included the advanced course on Reliability Engineering, which provides a theoretical foundation and explanation of relevant issues.

The courses on Electrical Measurement Methods and Tools as well as Digital Telecommunication System Technologies are recognized as less important and not suitable for a contemporary aviation study course, therefore they are excluded from the basic program.

Modern aviation is unthinkable without the use of English. Aviation is expected to be chosen by students with a good knowledge of English, which is also required in today's dynamic world. Taking this factor into account, the program replaces the course Professional English for Aviation with the study course on Aviation English. The new course has the enhanced content and the reduced amount of credit points.

Within the framework of the mechanics specialty, the courses Aircraft Engine Construction (6 CP) and Control Systems of Aircraft Engine (6 CP) are combined in the updated course on Aircraft Engine Design and Control Systems (6 CP).

The course on Heat Engine Theory (4 CP) has been replaced by the course on Piston Engines (2 CP) because some aspects of the earlier course were reviewed in Physics.

Changes in the content and planning of the study program have been made with the aim to integrate the latest theoretical findings in the field, information technology tools and practical training into the studies, which would yield comprehensive training of aviation specialists.

During the reporting period, changes were made in the formulation of the aim, objectives and learning outcomes of the study program, all of which was the result of changes in the content of the study program, implementation of the study process and consideration of the requirements of the qualification framework.

Changes in the name of the study program

When submitting the study program for assessment, the name of the study program was changed from *Aviation Transport* to *Aviation Engineering*, which was justified considering changes in the content of the study program.

By definition, engineering is a branch of science in which scientific and technical knowledge is applied to solve various technical problems. Engineers use imagination, reasoning, evaluation, and experience to apply science, technology, mathematics and experience. The outcome can be a design, product, service or useful activity applied to an object or process. The Bachelor's study program offered by TTI covers all the above-mentioned aspects, but the emphasis is on aviation, and more precisely, on aircraft maintenance. The aim of the program is to train knowledgeable and skilled aviation engineers. When studying similar programs offered by other universities, we often came across the concept of Aviation Engineering (*avioinženierija*, in Latvian). The name of the program reflects its core content components.

After the completion of the study program, graduates demonstrate general knowledge of the foundation of engineering sciences or related fields - physics, mathematics and natural sciences. This knowledge is essential for studying themes pertaining to specializations - maintenance of aircraft mechanics or maintenance of avionics systems. The level of knowledge to be acquired is sufficient to enable students to pass the EASA Part-66 qualification examinations at the end of their studies, which increases students' job opportunities after graduation. The term *engineering* also includes design, services or other useful activities or processes. The complementary subjects of the study program provide students with a broader understanding of the common aviation system and its many niches, such as aviation business, aeronautical navigation service, flight management and aviation sustainability. After graduation, graduates are not only able to select and apply appropriate methods, tools and equipment for the implementation of aircraft mechanical or avionics engineering solutions, they also know the structure, operating principles and functions of relevant

engineering equipment, they have skills to repair and maintain such equipment. In addition, graduates are able to select and apply appropriate techniques, resources, modern technologies and IT tools in their work. They understand the importance of each aviation niche in the overall system. Engineering means to understand, evaluate, create and develop sustainably.

Changes in the implementation options of the programme

In the future, the version of the programme in the amount of 58 CP with a period of implementation in full-time education of 1 year 6 months will not be implemented. This duration of the programme was envisaged after the acquisition of the 1st level professional higher education study programme "Technical Operation of Aviation Transport". From May 2022 TSI will not continue the implementation of the 1st level professional higher education study programme. RTU also no longer has a first level programme. Therefore, in the future, the TSI program "Aviation Engineering" will be implemented in only one variant in the amount of 160 CP.

1.2. Analysis and assessment of the 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 in the different study forms, types, and languages.

The Bachelor's study program *Aviation Engineering* is accredited for full-time (intramural) studies in Latvian, Russian and English.

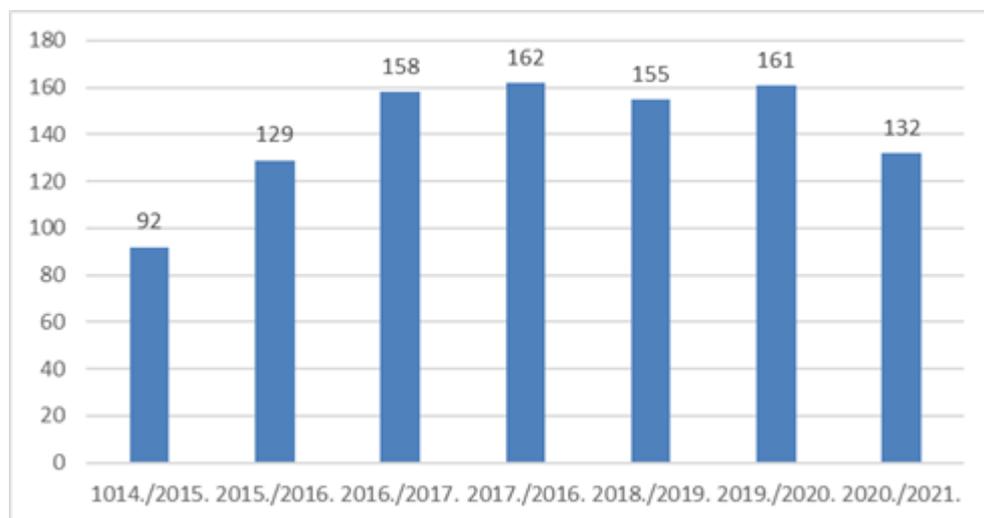


Fig.16 Dynamics of the number of students in the program

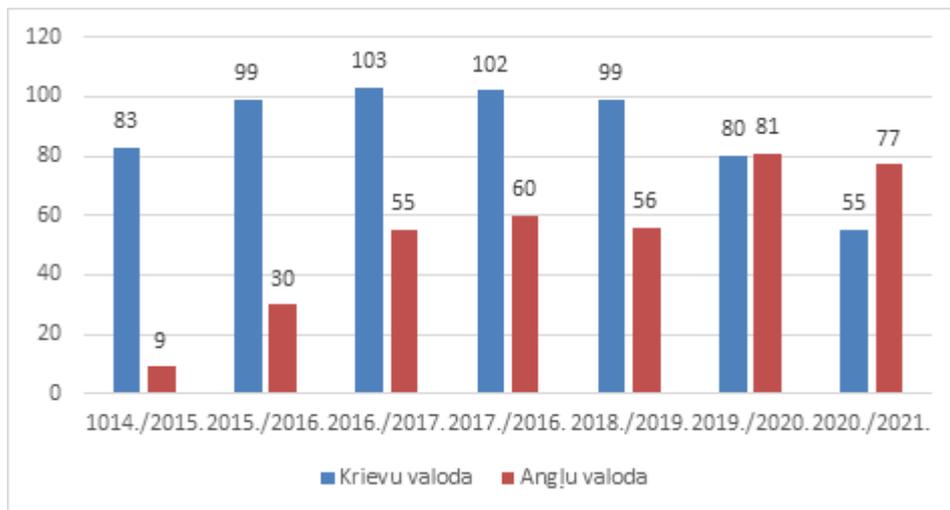


Fig. 17 Number of students by languages of instruction

There were no students studying in Latvian

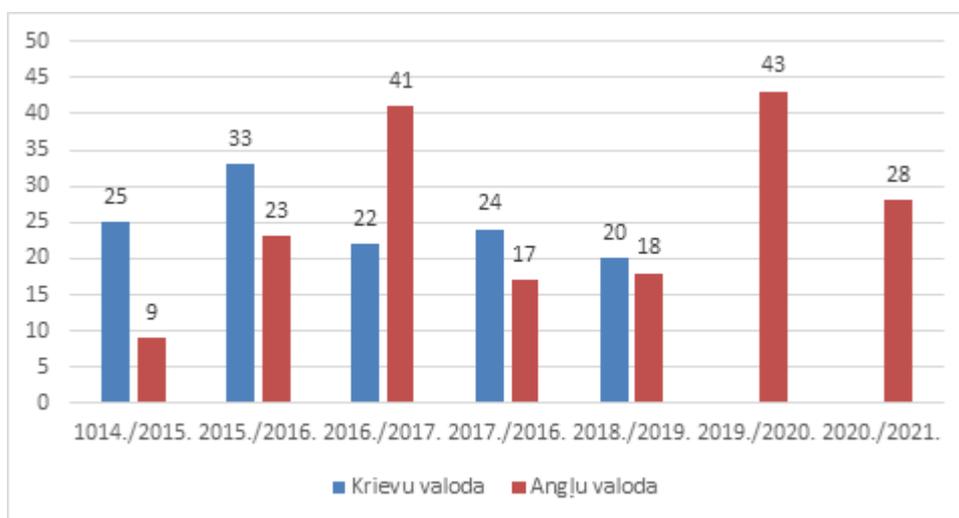


Fig. 18 Dynamics of the number of matriculated students by languages of instruction

The number of applicants wishing to study in Latvian was never high enough to organize a study group, although the admission was announced.

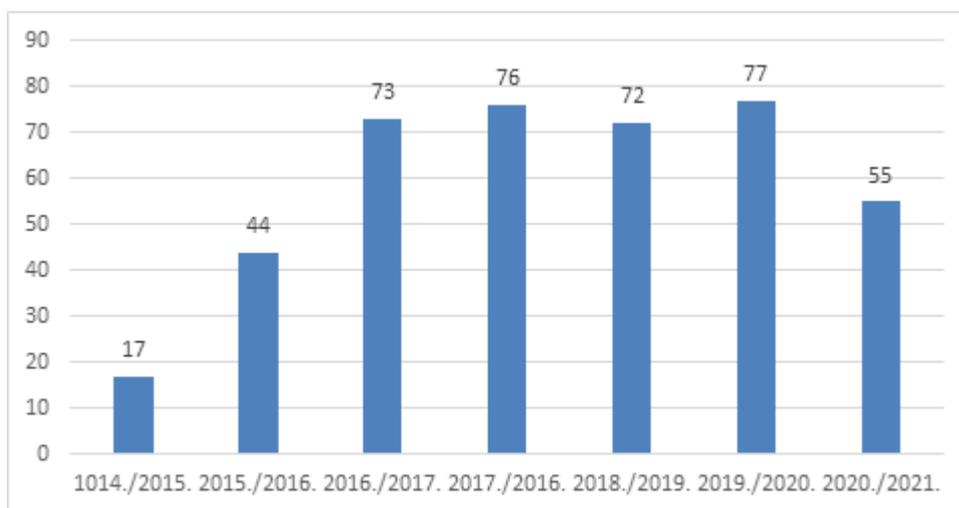


Fig. 19 Number of foreign students in the Bachelor's program

The distribution of foreign students in the study program by country of residence in 2020 and 2019

is provided below:

	2020	2019
Russian Federation	1	1
Ukraine	1	
Kazakhstan	11	13
Tajikistan	1	2
Uzbekistan	7	8
Algeria	1	1
Arab Republic of Egypt	1	1
India	26	43
Mongolia	3	3
Pakistan	2	1
United States of America	1	1
Spain		1
Peru		1
TOTAL:	55	76

The number of matriculated foreign students in the study program by country of residence in 2020 and 2019 is provided below:

	2020	2019
Ukraine	1	
Kazakhstan	2	6
Uzbekistan	2	5
India	5	16
Pakistan	2	2
Algeria		1
Spain		1

Mongolia		1
United States of America		1
TOTAL:	12	33

The figures above show that the number of students has remained almost unchanged for the past 4 years.

The number of students was not affected by the amendments of 21 June 2018 to the Law on Higher Education Institutions of the Republic of Latvia, which stipulates that higher education institutions whose study program language of instructions does not comply with Paragraph 3 of Section 56 of this Law have the right to continue implementation of such study programmes until 31 December 2022. After 1 January 2019, the admission of students to study programs with the language of instruction that does not comply with the provisions of Paragraph 3 of Section 56 of this Law is not permitted. Therefore, in 2019/2020, students for studies in Russian were no longer admitted at TTI. Yet, the number of foreign students has increased significantly since then.

The results of the 2020/2021 enrollment year were affected by the global Covid-19 pandemic, which impeded the free movement of students.

Until then, foreign students were admitted to studies in English and Russian, and many foreigners, mostly from the former post-Soviet republics, took the opportunity to pursue their education in Russian. The distribution of students in the 2020/2021 academic year by country of residence is provided in Chapter 5.2.

Although the program is accredited for studies in three languages, in fact, students studied only in English and Russian. The number of applicants wishing to study in Latvian was never sufficiently high to organize a study group. This was influenced by the fact that the aviation programs implemented by TTI and RTU were very similar, and RTU offers state financed education opportunities to students. This was one of the reasons why the concept of the TTI program was slightly modified to include courses that provide a broader insight into the industry.

For the fourth year in a row, TTI has won the procurement of the Latvian National Defense Academy for the provision of study courses of the compulsory elective block of the professional Bachelor's study program in Air Force Military Management. As a result, 11 to 15 LNDA cadets commence their studies at TTI every year. Currently, a total of 39 cadets are enrolled in Block B study courses of the LNDA study program at TTI. The compulsory elective block of the LNDA program is very similar to the Bachelor's program *Aviation Engineering* implemented at TTI, which is why TTI laboratories, technical equipment and knowledge of the teaching staff are fully suitable for the LNDA program implementation at TTI.

As the total number of students increases, so does the number of graduates.

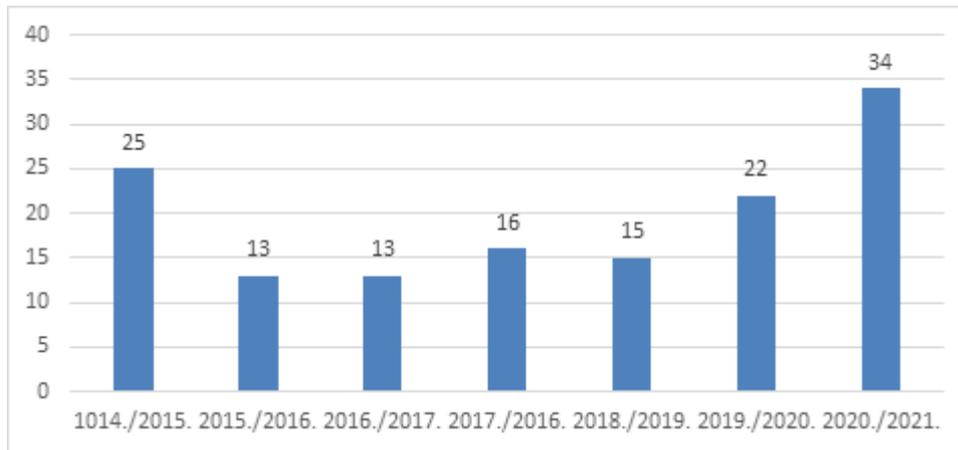


Fig. 20 Dynamics of the number of graduates in the Bachelor's program

The dropout rate of students in the program for the last two years has been 14%. In the 2019/2020 academic year, 22 students were exmatriculated. The main reason for exmatriculation was failure to fulfil the study plan (13 students), whereas other reasons included personal issues.

In the last year, 82% (or 18 students) of all exmatriculated students were foreign students, who formed 93% (12 students) of all exmatriculated students. Although the selection of foreign students, especially from India, proceeds very carefully, not all foreign students are able to meet the requirements for the assessment of study courses.

1.3. Analysis and assessment of the interrelation between the name of the study programme, the degree or professional qualification to be acquired or the degree and professional qualification to be acquired, the aims, objectives, learning outcomes, and the admission requirements.

The aim and objectives of the Bachelor's program *Aviation Engineering* as well as the learning outcomes to be attained during the study period correspond to the sixth framework level of the Latvian Education Classification (Cabinet Regulation No. 322 *Regulations on the Latvian Education Classification*).

The defined objectives of the study program are aimed at achieving the defined aim "to train internationally competitive specialists in aeronautical engineering by providing theoretical knowledge and developing practical skills in aircraft maintenance in the fields of mechanics and avionics, and to prepare graduates for further studies in higher level programs and for further self-education".

The name of the study program was created taking into account the names of similar programs in Latvia and in abroad. After the completion of the studies, the graduates, first of all, demonstrate a general knowledge of foundation of engineering sciences or related fields, such as physics, mathematics and natural sciences. This knowledge is used to study themes related to available specializations - maintenance of aircraft mechanics or maintenance of avionic systems. The level of knowledge to be acquired is sufficient to enable students to pass the EASA Part-66 qualification examinations at the end of their studies, which increases students' job opportunities after graduation. The term *engineering* also includes design, services or other useful activities or processes. The complementary subjects of the study program provide students with a broader understanding of the common aviation system and its many niches, such as aviation business,

aeronautical navigation service, flight management and aviation sustainability.

The outcomes of completion of studies include the abilities of graduates to select and apply appropriate methods, tools and equipment for the implementation of aircraft mechanical or avionic engineering solutions. Graduates have the knowledge of the structure, operating principles and functions of relevant engineering equipment, and they have basic skills to repair and maintain such equipment. In addition, graduates are able to select and apply appropriate techniques, resources, modern technologies and IT tools in their work. They understand the importance of each aviation niche in the overall system.

The mapping of study courses for the achievement of learning outcomes of study program, which allows to implement in-depth analysis and specify the learning outcomes to be achieved for specific study courses is available in Appendix 26.

Admission requirements are specified in the TTI Admission Regulations and are based on the following regulatory enactments: Articles 46 and 47 of the Law on Higher Education Institutions, Cabinet Regulation No. 846 of 10 October 2006 on *Requirements, Criteria and Procedures for Admission to Study Programs*. An applicant who has successful assessments in a document certifying secondary education, which confirms knowledge of the state language, a foreign language and mathematics (e.g., successfully passing centralized examinations), is able to study in a higher professional education program.

For studies in English, applicants are matriculated according to the CE certificate in English (with a result of not less than 55%), an English certificate from an internationally recognized testing institution for B2-C2 levels, or TTI entrance examination in English (at least 6 points in a 10-point system – only for those who have acquired secondary education in Latvia). Foreign applicants are matriculated if they can demonstrate an English certificate corresponding to B2-C2 levels from an internationally recognized testing institution, if they have successfully completed the TTI entrance examination in English at least at B2 level and if they have successfully passed examination in physics.

In the Admission Regulations of 2021/2022 academic year, the program Aviation Engineering is included under the old name “Aviation Transport”, with such a name the program will also be included in the Admission Regulations of 2022/2023. Following the decision on the accreditation of the program under the new name, amendments will also be made to the relevant Admission Regulations.

Only the name of the program is changed to "Aviation Engineering", applying the same admission requirements as the program with the previous name "Aviation Transport", ie: secondary education, foreign applicants - must pass a test in physics and english (after covering the registration fee).

Both tests take place on the TSI distant platform. Test completion can be performed within five days, and each test can be passed once.

Physics: time limit 60 minutes. The test contains 20 questions; each question has multiple choice answers. Answers can be changed during the test. After submitting the answers, the result is automatically generated. The test is considered passed if there are at least 6 out of 10 points.

English: time limit 60 minutes. The test contains 20 questions; each question has multiple choice answers. Answers can be changed during the test. After submitting the answers, the result is

automatically generated. This test is taken by all foreign applicants, including those who have a B2 international certificate in English. The test helps an applicant get acquainted with the TSI distant platform and ensures TSI Admission that the applicant is ready to study in English.

Such levels of knowledge achieved in applicants' previous education, motivation to obtain higher education and organization of the study process at TTI are able to ensure the attainment of learning outcomes and the award of a Bachelor's degree in Aviation Transport as a result of successful completion of the study program.

III - DESCRIPTION OF THE STUDY PROGRAMME (2. The Content of Studies and Implementation Thereof)

2.1. Assessment of the relevance of the content of the study course/ module and the compliance with the needs of the relevant industry and labour market and with the trends in science. Provide information on how and whether the content of the study course/ module is updated in line with the development trends of the relevant industry, labour market, and science. In 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.

The aim of the study program is to train aircraft maintenance personnel for a career in aeronautical engineering. Consequently, graduates of the Bachelor's study program can work in aviation in sub-sectors related to aircraft maintenance - in aircraft maintenance, planning, and more operational positions. Aircraft maintenance includes work activities related to the provision of the initial airworthiness of aircrafts as well as aircraft maintenance during the aircraft life cycle. The following possible positions can be identified in this respect: an aircraft and power mechanic, aircraft maintenance planner, analyst or director, product engineer and others. Operational staff may include pilots, air traffic controllers, flight planning specialists, aviation and non-aviation managers.

The program gives graduates the opportunity to gain a wide range of knowledge by studying the industry from the perspective of different players. Such specialists are in demand in any field because they are able to consider problems from different points of view, to think rationally and technically and make reasonable and adequate decisions, demonstrating their competencies acquired during their studies. Students are provided with an opportunity to improve their employment prospects through modern study courses aimed at digital innovation in aviation and the use of modern technologies in everyday life.

The foundation of the quality assurance of the study program is cooperation with potential employers, organization of meetings for the discussion of issues related to the current issues on the labor market, demands of the labor market, reviewing annual self-assessment reports, receiving and reviewing suggestions from the Study Council. The topicality of the study course is also ensured by contributions of lecturers attracted from the industry.

Study courses, including the contents of the course descriptions, are reviewed annually during the study program and study direction self-assessment procedure, held in December and January in

accordance with the course management regulations. As a result of such self-assessment, a program development plan is drawn up, which comprises various aspects of the study course, including updating of course descriptions following the specific field, labor market and science development trends. The updated courses are coordinated, approved and included in the study program register and published in the e-learning environment *Moodle* by the beginning of the new academic year.

The Bachelor's study program offers two specializations:

- Mechanics
- Avionics

Mechanics are specialists who perform maintenance and repair of aircraft mechanical systems and structural elements, such as fuselage, empanage, wings, landing gear or hydraulic system. Mechanics also control the operation of aircraft engines.

Avionics are specialists who repair and maintain aircraft power supply systems and electronic instruments, including aircraft communication devices and systems, navigation and radar equipment.

A mechanic or category B1 specialist typically performs the following duties:

- diagnose failures of aircraft mechanical systems;
- repairs the aircraft fuselage, wing, brakes, landing gear, power equipment, engines or other parts;
- replace damaged parts using manual or automatic tools;
- read the aircraft repair procedures included in the aircraft maintenance manual;
- carry out post-repair inspections of components or systems to ensure that they comply with established international, regional or local standards;
- fills in required fields on repair and maintenance work in special journals.

An avionician or B2 specialist typically performs the following duties:

- perform inspections of aircraft electronic systems using special testing tools;
- interpret test flights or other test data to identify failures in avionics systems or other systems that affect aircraft performance;
- installs components, such as electronic control or connection units, installs necessary software;
- repairs or replaces components that can no longer be used.

The amount of study credit points for each specialisation is 32 CP (51 ECTS).

The study program plan by specializations is provided in Appendix 24.

The overall amount of study credit points in the program is 160 CP (240 ECTS) and the structure of the program is given in Table 22.

Table 22. Structure of the Bachelor's program Aviation Engineering

Program part	Course code	Study courses	Credit points (CP)	Credit points (ECTS)	Final assessment
A		Compulsary courses	54	81	

A	B 03 009 05 B 254	Latvian or Foreign Language	2	3	leskaite
A	B 03 455	Physics	4	6	Eksāmens
A	B 04 103	Higher Mathematics	10	6	Eksāmens
A	05 P 003	Technical Drawing	4	6	Eksāmens
A	B 04 319	Academic Skills and Critical Thinking	4	6	Eksāmens
	05 B 295	Aviation English	4	6	Eksāmens
A	P 02 007	Electrical Engineering	6	9	Eksāmens
A	B 04 142	Labour Safety, Civil Defense and Environment Protection	2	3	leskaite
A	05 B 214	Technical Mechanics	4	6	Eksāmens
A	B 03 445	Human Factor	2	3	leskaite
A	B-04-007	Probability Theory and Mathematical Statistics	4	6	Eksāmens
A	P 02 014	Aviation Legislation	4	6	Eksāmens
A	P 02 009	Materials Engineering	4	6	Eksāmens
B		Limited elective courses	80	120	
B		General field-specific professional courses	48	72	
B	B 03 457	Introduction to Speciality	2	3	Test
B	P 03 888	Basics of Aviation Business	2	3	Test
B	P 02 013	Aerodynamics and Flight Dynamics	4	6	Examination

B	B 03 436	Digital Equipment and Electronic Systems	4	6	Examination
B	B 03 444	Aircraft Ground Handling	2	3	Test
B	B 03 442	Flight Management	2	3	Test
B	P 02 233	Aircraft Maintenance Provision	4	6	Examination
B	B 03 469	Global Positioning System	2	3	Test
B	B 03 439	Aeronautical Service	2	3	Test
B	B 03 433	Aircraft Maintenance Planning	4	6	Examination
B	B 03 447	Engineering Modelling and Simulation	4	6	Examination
B	B 03 448	Remotely Piloted Aircraft Systems (RPAS)	2	3	Test
B	B 03 449	Compliance Monitoring System	4	6	Examination
B	B 03 039	Reliability Engineering	4	6	Examination
B	B 03 443	Digital Technologies in Aviation	4	6	Examination
B	B 03 465	Organization of Aircraft Maintenance	2	3	Test
B		<i>Professional specialization courses</i>			
B1		Mechanics	34	51	
B1	B 03 435	Piston Engine	2	3	Test
B1	P 03 777	Modeling of Mechanical Systems	4	6	Examination
B1	B 04 136	Electronics Fundamentals	2	3	Test
B1	B 03 438	Construction of Aircraft Engines and Control Systems	6	9	Examination

B1	B 03 437	Aircraft Design and Strength	6	9	Examination
B1	P 02 020	Aircraft Liquid-Gas Systems	4	6	Examination
B1	B 03 456	Aircraft Avionics Systems	6	9	Examination
B1	P 02 026	Propeller and its Control System	2	3	Test
B2		Avionics	34	51	
B2	B 03 450	Electronics	4	6	Examination
B2	P 02 025	Aircraft Design	4	6	Examination
B2	B 03 451	Aircraft Electrical Equipment I	6	9	Examination
B2	B 03 454	Construction of Aviation Engines	2	3	Test
B2	P 02 019	Radio Navigation, Surveillance and Communication Systems	4	6	Examination
B2	B 03 452	Aircraft Electrical Equipment II	4	6	Examination
B2	P 03 900	Design of Electrical and Electronic Equipment	4	6	Examination
B2	B 03 077	Microprocessor Control Systems	4	6	Examination
B2		Practice	10	15	
B2	B 03 458	Training practice	4	6	Test
B2	B 03 459	Operational practice I	2	3	Test
B2	B 03 461	Operational practice II	4	6	Test
C		Free elective courses	6	9	
E		Final assessment			
		Bachelor's thesis	10	15	
		Program credit points in total	160	240	

The Bachelor's study program *Aviation Engineering* with specializations in mechanics and avionics prepares specialists not only for work in the Latvian labor market, but also in European and world aviation companies. Our advanced training concepts combine individual and group work on both theoretical and practical levels. The studies include design work and practice, which develop students' practical skills and ability to perform modeling and simulations of processes. TTI premises are equipped with professional equipment, aircraft maintenance simulator A320, aircraft Cessna 152, as well as many professional stands used by students for practical classes. Such an approach gives students the opportunity to immerse in aviation-like environment by studying a real aircraft,

its parts and equipment. Such an educational approach promotes the discovery of individual talent, expression of personal organizational and analytical qualities in aviation engineering.

The program offers free elective courses (Block C), of which 6 credits are required to fulfill the program requirements. The aim of these courses is to provide students with an opportunity to acquire additional knowledge in a field of science or to acquire additional skills useful for professional activities. Elective courses offer a variety of aviation and non-aviation subjects. The courses currently offered as Block C course are shown in Table 23.

Table 23. Free elective study courses (part C)

No.	Study courses	CP (ECTS)
1	Simulation Modeling in Logistics	2 (3)
2	Project Management	2 (3)
3	Philosophy	2 (3)
4	Standardization and Quality Control	2 (3)
5	Psychology of Business Relations	2 (3)
6	Introduction to Digital Marketing	2 (3)

In addition to the courses offered in the program, TTI students have the opportunity to enrol in courses of parts A or B of other TTI programs by coordinating it with the Study Department and ensuring these courses fit into their study plan. After the renovation of the TTI Sports Center, *Sport* has been offered as an elective study course for 5 years.

Appendix 24: Study program plan (for each study program form and type)

Appendix 25: Descriptions of the study program courses

2.2. Assessment of the interrelation between the information included in the study courses/ modules, the intended learning outcomes, the set aims and other indicators, the relation between the aims of the study course/ module and the aims and intended outcomes of the study programme. In 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.

The study program has been developed pursuant to Regulation No. 240 of the Cabinet of Ministers of 13 May 2014 on the National Academic Education Standard. The study direction and the study programs included in it have been developed taking into account the mutual connection and

sequence of study courses. This enables to achieve the goal of the study program and provide a set of knowledge, skills and competences in accordance Level 6 of the European Qualifications Framework of Latvian Education Classification.

In order to ensure the attainment of the aim of the study program, the study program contains nine elements of knowledge, skills and competencies to be acquired. Considering the achievement of learning outcomes, there have been identified specific study courses and the amount of knowledge, skills and competencies to be acquired (see the mapping of the study program in Appendix 27).

The correlation of the aims and learning outcomes of the study program (see Fig. 21) with the learning outcomes of specific study courses can be found in each study course description, which provides a description of the course content, course plan, study requirements, learning outcomes, study methods, literature and other sources.

The study program successively implements the sequence of study courses. The content of the program ensures the achievement of learning outcomes that includes the acquisition of in-depth theoretical knowledge and the development of research skills and abilities in the chosen field science.

The implementation of study courses includes the use of different teaching methods, the choice of which is influenced by the TTI infrastructure, which contains many laboratory and information stands, where students can learn aircraft construction elements or systems. The TTI infrastructure also has a specialized Airbus A320 simulator used in various study courses, for example, in Digital Technologies in Aviation (cockpit layout, displays, HMI, FMS and others). There are various IT software packages for research, modeling and simulation. An integral part of the study environment is the TTI library offering access to various databases.

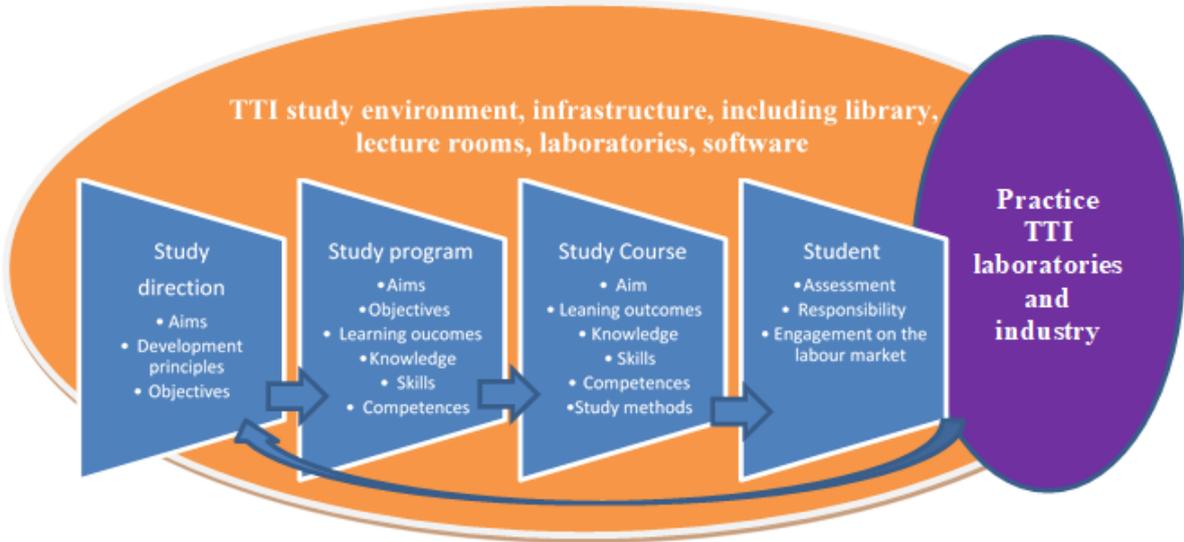


Fig. 21. Linking the aims of the Bachelor's study program to learning outcomes and students' integration in the labor market

Study courses are included in the study plan in a logical sequence, implementing the sequence of study courses. First, students acquire basic courses in natural sciences - Higher Mathematics, Physics and Technical Drawing. These courses prepare students for specialization courses, such as Electrical Engineering, Technical Mechanics, Materials Engineering, Aerodynamics and Flight Dynamics. These study courses provide all the necessary basic knowledge not only in natural

sciences, but also in aviation. They introduce students to the design of aircraft, answer the question of why an aircraft flies and explain the general principles of operation of aircraft mechanisms. Without basic knowledge of these subjects, to successfully continue studies in the chosen specialization is impossible. As for the course Academic Skills and Critical Thinking, its purpose is to develop students' knowledge of academic writing, research activities and studies and develop critical thinking skills.

The study program is designed so that students of both specializations study together in their Year One. After Year One, students have the opportunity to choose one of the two specialties - mechanics or avionics.

The Bachelor's study program *Aviation Engineering* offered by TTI focuses on aircraft technical inspection. After completing specialization courses, after the students have mastered the principles of operation of aircraft systems and their interconnections, the remaining components of the study program focus on aircraft maintenance. Initially, a joint course is offered for both specialties. This course is based on the content of EASA Part-66 Module 7 aircraft maintenance theory. After completing joint courses, students of each specialty acquire the remaining theory, advancing the knowledge of aircraft mechanics or avionics maintenance.

Aircraft maintenance is a practical process, therefore, in order to provide students with basic practical skills, the study program also includes Practice - Training Practice and Operational Practices. The Practice involves working in TTI laboratories, whereas the Operational Practices involve work in TTI laboratories and aircraft maintenance companies.

The reflection of learning outcomes of study courses in course descriptions confirms that in general knowledge, skills and competencies specified in the study program are achieved in the study courses.

Analyzing the mapping results of the study courses, it is obvious that students are able to achieve the aims set by the study program, understand and critically evaluate the basic laws and regularities of aviation engineering and aircraft maintenance. Using the acquired theoretical knowledge and skills, students are able to perform research activities and to demonstrate an analytical approach to the analysis of the research object. They are able to enhance and develop their skills, make decisions and find creative solutions in changing conditions as well as take responsibility and initiative by working individually or in a team.

The Bachelor's thesis developed at the end of the study additionally enhances students' competences to identify changes in aviation engineering, especially aircraft maintenance and related processes, to make decisions on work performance, planning and sustainable development, to understand the importance of professional ethics and to evaluate the impact of one's professional activity on the environment and society.

Students and graduates have been satisfied with the outcomes of the study program and study courses (see Section 2.6 of *Analysis and Evaluation of Survey Results* (students, graduates and employers)).

Appendix 26. Mapping of study courses and learning outcomes of the study program.

2.3. Assessment of the study implementation methods (including the evaluation methods) by providing the analysis of how the study implementation methods (including the evaluation methods) used in the study courses/ modules are selected, what they are, and how they contribute to the achievement of the learning outcomes of the study courses and the aims of the study programme. Provide an explanation of how the student-centred principles are taken into account in the implementation of the study process.

The study implementation methods, assessment methods, types and requirements are included in the description of each course available to students in the e-learning environment Moodle.

The study process is mainly implemented in the format of interactive lectures, seminars, workshops and student independent work. Courses include workshops, often discussions, role-plays, teamwork, project work, in-basket professional tasks or solving specific practical problems. The choice of a method depends on the learning outcomes that a lecturer is planning to achieve. The applied methods are geared to the development of the students' abilities, specifically, to learning, creative use of knowledge, cooperation, self-evaluation, offering of alternative solutions to problems, to critical thinking and making responsible decisions.

Teaching staff have ample opportunities to expand their range of methods, yet, all methods require careful preparation and this is a time-consuming process.

Teaching materials for all courses are published in the e-learning environment *Moodle*.

The basic principles and procedure for the assessment of the acquisition of the study program comply with the requirements of Article 40 of the National Academic Education Standard. Pursuant to the regulations adopted by the TTI Senate, the results of the academic Bachelor's study program are evaluated according to two evaluation criteria: a quality criterion based on the 10-point marking system and a quantitative criterion - a credit point based on the total number of hours in the course. The study program *Aviation Engineering* uses a complex method when assessing learning outcomes. It includes assessment of students' practical work, individual or group work, mid-term assessment and final examinations (a test or exam). In order to facilitate students' independent work, it is stipulated that the final assessment (a test or exam) should not exceed 50% of the final mark for the course. In the beginning of a semester, students are informed about the components of the final mark and their assessment.

In practice, the evaluation process takes place regularly throughout the course of studies. The final assessment of students' learning outcomes is completed at the end of a semester after all stages of assessment are completed, such as practical assignments, seminars, independent work, mid-term assessment and examination. Teaching staff develop an assessment methodology, which indicates the percentage of each assessment criterion in the composition of the total mark. In the updated study course descriptions there is a general tendency to increase the share of the mid-term assessment, which is a positive trend, as it allows students to sequentially cover study materials and knowledge is acquired at an even pace.

At the end of the Bachelor's studies, students choose a theme for their Bachelor's thesis and in cooperation with their supervisors write and defend it.

TTI implements student-centered learning to encourage students to become actively involved in the design of the study process and to ensure appropriate assessment of student performance. The principles of student-centered learning require the following:

- Students know and understand the learning outcomes of the study program or course, and

students are studying to achieve them.

- Students are involved in the enhancement of the study process and content.
- The applied teaching and testing methods are geared to skill development.
- The assessment criteria are described in course descriptions and explain to students to what extent they have achieved the expected learning outcomes; students also receive explanation of the assessment and advice.
- Students receive feedback that provides guidance on the learning process, if needed.
- Assessment is consistent, fair to all students and implemented in accordance with the approved procedures.
- There is a procedure for reviewing student appeals.
- Admission procedures and criteria are open.
- An information system has been established to ensure the implementation of the study process.
- TTI cooperates with other universities, QA agencies and ENIC-NARIC Centers to ensure smooth recognition of qualifications across different countries.

More information on the principles of student-centered learning adopted by the Institute, see point 1.3. in the table in the sub-section 2.5. in Section II.

2.4. If the study programme entails a traineeship, provide the analysis and assessment of the relation between the tasks of the traineeship included in the study programme and the learning outcomes of the study programme. Specify how the higher education institution/ college supports the students within the study programme regarding the fulfilment of the tasks set for students during the traineeship.

Pratice is a component of the academic Bachelor's program *Aviation Engineering*. The program includes Practice in the amount of 10 CP. The purpose of Pratice is to enable students to acquire practical work skills, advance and strengthen theoretical knowledge and skills, learn to use the main tools and technologies required for aircraft maintenance, learn about the main aircraft maintenance activities.

The objectives of Pratice are the following:

- to advance theoretical knowledge acquired during studies by performing practical and production tasks, and to develop practical skills;
- to develop a general idea of the principles of operation of an aircraft maintenance company, to develop knowledge about the organization of the company's production process;
- to develop the competences necessary for aircraft maintenance;
- to learn to collect and analyze information and data that are essential for the final stage of studies and for writing the Bachelor's thesis.

Practice is organized in accordance with the study plan and the Practice calendar plan, based on the agreements concluded between TTI, students and the companies where the students have their practice.

Practice consists of three stages: Training Practice (4 CP), Operational Practice I (2 CP) and Operational Practice II (4 CP).

Students complete their Training Practice (4 CP) in TTI workshops, laboratories and structural units. This Practice helps students learn how to use tools, technologies, and procedures required for conducting aircraft maintenance.

Operational Practice I (2CP) proceeds in TTI laboratories and structural units. The purpose of this practice is to help students consolidate the acquired theoretical knowledge and acquire practical skills necessary for successful further training and professional activities in aeronautical engineering.

Operational Practice II (4 CP) is mainly completed in aviation companies (maintenance companies or airlines) on the basis of agreements concluded between TTI, students and the companies in which students have their practice. Its main purpose is to help students acquire practical skills identified in *Aircraft Maintenance Practice of EASA Module 7*. In some exceptional cases, students can have their Operational Practice II completed on the TTI premises, using the TTI training base (AN-2 and Cesna aircrafts, simulators, workshops and laboratories). However, in this case, students have to have a special agreement signed with TTI on the completion of this practice at TTI.

Provision of practice within the framework of the study program is described in cooperation agreements between the Institute and major aviation companies. Cooperation agreements have been signed with companies such as *Airline Support Baltic*, *Wing 4 Sky Group* and *RAF-AVIA*, which engage their staff as practice supervisors to ensure compliance with the practice agreement requirements.

Practice is implemented in accordance with the practice plan, which is developed by a structural unit responsible for Practice. Then the practice plan is agreed with the program director and is finally approved by the Dean of the Faculty.

The Corporate Client Department coordinates the Institute units involved in organizing practices and gathers information on partner enterprises that provide practice placement. In accordance with the practice requirements, the Faculty provides students with the list of companies offering practice opportunities and the number of available practice places. Consistent with the TTI practice program, students have the right to independently choose practice places, in which case they have to provide the Institute with a document certifying the agreement with the company offering the practice placement and signed with a specific student.

During practice, students perform tasks according to the previously agreed practice program. The completion of practice tasks is recorded in the practice performance diary (*Logbook*). At the end of each part of the practice, students have to defend their practice outcomes, which are summarized in the practice report. After each defense, students receive a differentiated assessment. The next stage of practice can be started only if the previous one has been successfully passed.

At the end of the practice students write a report on their practice outcomes, which they prepare consistent with the *Internship Methodological Guidelines*. Students must also submit a practice diary and the practice supervisor's reference. Practice documents are accessible to students on the e-learning platform *Moodle*.

The practice defence takes place on the premises of the Faculty.

The attainment of the practice aims, completion of practice tasks and the practice report are assessed applying a differentiated assessment scale.

The practice aims and tasks are described in the practice program and students learn about them in the beginning of their studies. Practice tasks are relevant to the expected learning outcomes of the program (see the program mapping in Appendix 26).

Further information on the practice description is provided in sub-section 5.3. in section II.

International students are provided with the same support during internship as local students. According to the approved Internship Programme, only one of the three stages of the internship - Operational Internship II (in the amount of 4 CP) is mainly performed by students in aviation companies (in maintenance companies or airlines) on the basis of agreements concluded between TSI, the students and those companies in which the students practice. The main purpose of this internship is the practical acquisition of EASA Module 7 "Aircraft Maintenance Practice".

The HEI offers the student an internship company, and the HEI concludes an agreement for the student's internship in a specific company. In some cases, on an individual basis, students, in agreement with the HEI, may also undergo Operational Internship II at TSI, using its training base (AN-2 and Cessna aircraft, simulators, workshops and laboratories). Foreign students equally has such opportunity. A lecturer or researcher approved by the order of the Dean of the Faculty of Engineering of TSI and the internship supervisor appointed by the head of the internship company conduct the internship. Internship supervisor from TSI (lecturer or researcher), providing support to the student throughout the internship preparation and implementation:

- participates in the development of student practice tasks;
- advises students during the internship and development of the internship report;
- controls the course of internship in the company (on place of internship);
- cooperates with the company's management and internship supervisor on the part of the company to jointly solve possible problems, etc

2.5. 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 evaluations of the final theses.

Students choose themes of their Bachelor's theses independently from the list of research directions for Bachelor's theses offered by the Faculty. The offered themes are broad and comprehensive. Together with the supervisor of the final Bachelor's thesis, a student can make corrections and specify the theme. The student can also propose his or her own research theme. This is usually the case when the student is already working and the chosen research topic will help him or her to acquire professional competences in a specific field.

The list of possible research areas offered by the Faculty is updated annually, taking into account the development trends in aviation and global trends in economics, politics and society, which affect the needs of the labor market and create new requirements for the education of modern aviation professionals.

Table 24 provides a list of Bachelor's thesis topics that were defended in the previous academic year of 2019/2020.

Table 24: Titles of Bachelor's theses for the academic year 2019/2020

No.	Bachelor's thesis titles	Mark	Supervisor	Student's country of residence
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1.	The use of adaptive wing on a short-haul passenger aircraft	9	S.Yunusov	Latvia
2.	Application of composite materials in support structural of power plant	8	K.Ķečvaļš	Latvia
3.	Passenger aircraft CRJ 100/200 fuselage structural repair in the area of attachment of ADF antenna.	9	S.Yunusov	Russian Federation
4.	Types of Fatigue Testing. Active Equipment of Detecting Faults, Design Transparency, Lacquer Coated Microspheres and Carbamide	7	K.Ķečvaļš	India
5.	Controlled rescue parachute system for a light-engine aircraft	8	S.Yunusov	Latvia
6.	Utilization of B747-400 reliability program during aircraft	7	I.Alomar	India
7.	Noise Reduction Of Aircraft Engine	9	K.Ķečvaļš	India
8.	Design of wind tunnel for the small size gas-dynamic studies	7	K.Ķečvaļš	India
9.	Use of GPS Landing System and calculation of possible GBAS ground facilities siting	9	M.A.Lācāne	Latvia
10.	The effective prognosis of airframe corrosion propagation	7	J.Solovjovs	India
11.	The use of composite materials in the structural components of the aircraft fuselage	7	K.Ķečvaļš	Kazakhstan
12.	Modernization of aircraft L-39 fuel system	8	I.Alomar	India
13.	The solution of the problem leaks in the air conditioning system. Enhancement joints of some unit	7	K.Ķečvaļš	India
14.	Evaluation of the passenger aircraft technical state of the air conditioning system	9	S.Yunusovs	Latvia
15.	Improvement in the retraction of landing gear to improve the safety of maintenance	7	K.Ķečvaļš	India
16.	The use of adaptive winglets on a passenger airplane	8	S.Yunusov	Latvia

17.	Reducing the length of the run of the aircraft in emergency situations with the help of modernization of the reverse thrust of turboshaft engine	6	V.Labendiks	Latvia
18.	Radial clearance control system in a high-pressure compressor of an aircraft gas turbine engine	8	S.Yunusov	Latvia
19.	Development of a maintenance frequency program based on the document MSG-3	7	K.Ļečvaļš	Kazakhstan
20.	Enhancements of the trouble shooting procedure for the landing gear fault searching of some type of aircraft	8	K. Ļečvaļš	India
21.	Modernization of the passenger aircraft anti-icing system	8	S.Yunusov	Latvia
22.	Distributed propulsion system for a passenger airplane with an aerodynamic design of a flying wing	8	S.Yunusov	Kazakhstan
23.	Aircraft centering influence on technical characteristics of aircraft	7	S.Yunusov	Latvia
24.	ILS localiser signal accuracy depending on ground obstacles located nearby	9	M.A.Lācāne	Kazakhstan

The Bachelor's theses of the students of the program *Aviation Engineering* are relevant both a specific company and in the industry overall. Sample topics of theses are developed considering the experience of academic staff and the recommendations of employers. Students conduct topical and important applied research, which helps future specialists to develop their professional competences, understand typical aspects of operations of an organization, develop a product essential for professional activities and explore specific topical issues of modern organizations in Latvian and the region.

Student theses developed in collaboration with airlines are particularly important. They enable students to delve into current business problems and look for possible solutions in a real aviation environment. As aviation is a very dynamic industry, which is why this approach is of great benefit to students.

Theses of the program are evaluated by a commission, which includes industry professionals, who evaluate both the topicality of the thesis, student's knowledge and presentation skills.

Theses receive different marks, which points not only to the level of knowledge, but also to the ability of students to concentrate when speaking in front of the public, the ability to argue, motivate and defend own opinion and yield recommendations. In the summer of 2020, when 34 students graduated from the program, the average grade was 7.2 (on the scale of 4-9). In the last 5 years the average grade has been within the range of 6.5-7.5. The highest mark (10) has not been awarded so far. This indicates the serious attitudes of the final examination commission in assessing the achievements of each student. No unsatisfactory ratings have been received in the last 5 years.

2.6. Analysis and assessment of the outcomes of the surveys conducted among the students, graduates, and employers, and the use of these outcomes for the improvement of the content and quality of studies by providing the respective examples.

36.9% of students of the study program *Aviation Engineering* participated in the survey of 2020. 90% of the respondents evaluated their choice of university positively. The rate continues to remain high over the years.

In 2020, the majority (86.7%) of the surveyed students positively assessed their studies in their program. These indicators were significantly higher than in 2018, when a positive assessment had been provided by 52.9%, and in 2017 - 60%. The quality of studies was maintained (86.7%) despite the restrictions set by Covid-19, which affected the study process (the last year's indicator - 89.5%).

The indicator of academic support was positively assessed by 87.1% of the students of the program. Although slightly lower than last year, the indicator was stabilized over the last two years and was significantly higher than in 2017 (68.6%) and 2018 (73.4%). The possibility of receiving consultations was highly valued by 93.5% of students, and this indicator was significantly higher than a few of years ago.

The objectivity of students' knowledge assessment has always been a serious issue in the study process. In 2021, 86.7% of students positively assessed the objectivity of assessment, which is an increase of 2.5% in comparison to 2020. Over the last two years, the downward trend was halted and even slightly increased compared to 2017 and 2018 (71.4% and 61.8%, respectively).

Special attention should be paid to informing students about all changes in the study process and convenient creation of a list of classes. The following two indicators received positive assessment (77.4%): the indicator of the schedule of classes and of study paper submission, on the one hand, and the indicator of obtaining timely and effective information about all changes in the study process and class schedule, on the other hand.

Some lecturers were unable to effectively comply with the mandatory requirement of the Institute on presenting a course description, including the criteria of assessment of learning outcomes, as only 76.7% of the respondents produced a positive response to the question of whether the criteria of assessment of learning outcomes had been known and transparent.

The students indicated that due to the transition to distance learning, there were problems with the assessment of learning outcomes, and specifically in one study course - higher mathematics.

The sudden onset of unexpected and difficult circumstances in the second quarter of 2020 was a major challenge for any university, including TTI. However, having its own distance learning platform, TTI was able to offer a wide range of opportunities for knowledge exchange, which is why no major impediments in the study process were observed. All lecturers were urgently trained to use eTSI possibilities. After the end of the academic year, additional training was organized for lecturers to enhance their skills of using the platform.

Distance learning was organized for students using the e.tsi.lv website with wide possibilities - video conferences, exchange of materials, planning of the study process, etc. Although distance learning does not provide for the same level of effectiveness in the assessment of learning outcomes, the TTI platform is constantly being updated and improved with new functions so that students can take additional tests and engage in other activities motivating them to acquire the course content.

First-year students are interested in additional aviation and logistics courses, which would expand the program and in exceptional cases would provide students with the opportunity to work in the fields other than aircraft maintenance. Senior year students emphasize the need to include more practices in the program. In their opinion, Block C should include various courses on Aviation Management.

When reviewing the content of the study program, the above-mentioned student recommendations were taken into account. The program includes a larger number of study courses covering various areas of aviation, which significantly expands students' knowledge of general and specific aspects of aviation, while maintaining the traditional specialization of TTI aviation transport program - aircraft maintenance.

In order for students to acquire practical work skills, advance and strengthen their theoretical knowledge and skills acquired in the training process, to learn how to use the main tools and technologies required in aircraft maintenance, to learn how to conduct main aircraft maintenance activities, the updated study program includes three student practices: Training Practice (4 CP) in TTI workshops, Operational Practice I (2 CP) in TTI laboratories and structural units, and Operational Practice II (4 CP) mainly in aviation companies (maintenance companies or airlines).

The results of the graduate survey show that there are no graduates among the respondents who are dissatisfied with the study program.

Overall, theoretical knowledge of various fields were positively assessed by 87% of respondents, acquired research skills by 87.5%, improved ability to critically evaluate, analyze and systematize information, which is necessary for decision-making in the professional field, by 90.9%. The ability to work with databases, computer programs necessary for the work performance was rated slightly lower - 72.7%.

In their comments, some graduates indicated that the level of skills acquired in the program was sufficient to work in their specialty (as an aircraft maintenance mechanic / avionics specialist) but that they had little knowledge of a wider spectrum of issues in aviation.

Aviation is not just about the aircraft and its maintenance. In order to provide students with a broader awareness of the entire aviation industry, the study program has included new courses that inform students about other important components of the aviation business - airport operations, aircraft ground handling, aviation business, flight planning and aeronautical navigation services, focusing on the structure and operation of the airspace. Such contents of the study program will open up more job opportunities for students of aviation, and most importantly, will expand students' knowledge of a wide range of aviation opportunities and areas to specialize in the future.

68.42% of the respondents thought the knowledge, skills and competences acquired during the studies corresponded to the requirements of the modern labor market.

Today's world is dynamic, especially aviation. The digitization of systems and artificial intelligence are an integral part of modern aviation. Digitization refers to remote control, a wider field of vision and faster situational awareness, not only in military aviation. Remote control pertains not only to the use of remote control aircraft, but also to airspace control, etc. The TTI new Bachelor's study program offers courses in Digital Technologies in Aviation and Remote Control Aircraft Systems, which review modern aviation trends.

In general, the graduates of the program are satisfied with the acquired education. They indicated that the knowledge, skills and competences acquired during the studies corresponded to the requirements of the modern market.

32% of the respondents expressed a wish to continue their studies in a higher level program. This is

one of the reasons why the development plan of the study direction envisages the establishment of a Master's program in aviation engineering, which is as a logical continuation of the Bachelor's program.

83.33% of the surveyed supported cooperation with the Institute after graduation.

On the one hand, employers also positively assessed the level of training of graduates, but on the other hand, all of them pointed to gaps in practical skills of students, especially of the graduates of the Bachelor's program.

Employers recommend that TTI develop more active cooperation with companies, offer students internships in the field of professional specialization, use business situations and tasks in training, continue to promote students' personal growth, initiative, critical thinking, stress resilience and team work skills.

The program *Aviation Engineering* includes the course *Academic Skills and Critical Thinking*, enhancing academic skills of students, which are essential for producing theses of good quality. Additionally, critically thinking employees are required at the workplace. To improve practical and professional skills, the program includes Operational Practice (4 CP), which is implemented in TTI partner companies.

2.7. Provide the assessment of the options of the incoming and outgoing mobility of the students, the dynamics of the number of the used opportunities, and the recognition of the study courses acquired during the mobility.

The TTI Engineering Faculty implements student mobility in all study programs. The information on the student mobility agreements which provide for a reciprocal flow of student exchanges at the faculty is available in section 5.1.

Incoming mobility students are admitted with the status of exchange students to one of the programs of the Engineering Faculty during their exchange visit, although exchange students often choose attend courses in other faculty programs. Students are provided with the required amount of study courses and credit points. The offered courses are conducted in English. Recognition of learning outcomes achieved through the ERASMUS+ mobility program is regulated by the TTI ERASMUS+ Program Scholarship Instruction Manual (available at http://www.tsi.lv/sites/default/files/editor/2017.02.07._instrukcija_0.pdf).

The number of students choosing to go on exchange mobility from the programs of the Engineering Faculty is low. In the last six years, only 3 students of the study program *Aviation Engineering* have participated in exchange mobility (practice). Over the reporting period, 28 students from engineering programs have used the mobility opportunities, which is 17% of all TTI students who have participated in the mobility program. The mobility services are mostly used by students of social sciences. There are several reasons for this:

- combining work with studies;
- lack of similar courses at partner universities;
- requirement for acquiring specific knowledge consistent with EASA Part-66 Category B1 or B2 specialization.

The number of incoming exchange students in the program has significantly increased over the last six years reaching 25 students.

III - DESCRIPTION OF THE STUDY PROGRAMME (3. Resources and Provision of the Study Programme)

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. Whilst carrying out the assessment, it is possible to refer to the information provided for in the criteria set forth in Part II, Chapter 3, sub-paragraphs 3.1 to 3.3.

The resources and provision of the study program (see criteria 3.1-3.3 in section 3) fully comply with the conditions for the implementation of the study program and the achievement of learning outcomes.

Resources available to students, including study facilities, material and technical base, tools and equipment (for preparing study and research materials and developing practical skills required for conducting aircraft maintenance activities), information networks (Intranets, Moodle), databases (library network, free access to databases (book resource database)), computer applications and software create flexible and student-oriented learning environment essential for studies and research in the program.

The implementation of the study program is ensured by necessary technical equipment (computers with licensed software, projectors, interactive whiteboards, etc.) and various teaching methods (group work, discussions, practical assignments, etc.).

Laboratories have very good equipment, for example, one -105 laboratory, which ensures proper study processes in the program *Aviation Engineering*.

Table 24. 105. laboratory use in the study process

No.	Equipment	Study course	Study themes
1.	Aircraft <i>Cessna-152</i>	Introduction to Speciality	General Introduction to Aircraft Equipment
		Aircraft Design and Strength	Wing Power Schemes. Wing Strength. Wing and Stabilizer Construction
		Aircraft Electrical Equipment	Fundamentals of Structural Strength. Wing and Stabilizer Device

2.	Aircraft <i>Cessna-152</i>	Introduction to Speciality	General Introduction to Aircraft Equipment
		Aerodynamics and Flight Dynamics	Geometric and Aerodynamic Properties of the Wing. Wing Mechanization. Aircraft Stabilization and Flight Control
		Aircraft Design and Strength	Aircraft Control Systems. Landing Gear. Brakes.
		Aircraft Electrical Equipment	Aircraft Control Systems. Landing Gear. Brakes..
		Aircraft Maintenance Provision Organization of Aircraft Maintenance	Engine and Propeller. Landing Gear. Management. Glider. Diagnostic Elements in Maintenance
3.	Stand <i>Mechanization of Wings and Landing Gear</i>	Introduction to Speciality	General Introduction to Aircraft Equipment
		Aerodynamics and Flight Dynamics	Wing Mechanization. Aircraft Configuration and Resistance
		Aircraft Design and Strength	Release / Retraction of Wings and Landing Gear
		Aircraft Electrical Equipment	Release / Retraction of Wings and Landing Gear
4.	Stand <i>Brakes</i>	Aircraft Design and Strength	Aircraft Brake System
		Aircraft Electrical Equipment	Aircraft Brake System
		Aircraft Maintenance Provision Organization of Aircraft Maintenance	Brake Maintenance and Control
5.	Stand <i>De-icing Systems</i>	Aerodynamics and Flight Dynamics	Impact of Icing on Aircraft Aerodynamic Quality
		Aircraft Design and Strength	Aircraft De-icing System
		Aircraft Electrical Equipment	Aircraft De-icing System
		Aircraft Maintenance Provision Organization of Aircraft Maintenance	Maintenance of Aircraft De-icing System

6.	Stand <i>Piston Engine</i>	Aircraft Engine Design and Control Systems	Piston Engine Design and Operation
		Aircraft Electrical Equipment	Piston Engine Design and Operation
		Aircraft Maintenance Provision Organization of Aircraft Maintenance	Piston Engine Maintenance
7.	Physics laboratory equipment	Physics	Physics Sections: Mechanics, Thermodynamics

Every year the technical and exercise equipment of the TTI laboratories is supplemented and renewed to follow the education demand, the latest technological trends and the financial resources of the Institute. For example, the following equipment has been purchased and new laboratories have been opened in recent years:

- Airplane An-2 (from 2018), on the TTI premises
- Laboratory of robotics (from 2019)
- Drones and their control systems (from 2020)
- Room 105 (from 2020)
 1. Airplane Cessna-152.
 2. Airplane wing and stabilizer
 3. Exercise equipment "Wing mechanization and landing gear"
 4. Exercise equipment "Aircraft brake system"
 5. Exercise equipment "Anti-skid brake system"
 6. Exercise equipment "De-icing system"
 7. Exercise equipment "Piston engine"
 8. Laboratory equipment in the study course "Physics" (for the division of Thermodynamics)
- Room 03 (from 2021) - Laboratory exercise equipment "Laser cutting"
- Room 708 (from 2021) - Virtual Simulator "Flight Control" (currently in test mode).

Overall, the study base, information base (including libraries), material and technical base and financial base meet the requirements of the study program and implementation conditions, create preconditions for achieving learning outcomes and ensure the quality of the study process.

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

III - DESCRIPTION OF THE STUDY PROGRAMME (4. Teaching Staff)

4.1. 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 accreditation of the study program in 2012, out of 25 lecturers involved in the program, 20 were elected members of the TTI academic staff, while 2 other lecturers were independent employees of TTI working as APAC engineers. Only one course was taught by a lecturer from a company. Compared to the previous accreditation period, the number of professors and associate professors in the program has not changed, but the number of lecturers has significantly decreased to 6. Three lecturers of the previous accreditation period have obtained a doctoral degree and have been promoted to the position of an assistant and associate professor.

Although 8 years ago and since then almost all aviation teaching staff of the program have been working as instructors at APAC, in 2012 accreditation experts recommended that the level of aviation qualifications of the teaching staff of the program be increased. In the previous period, foreign guest lecturers and specialists working in companies taught only on a few occasions. Today teaching staff should include lecturers of such a profile. Currently, only 4 of the elected faculty members work in aviation companies, whereas 6 other lecturers work in leading aviation companies. This links the program to practical activities, as the course information is obtained directly from the professionals working in the field, which boosts students' interests.

During the post-accreditation period, the Institute carried out purposeful work on the composition of the academic staff in order to ensure the best quality of study programs. A human resource development plan was designed for the Faculty, which envisages the improvement of the quality of the study program based on further development of the existing academic staff and on the engagement of recognized academic staff, industry experts and professionals, foreign guest lecturers as well as students and graduates of the Institute doctoral program.

The current composition of the academic staff of the study program is described in the following sub-section. It is formed by evaluating the requirements of external regulatory enactments and of higher education quality and it ensures the attainment of the aims and learning outcomes of the study program and respective study courses.

4.2. 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.

Thirty two members of the teaching staff, of whom 20 are the TTI elected members of academic staff, ensure teaching in the study program.

Six professors teaching in the study program, including 5 with a doctoral degree in the relevant field of science, are Dr.hab.sc.ing. I.Kabaškins, Dr.sc.ing. A.Medvedevs, Dr.sc.ing. A.Grakovskis, B.Mišņevs, Dr.sc.ing.I.Jackiva, and Dr.admin.Y.Stukalina Four associate professors with a doctoral degree in the relevant field of science are Dr.sc.ing. M.A.Lācāne, A.Kraiņukovs, Dr.sc.ing. D.Pavlyuk,

N.Spiridovska.

There are 6 assistant professors working in the program - Dr.sc.ing. A.Bulekovs, Dr.sc.ing. K.Nečvals, Dr.sc.ing. A.Pozdņakovs, Dr.sc.ing. M.Smoļņinovs, Dr.sc.ing. S.Yunusov, Dr. Psych. K.Užule and two lecturers - Mg.oec. O.Zervina, who is currently studying for a doctoral degree in aviation, and J.Mikulko.

A total of 90% of the academic staff involved in the program have a doctorate.

Leading lecturers of other universities or specialists with specialized knowledge also teach in the program, e.g. A. Roskoša, associate professor of RTU, teach Latvian to foreign students, while a RTU doctoral student teaches courses on engineering modeling and simulation and aviation engine design.

To boost the quality of teaching, lecturers teach only in 1 of the 3 languages of the program. Of the invited lecturers, 2 have a doctor's degree, 3 are studying for a doctoral degree, while others have a Master's degree.

Lecturers conduct research and contribute to student education. The Transport and Telecommunication Institute, as far as possible, ensures the professional development of its staff and provides incentives with competitive salaries in Latvia.

The language skills of the lecturers employed by the program meet the official language knowledge requirements passed by the Cabinet of Ministers on July 7, 2008 as Regulation No. 733 on *Regulations Regarding the Extent of the Knowledge of the Official Language, the Procedures for Examining the Proficiency in the Official Language for the Pursuit of Professional and Occupational Duties, for the Acquisition of the Permanent Residence Permit and of the Permanent European Union Resident Status and the State Fee for Examining the Proficiency in the Official Language*. When recruiting, the TTI Human Resource Department verifies the official language skills (see Appendix 21).

In order to verify the English language skills of the academic staff, TTI periodically organizes testing of the English language proficiency and if necessary organizes additional training, for example, currently several members of the academic staff are enhancing their English language skills within the framework of Project 8.2.2. Further English language training will be supported by TTI own funding.

Not only the academic staff of the study direction is involved in the study process, but also several specialists of the field, who by sharing their professional experience with students advance their knowledge and skills and thus increase students' employment opportunities after graduation.

Currently, only 4 members of the elected academic staff of the program work in aviation companies: I.Alomar, general director and chief maintenance adviser at Terra Avia (AOC MD 022), M.Lācāne, head of the training center at Latvijas Gaisa Satiksme, A.Bulekovs, quality system manager at Wings 4 Sky Group, M.Smoļņinovs, researcher, project manager (areas of activity: maintenance of endurance tests of aircraft units) AVIATEST LTD.

Teaching staff of the program also includes working professionals. A.Savelļevs, member of the Board of Riga International Airport jointly teaches the course Basics of Aviation Business with the TTI lecturer O.Zervina. J.Tereshchenko, category B technician at airBaltic, teaches Aircraft Maintenance. M.Mikstāns, deputy director of the ground handling services at Riga International Airport, will teach the course Aircraft Ground Handling. M.Ivanovs, quality system manager at Flight Consulting Group, will teach the course Flight Management. J. Solovyov, head of TTI APAC theoretical training and examinations, will teach several study courses as a guest lecturer. The TTI doctoral student Maksim Pivovarov is a top manager in S7 Group, the largest holding company in the

Russian Federation, who specializes in aeronautical engineering, including maintenance of various aeronautical equipment. He will co-teach the course Digital Technologies in Aviation with the TTI professor B. Mišņeva.

Qualifications of the academic staff implementing the study program satisfy the program implementation requirements and the requirements of the regulatory enactments, thus, ensuring the attainment of the aims and learning outcomes of the study program and respective study courses.

Appendix 30. Confirmation of English proficiency of academic staff teaching in the program.

4.3. Information on the number of the scientific publications of the academic staff members, involved in the implementation of the 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 may be additionally specified (if applicable).

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).

4.5. Provide examples of the involvement of the academic staff in the scientific research and/or artistic creation activities both at national and at international level (in the fields related to the content of the study programme), as well as the use of the obtained information in the study process.

Further information is provided in sub-sections 4.2.- 4.6. in section II.

The research activities of the academic staff are mostly related to the lecturer specialization in the program and are relevant to study courses.

The scientific activities of the academic staff play a decisive role in the development of the study program and the content of specific study courses. In order to understand the nature of changes taking place in the world, it is necessary to conduct research in relevant fields, which has been implemented by the Faculty through the participation of academic staff in international scientific projects, international scientific and practical conferences and preparation of publications. Conversely, if the labor market needs management professionals with specific skills and competences (e.g. with the focus on enterprise digital transformation), this theme will be selected as a priority research area by both lecturers and students.

By conducting research, academic staff expand their knowledge and thus enhance the quality of their courses by integrating the most up-to-date information on relevant innovations.

Within the project Enhancing Excellence and Innovation Capacity in Sustainable Transport Interchanges (ALLIANCE), 5 independent research groups were established, led by the project partners. The first group *Simulation and Ground Handling at Airports* was led by prof. Yuri Tolujev on behalf of TTI and Dr. Tobias Reggelins on behalf of Fraunhofer IFF. The group included 3 young researchers - Iyad Alomar (TTI), David Weigert (Fraunhofer IFF), Alina Rettmann (Fraunhofer IFF). At the beginning of research activities, each research group prepared a research proposal with a detailed plan of actions. During the closing conference of the ALLIANCE project, the research groups presented the outputs of their research. The research groups continue their research after the end of the project. On 26 February 2019, the project participant Iyad Alomar defended his doctoral dissertation *Research on Alternative Control Methods for Land Vehicle Traffic at Airports*. TTI and German partners jointly prepared scientific papers, which are listed below:

- Alomar and J. Tolujev. "Optimization of ground vehicles movement on the aerodrome", *Transportation Research Procedia*, JUNE, 2017, pp. 58-64.
- Alomar, J. Tolujev and Medvedev. "Simulation of Ground Vehicles Movement on the Aerodrome". *Procedia Engineering*. 2017. pp. 340-348.
- Alomar, J. Tolujev, D. Weigert and A. Rettmann. "Shortening the turnaround times of aircraft by improving ground handling processes through a simulation study", *IEEE Xplore*, June, 2018, pp. 1-8.
- Tolujev, A. Medvedev and I. Alomar. "Analysis of Riga International Airport Flight Delays", *Reliability and Statics in Transportation and Communication. I. Kabashkin, I. Yatskiv and O. Prentkovskis eds. Springer,, Vol. 36, January, 2018, pp. 519-529.*
- Alomar, J. Tolujev, D. Weigert and A. Rettmann. "Development and Simulation of Priority Based Control Strategies of Ground Vehicles Movements on the Aerodrome". E. G. D. Karakikes ed. 2018. pp. 815-822.
- Weigert, A. Rettmann, I. Alomar and J. Tolujev. "Modelling and Simulation of the Riga International Airport to Reduce Turnaround Times of Crucial Clearance Processes" In book: "Reliability and Statistics in Transportation and Communication". I. Kabashkin, I. Yatskiv and O. Prentkovskis eds. Springer, Cham. 2018. pp. 530-539.

COST Action TU1408: *Air Transport and Regional Development*, supervisor prof. I. Kabaskins. This action explores the relationship between air transport and regional development. The benefits it brings are both scientific and societal in nature. These include a better understanding of these relations, focusing on Europe; analysing policy recommendations on how air transport infrastructure and services should be pursued to support the economic competitiveness that is dedicated to air transport and its economic, social and environmental consequences, in line with the Europe 2020 strategy. The following papers were published as research outputs:

- Kabashkin. "Design of Embedded Architecture for Integrated Diagnostics in Avionics Domain". *Procedia Engineering*. 2017. pp. 419-426.
- Mironov, P. Doronkin, A. Priklonsky and I. Kabashkin. "The Role of Advanced Technologies of Vibration Diagnostics to Provide Efficiency of Helicopter Life Cycle". *Procedia Engineering*. I. Kabashkin, I. Yatskiv (Jackiva) and O. Prentkovskis eds. 2017. pp. 96-106.
- Kabashkin. "Dynamic Redundancy in Communication Network of Air Traffic Management System" In book: "Advances in Dependability Engineering of Complex Systems". Springer, Cham. 2018. pp. 178-185.

More information is provided in Appendix 13, providing a list of projects involving the academic staff of the program, and Appendix 14, providing a list of scientific publications of the academic staff of the program for the reference period.

4.6. 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 courses/ modules. Specify also the proportion of the number of the students and the teaching staff within the study programme (at the moment of the submission of the Self-Assessment Report).

The teaching staff of the program cooperate to produce joint scientific papers and teaching materials, and to create, improve and teach joint study courses of the study program. Scientific papers are used in the study process.

Many courses included in the program are interdisciplinary. Their development is the outcome of joint efforts of academic staff of different areas of sciences.

The study program includes the study course Digital Technologies in Aviation. The course was co-developed by Dr.sc.ing. B.Mišņevs, TTI professor at Engineering Faculty, and the TTI doctoral student Maksim Pivovar (*S7 Group*). Prof. B.Mišņevs is the supervisor of Maksim Pivovar's doctoral thesis *Methodology for Building an Effective Data Migration Mechanism in the Process of Implementation of Information Systems at Enterprises of Aircraft Technical Services and Operations*. Such cooperation yields integration of research results of a doctoral student with practical experience in aviation leading to an integrated study course.

A significant portion of elective study courses is delivered by representatives of the specific professional field who are TTI elected academic staff and representatives of aviation companies. These courses comprise 30 CP in Latvian and Russian programs and 40 CP in the English program (see sub-section 4.2).

When developing the study program and study courses, the elected study courses were jointly developed with guest lecturers and the teaching staff of the faculty. The study course Aviation Business Management was developed in collaboration with A.Saveljevs, a member of the Board of Riga International Airport, and a Mg.oec. O.Zervina, TTI lecturer. The study course Aircraft Ground Handling was developed jointly by M.A. Lācāne, deputy director of the ground handling department of Riga International Airport and TTI associate professor.

Such cooperation promotes best competences of the teaching staff, enhances teaching quality, boosts interest in studies and motivates students. Integrated study courses are essential for ensuring acquisition of knowledge and skills as well as attainment of learning outcomes and aims of the study program. Such courses are typically delivered by specialists with specialized knowledge who share their professional expertise with students, thereby strengthening practical components of the study program and creating favourable conditions for the development of professional competences of a modern manager.

In general, a collaboration mechanism for teacher engagement in the development of study courses has been implemented in order to promote the development of study courses / modules and ensure their interconnection.

The ratio of the number of students and teaching staff in the study program is variable depending on the semester study plan and students' division into specializations in a specific study year according to a specified semester and study form.

At the time of the submission of the self-assessment report (academic year 2020/2021), the program is employing 30 members of the teaching staff and having 132 students enrolled.

The average ratio of students / teaching staff in the study program is four students per lecturer or six students per full-time elected lecturer.

Annexes

III. Description of the Study Programme - 1. Indicators Describing the Study Programme		
Compliance of the joint study programme with the provisions of the Law on Institutions of Higher Education (table)		
Statistics on the students over the reporting period	STATISTICS ON STUDENTS, Self-Assessment report, Part III, sub-chapter 1.2.docx	Statistikas dati par studējošajiem bakalaura studiju programmā.docx
III. Description of the Study Programme - 2. The Content of Studies and Implementation Thereof		
Compliance of the study programme with the State Education Standard	0208 Compliance of the program with the National Standart.pdf	0208 Atbilstība izglītības standartam.docx
Compliance of the qualification to be acquired upon completion of the study programme with the professional standard (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	Mapping of the study courses.xlsx	26.pielikums. Kartejums .xlsx
Curriculum of the study programme (for each type and form of the implementation of the study programme)	Study programm plan.zip	Studiju plans.zip
Descriptions of the study courses/ modules	Descriptions of the study courses.zip	Kursu apraksti.zip
Description of the Study Direction - Other mandatory attachments		
Sample of the diploma to be issued for the acquisition of the study programme.	Appendix 31. Diploma Supplement.zip	31.pielikums. Diploms un pielikums.zip
Description of the Study Programme - Other mandatory attachments		
Document confirming that the higher education institution/ college will provide the students with the options to continue the acquisition of education in another study programme or at another higher education institution/ college (a contract with another accredited higher education institution/ college), in case the implementation of the study programme is discontinued	Appendix 22. Agreements.zip	TSI RTU līgums.edoc
Document confirming that the higher education institution/ college guarantees to the students a compensation for losses if the study programme is not accredited or the licence of the study programme is revoked due to the actions of the higher education institution/ college (actions or failure to act) and the student does not wish to continue the studies in another study programme	Appendix 27. Confirmation.pdf	27.pielikums.Apliecinājums zaudejumu kompensācija.pdf
Confirmation of the higher education institution/ college that the teaching staff members to be involved in the implementation of the study programme have at least B2-level knowledge of a related foreign language according to European language levels (see the levels under www.europass.lv), if the study programme or any part thereof is to be implemented in a foreign language.	Confirmation eng.zip	Apliecinājums angļu valoda.zip
If the study programmes in the study direction subject to the assessment are doctoral study programmes, a confirmation that at least five teaching staff members with doctoral degree are among the academic staff of a doctoral study programme, at least three of which are experts approved by the Latvian Science Council in the respective field or sub-field of science, in which the study programme has intended to award a scientific degree.		
If academic study programmes are implemented within the study direction, a document confirming that the academic staff of the academic study programme complies with the provisions set out in Section 55, Paragraph one, Clause three of the Law on Institutions of Higher Education	Appendix 29. Confirmation.pdf	29.pielikums. Apliecinājums atbilstība AL.pdf
Sample (or samples) of the study agreement	32.Appendix. Sample of the study agreement 0408.pdf	32.pielikums. Studiju līguma paraugs 0308.pdf
If academic study programmes for less than 250 full-time students are implemented within the study direction, the opinion of the Council for Higher Education shall be attached in compliance with Section 55, Paragraph two of the Law on Institutions of Higher Education.	AIP.zip	AIP atzinums.zip