CENTRE FOR QUALITY ASSESSMENT IN HIGHER EDUCATION

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EVALUATION REPORT

STUDY FIELD of STATISTICS

at Vilnius Gediminas Technical University

Expert panel:
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2. **Prof. dr. Ričardas Krikštolaitis ,** *academic;*
3. **Prof. dr. Pedro Francisco Delicado Useros,** *academic;*
4. **Ms Gabija Girdžiūtė,** *representative of social partners;*
5. **PhD student Monika Briedienė,** *students' representative.*

Evaluation coordinator – *Ms Natalija Bogdanova*

Report language – English
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Study Field Data

I.

Title of the study programme	**Data Analysis Technologies**
State code	6121AX009
Type of studies	University
Cycle of studies	First
Mode of study and duration (in years)	Full time, 4 years
Credit volume	240 ECTS
Qualification degree and (or) professional qualification	Bachelor of Mathematical Sciences
Language of instruction	Lithuanian
Minimum education required	Secondary
Registration date of the study programme	22 June, 2011

II.

Title of the study programme	**Applied Statistics**
State code	6211AX009
Type of studies	University
Cycle of studies	Second
Mode of study and duration (in years)	Full time, 2 years
Credit volume	120 ECTS
Qualification degree and (or) professional qualification	Master of Mathematical Sciences
Language of instruction	Lithuanian
Minimum education required	Bachelor degree
Registration date of the study programme	1 February, 1997

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I. INTRODUCTION

1.1. BACKGROUND OF THE EVALUATION PROCESS

The evaluation of study fields is based on the Methodology of External Evaluation of Study Fields approved by the Director of the Centre for Quality Assessment in Higher Education (hereafter – SKVC) 31 December 2019 Order No. V-149.

The evaluation is intended to help higher education institutions constantly improve their study process and to inform the public about the quality of studies.

The evaluation process consists of the main following stages: *1) self-evaluation and self-evaluation report prepared by Higher Education Institution (hereafter – HEI); 2) site visit of the expert panel to the higher education institution; 3) production of the external evaluation report (EER) by the expert panel and its publication; 4) follow-up activities.*

On the basis of this external evaluation report of the study field, SKVC takes a decision to accredit the study field either for 7 years or for 3 years. If the field evaluation is negative then the study field is not accredited.

The study field and cycle are **accredited for 7 years** if all evaluation areas are evaluated as exceptional (5 points), very good (4 points) or good (3 points).

The study field and cycle are **accredited for 3 years** if one of the evaluation areas was evaluated as satisfactory (2 points).

The study field and cycle are **not accredited** if at least one of the evaluation areas was evaluated as unsatisfactory (1 point).

1.2. EXPERT PANEL

The expert panel was assigned according to the Experts Selection Procedure (hereinafter referred to as the Procedure) as approved by the Director of Centre for Quality Assessment in Higher Education on 31 December 2019 Order No. V-149. The site visit to the HEI was conducted by the panel on *16 December, 2021.*

1. **Prof. dr. Claudia Kirch (panel chairperson)** *Professor at Institute for Mathematical Stochastics, Faculty of Mathematics, Otto-von-Güricke-Universität Magdeburg (OVGU Magdeburg) Germany;*
2. **Prof. dr. Ričardas Krikštolaitis,** *Professor at Faculty or Informatics, Dep. of Mathematics and Statistics, Vytautas Magnus University, Lithuania;*
3. **Prof. dr. Pedro Francisco Delicado Useros,** *Professor at Faculty of Mathematics and Statistics, Polytechnic University of Catalunya, Spain;*
4. **Dr. Gabija Girdžiūtė,** *Actuary at ERGO Life Insurance SE, member of Lithuanian Actuary Society, Lithuania;*
5. **PhD. Monika Briedienė,** *doctoral student at Faculty or Informatics, Vytautas Magnus University, Lithuania.*

1.3. GENERAL INFORMATION

The documentation submitted by the HEI follows the outline recommended by SKVC. Along with the Self-evaluation report and annexes, the following additional documents have been provided by the HEI before, during and/or after the site visit:

No.	Name of the document
1.	List on additional evidence and factual questions
2.	Description of courses

1.4. BACKGROUND OF THE STUDY FIELD/STUDY FIELD POSITION/STATUS AND SIGNIFICANCE IN THE HEI

Vilnius Gediminas Technical University (VILNIUS TECH) was established in 1956 and is one of the biggest research universities in Lithuania with a focus on technologies and engineering. Studies of 29 fields are implemented at the University in the following groups of study fields: Engineering, Informatics, Mathematics, Technologies, Social Sciences, Humanitarian Sciences, Business and Public Management, Arts. Study process is carried out in 10 faculties: Antanas Gustaitis' Aviation Institute, Architecture, Business Management, Civil Engineering, Creative Industries, Electronics, Environmental Engineering, Fundamental Sciences, Mechanics, Transport Engineering. Study programmes in the field of engineering sciences make 70 % of all study programmes. In 2021 there were over 9 400 students and 13.5 % of them were international students (degree seeking or exchange). In 2021 there were 960 academic staff members (67 % with PhD degrees). Research and experimental development work are carried out in 13 institutes, 3 research centres and 22 research laboratories. VILNIUS TECH publishes 15 research journals (10 of which are listed in Clarivate Analytics Web of Science).

The Faculty of Fundamental Sciences was established in 1993. The faculty was composed of the departments working in the branches of exact science and lecturing common subjects throughout the University. Currently, the Faculty of Fundamental Sciences consists of 8 departments: Information Systems, Information Technologies, Graphical Systems, Chemistry and Bioengineering, Physics, Engineering Graphics, Mathematical Modelling, Mathematical Statistics. The faculty also has an Institute of Applied Informatics, 6 science and 6 teaching laboratories.

In the field of statistics, 2 study programmes are implemented: the first-cycle study programme Data Analysis Technologies and the second-cycle study programme Applied Statistics and the specialisations are: Data Science; Statistical Applications in Finances and Economics. Implementation of first-cycle studies in the field of statistics was started in 2011, of the second-cycle studies – in 1997. These study programmes are carried out by the Department of Mathematical Statistics.

II. GENERAL ASSESSMENT

Statistics study field and first-cycle at Vilnius Gediminas Technical University is given **positive** evaluation.

Study field and cycle assessment in points by evaluation areas

No.	Evaluation Area	Evaluation of an Area in points*
1.	Intended and achieved learning outcomes and curriculum	3
2.	Links between science (art) and studies	2
3.	Student admission and support	3
4.	Teaching and learning, student performance and graduate employment	3
5.	Teaching staff	2
6.	Learning facilities and resources	4
7.	Study quality management and public information	4
	Total:	21

*1 (unsatisfactory) - there are essential shortcomings that must be eliminated;
2 (satisfactory) - meets the established minimum requirements, needs improvement;
3 (good) - the field is being developed systematically, has distinctive features;
4 (very good) - the field is evaluated very well in the national and international context, without any deficiencies;
5 (excellent) - the field is exceptionally good in the national and international context/environment.

Statistics study field and second-cycle at Vilnius Gediminas Technical University is given **positive** evaluation.

Study field and cycle assessment in points by evaluation areas

No.	Evaluation Area	Evaluation of an Area in points*
1.	Intended and achieved learning outcomes and curriculum	3
2.	Links between science (art) and studies	2
3.	Student admission and support	3
4.	Teaching and learning, student performance and graduate employment	3
5.	Teaching staff	3
6.	Learning facilities and resources	4
7.	Study quality management and public information	4
	Total:	22

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5 (excellent) - the field is exceptionally good in the national and international context/environment.

III. STUDY FIELD ANALYSIS

3.1. INTENDED AND ACHIEVED LEARNING OUTCOMES AND CURRICULUM

Study aims, outcomes and content shall be assessed in accordance with the following indicators:

3.1.1. Evaluation of the conformity of the aims and outcomes of the field and cycle study programmes to the needs of the society and/or the labour market (not applicable to HEIs operating in exile conditions)

(1) Factual situation

Nowadays, Data Analyst, Data Scientist and Statistician are among the most in-demand professions in the world, and in particular in Lithuania, where these professions are constantly appearing on websites offering jobs to professionals. The demand for Data Analysts/Data Scientists/Statisticians is confirmed by business representatives. Only two HEI in Lithuania offer studies in the Statistics study field (VU and VTGU). Additionally, there are three more study programs (in the Applied Mathematics study field) offering programs related to Data Science (two in KTU, and another in VDU).

Second-cycle studies in the field of statistics (Applied Statistics, AS) were started in 1997 at VGTU. The Implementation of the first-cycle studies was in 2011 (SER, page 7), but it has been recently that its name has been updated to Data Analysis Technology (DAT) and that subjects such as Programming using Python, Computational Statistics, Introduction to Bayesian Statistics, or Big Data Analytics, have been included. DAT and specialisation "Data Science" of AS are devoted to train analysts capable of applying contemporary methods of analysis and forecasting, technologies and analytical software tools. A need for such specialists is currently growing in Lithuania and abroad (SER, page 8). Specialisation "Statistical Methods in Finances and Economics" of AS is in line with applied econometrics, an area highly needed in Lithuania, whereas professionals of the required qualification in Lithuania are scarce. The master program AS has recently developed a second specialisation in Data Science (SER, page 8).

(2) Expert judgement/indicator analysis

The panel judges that the aims and outcomes of the DAT and AS study programmes meet the needs of both society and labour market. This judgement is confirmed by the broadly positive opinions of Alumni and Social Partners at the site visit. Alumni confirm that the study programmes prepared them well for the professional career. In particular, they mention that the background they obtained at VGTU is allowing their continuous learning since they arrived at work. Employers also confirm the good general training in theoretical and (especially) practical skills that the programmes provide.

However, they also mention some additional study contents which would be assumed beneficiaries, such as data management in practice (e.g., confidential/personal data treatment) or clinical trials. The opinion of the experts is that the inclusion of these contents in the study programmes would reinforce the connection between the studies and the needs of the labour market, which would benefit the study programmes.

3.1.2. Evaluation of the conformity of the field and cycle study programme aims and outcomes with the mission, objectives of activities and strategy of the HEI

(1) Factual situation

Among the aims of VILNIUS TECH, the following can be found: to train qualified professionals, receptive to science and latest technologies, who would be able to work successfully both on Lithuanian and foreign markets (SER, pages 6 and 10). Among the aims of DAT and AS, the following can be found: to educate data analysis specialists possessing solid knowledge in mathematical statistics and informatics as related with the big data analysis, aware of the possibilities of the contemporary software tools, capable of selecting and applying statistical modelling and forecasting methods for solving real business problems (SER, page 9). SER (Section 1.3) points out that the aims and learning outcomes of DAT and AS programmes help achieve key activity goals defined in the University strategy and implement the mission undertaken since the main activity is aligned with the implementation of statistical studies.

(2) Expert judgement/indicator analysis

The panel concludes that the aims and outcomes of the DAT and AS study programmes meet the main mission, objectives, and strategy of VGTU. Further evidence of this was provided at the Senior Management meeting during the site visit, where the Rector of VGTU explicitly confirmed that Mathematics is fundamental in the strategy of the University.

Further discussions with the staff, students, alumni and social partners provided clear evidence that the DAT and AS study programmes are providing graduates with knowledge of the latest statistical technologies, enabling them to work successfully both in Lithuanian and international companies.

3.1.3. Evaluation of the compliance of the field and cycle study programme with legal requirements

(1) Factual situation

Statistics field study programmes in VGTU were created and are operated in accordance with legal requirements (SER, Section 1.3). The main document used while forming DAT and AS programmes were Description of the Group of the Fields of Mathematical Studies. All the legal requirements are observed in the VGTU study programmes in the Statistics field (SER, Section 1.3; in particular tables 1.1 for DAT and 1.2 for AS). In particular, the first-cycle programme consists of 240 credits, 177 of which are composed by the study field subject (the legal minimum is 120), 15 are devoted to the final thesis (the legal minimum is 15), and the other 15 credits correspond to an internship (the legal minimum is 15). The master programme consists of 120 credits, 75 of which are composed by the study field subject (the legal minimum is 60), and 30 correspond to the final thesis (the legal minimum is 30). It is worth mentioning that DAT and AS programmes significantly exceed the minimum legal requirements for student-teacher contact work, which is more than 50 % in both programmes (the legal minimum is 20 % for DAT and 10 % for AS).

(2) Expert judgement/indicator analysis

The panel judges that the DAT and AS study programmes at VGTU meet with the legal study requirements. In particular, the panel has verified that the two study programmes fulfil all the credit legal requirements for the whole study programmes, for the modules devoted to the field of study, for the final thesis, and the internships. In particular, in the Bachelor programme Professional Internship (FMSAB16785) in the 7th semester have 12 credits (when the legal minimum is 15), but the panel has checked that the 12 credits of the internship are complemented with 3 credits of the module Cognitive Practice (FMSAB16484, 4th semester) which consists of "excursions to the institutions working in the field of statistics or virtual meetings'' (SER, page 88). So this module can be considered as an initial internship. This module is evaluated by "An Internship report" (Table 1.1).

3.1.4. Evaluation of compatibility of aims, learning outcomes, teaching/learning and assessment methods of the field and cycle study programmes

(1) Factual situation

According to the SER (Annex 1), the aim of the Data Analysis Technologies study programme is to prepare data analysis specialists with strong knowledge of mathematical statistics and informatics, who can analyse statistical data and have acquired practical work skills in statistical projects. The same Annex indicates that the aim of the Applied Statistics study programme is enriching the DAT graduate profile in relation to big data analysis, knowledge of software capabilities of modern business analytics systems, and the ability to apply statistical modelling and forecasting methods to solve both research and practice problems. The aims and results of both study programmes (11 for DAT and 13 for AS) have been described and grouped into five categories: knowledge, research skills, special skills, social skills and personal skills.

The study plan for DAT and AS programmes is detailed in the Annex 2 of the SER. The courses are grouped by semesters, and for each course the following information is provided: the number of credits, the course block (general education, subjects of statistics field, special subjects, or final work), the evaluation method (exam, course mark, preterm exam, internship report, or public defence of the final work), and the instructor. Annex 3 of the SER includes two tables (one for DAT and the other for AS) that, for each study programme result, show by which modules in the study plan of DAT and AS are covered. Annex 5 of the SER provides with more detail than Annex 3, information about the compatibility of study programmes aims and teaching, learning and assessment methods for each module in the study plans. For each aim/result of the study programme, the courses contributing to achieve it are listed, jointly with a brief description of the study methods and assessment methods of each course.

(2) Expert judgement/indicator analysis

After having examined the factual situation (described above), the panel judges that the aims, learning outcomes, teaching and assessment methods are appropriate and valid for DAT and

AS programmes. In particular, each individual DAT study programme result is confirmed by at least 6 different study subject modules. For AS, this happens at least by 2 different modules. The panel considers appropriate the large variety of study methods in both study programmes (lectures, exercises, laboratory works, independent work and work in teams, or practical problems with the use of the appropriate computer software, among others). Moreover, the panel also considers appropriate the assessment methods used in the different courses (Colloquia, control works, homeworks, exams, or public defences of the work, among others).

3.1.5. Evaluation of the totality of the field and cycle study programme subjects/modules, which ensures consistent development of competences of students

(1) Factual situation

The modules of the DAT study programme are typical of a Statistics/Data Sciences degree. They are arranged in such a way that student abilities are consistently developed. At the first and second courses, fundamental subjects are studied (mainly mathematics foundations, and some basic programming). Then the third course introduces the main tools in Statistics and Data Science. Practice in the 7th semester provides students with the necessary practical skills in the fields studied by them. The final bachelor work demonstrates abilities acquired by a student throughout the studies (SER, page 14 and Annex 2). Courses in the AS programme (devoted mainly to advanced mathematics, advanced statistical modelling, software systems for data analysis, optimization, economics, finance) are arranged in three semesters, and the final work is developed mainly during the fourth semester. From the first semester, students have to choose one of two elective specialisations: "Data Sciences" or "Statistical Methods in Finance and Economics" (SER, page 14 and Annex 2).

(2) Expert judgement/indicator analysis

The panel considers that the DAT and AS study programmes at VGTU ensure consistent development of student competencies. The contents of the programmes look comprehensive and support the SER statement that the topics are interconnected and provide a consistent process of student education. Annex 2 shows there is a balance of modules across mathematics, statistics and programming fields. Important emerging trends (such as machine learning, artificial intelligence, neural networks, Python programming language) are also incorporated into the programmes.

From Annex 2 of SER, it seems that there are a few teachers that teach too many courses at DAT (and also at AS). Some of them even teach 2 compulsory courses in the same semester. The members of the panel consider that distributing the teaching duties among a larger number of teachers would be strategic for DAT and AS study programmes in order to avoid undesirable scenarios such as, for instance, the retirement of one overloaded member of the department (see also 3.5.).

3.1.6. Evaluation of opportunities for students to personalise the structure of field study programmes according to their personal learning objectives and intended learning outcomes

(1) Factual situation

Students can distribute subjects of both DAT and AS study programmes in time according to their needs. This is called "individual study plans", which must be approved by the Dean (SER, page 15). Students have the opportunity to participate in Erasmus+ exchange program (SER, page 25). Professional internships are mandatory in the undergraduate programme DAT, with a weight of 3 credits in Semester 4 and 12 credits in Semester 7 (SER, Annex 2). There are elective subjects in the DAT study programme: language and other general education contents in 1st, 2nd and 3rd courses, and special subjects on Statistics in 4th.

Due to the moderate number of enrolled students the choice of elective courses for an individual student is very limited while the whole class has some choice as confirmed on the site visit.

(2) Expert judgement/indicator analysis

At the site visit it turned out that elective courses are selected by the whole year group but that the individual student has no or very little choice in that matter. The panel strongly suggests that the study committee checks if synergistic effects with other related study programmes (such as applied mathematics) can be used to increase a students' individual choice in elective courses.

3.1.7. Evaluation of compliance of final theses with the field and cycle requirements

(1) Factual situation

The final thesis is worth 15 credits at the DAT programme, and 30 at AS. When preparing their final theses, students must follow the "Description of the procedure for the preparation and defence of the final theses", approved by VGTU Rector in May, 2021 (SER, page 15). Themes and supervisors of the final theses are approved by the faculty dean (SER, page 16). The defence of the thesis is in the presence of a Degree Awarding Commission (DAC). The bachelor DAC is drawn from 5 competent specialists (scientists and professionals). The chairman of the commission must be a practitioner-professional holding no job in VGTU. The master DAC is drawn from 5-7 components. The supervisor of the master theses must belong to the DAC.

During the site visit, students and staff explained that, usually, students choose the topic for his/her thesis from a list of topics proposed by programme teachers. This is an aspect to be improved that has been identified as such at the SER (SER, page 17), where it is mentioned that at the present time intensive work is being done with social partners encouraging them to propose themes for the final works of the students.

Five final theses have been provided as examples of all the graduation theses defended at VGTU in the statistics programs DAT and AS from 2018 to 2020. None of them were written in English. Four of them are apparently of good quality (three of them were graded 10 and the other one 8). The fifth one (a Bachelor thesis graded 7) was extremely short (only 15 pages) and seemed to be limited to using one particular R library.

(2) Expert judgement/indicator analysis

The panel judges that the Final Thesis for DAT and AS study programmes at VGTU complies with the field and cycle requirements. At this moment the topics for the thesis (a large variety of updated and relevant topics in Statistics: applied statistics models, risk analysis, time series, spatial statistics, biostatistics, big data, machine learning, among others) are mainly proposed by teachers, but an important effort is being made to involve social partners in the proposals of topics for the final thesis.

Strengths and weaknesses of this evaluation area:

(1) Strengths:
1. DAT and AS study programmes are providing graduates with knowledge of the latest statistical technologies, and being able to work successfully both on Lithuanian and international companies.
2. Employers and alumni have very positive opinions of the good general training in theoretical and (especially) practical skills that the DAT and AS programmes.
3. There have been important updates in the previous study programs in the field of Statistics. The name of the undergraduate program has changed (now it is DAT) and also the contents, that now are more connected with the nowadays practical applications of data analysis (subjects such as Programming using Python, Computational Statistics, Introduction to Bayesian Statistics, or Big Data Analytics, have been included). The master program AS has now a second specialisation in Data Science.
4. An important effort is being made to involve social partners in the proposals of topics for the final thesis.

(2) Weaknesses:
1. From Annex 2 of SER, it seems that there are a few teachers that teach too many courses at DAT (and also at AS). Some of them even teach 2 compulsory courses in the same semester.
2. Not enough individual choice for the individual students in choosing elective courses.
3. At this moment the topics for the thesis are mainly proposed by teachers (it is acknowledged that an important effort is being made to involve social partners in the proposals of topics for the final thesis).

3.2. LINKS BETWEEN SCIENCE (ART) AND STUDIES

Links between science (art) and study activities shall be assessed in accordance with the following indicators:

3.2.1. Evaluation of the sufficiency of the science (applied science, art) activities implemented by the HEI for the field of research (art) related to the field of study

(1) Factual situation

VGTU academic staff carried out research in theoretical statistics as well as statistical methods applications in Engineering, Medicine, Biology, Economics, Insurance, etc. They have publications in high impact journals such as *Ticks and tick-borne diseases*, *Journal of business economics and management*, *Sustainability*, *Nonlinear analysis: modelling and control*, *Symmetry*, etc. These researches are highly relevant to the Statistics field. However, only one of the three main lecturers in the first-cycle programme is an active researcher.

According to Annex 6, 21 teachers in both study programmes are working with no less than 50 % of their working time and no shorter than 3 years at VGTU. In the period 2017-2021 31 scientific articles were declared which are published in the Clarivate Analytics Web of Science database. However, 6 persons did not have any papers in CA WOS during this period and four of them did not declare any scientific work in the 2017-2021 time period.

According to additional material presented by VGTU, only 12 teachers in the first-cycle and 14 teachers in the second-cycle are involved in teaching courses directly related to the Statistics field. Half of the teachers in both study-cycles are not active researchers. In the analysed period they have only 1 or none articles in CA WOS databases.

The SER provided three national and international research projects in the period 2017-2020, in which separate researchers participated. However, the main leaders and owners of these projects are other institutions (also see 3.5). During the visit, both University and Department authorities, and teachers themselves stated that so far there are no requirements or incentives to participate in the project activities (e.g. writing and submitting proposals, looking for collaboration possibilities, etc.). The management of the Department acknowledged that participation in project activities is very low and in the future will seek to improve the situation with project activity.

(2) Expert judgement/indicator analysis

The panel concludes that the scientific research activities implemented are related to the field of study but it is insufficiently low. Generally, teachers who are involved in the programmes are not as active in research and project activities as one would hope for – in particular, those directly related to the statistics field. This is particularly problematic in the first cycle programme, where out of the three main lecturers only one is an active researcher. On the master level, only two teachers are more active in terms of publication. In general, project activity is scarce, because in recent years only few teachers participate in projects.

3.2.2. Evaluation of the link between the content of studies and the latest developments in science, art and technology

(1) Factual situation

The aims of both programmes, as well as curriculum, reflect the latest developments in science. The aims of the DAT programme are related to the capability of analysing statistical data and applying data analysis models. The aim of the AS programme is related to big data analysis, awareness of the possibilities of the contemporary software tools for business analytics systems, the capability of selecting and applying statistical modelling and forecasting

methods. These aims of both programmes are well reflected in the final thesis. The master programme AS has now a second specialisation in Data Science. Topics of master thesis fit well with the latest tendencies in applied science, particularly applying statistical methods in different fields. It is worth mentioning that an important effort is being made to involve social partners in the proposals of topics for the final thesis (see also 3.1.7.).

Courses related to big data technologies, Bayesian statistics, neural networks, multivariate analysis for the DAT programme and data science seminar, optimization problems in statistics, Bayesian methods, time series analysis, data analysis methods for the AS programme could serve as courses that use the latest developments of the science.

(2) Expert judgement/indicator analysis

The panel concluded that some courses in both study programmes cover topics as big data analysis, time series analysis, Bayesian statistics, neural networks, multidimensional statistics, etc., which requires the latest knowledge in science. In the majority of cases VGTU in the field of statistics employs teachers with past experience in probability theory and mathematical statistics but due to the lack of participation in international research activities (conferences and publications in international journals) they may not be familiar with the recent developments in the field in its entirety.

The panel states that some topics from advanced multidimensional statistical methods, which require the latest trends in science, are reflected in the research publications. However, only two teachers from the second-cycle programme regularly publish the results of their research, which may indicate a lack of focus on the recent trends in science.

3.2.3. Evaluation of conditions for students to get involved in scientific (applied science, art) activities consistent with their study cycle

(1) Factual situation

Research is carried out by students during the final works and course projects. Also, students have the possibilities to present research results in scientific conferences. In recent years, there have been several examples of students engaging in research activities together with lecturers. In 2021 two students together with professors made presentations at the 62nd conference of the Lithuanian mathematical association, one student together with a professor published a research paper, and three students presented their work in the Baltic-Nordic-Ukrainian Network on Survey Statistics.

Second-cycle students are having three Master's Research Works (total 9 ECTS) and Master Graduation Thesis (30 ECTS) of which one of the main aims is research work.

(2) Expert judgement/indicator analysis

The panel concludes that there is a good opportunity for students to get involved with scientific activities related to their study programmes. Students have the opportunity to participate in scientific conferences and publish scientific papers. However, these cases are

exceptional and a systematic approach to attracting students to research has not yet been seen.

Strengths and weaknesses of this evaluation area:

(1) Strengths:

1. Topics of master thesis fit very well with the latest tendencies in applied science, particularly applying statistical methods in different fields.

(2) Weaknesses:

1. Two main teachers who teach study field subjects in the first-cycle programme are not active in research; they did not declare any research activity in the last 4-5 years.
2. Only two teachers in the second-cycle are more active in publication.
3. Lack of strategy or support for involving teachers in project activities.
4. Students' have good opportunities to perform scientific activities, but their involvement remains very low.

3.3. STUDENT ADMISSION AND SUPPORT

Student admission and support shall be evaluated according to the following indicators:

3.3.1. Evaluation of the suitability and publicity of student selection and admission criteria and process

(1) Factual situation

Admission to Vilnius Gediminas Technical University first-cycle study programmes is organised during the General Admission period in accordance with the procedures of LAMA BPO (Association of Lithuanian Higher Education Institutions for Centralised Admissions), an institution authorised by the Ministry of Education, Science and Sports of the Republic of Lithuania and the Admission Procedure of Vilnius Gediminas Technical University. Admission to the second-cycle studies is done under the rules approved by the Rector of Vilnius Gediminas Technical University. The SER report mentions that if a student is identified (at the time of admission) as lacking certain knowledge (it is checked whether the student has taken the required subject credits), he or she is given additional courses before the start of the first semester. However, students mentioned to the panel that no retraining or bridging courses are being held and they have to study on their own and fill the gaps.

All admission rules (for both cycles) are published on the University website. This was checked by a panel member, and she confirmed that there are all necessary documents and information in Lithuanian and English online.

The SER report provides tables (SER, pages 22-23, tables 3.1 and 3.2) that illustrate student enrollment, with data for 2018-2020 showing the number of students remaining similar. It should be noted that the number of students wishing to study in the DAT programme and be

admitted differs 4,5 times. During the meetings with the administration, it was emphasised that many students do not choose VGTU as the first priority, explaining the difference between the number of students studying and willing to study.

It is also worth adding that during the meetings with the students, a wish was expressed that the student community could be larger, it is understandable that students lack more communication, mutual help due to their small number. Students also mentioned that school graduates are not always aware that these statistical programs exist at VGTU.

(2) Expert judgement/indicator analysis

The members of the panel conclude that the criteria for the selection and admission of the first-cycle students and the suitability and publicity of the process are appropriate. However, the situation regarding admission to the second-cycle raises questions, as students do not always feel ready and have the necessary knowledge. It is essential to ensure that admitted students have the necessary competencies and, in their absence, to organise retraining or bridging courses in a structured way. Perhaps the method of assessing the suitability of a candidate's knowledge in terms of the number of essential credits taken is not sufficient and additional criteria should be introduced for the admission of second-cycle students.

Nevertheless, higher student admission is a challenge (in 2018, 19 students were admitted (101 students wished to study), in 2019 – 17 (127) and 2020 – 17 (96)). The SER cites several factors, such as demographic challenges, the abandonment of the compulsory high school mathematics exam, and the cost of studies, which have contributed to this. These challenges were also mentioned by the administration during the meeting.

The members of the administration also mentioned that a lot of attention is paid to the publicity of the programmes, events, fairs are organised, where the presentations of the programme are available, additional classes are established in schools, additional courses are organised for students who want to change their field of study. All this is done to attract more students. The members of the panel support such methods and encourage their continuation.

3.3.2. Evaluation of the procedure of recognition of foreign qualifications, partial studies and prior non-formal and informal learning and its application

(1) Factual situation

Individuals with knowledge and skills acquired through work experience, non-formal learning, self-directed learning, informal learning, volunteering, etc. can formalise their non-formal learning outcomes. The SER (SER, page 24) mentions all the necessary documents and legislation on which the crediting or non-crediting of knowledge and skills is based. The report emphasises the importance of paying attention to existing certificates or other documents that prove the fact of acquired knowledge. It should also be noted that the volume of study credits that can be validated for a candidate's non-formally and informally acquired competencies shall not exceed 70 % of the scope of the study programme that a candidate is applying to study.

(2) Expert judgement/indicator analysis

Even though the SER report does not describe any specific case of such a request (recognition), the panel considers that there is a clearly defined process within the institution to the procedure of recognition of foreign qualifications, partial studies and prior non-formal and informal learning and its application. Appropriate procedures are in place if the applicant wishes to follow this path.

3.3.3. Evaluation of conditions for ensuring academic mobility of students.

(1) Factual situation

The international relations coordinator, Vice-dean and International Relations Office are responsible for a constant campaign among students regarding their academic mobility in VGTU. News is actively published on the university's online portals, social networks and letters to students, likewise, all information is presented to students in a special course.

The SER report (SER, page 25) emphasises that the full-time studies in a foreign language in either the first-cycle DAT programme or the second-cycle AS programme are not available; therefore academic mobility for incoming students is not a distinctive feature of these study programmes. Analysing the SER, it can also be seen that a small number of students take advantage of academic mobility. The authors of the SER mention that the process was also affected by the pandemic situation.

(2) Expert judgement/indicator analysis

The panel judges that VGTU has appropriate procedures in place to allow for academic mobility of students, but that uptake is low (the SER report states that only 3 second-cycle students and 0 first-cycle students went abroad to study) and should ideally be improved. It is clear from the report that participation in the Erasmus + program is only possible. Perhaps expanding the range of partner programs could increase student academic mobility.

3.3.4. Assessment of the suitability, adequacy and effectiveness of the academic, financial, social, psychological and personal support provided to the students of the field

(1) Factual situation

Based on the information provided in the SER report (SER, page 25-27) and a summary of the interviews with the students during the meeting, it can be seen that all students of the field have the opportunity to receive support: academic information and consulting, career services, information technology services, library and information services, financial support, accommodation services, cultural and leisure services, the opportunity to participate in student activities, psychological services, spiritual and religious services and support and services for students with special needs. The main focus is on academic support to help the students study successfully, as well as the ability to establish themselves in the labour market after graduation. Despite these facts, students mentioned during the meeting that they needed

more help when a student comes from another field of study, especially for second-cycle students (see also 3.3.1.).

(2) Expert judgement/indicator analysis

The members of the panel consider that the University evaluates all possible student support systems, which do not only include the support required by the legislation, but also individual backing (University offers different types of scholarships) or psychological support for a student, as well as mentoring assistance.

To further improve the situation, the panel recommends paying more attention to bridging courses. It should be emphasised that the University must ensure that students admitted to the second-cycle have the necessary competencies to complete their studies successfully.

3.3.5 Evaluation of the sufficiency of study information and student counselling

(1) Factual situation

The SER refers (SER, page 25) to an introduction programme for the first year students, which supports the integration into the daily routine of the University. Student surveys are carried out to determine the effectiveness of the induction lectures "Introduction to Studies" as about other subjects and this is a good example of how student feedback should be taken into account. It was also mentioned during the meeting with the students that it does not take long to get a response from the administration, lecturers or other University staff. This improves communication between the student and the University.

(2) Expert judgement/indicator analysis

The panel agrees that students are provided with sufficient study information and study counselling. This was also agreed to by the students during the meeting, who also reported strong support from lecturers and a good information flow.

Strengths and weaknesses of this evaluation area:

(1) Strengths:
1. Students are provided with appropriate, sufficient and effective academic, financial, social and psychological support. Also, they are provided with sufficient study information and study counselling.
2. The criteria for the selection and admission of the first-cycle students and the suitability and publicity of the process are appropriate.

(2) Weaknesses:
1. The criteria for the selection and admission of second-cycle students should be reviewed. Bridging studies should be better organised for students entering from other specialities and without the necessary knowledge.
2. Despite the efforts of the University, a decline in the number of students admitted.

3. Only a small number of students take advantage of academic mobility, engage in projects and participate in scientific events.

3.4. TEACHING AND LEARNING, STUDENT PERFORMANCE AND GRADUATE EMPLOYMENT

Studying, student performance and graduate employment shall be evaluated according to the following indicators:

3.4.1. Evaluation of the teaching and learning process that enables to take into account the needs of the students and enable them to achieve the intended learning outcomes

(1) Factual situation

Various methods are used to enable students to achieve the intended learning outcomes, including classical classroom teaching, problem solving on paper but also using computer programmes, discussions, presentations of work results, group work. According to the SER, the programme aims at problem-based and project-based learning. 'Individual study plans can also be designed for students in cases when courses are chosen from several study programmes' (SER, page 29).

During the remote teaching necessary due to the COVID-19 pandemic, the virtual learning environment Moodle in combination with Zoom was used.

There exists a support group that consults teachers on integrating tools for electronic studies into the study process.

In a survey (see table 4.3 of the SER) students agree that in the first lecture of the study module the aims and scopes of the course are discussed, the semester plan as well as assessment procedure.

(2) Expert judgement/indicator analysis

A wide range of teaching and learning techniques (such as lectures, homework, laboratory work, term papers) are used such that students of different 'learning types' can be accommodated.

Furthermore, the students confirm that the transition to remote teaching (beyond the usual starting difficulties that cannot be avoided) went well and a variety of functionality of Moodle was used beyond the mere file-sharing functionality. Furthermore, the staff confirm at the site visit that the University helped with the transition to remote teaching and that there exist lecture halls with the necessary equipment such as cameras.

In particular, for the Master students remote teaching offered them some additional flexibility in balancing work and study which they appreciated. Both the students and the teaching staff agree that in the master's programme about half of the teaching – in particular the more

theoretical courses – could be delivered remotely without compromising the quality of the teaching.

Individualization of study plans is in principle possible, however, during the site visit it became clear that due to the small number of students, they are often only able to choose as a whole class between different elective courses but not on an individual basis according to their own interests (see also 3.1.).

3.4.2. Evaluation of conditions ensuring access to study for socially vulnerable groups and students with special needs

(1) Factual situation

Students with severe disabilities can apply for a flexible assessment schedule, a partial or complete exemption from tuition fees as well as can be awarded (if the criteria are met) a monthly payment to help them with the accessibility of the studies such as buying equipment, hiring consultants etc. According to the SER, the University campus is fully equipped with facilities for students with disabilities. There are also training for the University teachers to improve the study conditions for students with special needs.

(2) Expert judgement/indicator analysis

From the description it seems that all formal requirements are met and the University is taking care of these issues. It does not become clear from the SER how it is determined whether help is needed and who takes the initiative (the university or the individual student). Given the small number of students in the field of Statistics, this was not a topic of concern during the site visit or otherwise – and it is well appreciated that these things are being dealt with on the University scale including the individual programme.

3.4.3. Evaluation of the systematic nature of the monitoring of student study progress and feedback to students to promote self-assessment and subsequent planning of study progress

(1) Factual situation

The students' study process is monitored by the Faculty Vice-Dean for studies, the chairperson of the study programme committee, a lecturer-curator. VGTU has an electronic interim assessment system that enables lecturers to enter grades for students' interim assessments in order to support the monitoring of students' progress throughout the semester. This system also automatically generates the final grade for the course. According to the student survey (given in Table 4.3 of the SER), the majority of students agree that the assessment was objective and with reference to the criteria identified in the study module description. Annex 5 of the SER confirms that a variety of assessment methods such as tests, homework, laboratory work, colloquia and exams are used in the programmes. Meetings with lecturers to clarify the grades are present but students would profit from additional more structured feedback regarding their areas of improvement during the course.

The panel noticed that in the analysed period only one issue of graduates have finished the first-cycle programme, whereas every year students finished the second-cycle programme. The dropout of students is rather high for the first-cycle – it is more than 40 % (5 from 12 did not finish studies) and for the second-cycle the average dropout is about 20 %. In both cases there are two main reasons: 1) students choose the wrong study programme, 2) personal reasons.

(2) Expert judgement/indicator analysis

In the SER there is not much information on how students' progress is monitored systematically. On an individual basis, at the site visit students confirmed that lecturers quickly respond to questions and requests. Lecturers and students seem to have a good relationship allowing them to quickly give individual feedback on a personal level.

3.4.4. Evaluation of employability of graduates and graduate career tracking in the study field.

(1) Factual situation

According to SER (table 4.5) all graduates from the Bachelor study programme had a job at the time of the survey and 77 % of the graduate students had a job related to their study programme within the first 6 months after graduation. The Bachelor programme includes an obligatory internship during the 7th semester, at the end of which 22 % (Table 4.5, SER) of the students were offered a job after their internship and 11 % took it.

Successful graduates of the first-cycle studies are entitled to enter the second-cycle programmes through competition, while the second-cycle graduates can opt for their doctoral studies.

(2) Expert judgement/indicator analysis

Overall employment of the graduates is very positive providing additional evidence that well trained data scientists and statisticians are in high demand. During the site visit social partners and alumni agreed that in their professional jobs techniques for integrating data, data editing, data management, data privacy among others plays a very important role that is only partially covered in the study programmes. On the other hand, both groups emphasised that the programme prepared them for life-long learning (which is one of the goals stated several times throughout the SER) enabling them to quickly adjust to new requirements and skills necessary in their respective jobs. The social partners particularly emphasised students' skills on a practical level such as programming.

3.4.5. Evaluation of the implementation of policies to ensure academic integrity, tolerance and non-discrimination

(1) Factual situation

Rules are regulated in the 'Code of Academic Ethics of Vilnius Gediminas Technical University' and each student signs a 'Student Declaration of Integrity' form upon admission to the University. The University has a plagiarism check system available. In case of a student's dishonesty (including plagiarism, submission of someone else's work as their own, earning money by preparing such works for other students) the lecturer must report the student to the University. In this case, the Dean imposes a penalty either allowing the student to repeat the exam or in severe cases requiring the student to retake the whole course. In repeated cases, the Rector can remove the student from the University. To reduce the number of such cases teachers should reduce the possibilities for students to conduct such dishonesties.

VGTU published a project proposal "Gender Equality Plan for 2022–2027" in which they declare that VILNIUS TECH promotes equality and diversity without tolerating discrimination in all its activities.

(2) Expert judgement/indicator analysis

The panel concludes that policies are in place to detect and deal with students' dishonesty. On the VGTU webpage there the "Gender Equality Plan for 2022–2027" can be found, which promotes equality and diversity without tolerating discrimination in all its activities. No further information was available to the panel.

3.4.6. Evaluation of the effectiveness of the application of procedures for the submission and examination of appeals and complaints regarding the study process within the field studies

(1) Factual situation

In 2020 VGTU issued Rector's Order "Description of Vilnius Gediminas Technical University student appeals and complaints procedure". This document declares that before submitting an appeal against the assessment of achievements, the student must contact the lecturer (commission) who assessed him/her within 3 working days from the date of publication of the assessment. The student, disagreeing with the explanations and arguments of the lecturer (commission), may submit a written appeal for violations of the assessment of achievements within 5 working days from the date of entering the result into the University information system.

Students have the right to appeal assessment scores within 10 calendar days from the date of assessment by submitting a written appeal addressed to the head of the department which coordinates the course. The case is then dealt with by an Appeal Commission consisting of 3 teachers (none of which were previously involved in the assessment). According to the SER, '[t]here were no complaints or appeals in the Programmes during the period in question.'

(2) Expert judgement/indicator analysis

The panel judges that procedures for submission and examination of appeals are in place and look effective enough. However, given the fact that one should give students some time to think about whether or not to appeal and then they also need time to formulate the written appeal, 10 calendar days seem rather short.

Strengths and weaknesses of this evaluation area:

(1) Strengths:

1. Students were very positive about the teacher-student relationship and the response time of (most) teachers.
2. Individual feedback seems to work rather well.

(2) Weaknesses:

1. A small number of students severely restricts the individualization of study plans in terms of the choice of elective courses.
3. Rather short period of time to appeal for students.
4. The SER does not indicate how students' study progress is systematically monitored and how corresponding feedback is given to students so it is not clear whether this is sufficient beyond the individual basis or not..

3.5. TEACHING STAFF

The evaluation of this section partly related to several points already raised in the evaluation Area 3.2. Nevertheless, the panel repeat and elaborate with view on the specific criteria raised in this section for better readability.

Study field teaching staff shall be evaluated in accordance with the following indicators:

3.5.1. Evaluation of the adequacy of the number, qualification and competence (scientific, didactic, professional) of teaching staff within a field study programme(s) at the HEI in order to achieve the learning outcomes

(1) Factual situation

According to table 5.1 of the SER a total of 19 teachers are involved in the first-cycle programme (in the academic year 2019-2020, consisting of 2 professors, 10 associate professors and 7 lecturers) implying a very good teacher-student ratio between 1.29 and 0.48 (depending on the academic year). Table 5.3 shows a similar situation (with 11 teachers and teacher student ratios between 0.39 and 0.61) for the second-cycle. While at first sight, this seems broad enough, a closer look reveals that half of the first-cycle programme's courses are concentrated to three teachers only: they are having 20 courses (8+7+5) which covers 120 ECTS. The second-cycle programme does not suffer from that same problem as much as more teachers are involved.

Tables 5.2 & 5.4 provide age composition for the first and second cycle programmes. In the academic year 2019-2020 the majority of teachers are between 31 and 50 years: about 79 % for the first-cycle programme and about 73 % for the second-cycle programme. About 16 % (first-cycle) and about 27% (second-cycle) are teachers who are in the age group of more than

60 years. While at first sight, this may not be such a bad age balance, a closer look reveals that two major teachers who have 13 courses (75 ECTS) in the first-cycle (according Annex 2) are in the age group over 60 years and it is unclear whether this issue can be solved in time. Again the problem is not so severe for the second-cycle.

Annex 6 gives a table of all teachers including at most 3 publications of theirs within the last 3 years. These publications rarely contain contributions to international journals of statistics as would normally be expected (exceptions are Statistics and Probability letters), as the majority of research is related to statistical methods applications in Engineering, Medicine, Biology, Economics, Insurance and as a consequence publications are in other field journals (also see 3.2).

In the period 2017-2020 the teaching staff participated only in 3 projects which is well below what could have been expected. However, no project was carried out in the relevant department. During the meeting with the staff responsible for the preparation of the SER, it was mentioned that they are thinking about how to improve participation in the project activity. Meanwhile, in the meeting with the teaching staff, it was mentioned that the teachers are participating in the projects as they want.

 (2) Expert judgement/indicator analysis

The research output and project activities of too many teachers is neither competitive nor internationally visible. Therefore, the panel strongly suggests to involve teachers more in research projects and encouraging them to publish more in international journals.

During the site visit, it became clear that the teaching load of the teachers was very high which can partly explain their lack of research and project activities as there is no time left for such activities with such a teaching load. This is particularly problematic given that similar problems have already been identified by the previous external assessment (Recommendation: 'to reduce the pedagogical workload of teachers', p. 56 of the SER). Students praised the teaching abilities as well as the effort put into teaching by the majority of the teachers in the programme during the site visit.

3.5.2. Evaluation of conditions for ensuring teaching staffs' academic mobility (not applicable to studies carried out by HEIs operating under the conditions of exile)

(1) Factual situation

The University provides the necessary infrastructure e.g. in terms of Erasmus + contracts for mobility. Two third of the teachers speak English at the level of at least B2 according to the SER which should in principle enable them to take part in such activities in addition to international conferences. However, only two teachers took advantage of this prior to COVID-19 according to the SER (one 7-day internship in Leipzig, Germany, in 2017 in addition to a teaching visit delivering a 15 hour cycle of lectures at the University of Jordan). One teacher was part of a doctoral defence committee in Sweden.

There are only two conferences mentioned in the SER where lecturers of the study field belonged to the organising committee: 'The Annual conference of the Lithuanian Mathematical Society' as well as the international 'Workshop on Survey Statistics Theory and Methodology' in 2017 which took part in Vilnius. Furthermore, they are members of editorial boards of only 3 journals, namely 'Statistics in Transition', 'Lietuvos statistikos darbai' as well as the newsletter 'The survey statistician'. Compared to international standards this is not much, in particular given that the majority of this activity seems to take place on the national level.

(2) Expert judgement/indicator analysis

During the site visit a translator was used to communicate with some of the staff which indicates that their English proficiency is beneath the usual standard in academia which is required for active international collaborations both on a research and teaching level. The lack of activity and participation in international programmes mirrors the lack of research activities on an international level already described.

3.5.3. Evaluation of the conditions to improve the competences of the teaching staff

(1) Factual situation

Teachers whose work experience in VGTU is less than 10 years must improve their didactic qualification by 40 academic hours during the term, if higher - 20 academic hours. VILNIUS TECH offers a variety of courses to help teachers improve their pedagogical competencies organised and conducted by the Educational Competencies Group of the Academic Support Centre. Indeed according to the SER development of the educational competencies is linked to teacher certification procedures.

Teaching staff could improve competencies through various activities. Members of teaching staff participated in various associations activities (European Women in Mathematics, International Association of Survey Statisticians, Baltic-Nordic-Ukrainian network on survey statistics, Lithuanian Mathematical Society, Lithuanian Statistics Society), organisation conferences (Workshop on Survey Statistics Theory and Methodology, Annual conference of the Lithuanian Mathematical Society), belong to the editorial boards of scientific journals in the field of studies (Statistics in Transition, Lietuvos statistikos darbai, ISI section IASS newsletter „The Survey Statistician").

(2) Expert judgement/indicator analysis

The University offers a variety of courses to improve teaching competences of the staff. During the site visit, the teachers confirmed that there is sufficient choice in topics that everyone can select that is most helpful and interesting for him or her.

Strengths and weaknesses of this evaluation area:

(1) Strengths:

1. Students feel taken good care of by their teacher and judge their teaching abilities as very high.

(2) Weaknesses:

1. Very few teachers cover most of the Bachelor programme, making the programme very vulnerable to the absence of personnel.
2. Teachers' research output and involvement in professional activities (such as conference organisation or participation or editorial activities) – for the majority of teacher with some individual exceptions – seems to be below average and is rarely internationally competitive.
3. The teaching load is generally higher than the standard because the standard salary is low, and teachers try to improve it by teaching more hours. This fact has a negative effect on research and – in the long run – also on the teaching.

3.6. LEARNING FACILITIES AND RESOURCES

Study field learning facilities and resources should be evaluated according to the following criteria:

3.6.1. Evaluation of the suitability and adequacy of the physical, informational and financial resources of the field studies to ensure an effective learning process

(1) Factual situation

Section 6 of the SER describes the facilities of the VGTU Faculty of Fundamental Sciences (FMF). Additionally, a video provided by VGTU complements this information. All the teaching activities of DAT and AS programmes take place at the FMF building. Auditoriums, standard classrooms and computer classrooms are equipped with teacher's and students' technology tools that are international standard nowadays. All University buildings are connected to a wireless network. A unified student authorization system has been implemented, which allows connecting, with the same login name and password, to email, Eduroam network and computer class computers.

Both DAT and AS study programmes widely use open source statistical software, such as programming languages R, Python. In addition, the University staff and students can use licensed MATLAB/Simulink software (even on their personal computers). The Moodle virtual learning environment is widely used at the University. ZOOM platform is used for distance learning. The University also has an internal information system *mano.vgtu.lt*, the participants of all meetings confirmed that the system is clear, it is convenient to use and the necessary information can be found in it.

Students of the FMF can use the new reading room of Technology and Management Sciences (open on weekdays from 10:00 to 18:30), which is located next to the faculty. Additionally,

they can access the VILNIUS TECH Central Library, whose reading room is open 24/7. It is worth mentioning that more and more textbooks, papers, and other materials required for studying are available online. In particular, students can find the literature recommended by teachers for particular courses on the VGTU electronic services platform Library-University-Student (BUS).

During the site visit, students and alumni confirmed that learning facilities and resources are appropriate for the learning process, that the internal IT systems are well established helping the communication between students and teachers and that they can use licences of proprietary software even when they are at home. Additionally, they noted that they have access to the VGTU supercomputer and cloud to perform larger computations. Finally, they pointed out that computer facilities in the classrooms are not always up to date and that the Wireless Internet access is weak sometimes, mainly when many students use their laptops during classes. Then the Internet connection is eventually lost. This last point was acknowledged by the faculty administration staff, who indicate that they are working for the continuous improvement of computer labs and Wi-Fi connections from any point in the Faculty.

(2) Expert judgement/indicator analysis

Overall, there is an impression that the physical and informational resources are acceptable. This impression has been reinforced by the video, which points out several positive points, such as that the University is ready to welcome students with special needs, such as reduced mobility. Nevertheless, alumni and students indicate two weak points (unstable Wi-Fi connections, and computer facilities in the classrooms not being always up to date). These comments contrast with what the panel has appreciated in the demonstration of the material resources provided by VGTU. The panel considers that FMF could check the two weak points indicated above and, if it would be the case, take them into account.

3.6.2. Evaluation of the planning and upgrading of resources needed to carry out the field studies

(1) Factual situation

The library collection is renewed annually. Teachers delivering lectures in DAT or AS suggest the required literature. In particular, the Department of Mathematical Statistics, which coordinates the DAT and AS study programmes, annually acquires new books from the faculty funds or other sources. VILNIUS TECH Library annually updates access to various databases of international scientific publications. The network infrastructure is being improved, classrooms and computer classes are refurbished, and the number of computer classrooms is increasing (SER, section 6.2).

(2) Expert judgement/indicator analysis

The panel judges that VGTU in general and FMF, in particular, have an acceptable renewal policy for physical facilities (for instance, improving classrooms and computer classes), library services (for instance, updating access to scientific international databases), and information and technology infrastructures. It is expected that in the coming years the

problems identified by alumni and students (unstable Wi-Fi connections, and computer facilities in the classrooms not being always up to date) will be corrected.

Strengths and weaknesses of this evaluation area:

(1) Strengths:
1. The university is ready to welcome students with special needs, such as reduced mobility.
2. The required software is accessible for students to work at both FMF and home.
3. VGTU Central Library is open 24/7.
4. Literature recommended by teachers is available in the electronic platform BUS.
5. The library collection is renewed annually. Teachers delivering lectures in DAT or AS suggest the required literature.
6. Annually updating access to various databases of international scientific publications.
7. Continuous improving classrooms and computer classes.

(2) Weaknesses: none

3.7. STUDY QUALITY MANAGEMENT AND PUBLIC INFORMATION

Study quality management and publicity shall be evaluated according to the following indicators:

3.7.1. Evaluation of the effectiveness of the internal quality assurance system of the studies

(1) Factual situation

VILNIUS TECH has a wide range of documents regulating internal quality of studies. The overall structure and duty allocation to internal units are well summarised in "Description of Internal Study Quality Assurance at VILNIUS TECH" (available on VILNIUS TECH website at https://vilniustech.lt/files/3716/185/9/19_0/IQA.pdf). Responsibilities on implementation of ESG 2015 is summarised as follows:

ESG 2015 standard	Vilnius TECH internal quality assurance party
1.1 Policy for quality assurance	Senate
1.2 Design and approval of programmes	Senate, SD, APC, USK, FSK, Department, SPK
1.3 Student-centred learning, teaching and assessment	SD, APC, Faculty administration, Department, SPK
1.4 Student admission, progression, recognition and certification	SD, SPIC, Faculty administration

1.5 Teaching staff	Senate, SD, APC, Department, SPK
1.6 Learning resources and student support	Faculty administration, Department
1.7 Information management	SD, Faculty administration
1.8 Public information	SD, SPIC, Faculty administration, SPK
1.9 On-going monitoring and periodic review of programmes	SD, APC, FSK, SPK
1.10 Cyclical external quality assurance	SD, SPKVAC, APC, SPK

APC – Academic Support Centre, FSK – Faculty Study Committee, SD – Academic Affairs Office, SPIC – Admission and Information Centre, SPK – Study Program Committee, SPKVAC – Centre for Strategic Planning, Quality Management and Analysis, USK – University Study Committee.

Further detailed duty and task allocation is provided in the document noted above. Corresponding active involvement of all internal counterparties e.g., management, teachers, students are proven by activities of the Faculty Council, the Faculty Study Committee and the Study Program Committee, as described in SER. Observations collected via internal or external reviews, surveys of internal interested parties (teachers, students) are analysed and considered in further development of study fields in scope.

(2) Expert judgement/indicator analysis

Duty allocation as described in "Factual situation" is considered sufficient and in line with ESG 2015. Main responsibilities are organised in a way to have effectively running internal quality assurance system.

3.7.2. Evaluation of the effectiveness of the involvement of stakeholders (students and other stakeholders) in internal quality assurance

(1) Factual situation

As noted in the SER, students and other stakeholders are members of the Faculty Council, the Faculty Study Committee and the Study Program Committee, therefore, take an active role in internal quality assurance. The final thesis defence commission consists of VILNIUS TECH employees and social partners. Course and results of the final thesis defence, suggestions and remarks of employers and students are periodically discussed at the meetings of the department. A comprehensive list of external partners (academic and social) is provided in SER including common activities and internships. Information and suggestions obtained via the above mentioned activities are considered by teachers in the study quality improval and course update process.

(2) Expert judgement/indicator analysis

Students and other stakeholders are actively involved in internal quality assurance activities. The feedback and suggestions are taken into account revising and improving internal quality. Overall involvement of stakeholders is assumed very good.

3.7.3. Evaluation of the collection, use and publication of information on studies, their evaluation and improvement processes and outcomes

(1) Factual situation

Key information about the study programme's scope is easy to find on VILNIUS TECH official website. The presentation is neat, transparent and contains the main points that would be considered of public interest. A short video for the DAT programme is assumed beneficiary to catch the eye of a student considering applying for this programme. Information on the study fields is easily accessible from the website of the Open Information Consultation System (AIKOS) and the Lithuanian Association of Higher Education Institutions for Joint Admission (LAMA BPO).

The internal publication is processed via the VILNIUS TECH information system *mano.vgtu.lt* which has a broad list of functionalities including but not limited to study plan and course review and update, management of student data, distribution of Rector's or Dean's related orders. Users (students and teachers) find the system user-friendly, admit that it contains all the information needed and serves their needs. Quick technical support on any issues that may arise was noted as well.

(2) Expert judgement/indicator analysis

Public information is of sufficient quality, easy to find and oriented towards external interested parties (potential students, their relatives, school teachers, etc.). Internal data distribution is processed via University's information system *mano.vgtu.lt* and suits internal users' needs well.

3.7.4. Evaluation of the opinion of the field students (collected in the ways and by the means chosen by the SKVC or the HEI) about the quality of the studies at the HEI

(1) Factual situation

Student opinion about the studies is collected via surveys that are carried out twice a year. Student survey results provided in SER show that both DAT and AS programmes are evaluated positively in terms of content, real world examples, and applicability for future careers. Overall workload is suitable for students, active participation in lectures is encouraged. The latter was proven in onsite meetings as well.

(2) Expert judgement/indicator analysis

Students' opinion collection frequency (twice a year) and content (covering main areas of study evaluation) are assumed very good. Overall students' opinion about the study programmes is positive.

Strengths and weaknesses of this evaluation area:

(1) Strengths:

1. User-friendly, designed to suit users' needs and timely updated University's internal system *mano.vgtu.lt.*

(2) Weaknesses: none

V. RECOMMENDATIONS

Evaluation Area	Recommendations for the Evaluation Area (study cycle)
Intended and achieved learning outcomes and curriculum	1. To include additional study contents in data management in practice. 2. To involve more teachers in the evaluated studies to reduce the current concentration of the teaching duties. 3. To allow more individual choice for students when choosing elective courses. 4. To involve social partners in the proposals of topics for the final theses. 5. To increase the number of final theses written in English (mainly at the Master level).
Links between science (art) and studies	To increase teaching staff research activity (article publication, participation in projects) in general on national and international level.
Student admission and support	1. Encourage students to make more active use of mobility support programs for semesters or longer studies at foreign universities. This helps to broaden students 'horizons, increases their motivation. 2. Because of the challenging new students' admission, more explicit and aggressive marketing of the programmes is recommended. This should include further cooperation with companies and Secondary Schools to increase younger pupils' interest. 3. Even though the pandemic situation is changing, leave it up to students to choose at least part of the distance learning or laboratory work. 4. It is essential to ensure that second-cycle admitted students have the necessary competencies and, in their absence, to organise retraining or bridging courses in a structured way.
Teaching and learning, student performance and graduate employment	1. Synergistic effects with other study programmes should be used to give students a true choice between different selective classes. 2. Given the lack of information in the SER, reconsider the systematic evaluation of students' performance and the feedback given to them beyond the individual basis. 3. Reconsider the period of time for students to appeal.
Teaching staff	1. It is recommended to increase scientific visibility both by publishing scientific articles and participating in project activities. 2. Distribute the subjects taught more evenly so that there would not be more than 4-5 subjects in the program per particular teacher.

Learning facilities and resources	1. To update the computer facilities in the classrooms. 2. To solve the problems with wireless connectivity at FMF.
Study quality management and public information	1. Share study quality monitoring survey results with social partners. 2. Increase the importance of feedback obtained from social partners and alumni while reviewing and updating study program content.

VI. SUMMARY

Main positive and negative quality aspects of each evaluation area of the study field _Statistics_ at Vilnius Gediminas Technical University:

DAT and AS study programmes are providing graduates with knowledge of the latest statistical technologies, and being able to work successfully both on Lithuanian and international companies. Employers and alumni have very positive opinions of the good general training in theoretical and (especially) practical skills that the DAT and AS programmes. There have been important updates in the previous study programmes in the field of Statistics. The name of the undergraduate program has changed (now it is DAT) and also the contents, that now are more connected with the nowadays practical applications of data analysis (subjects such as Programming using Python, Computational Statistics, Introduction to Bayesian Statistics, or Big Data Analytics, have been included). The master programme AS has now a second specialisation in Data Science. Topics of master theses fit very well with the latest tendencies in applied science, particularly applying statistical methods in different fields. It is worth mentioning that an important effort is being made to involve social partners in the proposals of topics for the final thesis. Nevertheless, only a small number of students participate in scientific events, engage in projects, and take advantage of academic mobility.

Students are provided with appropriate study information and effective academic, financial, social and psychological support. During their studies the students feel well cared for with approachable teachers that put a lot of effort into helping them succeed with their studies. Teachers also quickly adapted to online teaching due to the pandemic. In particular, more theoretical classes can be taught remotely without a loss but the advanced accessibility of online classes is very helpful for master students who are working as well as studying, such that it is recommended to continue in this format at least for some classes. Using synergistic effects between related study programmes of the Faculty could help to broaden the number of courses students can choose from for their elective courses permitting them to build their own individual profile in the study programmes. Furthermore, bridging studies could be better organised for students entering from other specialities and without the necessary knowledge.

From a strategic point of view, it is not optimal that very few teachers cover most of the programmes e.g. in view of sustainability and continuity. Similarly, the current attempts to attract more young teachers should be continued to achieve a more balanced age structure. The programmes would certainly benefit if statistics teachers could be more often included in research activities and projects and the corresponding output be published in international journals of the field.

The library is open 24/7 which is appreciated by the students and internal IT systems are well established helping the communication between students and teachers. However, computer facilities in the classrooms are not always up to date and University Wi-Fi could be more stable to allow for a large number of devices to be connected simultaneously. Regarding

learning facilities and resources, they are excellent and they ensure an effective learning process. There is a continuous improvement of classrooms and computer classes and the required bibliography and software is accessible for students to work at both FMF and home. Moreover, the faculty is ready to welcome students with special needs, such as reduced mobility.

Signature of expert panel chairperson:

Prof. dr. Claudia Kirch