VILNIAUS GEDIMINO TECHNIKOS UNIVERSITETO

STUDIJŲ PROGRAMOS *TAIKOMOJI STATISTIKA (621G31001)* VERTINIMO IŠVADOS

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EVALUATION REPORT

OF *APPLIED STATISTICS (621G31001)*

STUDY PROGRAMME

at VILNIUS GEDIMINAS TECHNICAL UNIVERSITY

1. **Prof. Dr. Andrew McGettrick (team leader)** *academic,*

2. **Prof. Dr. Jose Maria Sarabia,** *academic,*

3. **Prof. Dr. Manuel Samuelides,** *academic,*

4. **Doc. Dr. Vytautas Janilionis,** *academic,*

5. **Benas Gabrielis Urbonavičius,** *student's representative.*

Išvados parengtos anglų kalba
Report language - English

Vilnius
2015

DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	*Taikomoji statistika*
Valstybinis kodas	621G31001
Studijų sritis	Fiziniai mokslai
Studijų kryptis	Statistika
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Antroji
Studijų forma (trukmė metais)	Nuolatinė (2 metai)
Studijų programos apimtis kreditais	120
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Statistikos magistras
Studijų programos įregistravimo data	1997-02-01

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INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	*Applied Statistics*
State code	621G31001
Study area	Physical Sciences
Study field	Statistics
Kind of the study programme	University studies
Study cycle	Second
Study mode (length in years)	Full-time (2 years)
Volume of the study programme in credits	120
Degree and (or) professional qualifications awarded	Master of Statistics
Date of registration of the study programme	1997-02-01

Studijų kokybės vertinimo centras

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I. INTRODUCTION

1.1. Background of the evaluation process

The evaluation of on-going study programme is based on **Methodology for evaluation of Higher Education study programmes,** approved by Order No 1-01-162 of 20 December 2010 of the Director of the Centre for Quality Assessment in Higher Education (further – SKVC).

The evaluation is intended to help higher education institutions to improve constantly their study programmes 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 (further - HEI); 2) visit of the expert team at the higher education institution; 3) production of the evaluation report by the expert team and its publication; 4) follow-up activities.*

On the basis of external evaluation report of the study programme SKVC takes decision to accredit study programme either for 6 years or for 3 years. If the programme evaluation is negative such a programme is not being accredited.

The programme is **accredited for 6 years** if all evaluation areas are evaluated as "very good" (4 points) or "good" (3 points).

The programme is **accredited for 3 years** if none of the area was evaluated as "unsatisfactory" (1 point) and at least one evaluation area was evaluated as "satisfactory" (2 points).

The programme **is not accredited** if at least one of evaluation areas was evaluated as "unsatisfactory" (1 point).

1.2. General

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

No.	Name of the document

1.3. Background of the HEI/Faculty/Study field/ Additional information

The institutional vision and mission statements of the institution, taken from the University web site at www.vgtu.lt and accessed on 18th December 2014, are set out below:

The mission of VGTU is *to develop a publicly responsible, creative, competitive individual who is receptive to science, the latest technologies and cultural values; to promote scientific progress, social and economic well-being; to create value that ensures the development of both Lithuania and the region in the global context.*

The vision of the VGTU *is to be a prestigious Lithuanian institution of higher education, the scientific and studies level of which conform to the best European technical universities' level. The university is attractive for both Lithuanian and foreign scientists and students, is able to*

respond to the environment challenges and has a great social importance to the national progress.

This Master study programme in Applied Statistics is run by the Department of Mathematical Statistics in the Faculty of Fundamental Sciences. There is a focus in the programme on statistical approaches in finance and economics. Although described as a full-time study programme, most students are in employment.

The study programme had been evaluated in 2007; at that time there had been unconditional recommendations for accreditation. Comments had been made about assessment issues, attractiveness of certain modules and limited choices of modules. It is claimed in the current self-evaluation report (SER) that all such matters have now been addressed.

1.4. The Review Team

The review team was completed according *Description of experts' recruitment*, approved by order No. 1-55 of 19 March 2007 the Director of the Centre for Quality Assessment in Higher Education. The Review Visit to HEI was conducted by the team on *20th November, 2014.*

1. **Prof. Dr. Andrew McGettrick (team leader),** *Chair of ACM Education Board and ACM Education Council, Member of ACM Education Board, BCS representative to the General Assembly of IFIP, the International Federation for Information Processing, Ph.D. in Pure Mathematics, Cambridge University, United Kingdom.*

2. **Prof. Dr. Jose Maria Sarabia,** *Professor of Quantitative Methods in Business and Economics, Professor of Statistics and Operational Research (University of Cantabria), Spain.*

3. **Prof. Dr. Manuel Samuelides,** *Full Professor in Applied Mathematics, Ecole Nationale Suprieure de l'A‖eronautique et de l'Espace (SUPAERO), Toulouse, Head of Applied Mathematics Department (1978 to 2006), Joint position as senior scientist in ONERA (French National Agency for Research in Aeronautics and Space) (1988 to present), France.*

4. **Doc. Dr. Vytautas Janilionis,** *Dean of Faculty of Mathematics and Natural Sciences at Kaunas University of Technology, Lithuania.*

5. **Mr. Benas Gabrielis Urbonavičius,** *student at Kaunas University of Technology, Lithuania.*

During their visit to the Institution, the Review Panel met with the Faculty administrative staff, with those staff who had responsibility for the production of the self-evaluation report, with the staff teaching on the study programme, with students, with alumni and with social partners. They also had the opportunity to familiarize themselves with a selection of students' course papers.

II. PROGRAMME ANALYSIS

2.1. Programme aims and learning outcomes

The main aim of the study programme is to equip students with up-to-date and appropriate knowledge of statistical models and methods to enable them to work effectively with real data. The selected domains of application include the application of statistics in contemporary business, seen as very important for Lithuania. More precisely, the programme addresses statistics associated with data from econometric analysis, from price dynamic analyses and from insurance premiums. Essentially the domain of applications is seen as economics and finance. Within Lithuania there are few employees with the necessary skills to address this area, seen as very important for the Lithuanian labour market.

With the movement towards 'big data', the Review Panel noted that this area of applied statistics is of increasing importance in many countries and across a range of application areas beyond economics and finance, for instance other branches of business, science and education. It would be of benefit both to students and to the study programme to familiarize students with the broader set of application areas.

The learning outcomes are categorized in to five sub-headings: knowledge, special abilities, the ability to conduct research, social abilities and personal abilities. Knowledge covers data analysis including methodology and relevant mathematical statistics and optimization techniques, statistical models, statistics in economics and finance / insurance, and statistical analysis software systems in particular R and SAS. Special abilities cover performing econometric analysis, undertaking stochastic risk analysis, selecting insurance models, undertaking insurance premium estimation and programming the SAS and R software systems. The ability to conduct research addresses the choice of research methods and methodologies, the development of models, concerns about optimization, and the ability to critically assess results. Social abilities are about presenting information effectively to different audiences, about interdisciplinary team-work and about preparing scientific papers and reports. Personal abilities are about critical thinking, about drawing appropriate attention to upcoming difficulties and generally about adopting a thoroughly professional attitude to work. In the view of the Panel the learning outcomes are well-defined and clear.

The name of the programme, the learning outcomes, the content and the qualification are all mutually compatible. The title of *Applied Statistics* does not convey the domains of application, namely finance and economics but the literature related to admission does address this. Students may see this as a preparation for undertaking doctoral studies but the emphasis is on advanced study for business / industry.

The Review Panel was of the view that there would be merit in acquainting students with the wider and increasingly important areas of application of the field of applied statistics.

2.2. Curriculum design

The curriculum design meets the formal legal requirements for Master degrees at VGTU. There are classes valued at 120 credits with 60 credits worth of classes in each of the two years of the study programme. There are 66 credits of field of study classes (60 is required), 15 elective credits (30 required), and the final thesis is rated at 39 credits (30 required). All the teachers on the programme hold a scientific degree and 37.5% of the teaching is carried out by professors. There are precisely 5 subjects taught in each of the first three semesters, matching the legal

requirement. Students spend 74.3% of the time on individual work; the legal requirement is not less than 30%.

In the first semester the study subjects are Operations Research, Statistical Software Systems, Scientific Researches and Innovations, Fundamentals of Theory of Stochastic Approximation; in the second semester they are Data Analysis Methods, Insurance Mathematical Models, Statistical Analysis by Sampling Methods, and there is free choice of a module; in the third semester the study subjects are Statistical Models in Economics, Mathematical Models of Financial Markets, Analysis and Forecasting of Economical Indicators and an option from one of Queuing Theory or a Practical course; the final fourth semester is devoted to the final thesis. In each of the first three semesters time is devoted to preparing students for the important final thesis.

These classes provide a sound and beneficial education in applied statistics and several of the classes have an emphasis on applied areas to demonstrate the utility of theory in important application areas. The Review Panel approved of this balance.

The classes are spread evenly so that in each semester the load is 30 credits. Teaching is normally carried out in Lithuanian and many of the references are also in Lithuanian. Since an aim is to prepare students for an international market, it might be expected that there would be a greater emphasis on English. Moreover, the vision of the Institution includes being 'attractive for both Lithuanian and foreign scientists and students'.

The content of the modules is generally consistent with the type and level of studies, and generally reflects up-to-date developments. However, in the Statistical Software Systems class, time is devoted to such matters as installing software and practicing data entry; on a Master level programme such as this, students might be expected to undertake the bulk of these activities in their own time. Some of the references provided within class outlines are a little dated. The impression is of a study programme that needs to be updated with greater emphasis being placed on English and the recent international literature. For instance, in the recommended reading associated with classes there is little reference to journals and published articles.

2.3. Teaching staff

The legal requirements regarding staff are met, i.e. that:
- At least 80% of all study subjects teachers must hold a scientific degree, i.e. PhD;
- Of these at least 60% must be active in research in the field of study;
- At least 20% of the course material must be taught by professors;
- If the course is oriented towards practical activity, then the rules are slightly different. At least 60% of all study subject teachers must have a scientific degree and of these 40% must be active in research.

According to the SER, the study programme is provided by the staff meeting legal requirements. The teaching staff consists of 12 lecturers (SER Annex 8.4). Actually, from SER 4.1, it seems that the really active lecturer staff is composed each year of 8 lecturers from the Faculty of Fundamental Sciences. The total number of teaching staff has been steady since 2008. The number of staff at professor grade in 2010 - 11, 2011 - 12, 2012 - 13 was 4, 4, 3 respectively and the number of associate professors over this same period was 4, 4, 5. The numbers of students in the corresponding periods were 24, 19 and 23. So, the student/teacher ratio is appropriate.

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The qualifications of the teaching staff are adequate to ensure the learning outcomes. All staff members are at professor or associate professor level and have acquired a doctorate. Also, all have acquired the Institution's own certificate of competence for teaching. So, the *qualifications* of the staff are excellent. However, on the basis of the curricula vitae of the staff, evidence of expertise in the areas of economics, finances or insurance is less visible. There is one member of staff over 60 and two members in the age range 51-60. The average age of teachers is 51 with many having spent many years in VGTU. It was noted that staff could normally continue to serve until the age of 70; this was useful when it was proving difficult for the Institution to recruit good young staff with pedagogical competence.

The staff members involved in the teaching of the study programme publish. Most of their publications are in mainstream statistics but predominantly in Lithuanian journals such as those from Vilnius Institute of Mathematics and Informatics. Evidence of publications in high quality international journals is quite sparse. The research domain of the staff is generally focused on the theory of probability. However, some of them developed also some expertise in the domains of probability applied to finance, insurance, cryptography or bioinformatics. Some staff members belong also to the Institute of Mathematics and Statistics from Vilnius University. One is a member of the Lithuanian Academy of Sciences.

The staff members supervise currently quite applied Masters theses. To their credit, more than half of the submitted Master thesis use real data; around one third of the theses use computer numerical computation to assess theoretical models. Very few theses are purely theoretical.

The Review Panel observed that one or two professors had previous professional experience in finance companies or public institutes of statistics. Other invited teachers give lectures from time to time in applied fields. It would be good that the turnover and the replacement of the staff would be oriented in that direction. So, it would be good to recruit new teachers according to these aims rather than to ensure that the present theoretical courses "are consistently taken over by younger lecturers" (as stated in the SER).

The teaching staff members are very active in scientific research. But their competence is either theoretical or turned towards econometrics and applied statistics for finance and insurance. The computer science competence of the teaching staff is limited to programming skills and the use of professional statistical software packages.

The students generally had a very positive view of the staff; they were seen as interested and taking trouble to provide explanations to the students. Some of the courses were seen by students as being overly theoretical and 'far from reality'. Students would have welcomed a greater level of practical work as well as access to past examination papers and their solutions. Students saw feedback from staff on their work as variable.

The Review Panel observed that a new application domain is developing quite fast which needs joint competence in computer science and statistics. This domain had successively been called in the last decades "machine learning", "data mining" and "big data". It is intensively used in financial applications but also in social sciences, signal processing and data localization. So, the recruitment or the invitation of teachers possessing these competences is important. The international mobility of the staff, encouragement to follow traineeships and qualification raising courses are also important; the desire for staff to have more such opportunities has been noted in the Institution's self-evaluation report and the Review Panel concurred with that view.

In conclusion, the teaching staff in mathematics is quite competent both in probability theory and in finance and insurance applications. Since the average age is too high, the teaching staff members have been enriched more or less recently by new teachers who are more strongly oriented towards application and the use of software. The composition of the Master thesis is a good example of that progress.

But these innovations have to be increased and deepened. The pedagogy have to be more practical and the applications courses and the optional courses fields have to be enlarged by the association of teachers and lectures for the associate companies and institutes which have more practical skills and computer science theoretical basis algorithmic data processing. The institutional self-evaluation report highlights some issues that relate to staff development and these ought to be addressed. It suggests there should be greater opportunities for staff to undertake traineeships and go on qualification-raising courses.

The present success of the Master study programme, and the association of the departments within the VGTU Faculty of Fundamental Sciences, can support this evolution. This staff evolution should be used to increase the success of that Master formation even further.

2.4. Facilities and learning resources

The number, size and quality of rooms, auditoria and computer laboratories are sufficient for successful studies. Lectures, practical and laboratory works take place in the 5 classrooms (20-68 seats), and the 3 computer classrooms (28-32 seats); general university study courses are provided in the auditorium with 180 seats. Computer classrooms have access points for plugging in laptops to allow students to use their personal computers comfortably during lectures. Premises meet occupational health and hygiene requirements. Mobility impaired students can also study in the study programme because the university has adapted facilities for special needs students: a special ramp, parking spaces and comfortable elevators. Students do not have rooms for meetings, rest, group work, and etc.

Teaching and learning equipment is adequate. The wireless computer network EDUROAM provides high-quality network connectivity and there is Internet access for students' laptops or smart phones in all university buildings. The university has a unified student authorization system that allows connection to e-mail, networks or computers in computer classrooms.

Software used for the delivery of the programme is not described in SER. During the assessment visit it was found that students use various types of statistical-econometric software like SAS, SPSS and R. The computer hardware and software are up-to-date and legal. The available software and ICT facilities meet students' teaching and learning demands.

Details of the course "Practical training" are not described in the SER. There are no agreements with practical training providers. The ERASMUS+ programme offers the students a possibility to go for practical training abroad but students do not take advantage of this opportunity. Most of the students on the programme are already in employment.

Learning and teaching materials are stored in the university's central library and in the reading room of the Faculty. The central library has about 0.5 million publications. VGTU's central library is open 24 hours a day. VGTU library's digital educational materials are also accessible via the website. An additional reading room with the capacity for 17 people was set up for students of the Faculty of Fundamental Sciences; the room has 9 computerized workplaces. VGTU library constantly renews its inventory. Each year library employees survey departments

and compose a list of books needed. Libraries and reading rooms have Internet access points. The university's teaching staff and students have access to more than 20 subscribed international scientific publication databases (Science Direct, Zentralblatt MATH, Cambridge Journals, EndNote WEB, Project Euclid, RefWorks, etc.). However, the learning resources that are in databases are not mentioned in the course descriptions and are not sufficiently used by the students.

The Institution's Moodle system was seen as an important repository of all teaching materials. At the time of their visit the Review panel were given an impressive presentation on the wide set of resources available to students. This covered textbooks, articles and electronic facilities such as a plentiful supply of e-books. The Review Panel noted that attention is paid to the development of learning materials, improvement of provision of study programmes, especially applying IT for studies. The unified course management system (Moodle) is used at the Faculty.

The textbooks published by study programme teaching staff are very good and used by students and staff of other universities (D.Krapavickaitė, A.Plikusas. Imčių teorijos pagrindai (Basics of Sampling Theory), D.Krapavickaitė. Statistinės analizės sistemos SAS pagrindai (Basics of the SAS Analysis System), J.Sunklodas. Tikimybių teorijos kursas (Probability Theory Course)).

The Review Panel noted that the main textbooks of some courses are not available for the students or there is a limited number of copies at the library. For example, the main textbooks are not available for the courses: "Scientific Researches and Innovations: Asymptotical Methods in Process Statistics"; "Fundamentals of Theory of Stochastic Approximation"; "Statistical Models in Economics"; "Mathematical Models of Financial Markets"; "Queuing Theory". The main textbook for the course "Analysis and Forecasting of Economic Indicators" covers about 20 percent of course.

2.5. Study process and students' performance assessment

Admission is open to students who have a Bachelor degree in statistics or mathematics. Admission is also open to students who hold other degrees but they must have studied 21 credits of mathematics, 12 credits of information technology and 12 credits covering topics such as statistics and probability theory. The self-evaluation report acknowledges that the level of statistical knowledge of those entering the programme varies considerably and this has created certain teaching problems. The Review Panel was pleased to note imaginative approaches to addressing this issue in a positive fashion; in one instance, the class was divided into novices and experts and the two groups were then successfully treated separately.

In recent years the numbers of students applying to enter the programme have been 41 (with 19 of these first choice applications) in 2010, 67 (with 43 first choice) in 2011, 63 (with 26 first choice) in 2012 and 56 (with 28 first choice) in 2013. The corresponding numbers admitted were 9, 11, 14 and 17. Over that period the academic attainment of applicants has been in decline but not markedly.

Admission is based on a weighted average of performance in the subjects of a student's diploma with additional weight being given for academic articles in peer-reviewed journal articles or conference proceedings (but at most one such article), student scientific internships and student scientific research.

The numbers of students entering the second year of the programme have been 8 students in 2011 of whom all graduated, 9 In 2012 of whom 8 graduated and 10 in 2013 of whom 9 graduated.

The study process is composed of lectures, practical sessions and laboratory work. Most of the students in the programme are in employment. The SER offers the view that this is viewed by staff as an impediment to mastering theoretical material.

Student support is provided by an employee in the Dean's office and by the lecturing staff who publicize open hours (two hours twice per week) and are accessible by e-mail. Scholarships can be provided for activities that are seen to benefit the University; these are seen to include cultural and sporting activities. Dormitory accommodation is available. Loans for fees and other purposes are also available for the Lithuanian State Foundation.

The assessment system is governed by VGTU student knowledge evaluation procedures (Senate decree no. 51-2.4 of 31st May 2011). There is a final test associated with each module. A student may appeal a decision about grading.

Assessment is carried out on the basis of mechanisms such as examinations, coursework and control work. However, there is little detail in the documentation about the weight being given to each or of who controls that weighting. One approach commonly adopted in some countries is to give the examination a weight of 50%, the other work a weight of 50%, to have an overall pass mark of 50% but also to insist that students achieve at least, say, 40% on the examination.

Student expertise in the use of the SAS and the R statistical packages varied. A course to provide an introduction to these topics had been cancelled and some students had seen this as a considerable problem. The Review Panel noted that the material for this course was present on the Moodle system and this should be drawn to the attention of all students.

Students realized that they would benefit from greater expertise in computing but also realized there were limits to what could be accomplished in two years of the study programme. One student had taken the opportunity provided by the obligatory elective element in the programme to achieve greater programming skills. But the obligatory elective element of the programme was generally seen as problematic by students, often being characterized by timetabling and other problems.

Students felt that the Thesis 1, 2, 3 element of the curriculum could be collapsed. The Review Panel drew attention to the fact that there were elements of double counting associated with thesis assessment. Thus work carried out in thesis 1, for instance, attracted a mark; the same material was often included, perhaps with slight modification, in later work that again attracted a mark. The Review Panel suggested that these matters should be resolved and certainly double counting should be eliminated.

Professional activities tend to focus on honesty and integrity and an emphasis is placed on this.

2.6. Programme management

There is a study programme committee that oversees the health and development of this study programme in Applied Statistics. Membership of the committee includes 5 members of the academic staff of the Department of Mathematical Statistics as well as representatives of the

students and social partners. In the view of the Review Panel, the operation of this seemed to be effective.

The study programme is promoted as a Master degree in Applied Statistics with specialization in finance and economics. There was only one such specialization and so the Review Panel observed that the concept of specialization was redundant and so should be removed.

The different levels of expertise in statistics of students entering the study programme had proved problematic but imaginative solutions had been employed to address the issue. The students were divided into two groups, those with a good background and those whose background was less than ideal. The two groups were dealt with successfully.

Students are involved in the ongoing development of the study programme. The opinions of students are seen as important and there is a student on the Study Programme Committee. Students are invited to provide feedback via a questionnaire on the Medina system at the end of each semester. In the Institution's own self-evaluation, these are recognized as being less than fully effective since relatively small numbers of students complete the questionnaires. In the coming semester the completion of this questionnaire at the end of each semester would become compulsory. But also open meetings involving staff and students are also arranged and academic matters are discussed. These provide input to the study programme committee and form the basis of improvements. On the basis of the discussions with stakeholders during the evaluation visit, the Review Panel considered these processes to have been effective.

Social partners are involved in the processes associated with study programme assessment, implementation and improvement. There is a representative on the Study Programme Committee and on the Faculty Board. Moreover, it is part of University policy that a social partner should chair the commission that oversees the defense of final theses.

All lecturing staff were reviewed every 5 years and part of their evaluation involved addressing pedagogical matters and publication of text-books, and the production of methodological materials such as e-books and e-libraries were viewed positively. During discussions with staff there emerged some misunderstandings in this area (arising from the relative importance of research and teaching as seen by the University) and the Review Panel would suggest that this matter be clarified. The University had recently mounted pedagogical courses for staff. These had been oversubscribed and it was the intention to repeat these courses. The Review Panel viewed this positively.

There was no mention in the self-evaluation report or during discussions at the time of the visit of the Review Panel of concepts such as academic standards, of either internal or external moderation of examination papers, of double marking or of external scrutiny of awards; the latter is essentially about performing comparisons of the academic standards with those of other comparable (national and international) universities.

The University had no plans to internationalize its programmes (and so teach in English) but it did have aspirations to attract foreign scientists and students. Moreover, in discussions with social partners it emerged that there were strong reasons for graduates to be able to communicate effectively in English. The Review Panel asked that this be noted and steps be taken to facilitate it.

At the meeting with alumni, it became clear that this was the first occasion on which they had been called back to the Institution to provide feedback on their study programme. During

discussions and taking account of their own experiences, suggestions were made that additional elective classes on topics such as macroeconomics and survey sampling might be included with benefit. Social partners also expressed the desirability of an option on macroeconomics.

III. RECOMMENDATIONS

1. The Department should review this study programme: to take advantage of the exciting possibilities associated with uses of applied statistics in machine learning and 'big data'; to address student concerns about 'overly theoretical'; to consider including an additional elective in macroeconomics (and possibly survey sampling); to increase the amount of practical work; to offer more opportunities for students to develop enhanced skills in informatics as it might be used in applied statistics; to address problems associated with the obligatory elective element of the study programme.

2. Staff should be encouraged to publish more widely in the highly respected international literature and greater efforts should be made to draw international literature to the attention of students and include it in their recommended reading.

3. Opportunities and encouragement should be given to students to increase their abilities in English.

4. The recruitment of younger staff members should, of course, place an emphasis on high academic achievement but, to benefit this study programme, it should also place an importance of experience of the applications in the real world of applied statistics.

5. Consideration should be given to reviewing the arrangements for the thesis. In particular, the assessment processes associated with theses should be reviewed to remove the possibility of 'double counting'.

6. There was only one specialization within the present version of this study programme and so the Review Panel observed that the concept of specialization was redundant and so should be removed.

7. The library provision should be reviewed to ensure that students had sufficient and easy access to the recommended text-books and other literature.

8. Academic standards should be addressed so that staff are able to defend them in a confident manner based on excellent practice.

9. The Faculty should clarify with staff the issue about the value in producing text-books and other methodological aids, seeing these as being important.

10. The courses for staff on pedagogy should be re-run and made available to all staff so that the pedagogical competence of all staff can be ensured.

11. The Department should continue to develop its ideas about student centered learning, so that problems associated with the differing backgrounds of students can continue to be addressed in a positive fashion. Related to this, student attention should be drawn to the existence on the Moodle system of material on an introduction to the SAS and the R systems.

12. The Review Panel would recommend that the Department take advantage of the opportunities of taking full account of the views of alumni and social partners.

IV. EXAMPLES OF EXCELLENCE (GOOD PRACTICE)*

V. SUMMARY

This Master study programme on Applied Statistics is administered by the Department of Mathematical Statistics in the Faculty of Fundamental Sciences. The study programme had been previously evaluated in 2007.

The primary focus of the study programme was essentially as an advanced professional Master to prepare students for the labour market. Graduates were seen by social partners to be in great demand within Lithuania and there were great opportunities for them further afield. The main application areas that had been selected for demonstrating the utility of applied statistics within the study programme were finance and economics.

During their visit the Review Panel sought to draw the attention of the Department to the wider and very exciting developments involving the applications of applied statistics and encouraged the Department to inform students of these. There were applications involving 'big data' and machine intelligence and a recommendation would be to consider new electives in such areas for the students.

Students voiced very positive comments about the staff seeing them as approachable and supportive, and taking time and trouble to explain. A small number of the lecturers were seen as delivering material that was very theoretical with little obvious applications in the eyes of the students but overall they were very happy with their study programme. The topics of the final thesis did not always involve finance or economics, and the associated assessment processes would benefit from slight adjustment to avoid an aspect of 'double counting'.

The Review Panel gained a very positive view about the study programme and its delivery and saw great potential if the curriculum was suitably reviewed to take advantage of the exciting possibilities and the marketing of the study programme reflected these changes. The recommendations of the Review Panel were constructed to assist with this.

if there are any to be shared as a good practice

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VI. GENERAL ASSESSMENT

The study programme *Applied Statistics* (state code – 621G31001) at Vilnius Gediminas Technical University is given **positive** evaluation.

Study programme assessment in points by evaluation areas.

No.	Evaluation Area	Evaluation of an area in points*
1.	Programme aims and learning outcomes	3
2.	Curriculum design	3
3.	Teaching staff	3
4.	Facilities and learning resources	3
5.	Study process and students' performance assessment	3
6.	Programme management	3
	Total:	**18**

*1 (unsatisfactory) - there are essential shortcomings that must be eliminated;
2 (satisfactory) - meets the established minimum requirements, needs improvement;
3 (good) - the field develops systematically, has distinctive features;
4 (very good) - the field is exceptionally good.

Grupės vadovas: Team leader:	Prof. Dr. Andrew McGettrick
Grupės nariai: Team members:	Prof. Dr. Jose Maria Sarabia
	Prof. Dr. Manuel Samuelides
	Doc. Dr. Vytautas Janilionis
	Benas Gabrielis Urbonavičius

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VILNIAUS GEDIMINO TECHNIKOS UNIVERSITETO ANTROSIOS PAKOPOS STUDIJŲ PROGRAMOS *TAIKOMOJI STATISTIKA* (VALSTYBINIS KODAS – 621G31001) 2015-01-08 EKSPERTINIO VERTINIMO IŠVADŲ NR. SV4-4 IŠRAŠAS

<...>

V. APIBENDRINAMASIS ĮVERTINIMAS

Vilniaus Gedimino technikos universiteto studijų programa *Taikomoji statistika* (valstybinis kodas – 621G31001) vertinama **teigiamai**.

Eil. Nr.	Vertinimo sritis	Srities įvertinimas, balais*
1.	Programos tikslai ir numatomi studijų rezultatai	3
2.	Programos sandara	3
3.	Personalas	3
4.	Materialieji ištekliai	3
5.	Studijų eiga ir jos vertinimas	3
6.	Programos vadyba	3
	Iš viso:	18

* 1 - Nepatenkinamai (yra esminių trūkumų, kuriuos būtina pašalinti)

2 - Patenkinamai (tenkina minimalius reikalavimus, reikia tobulinti)

3 - Gerai (sistemiškai plėtojama sritis, turi savitų bruožų)

4 - Labai gerai (sritis yra išskirtinė)

<...>

IV. SANTRAUKA

Magistrantūros studijų programą *Taikomoji statistika* vykdo Fundamentinių mokslų fakulteto Matematinės statistikos katedra. Studijų programa prieš tai vertinta 2007 m.

Pagrindinis studijų programos tikslas – rengti aukštos kvalifikacijos magistro laipsnį turinčius studentus darbo rinkai. Socialiniai partneriai mano, kad tokių absolventų paklausa Lietuvoje yra

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didelė, absolventai taip pat turi puikių galimybių išvykti ir į kitas šalis. Finansai ir ekonomika buvo parinktos kaip pagrindinės taikomosios šios studijų programos sritys, demonstruojančios taikomosios statistikos naudą.

Vizito į universitetą metu vertinimo grupė siekė atkreipti Katedros dėmesį į platesnes ir įdomesnes sritis, kur būtų naudojama taikomoji statistika, ir skatino Katedrą apie tai informuoti studentus. Taikomoji statistika taikoma didelės apimties duomenims tvarkyti ir sistemos mokyme, todėl siūloma apsvarstyti naujus pasirenkamuosius dalykus ir juos pasiūti studentams.

Studentai labai gerai atsiliepė apie dėstytojus, kurie yra draugiški ir paslaugūs, skiria laiko ir padeda spręsti problemas. Studentai nurodė, kad keli dėstytojai pateikia labai daug teorijos ir mažai akivaizdaus pritaikymo praktikoje, tačiau apskritai jie buvo labai patenkinti studijų programa. Baigiamojo darbo temos buvo ne visada iš finansų ar ekonomikos sričių. Baigiamųjų darbų vertinimo procesą būtų galima šiek tiek pakoreguoti ir patobulinti, siekiant išvengti dvigubo balų skaičiavimo už tuos pačius dalykus.

Vertinimo grupė susidarė labai gerą įspūdį apie studijų programą ir jos vykdymą bei mato didelį jos potencialą, jei studijų turinys būtų iš naujo tinkamai apsvarstytas pasinaudojant egzistuojančiomis galimybėmis, ir jei programos rinkodara atspindėtų šiuos pokyčius. Vertinimo grupė parengė rekomendacijas, kurios turėtų padėti tai įgyvendinti.

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III. REKOMENDACIJOS

1. Katedra turėtų iš naujo apsvarstyti šią studijų programą: pasinaudoti puikiomis galimybėmis, siejamomis su taikomosios statistikos naudojimu mašininiam mokymui ir didelės apimties duomenims tvarkyti, studentų susirūpinimu dėl pernelyg teorinio pobūdžio studijų, apsvarstyti galimybę papildomai įtraukti pasirenkamąjį makroekonomikos dalyką (ir galbūt imčių tyrimų), padidinti praktinio darbo apimtį, studentams pasiūlyti daugiau galimybių tobulinti įgūdžius informatikoje, nes jų gali prireikti taikomojoje statistikoje, spręsti problemas, susijusias su studijų programos privalomais ir pasirenkamaisiais dalykais.

2. Skatinti personalą plačiau skelbtis pripažintuose tarptautiniuose leidiniuose ir stengtis atkreipti studentų dėmesį į tarptautinę literatūrą ir ją įtraukti į rekomenduojamą literatūrą.

3. Skatinti studentus ir suteikti jiems galimybių gerinti anglų kalbos įgūdžius.

4. Priimant į darbą jaunesnius dėstytojus, be kita ko, reikia atkreipti dėmesį į aukštus jų akademinius pasiekimus, tačiau, siekiant užtikrinti studijų programos naudingumą, taip pat įvertinti ir jų patirtį pritaikant taikomąją statistiką realiame gyvenime.

5. Atkreipti dėmesį į baigiamųjų darbų rengimo peržiūrą. Kalbant konkrečiau, būtina apsvarstyti baigiamųjų darbų vertinimo procesą ir pašalinti dvigubą vertinimą, kai balai skiriami už tuos pačius pasikartojančius dalykus.

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6. Dabartinėje studijų programos versijoje siūloma tik viena specializacija, todėl vertinimo grupė pažymi, kad tokia specializacijos koncepcija yra nereikalinga ir turėtų būti panaikinta.

7. Iš naujo įvertinti bibliotekos fondą ir užtikrinti, kad studentai turėtų pakankamą ir lengvą prieigą prie rekomenduojamų vadovėlių ir kitos literatūros.

8. Akademiniai standartai turėtų būti tokie, kad dėstytojai galėtų juos įtikinamai apginti remdamiesi gerosios praktikos pavyzdžiais.

9. Fakultetas kartu su dėstytojais turėtų aptarti rengiamų vadovėlių ir kitos pagalbinės metodologinės medžiagos vertę, nes tai yra svarbu.

10. Pakartotinai rengti pedagogikos kursus, kurie būtų prieinami visiems dėstytojams, siekiant užtikrinti jų pedagoginę kompetenciją.

11. Katedra turėtų toliau plėtoti idėjas dėl į studentą orientuoto mokymo, kad būtų galima spręsti problemas, susijusias su skirtingu studentų išsilavinimo lygiu. Taip pat reikėtų atkreipti studentų dėmesį į tai, kad *Moodle* sistemoje yra pateikiama įvadinė medžiaga apie SAS ir R sistemas.

12. Vertinimo grupė rekomenduoja Katedrai pasinaudoti galimybe ir tinkamai atsižvelgti į absolventų ir socialinių partnerių nuomonę.

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Paslaugos teikėjas patvirtina, jog yra susipažinęs su Lietuvos Respublikos baudžiamojo kodekso 235 straipsnio, numatančio atsakomybę už melagingą ar žinomai neteisingai atliktą vertimą, reikalavimais.

Vertėjos rekvizitai (vardas, pavardė, parašas)

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