STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

ŠIAULIŲ UNIVERSITETO
STUDIJŲ PROGRAMOS *MATEMATIKA (612G10005)*
VERTINIMO IŠVADOS

EVALUATION REPORT
OF *MATHEMATICS* (*612G10005*)
STUDY PROGRAMME
at ŠIAULIAI UNIVERSITY

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2. **Prof. Dr. Carl Winslow,** *academic,*
3. **Prof. Dr. Tomaz Pisanski,** *academic,*
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Išvados parengtos anglų kalba
Report language - English

Vilnius
2014

DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	***Matematika***
Valstybinis kodas	612G10005
Studijų sritis	Fiziniai mokslai
Studijų kryptis	Matematika
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Pirmoji
Studijų forma (trukmė metais)	Nuolatinė (4 metai)
Studijų programos apimtis kreditais	240
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Matematikos bakalauras
Studijų programos įregistravimo data	1999-04-23

INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	***Mathematics***
State code	612G10005
Study area	Physical Sciences
Study field	Mathematics
Kind of the study programme	University studies
Study cycle	First
Study mode (length in years)	Full-time (4 years)
Volume of the study programme in credits	240
Degree and (or) professional qualifications awarded	Bachelor of Mathematics
Date of registration of the study programme	1999-04-23

CONTENTS

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	Overview of the programme’s structure
2	CVs for faculty members teaching in the Economics minor

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

The Mathematics Bachelor study programme is monitored by the Department of Mathematics, which recently celebrated its 65th anniversary and has a long history of providing university mathematical education in the region. The Department is situated in the Faculty of Informatics, Mathematics and E-learning of the University. The Department is responsible for the quality of study process and the maintenance of its scientific and educational coherence. The main recent change of the programme was the introduction, in 2011, of a minor in Economics, while other improvements - suggested by the previous evaluation - have also been implemented, to add more practical dimensions to the programme (including a practicum module) and to increase the engagement of faculty of students in international mobility.

1.4. The Review Team

The review team was completed according to *Description of experts'recruitment*, approved by order No 1-55 of 19 March 2007 of the Director of the Centre for Quality Assessment in Higher Education, as amended on 11 November 2011. The Review Visit to HEI was conducted by the team on *15th October, 2014.*

1. **Prof. Dr. Neda Bokan (team leader),** *full Professor at State University of Novi Pazar, Serbia.*
2. **Prof. Dr. Carl Winslow,** *full Professor of didactics of mathematics, Deputy Head of research at Dept. of Science Education, University of Copenhagen, Denmark.*
3. **Prof. Dr. Tomaz Pisanski,** *Professor of Discrete and Computational Mathematics, University of Ljubljana, Slovenia.*
4. **Prof. Habil. Dr. Alfredas Račkauskas,** *Professor in Faculty of Mathematics and Informatics, Head of the Department of Econometric Analysis, Vilnius University, Lithuania.*
5. **Mr. Žilvinas Kalvanas,** *student at Kaunas University of Technology, Faculty of Economics and Business, Lithuania.*

II. PROGRAMME ANALYSIS

2.1. Programme aims and learning outcomes

The description of the programme aims and learning outcomes is phrased as forms of "knowledge" and "ability" using general terms such as "knowledge and understanding of the concepts, definitions and theorems of the main mathematical areas…" and "Ability to study independently and develop permanently his/her own professional competence". Such overall goal descriptions are increasingly common throughout Europe, and can be useful to give non-specialists an overall idea of the targets of the programme. To a specialist the descriptions of individual modules are more telling; they are equipped with specific learning outcomes, such as "Will be able to formulate and prove main propositions related to metric, linear, normed, with scalar multiplication and topological spaces". One still needs more detail - in particular, examples of how examinations and tests are conducted. Here, the examination of examples of tests and students' productions, effected during the study visit, suggested that the level of ambition could be strengthened, where some of the tests examined was limited to reproduction of (parts of) definitions, e.g. of the mere notions of metric space or σ-algebra. This is confirmed by the fact that students pass their examinations with no failures and with an average working load (according to themselves) of 20-30 hours per week.

As regards the programme as a whole, the details in Annex 1 needed to be synthesised. So, the review team requested and got an overview of the programme structure with names, ECTS volume and time wise placement of the modules which make up the programme (supplementary document 1 mentioned in the table above). Such an overview would be useful in any presentation of the programme to specialists and future students alike.

A variety of studies and circumstances were cited in the self-evaluation report (SER) to support the claim that the programme is well adapted to the needs of society, in particular in the region of the university. For instance, it says (art. 30):

We can ground the need of Mathematics study programme according to mathematics bachelor study programmes implemented in the world – Nijmegen Radboud University (the Netherlands), Bergen University (Norway), Allahabad University (India), Brussels University (Belgium), California University (the USA), which announce that for a successful work in financial companies it is necessary to understand and apply mathematics as well as some of its branches.

This does not mean that the programme is not well adapted to societal needs; only that it is hard, if not impossible, to argue abstractly for the societal relevance of a general academic programme on pure mathematics, or to try to document it through surveys of opinions and the like. In fact, the study visit showed that graduates of Mathematics study programme are frequently employed in the private sector, and the social partners of the university confirmed the need for graduates for positions in the region's private and public sector.

A more worrying fact is the **volume of student intake**. Here, the programme in Mathematics is struggling, as no students were admitted in 2013 and 2014. However, the collaboration with social partners (which includes the municipality of the city, as well as several of its secondary schools) gives reasonable hope that this situation will improve in the coming years.

According to the descriptions of the programme modules (SER, Annex 1), the programme is indeed a fairly standard undergraduate programme in pure mathematics, with a special emphasis on modelling and links to financial mathematics and statistics. The latter is in accordance with the fact that all students (recently) take a minor in Economics. The programme has since 2014

offered also a minor in Informatics, but in reality, all students follow the minor in Economics. The learning outcomes are satisfactory as measured by course exams which have few or no failures, however as mentioned above, the requirements of these examinations may have to be strengthened in some cases to conform of the requirements of similar study programmes.

Indeed, the name of the programme and the description of general learning outcomes are compatible with a classical undergraduate major of pure mathematics, along with the possibility of a minor in Economics, actually chosen by all students. One could, however, work to ensure that the modules in pure mathematics and Economics become even more integrated, even if the teachers of the mathematics modules strive already now to include good examples of applications to Economics.

2.2. Curriculum design

The programme under evaluation was designed and described in accordance to the documents approved by the Minister of Education and Science. In particular, it respects the overall volume (240 ECTS), as well as the prescribed regulation of specific parts such as general study subjects, subjects of study field, internship, etc.

According to the syntheses requested and obtained (Doc. 1 mentioned above), one can confirm that the modules are spread evenly (30 ECTS per semester for four years), with a good progression from elementary to advanced and applied topics in both mathematics and the minor. The detailed description of the modules (in pure mathematics, SER Annex 1) confirms that the contents are chosen with a satisfactory level of ambition and correspondence to similar programmes internationally. The only reservation is already mentioned above (regarding the requirements of students' knowledge and competence in course examinations).

A good mixture of different working formats - such as lectures, exercise sessions, literature search, etc. - are available for each module. Students' and teachers' responses to the questions confirm this. Also, a low number of students in each module contribute to enable teachers to give more attention to the individual student. Examples of examination items and final theses helped the review team to gain a better picture of the learning outcomes required and (consequently) worked in within the modules (naturally, these and other teaching materials were in Lithuanian language but were translated into English by the Lithuanian member of the committee). The main outcome of the analysis of these sample items is that the mathematical and practical level of ambition could be strengthened considerably in several mathematics and statistics modules, such as the basic courses on Algebra (the linear algebra part) and Analysis (optimization problems), Mathematical Statistics and Probability Theory.

As mentioned above, the main uncertainty is whether the largely parallel structure of general, mathematics and economics modules is sufficient to ensure the interdisciplinary and professional competences aimed at by the programme. On the other hand, actual integration of the different disciplines seems to be to a large degree implemented in the programme structure through the inclusion of Economics examples in mathematics courses. This thus represents a good follow-up on the recommendation of earlier assessments of the programme ("to make the programme more practical"; SER 48). The initiatives taken to comply with this recommendation ("the examples and tasks of more practical and applied nature have been included in study subjects", SER 48) was in fact exemplified and explained during the study visit.

Besides classical and indispensable domains like analysis, geometry and algebra, the programme contains a good emphasis on areas in and close to mathematics which have become increasingly

important over the last century, such as logic, probability theory, statistics and topics related to information technology. An interesting detail is the integration of linear algebra into a sequence of to 6 ECTS subjects, both named “algebra”; this may reflect a relatively low priority of this area. A specific question is the extent and depth in which these or other modules treat Simplex Methods and other elements of linear algebra that are of particular importance in Economics; and the extent to which a real interaction of modules are developed in this area.

2.3. Teaching staff

Legal requirements of staff are addressed in SER 60, 70, 74-75, 80. As the academic staff teaching the programme consists (with three exceptions, who are Masters, cf. SER Annex 2) of doctors in relevant fields, the review team does not see any problems concerning the formal qualifications of the teaching staff. In terms of research activity of the faculty members (SER Annex 3) one gets the impression that few publish in major international journals (average about 1 ISI Web of science paper per faculty member in *five years*, cf. SER 75); the research ambitions of the department should naturally be weighed against other priorities, and it was revealed during the study visit that the faculty members have excessively high teaching loads (about 20 hours of teaching per week seems to be the norm - that is, 4 to 5 times what we estimate to be usual in research universities in many Western countries). This will have to change in order to ensure that all faculty members do research and publish regularly in acknowledged scientific journals.

As far as the mathematics and general modules go, the qualifications of the teaching staff seem to be adequate to ensure learning outcomes, with the major reservation that research activities are heavily restrained by teaching loads as mentioned above. The faculty teachers teaching in the Economics minor were not covered by the SER (Annex 2 and 3) and formally this minor is just an option in the programme; however, as all students take this minor currently, so the review team requested and got the CVs of the responsible faculty members specializing in Economics and the group can confirm very similar conclusions for them as for the mathematics faculty except that their teaching load could be slightly less excessive.

Indeed, the student/teacher ratio is low (because the programme has currently less than 30 students in total). But the teaching load of Mathematics faculty members is still too high, as the number of course hours does not depend on the number of students and the faculty members teach in other programmes of the Faculty (these are not specified but programmes in social and natural sciences naturally have fundamental courses in mathematics; most faculty members have the largest part of their teaching load in such other programmes). The specialties of faculty reflect, overall, the modules they teach in this programme.

There is a satisfactory blend of different ages and genders in the teaching faculty. The tendency to academic inbreeding must be consciously fought especially at regional universities. The review team recommends that the Department of Mathematics implements a policy to recruit new faculty members among candidates who have spent at least some years at other universities, either as students or in previous positions.

Faculty members have possibilities for professional development aimed at strengthening their teaching performance, however these are not used. It should be examined whether this is due to low quality of the offer, to lacking motivation or time of the teaching staff, or other reasons. The need to ensure continuous development of teaching practice must not be confused with general meetings or lectures for the entire department; professional development of teaching must happen in close connection to actual teaching, for instance involving peer observation to include

also aspects of teaching which can only be substantially commented by specialists of the discipline.

While the department wishes to increase its ambitions in the direction of teaching staff research, and some interesting examples of inclusions of students in research were documented and explained, the main obstacle is the low research output of the faculty as a whole, and (partially as a cause) their high teaching load. When these obstacles were addressed, more could be done to integrate research projects with social partners and alumni, as well as with teaching. The mathematical journal published by the University is referred by MathSciNet.

2.4. Facilities and learning resources

Facilities and learning resources were found to be very satisfactory during the study visit. In particular the access to study material of both students and staff were found to be excellent. Teaching facilities were also found to be very satisfactory for modern mathematics teaching, with up-to-date computer and multimedia equipment to support the use of a variety of software that are nowadays important tools in both mathematics, statistics and economics. Wireless internet access is available at the department and students may use work stations and desk space both at the department and at the University library.

Moreover, the mandatory internship of students is now fully implemented, at the recommendation of the previous evaluation report. The department strives to introduce more problems from “real life”, not least in the internship (often taking in place in the banking sector) and in the final theses.

The library complex of the university was renovated in 2008 and is impressive by international standards. It offers ample facilities for students and faculty to search and find relevant literature, with an online reservation system that permits taking out most volumes for study at home. A large number of textbooks and journals of relevance to the programme are accessible; the library possesses a total of 464000 physical units and books can be taken out by students and staff using an online reservation system. The review panel eas slightly surprised to note that the university has not yet online access to all major mathematics journals or to the main reference tool *MathSciNet* (*Mathematical Reviews*). As for the last point, other virtual databases for literature search and referencing are available and may in practice work just as well.

2.5. Study process and students‘ performance assessment

The admission is performed according to the rules approved in Lithuania, so the requirements to all entrants are the same and equal. The requirements include lower limits on examination grades of mathematics, Lithuanian language, information technologies (0,2), and foreign language. While these requirements have been frequently changed in recent years, the number of persons admitted to mathematics programmes in Lithuania has decreased by more than three times. This in particular seems to affect smaller universities in the province. At Šiauliai, the numbers for the years 2011-2014 are 18, 4, 0 and 0. Among those admitted in 2011 and 2012 (and presently studying in the programme), there are no students in the places not financed by the state.

The fact that the programme has had no new students in 2013 and 2014 can be linked to many factors independent of the programme (students’ financial situation, lack of motivation from school etc.) but it is clear that new initiatives from the University are necessary to address these

problems, if possible in collaboration with social partners of the region who are very supportive of the programme, judging from the meeting the review team had with them.

The completion rates are very high, possibly as a result of a strict admission process, but in part also because the examinations or tests are modest in their requirements; this could and should be systematically addressed. It appears that the grades for final theses are too high in some cases, and that the requirements could be significantly strengthened here - both as regards length (10 pages in some cases, with not much dense contents), depth (mathematical contents corresponding to modules at university) and applications (to problems from social partners).

Some students write scientific articles together with their teachers, but their number is not high considering the total number of students and period; 7 articles were written in the years 2009-2013 and the students participated in conferences on undergraduate research, held at Kaunas Technological University. They can also join the activities of the department, students' agency and other organizations.

Students have possibilities to participate in student mobility programs and these possibilities have been more actively promoted as an outcome of the previous evaluation (SER 144), although the number of students engaging in international mobility under the *Erasmus* program is still fairly low (a total of 10 outgoing students over 4 years). The number of incoming students is also quite low (3 students in a 4 year period), which could be explained by the fact that only a few subjects are offered in English or Russian (SER 145).

According to SER 117-126, the Institution offers a number of support options, especially as regard to academic affairs. According to students, social support is insufficient and this could be addressed in collaboration with social partners who might offer more scholarships. Indeed, the social situation of students (with/without grants, need to work on the side etc.) may be important factor for recruitment and retention, and the need to have part-time jobs could also affect some students' academic benefit and study intensity in the programme.

The students are given additional consultations by their teachers; flexible study schedules or individual study plans are compiled.

The cumulative assessment system is applied in the study programme which is explained during the introductory lecture; later the information on the assessment, according to the report, is only accessible in the academic information system. The weight parts of the cumulative score are set by the teacher responsible for the subject, so the weight parts of every module can be different. As students generally do not seem to fail their exams (SER 112), this point only seems to raise (or confirm) one of our previously mentioned concerns, namely that some or all examinations might be too easy. According to the self-evaluation report, the detrition rate of students in the academic years 2009-2014 was 7%; this is fully acceptable. The main reasons for detrition are employment and unfavourable financial possibilities.

Stakeholders, including practice placement supervisors, participate in "quality assessment of the programme" and social partners of the region are to a large extent very satisfied with, and supportive of, the programme. Former students and social partners appear willing to engage in more formal associations and contracts with the university to support this programme.

2.6. Programme management

Responsibilities for decisions and monitoring of the implementation of the programme are clearly allocated. It appears satisfactory both from the documents provided and from the study

visit. This does not mean that all responsibilities appear to be assumed entirely. In particular, it pertains to the management to ensure that the faculty members who teach in the programme are active researchers and have the time to be so, a requirement which they have not entirely lived up to, as already mentioned. Also, the promotion of the programme needs to be organized so as to have new candidates for this programme (there were no students enrolled during the last two academic years).

A relatively elaborate quality assurance system has been set up to regularly monitor the quality and progress of the programme.

Student assessment of teaching is done regularly, with feedback and follow-up that are known and acceptable (or even laudable) to the students. Nine out of ten recommendations of the previous external evaluation of the programme have been satisfied (the one exception being formally partial, as the teaching load of faculty has been insignificantly reduced - but the need remains). In particular, internship has been introduced in the programme, the number of specializations has been reduced, the programme has now more practical elements, some faculty members have had sabbatical leave, and closer contacts with social partners have been developed.

The evaluation and improvement processes involve stakeholders, and indeed with tangible results (development of new modules such as Financial Mathematics and Computer Statistics, and the implementation of internships and problem-based theses).

According to both students and teachers, the quality is continuously monitored and improved through formal, anonymous evaluations and formative exchange between students and faculty. It would be good to supplement these internal procedures with occasional invitation of external experts (mathematicians from other Lithuanian universities) to observe and comment on teaching and exams. Despite the language barrier for some faculty members, one might also consider involving foreign visitors to the Department in such activities, to exchange about teaching ideas with mathematics experts who have an even more different horizon of experience.

III. RECOMMENDATIONS

1. Reduce the teaching load of mathematics staff significantly, to allow all faculty members time for research (at *least* 25% of a normal workload, i.e. about 500 hours per year). Once this is put in place, continuously *monitor* and *support* faculty research output, which should *at least* double in terms of publications in major international journals (referenced by *MathSciNet*).
2. Implement a policy of recruitment to permanent posts in the Department of Mathematics which favours candidates who have spent at least some years at other universities, either as students or junior faculty, to avoid the risk of academic inbreeding.
3. Increase actually implemented ambitions and requirements for the level of students' mathematical competence, for instance through examination tasks that are more demanding in terms of students' autonomous use and production of mathematical results, reasoning and techniques. Rote learning of definitions and results will then not need to be worked on.
4. Involve visiting faculty from other universities in observation and discussion of teaching and exam practices, to contribute to ongoing developments of the programme while drawing on a wide range of experiences and cultures of mathematics teaching.

5. Stronger and more explicit links between mathematics modules and the Economics minor are necessary, both in the programme itself and in the presentation of it to potential students (who could be more motivated by this than by what could be perceived as a direct continuation of the less-than-popular school mathematics). For example, new courses or course elements on econometrics, game theory, processing of huge data basis would be positive initiatives in this direction.
6. Establish an Alumni club to associate social partners and former students of this programme.
7. Promote the programme to potential students, new marketing initiatives must be taken, such as the production and dissemination of short videos with experience of former students (now working in the region).

IV. EXAMPLES OF EXCELLENCE (GOOD PRACTICE)*

The programme interacts increasingly with social partners (both private and public) and has a wide basis of support in the region. In particular, partners are contributing in several ways to the promotion, development and continuous assessment of the programme, as well as to some of its elements (such as internship).

V. SUMMARY

This is a well equilibrated programme of Mathematics which is well linked to a minor in Economics that all students currently take. The programme produces candidates whose competences are necessary in the region and is highly appreciated by social partners, including employers and former students. It is adequately developed and assessed internally, and has succeeded in following almost all recommendations of the previous external assessment. The exception is that Mathematics teaching staff still has excessive teaching loads, and therefore insufficient time available for research; indeed, the output in terms of scientific publications must be monitored better, and increased, once this problem is solved. Both students and social partners are very satisfied with and supportive of the programme. The dropout and failure rates of students are very low. Students need more social support to avoid that some of them spend excessive time on part-time jobs. At the same time, the review team recommends that students' study intensity should be increased to implement more ambitious requirements at examinations and in connection with the final theses. Finally, the lack of students applying for admission must be addressed by the university and programme management in collaboration with social partners.

VI. GENERAL ASSESSMENT

The study programme *Mathematics* (state code – 612G10005) at Šiauliai 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	4
5.	Study process and students' performance assessment	3
6.	Programme management	3
	Total:	**19**

*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. Neda Bokan
Grupės nariai: Team members:	Prof. Dr. Carl Winslow
	Prof. Dr. Tomaz Pisanski
	Prof. Habil. Dr. Alfredas Račkauskas
	Žilvinas Kalvanas

Vertimas iš anglų kalbos

ŠIAULIŲ UNIVERSITETO PIRMOS PAKOPOS STUDIJŲ PROGRAMOS *MATEMATIKA* (VALSTYBINIS KODAS – 612G10005) 2014-11-24 EKSPERTINIO VERTINIMO IŠVADŲ NR. SV4-565 IŠRAŠAS

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VI. APIBENDRINAMASIS ĮVERTINIMAS

Šiaulių universiteto studijų programa *Matematika* (valstybinis kodas – 612G10005) 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	4
5.	Studijų eiga ir jos vertinimas	3
6.	Programos vadyba	3
	Iš viso:	**19**

* 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)

<...>

V. SANTRAUKA

Matematikos studijų programoje išlaikyta gera studijų dalykų pusiausvyra. Programa gerai susieta su gretutinėmis Ekonomikos studijomis, kurią šiuo metu yra pasirinkę visi studentai. Programa yra skirta specialistams, kurių gebėjimai reikalingi regionui, rengti. Ją labai vertina socialiniai partneriai, įskaitant darbdavius ir buvusius studentus. Programa parengta tinkamai, ji vertinama universitete. Ją rengiant sėkmingai įgyvendintos beveik visos ankstesnio išorinio vertinimo rekomendacijos. Trūkumu išlieka per didelis šioje programoje dirbančio akademinio personalo dėstymo krūvis, dėl kurio personalui nelieka laiko mokslinei veiklai. Mokslinių publikacijų skaičių reikėtų stebėti ir imti didinti, kai tik bus išspręsta darbo krūvio problema. Tiek studentai, tiek socialiniai partneriai yra labai patenkinti programa ir ją palaiko. Studentų „nubyrėjimo“ ir nesėkmių rodikliai yra labai maži. Studentams reikia daugiau socialinės

paramos, kad kai kurie jų nepraleistų pernelyg daug laiko dirbdami darbuose nepilnu etatu. Ekspertų grupė rekomenduoja didinti studentų studijų intensyvumą, kad būtų įgyvendinti ambicingesni egzaminų ir studentų baigiamųjų darbų reikalavimai. Galiausiai universitetui ir programos vykdytojams bendradarbiaujant su socialiniais partneriais reiktų spręsti mažo norinčiųjų studijuoti programoje skaičiaus problemą.

<…>

IV. KOMPETENCIJOS (GEROSIOS PRAKTIKOS) PAVYZDŽIAI

Įgyvendinant programą labai aktyviai bendraujama su socialiniais partneriais (tiek privačiais, tiek viešais). Programa susilaukia plataus palaikymo regione, o partneriai keliais būdais prisideda ją ir kai kuriuos jos dalykus (pvz., praktiką) populiarinant, rengiant ir nuolat vertinant.

<…>

III. REKOMENDACIJOS

1. Gerokai sumažinti *Matematikos* studijų programos personalo dėstymo krūvį, kad visiems fakulteto darbuotojams atsirastų laiko mokslinei veiklai (*bent* 25 % įprasto darbo krūvio, t. y. apie 500 valandų per metus). Kai tik tai bus padaryta, nuolat *stebėti* ir *palaikyti* fakulteto darbuotojų mokslinį produktyvumą. Publikacijų svarbiausiuose tarptautiniuose žurnaluose (pateikiamuose *MathSciNet*) skaičius turėtų *bent* padvigubėti.
2. Įgyvendinti samdymo į nuolatines pareigas Matematikos katedroje politiką, pagal kurią pirmenybė būtų teikiama kandidatams, bent kelerius metus praleidusiems kituose universitetuose kaip studentams arba jaunesniesiems mokslo darbuotojams, kad būtų išvengta akademinio nepotizmo.
3. Padidinti realiai įgyvendinamas studentų matematinių gebėjimų ambicijas ir reikalavimus, pavyzdžiui, parinkti tokias egzaminų užduotis, kurios pareikalautų iš studentų daugiau savarankiško darbo, matematinių rezultatų, argumentuoto mąstymo ir technikos. Tada mechaniškas apibrėžčių ir rezultatų įsiminimas taps neaktualus.
4. Įtraukti kviestinį mokomąjį kitų universitetų personalą į dėstymo ir egzaminavimo praktikos stebėjimą ir aptarimą, siekiant užtikrinti nuolatinį programos tobulinimą, remiantis įvairia matematikos dėstymo praktika ir kultūra.
5. Reikia stipriau ir aiškiau apibrėžti ryšius tarp matematikos modulių ir gretutinių *Ekonomikos* studijų tiek pačioje programoje, tiek jos pristatyme potencialiems studentams (kuriuos ši perspektyva motyvuotų labiau nei specialybė, kuri galėtų būti vertinama kaip tiesioginė mokykloje itin nepopuliarios matematikos tąsa). Pavyzdžiui, teigiami dalykai, siekiant įgyvendinti šią rekomendaciją, galėtų būti nauji ekonometrijos, žaidimų teorijos, didžiulių duomenų apdorojimo pagrindų studijų dalykai ar studijų dalykų dalys.
6. Įsteigti alumnų klubą, kuris jungtų socialinius partnerius ir buvusius šios programos studentus.
7. Norint populiarinti programą tarp potencialių studentų būtina imtis naujų rinkodaros iniciatyvų, pavyzdžiui, kurti ir platinti trumpus filmukus, kuriuose būtų pasakojama apie buvusių studentų (dabar dirbančių regione) patirtį.

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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)