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STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

VILNIAUS UNIVERSITETO

PROGRAMŲ SISTEMOS **STUDIJŲ PROGRAMOS (621I30001)**

VERTINIMO IŠVADOS

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EVALUATION REPORT

OF *SOFTWARE ENGINEERING* (621I30001)

STUDY PROGRAMME

at VILNIUS UNIVERSITY

Grupės vadovas:
Team leader:

Prof. Jukka Paakki

Grupės nariai:
Team members:

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Vilnius
2013

DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	*Programų sistemos*
Valstybinis kodas	621I30001
Studijų sritis	Fizinių mokslų studijų sritis
Studijų kryptis	Programų sistemos
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Antroji
Studijų forma (trukmė metais)	Nuolatinė (2 m.)
Studijų programos apimtis kreditais	120 ECTS
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Programų sistemų magistras
Studijų programos įregistravimo data	Lietuvos Respublikos švietimo ir mokslo ministro 2006 m. kovo 6 d. įsakymu Nr. 410

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INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	*Software Engineering*
State code	621I30001
Study area	Physical Sciences
Study field	Software Engineering
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 ECTS
Degree and (or) professional qualifications awarded	Master of Software Engineering
Date of registration of the study programme	6 of March 2006, under the order of the Minister of the Ministry of Education and Science of the Republic of Lithuania No. 410

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The Centre for Quality Assessment in Higher Education

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I. INTRODUCTION

Vilnius University (VU) has been founded in 1579. The University has 12 faculties, of which the Faculty of Mathematics and Informatics is one of the largest and has ten departments. The departments are organized in such a way that five of them are mainly within mathematics (Differential Equations and Numerical Mathematics, Econometric Analysis, Mathematical Analysis, Mathematical Statistics, Probability Theory and Number Theory), four are within computer science (Computer Science, Computer Science II, Mathematical Computer Science, Software Engineering), and one is in didactics of the two disciplines (Didactics of Mathematics and Informatics).

Senate is the highest governmental authority of VU and approves the structure of the University. The academic activities are managed by the rector who is responsible for the performance of the University. Key issues of the University can also be addressed in the Council. Faculties, institutes and study centres, jointly called "academic divisions", are responsible for the organization of studies. A faculty is managed by the dean. Departments have autonomy in solving the academic and scientific tasks set by the faculty and the University. Departments are led by their heads.

The Master study programme in Software Engineering has been registered in March 2006. The programme belongs to the second level of university studies, and results in the degree Master of Software Engineering. The programme is organized and implemented by the Faculty of Mathematics and Informatics, with the department of Software Engineering having the main responsibility.

The study programme is evaluated according to the *Methodology for Evaluation of Higher Education Study Programmes*, as approved by Order No 1-01-162 of 20 December 2010 of the Director of the Lithuanian Centre for Quality Assessment in Higher Education, and to the *General Requirements for Master Degree Study Programmes*, as approved by Order No V-826 of 3 June 2010 of the Minister for Education and Science of the Republic of Lithuania. This evaluation report has been produced by an international Expert Team invited by the Centre for Quality Assessment in Higher Education. The report is based on analysis of the assessment material submitted by VU, and on observations and interviews on a site visit conducted by the Team.

The site visit to the study programme took place on 29 November, 2013. During the visit the Expert Team met and interviewed the administrative staff of the Faculty (on 26 November), the group responsible for the self-evaluation report, teachers and students of the study programme, as well as alumni (graduates), employers and other social partners of the programme. The Team also observed the central support services of the programme (classrooms, library, computer classes and laboratories) and studied the students' course works and Master's theses.

At the end of the site visit the Expert Team presented its preliminary findings and general remarks to the staff responsible for the study programme. After the visit the Expert Team discussed its findings and produced this joint evaluation report.

The international Expert Team consisted of its chair, professor Jukka Paakki (University of Helsinki, Finland), professor Rolf Backofen (University of Freiburg, Germany), professor Jerzy Marcinkowski (University of Wrocław, Poland), Vida Juozapavičienė (employer representative – social partner, Lithuania), and Lukas Jokūbas Jakubauskas (student representative, Lithuania).

As a general remark, the Expert Team was impressed by the language skills of the interviewees: all the meetings were held in English and no translator was needed during the visit.

II. PROGRAMME ANALYSIS

1. Programme aims and learning outcomes

The *Master study programme on Software Engineering* has been registered in 2006. The previous external evaluation of the Programme took place in 2006. In 2009, the Programme was accredited until the end of 2014. Since its start in 2006, the Programme has been constantly renewed and improved on the basis of changes in the national legislation and the labour market, external and internal evaluations, and feedback from students and social partners. The aims, objectives and learning outcomes of the Programme are well defined, clear and published in the website of the Department of Software Engineering.

The general objective of the Programme is to educate qualified software engineering specialists who are able to lead projects in software development, software maintenance and software process improvement, apply their knowledge in different application areas, make decisions based on incomplete information, provide logical, unambiguous and clear arguments of their decisions, and carry out independent research. The Programme has been designed in such a way that it provides deeper knowledge over a basis acquired in Bachelor studies (in Software Engineering) The learning outcomes and the curriculum meet these objectives by being both broad and advanced enough in the area of software development.

The graduates of the Programme establish themselves in the labour market very successfully, and basically all of them are employed in accordance with the aims and objectives of the Programme. On the other hand, good employment of the students involves problems as well since the main reason for drop out is starting to work during the studies, actually already on Bachelor level. Based on the meeting of the Expert Team with social partners, still more Masters (and Bachelors) of Software Engineering would be needed in the Lithuanian labour market.

In the Lithuanian labour market, the Masters of Software Engineering graduating from the Programme are typically employed as business analysts and consultants, project managers, technology leaders, and software architects. Being closer to business and specialist issues, the professional profile of the graduates is different, most notably, from the profile of the Bachelors of Software Engineering and the Masters of Informatics who mainly work in software development tasks.

The Programme is implemented by the Faculty of Mathematics and Informatics and its departments of Software Engineering (main stakeholder), Computer Science, and Mathematical Computer Science. Occasionally, Master's theses are supervised by staff from other departments and institutes of the University. The Study Programme Committee is responsible for coordination and quality assurance of the Programme.

From a governmental point of view into higher education in Lithuania, Software Engineering ("main field") belongs to the group of "study fields" of Mathematics and Computer Science in the "study area" Physical Sciences. This has implications on the nature and profile of the Study Programme which is by its context a member of the academic disciplines in natural and exact sciences (and not, for instance, in social sciences). In addition to Software Engineering, the Faculty of Mathematics and Informatics offers Master programmes also in the related fields of Informatics and Computer Modeling. The Master programme in Software Engineering has

practically no overlap with the other Master programmes: the Programme has its own distinctive characteristics by concentrating on one of the most relevant sectors in IT industry, software development.

As summary, the aims and learning outcomes of the Programme are consistent with the type and (Master) level of the studies and the qualifications provided. Also the name of the Programme, as well as its learning outcomes, content and qualifications are compatible with each other.

2. Curriculum design

The curriculum of the Programme has been designed to comply with the national General Requirements for Master Degree Study Programmes (2010) and the Regulation for Study Programmes at Vilnius University (2012). In addition, the internationally widely acknowledged education models of Computer Science and Software Engineering, the joint ACM / IEEE-CS Computing Curriculum (2005) and the Software Engineering Body of Knowledge (SWEBOK) document (2004) by IEEE Computer Society have been used as substance frameworks for the Programme.

The Study Programme meets the legal requirements as follows:

- the volume of the Programme is 120 credits in ECTS (European Credit Transfer and Accumulation System) (minimum: 90 ECTS, maximum: 120 ECTS)
- the volume of subjects in the study field is 72 ECTS (minimum: 60 ECTS)
- the volume of the final Master's thesis is 30 ECTS (minimum: 30 ECTS)
- the volume of professional practice is 18 ECTS (maximum: 30 ECTS)
- the number of subjects per semester varies between 1 and 5 (maximum: 5)
- student workload per year is 60 ECTS and 1600 hours (60 ECTS)
- student workload per ECTS varies between 25 and 30 hours (25-30 hours)
- the volume of optional subjects is 17 ECTS (maximum: 30 ECTS)
- the volume of subjects varies between 5 and 30 ECTS (minimum: 5 ECTS)
- the share of independent work is 77,5 % in total and varies between 45 and 97,5 % per study subject (minimum: 30 %)

The curriculum is relatively broad and covers most of the subjects that are internationally considered essential for advanced level of Software Engineering. The curriculum contains 17 credits of optional subjects so that students can choose topics that they personally find interesting or relevant for their career. In addition to Software Engineering, there are also more general subjects of Computer Science (Informatics) in the curriculum. The Expert Team considers the scope of the Programme to be sufficient to ensure reaching the learning outcomes.

The compulsory part of the curriculum consists of 32 credits of subjects in Software Engineering (*Requirements Engineering*, *Project Management*, *Software Systems Architecture and Design*, *Software Engineering Methods and Tools*, *Software Process Assessment and Improvement*), 5 credits of subjects in general Computer Science (*Parallel and Distributed Computing*), 18 credits of practical work (*Professional Practice*), and 48 credits for the Master's thesis (30 credits) and associated research work (18 credits).

The volume of the optional part of the curriculum is 17 credits, which consists of subjects in Software Engineering (*Software Acquisition and Maintenance*, *Software Quality*, *Statistical Analysis in Software Engineering*, *Software Systems Testing and Configuration Management*) and in Computer Science (*Human Computer Interaction Design*, *Information Security*, *Electronic Signature Infrastructure and Electronic Commerce*). The availability of subjects that

are outside the actual core of software engineering is argued in the self-evaluation report by their request among the employers. This might be the case, but the optional modules (A, B, C) in the curriculum are organized in such a way that a student is allowed to choose just the three Computer Science subjects and omit all the optional subjects in Software Engineering. Such an option makes it possible to skip too many important subjects in software engineering and should be precluded.

Both the students and the graduates would like to have more optional subjects in the Programme, for instance in leadership, software project management, and lean software development. These might be given by experts working in software industry. Yet another problem with optional subjects (courses) is that all of them may not be necessarily given to all the students: according to the students who were interviewed by the Expert Team, if the number of students enrolled for a course stays below a given threshold, the course will be cancelled, and if there are too many students enrolled, just a limited number of them are actually registered. This has to be solved by making sure that all the courses in the curriculum (both compulsory and optional ones) are regularly provided for all the students of the Programme.

The Programme has been integrated well with the Bachelor study programme in Software Engineering: for all the compulsory and optional subjects in the area of Software Engineering there is a corresponding subject as a compulsory module in the Bachelor curriculum. The correspondence between the Bachelor subjects and the Master subjects has been designed such that the Bachelor subject serves as an introduction and basis for the Master subject which advances the knowledge and skills provided in its the Bachelor-level counterpart. This applies to course material as well: with minor exceptions, the text books used in the Master Programme are more advanced than those used in the Bachelor programme. Also, the study subjects are spread evenly over the semesters in the study programme plan, and their themes are not repetitive; that is, there is no overlap in the subject descriptions.

With regard to the number of students in the Programme, the number of Master's theses is high, 27 in 2012 and 31 in 2013. Based on the final grades, also the quality of the theses seems to be exceptionally high: as many as 16 theses (28 %) have got the highest grade (10).

The high quality of the theses is – at least partly – due to a careful process which involves not only the production of the actual thesis in the final 4th semester of the studies, but also three preliminary phases (*Research Work*) conducted in semesters 1-3, each of them yielding 6 credits. The preliminary phases include producing a research plan, a literature review on the topic, and a constructive solution to the problem. After completing the thesis, the student has to present it to a Graduation Thesis Defence Committee. The thesis process follows the conventional process of scientific research and meets the legal requirements. Students can also choose their own topic for Master's thesis, if no suitable one is found in the official list compiled at the Department of Software Engineering.

Most theses, however, are not within the actual field of the Programme, Software Engineering, but on topics such as 3D virtual worlds, data mining, human language processing, mobile technologies, graph algorithms, geometric modelling, bioinformatics, neural networks, video technologies, database systems, quantum computing, fingerprint technologies, e-commerce, simulation, electronic document management, and data filtering. This problem is made even more severe by the fact that as much as 48 credits in total (40 % of the curriculum) is allocated to the Master's thesis process, including the preliminary phases. Therefore, the Expert Team finds it necessary to improve the Master's thesis process such that majority of the theses are made on topics that are in the core of the Programme, Software Engineering.

With the exception of Master's thesis and the related research work addressed above, the content of the subjects is consistent with the type and (Master) level of the Programme, the content of the Programme reflects the latest achievements in software engineering, and the content and methods of the subjects are appropriate for the achievement of the intended learning outcomes.

3. Staff

According Annex 2 of the self-evaluation report, there are 14 teachers in the Programme: 4 professors, 5 associate professors, and 5 lecturers. All teachers, except four, are also teaching in the Bachelor programme in Software Engineering. According to Annex 3, most teachers have practical experience in the field, either from primary occupation or a "second job" in a software company. The combination of academic background and practical experience of the staff is acknowledged by the Expert Team. The close relationship of the Programme with a prominent industrial sector could, however, be exploited even more, for instance by inviting more experts from industry to give optional courses in their special areas of expertise. Still, there are enough teachers in the Programme to ensure its learning outcomes.

About 86 % (12) of teachers have a scientific PhD degree, and more than 20 % of the subjects (calculated in credits) in the Programme are taught by professors, so the legal requirements on staff are satisfied. It can also be noted that two professors of the Programme, Roman Baronas and Albertas Čaplinskas, have been awarded the Lithuanian State Science Prize.

Most teachers (8) have publications from the years 2008-2013. However, just a couple of them have research background (publications) in the scientific field of the Programme, Software Engineering. This problem is severe here on Master's level where research activities play a central role. The lack of teachers' scientific merits in the field shows most explicitly in Master's theses which in most cases are made on topics outside of actual software engineering, probably because there are not enough thesis supervisors competent in the field.

A related problem that seems to be common for all the Computer Science programmes at Vilnius University is the relatively high age of staff. There are three teachers in this Programme who are over 60 years of age, and the mean age, as well as the median, is 52 years. Moreover, turnover of the teaching staff is rather low. Software Engineering is a constantly and rapidly changing discipline, so it is crucial to ensure that the staff of the Programme always has those qualifications that match the current state of the art and practice in the field. Personal planning of the Faculty must make sure that retiring teachers will be replaced by younger professionals and active researchers in Software Engineering.

Concerning staff evaluation, the crucial factor seems to be the number of publications listed in the ISI Web of Science. This choice, while not being made by the Faculty of Mathematics and Computer Science, is unfortunate for a couple of reasons. First, the mere number of publications can hardly be seen as a proxy of the quality of research. Second, in general the ISI Web of Science is losing – due to inflation in impact factors – its usefulness as a tool to measure scientific achievements. And third, the ISI Web of Science has never been a proper tool to measure scientific achievements in Computer Science where many of the most prestigious venues of publication (such as conferences) are excluded from it. At the moment, the primary source for measuring scientific value of publication venues in Computer Science is the Microsoft Academic Search service, so it is recommended to use that service in addition to the ISI Web of Science.

4. Facilities and learning resources

The premises provided by the Faculty for the Programme are adequate both in their size and quality. Teaching takes place in two locations, at Naugarduko g. 24 / Šaltinių g. 1a (two buildings next to each other) and at Didlaukio g. 47. The two locations are reachable by public transport which, however, takes some time (roughly 30-40 minutes). However, the timetable of the Programme is organized in such a way that the teachers and students in most cases do not need to travel between the locations on the same day, and they reassured the Expert Team that this is indeed the case. The problem of two separate locations will hopefully be solved in the near future since the Faculty is supposed to get a new building in 2017. If possible, the (new) facilities should be adapted better for persons with a disability.

The Programme is well equipped with modern computing infrastructure and resources. The Faculty has four special laboratories (Mobile Application Development Laboratory, Robotics Laboratory, Networking Laboratory, Science and Business Communication Laboratory) with specialized hardware and software, as well as a supercomputer with 2000 cores and 600 TB of disk space. The buildings have wireless Internet connection that is also available to students and their personal devices. The Faculty invests around 200 000 LTL annually for renewal and updating of the IT equipment, and, for instance, eight new computer classes have been set up in recent years.

Each year, the Faculty invests between 17 000 and 28 000 LTL on material in its library. The library is equipped well enough with literature in Computer Science, and there seems to be enough up-to-date text books in Software Engineering for the students of the Programme. It can also be positively noted that the library has access to the ACM and IEEE digital libraries, which gives the students the possibility to read the most recent journals and conference proceedings in Computer Science (and Software Engineering). Students have reported that most of the material they need is accessible to them on-line.

As mandated by the general requirements, the curriculum of the Programme includes 18 credits of professional practice. The practice is adequately and effectively organized: students have enough options to choose their practice placement from lists announced by local IT companies, the Faculty and the company sign an agreement for the practice, two supervisors (one from the Faculty, one from the company) are assigned for each student, and the student has to write a report and give a public presentation of the practice after it has been completed. According to a survey conducted in 2013, all the students of the Programme seem to carry out their practice at their working place, probably in the same tasks they are employed for. The pedagogical – or even practical – added value of the professional practice in the Programme is therefore rather questionable.

5. Study process and student assessment

There is a formal entrance examination to the Programme, and Bachelors graduated in any study field are eligible to apply. In order to guarantee the incoming students' abilities to study in the Programme, the entrance examination tests their knowledge both in Software Engineering and in general Computer Science. In addition to the grade of entrance examination, grades of subjects in the Bachelor degree as well as additional points for publications are taken into account when calculating the "competition score" of the applicants.

Both the students and the Expert Team find the entrance examination rather easy. Moreover, half of the questions are related to Computer Science (programming and databases, for instance) and just half to the actual field of the Programme, Software Engineering. Therefore, the Expert Team

recommends making the entrance examination harder and more explicitly focused on Software Engineering, in order to make it more selective.

According to the data on student admission and competition, there have been between 34 and 49 students annually admitted to the Programme during the years 2008 to 2012, somewhat less than the number of first-request applicants. Most students are admitted to state-funded study places, and the number of self-funded students is very small (from 1 to 3 admitted in 2008-2012). A vast majority of the enrolled students have a Bachelor degree in Software Engineering from Vilnius University.

In 2008-2012, the number of state-funded study places has varied between 34 and 46 and the number of applicants between 50 and 83, so there have been enough applicants to the Programme and, according to the self-evaluation report, it is "one of the most popular and motivating second cycle study programmes implemented by the Faculty of Mathematics and Informatics". What might be alarming is that in 2012 both the number of state-funded places and the number of applicants clearly dropped when compared to the previous year (from 43 to 34 and from 73 to 50, respectively).

On the average, about one third (33 %) of the students enrolled to the Programme in 2008-2012 have dropped out. The main reason for drop-out and termination of studies is the high demand of software specialists in IT companies, which tempts students to get a job already during their studies (often already on Bachelor level). From the positive side it can be concluded that the professional activities of the graduates – and even of the majority of "drop-outs" – meet the expectations of the Programme providers and the employers.

The University provides the following forms of social support to the students (of this Programme): incentive scholarships for particularly good study results; social scholarships for students from the needy families or living alone, for those receiving social allowance, for those with 45 % or higher level of disability, and for those below 25 years of age who are granted care or whose both parents (or one of the parents) are dead; one-time social scholarships in cases of death of a family member, natural or other kind of disaster, disease or other similar case; and one-time target scholarships for students who have achieved good results either in sports or in cultural, research or public activities.

Disabled students can receive social support from the Faculty, and they can study according to an individual plan. Students can get psychological help and services from the VU Psychological Innovation and Experimental Research and Training Centre and from the Youth Psychological Help Centre, and they can get advice for career planning from the VU Career Centre.

All the students have a right to get accommodation in the Students' Residence. The Student Representation Office of the Faculty is involved in numerous activities and organizes cultural and sports programmes to the students.

The assessment of study results follows the publicly available general procedures approved by the University Senate. The assessment criteria applied in the Programme are given at the beginning of each course by the teacher, and they are specified in subject descriptions. Students are informed of the reasons for their examination grades, and they can make a formal appeal to the Appeals Committee if they do not agree with the grade or the assessment process. The students get a written review of the Master's thesis. In general, the assessment system is clear, adequate, and publicly available.

According to the general University regulations, the results of examinations shall be entered into the Studies Information System of VU within five working days after the examination. The Expert Team finds this time requirement too tight, especially for a study field (Software Engineering) where the essential problems are of such abstract and manifold nature that they usually require a lengthy essay-type solution. In order to enabling more adequate examinations (in Software Engineering), the Faculty should make a statement to the University for extending the current 5-days deadline of examination results.

The University has a plagiarism detection system that is used in the Programme for checking that there is no direct and non-refereed plagiarism in the Master's theses. The system only checks overlap with the theses made at Vilnius University, so it is currently restricted to a rather local context only; most notably, the system cannot detect a piece of text that has been copied from the Internet.

For supporting teacher and student mobility, the Faculty has signed 76 Erasmus exchange agreements with foreign universities and other higher educational institutes. Unfortunately, the students do not take advantage of such wide opportunities: for instance, in 2009-2013 the number of Master students in Software Engineering who have been in Erasmus exchange has varied between none and 3, with 2 students being the annual average. The main reason for low participation in Erasmus exchange is that most students have a job that they cannot quit or interrupt for the internship period. Since international experiences and contacts are important for all students, and especially for those studying in fields with international job markets, the students of the Programme should be encouraged to more exploit their possibilities for Erasmus exchange.

6. Programme management

The Study Programme Committee has the main responsibility of managing the content and quality of the Programme. The Committee has six members: two professors, two associate professors, one representative of social partners, and one student representative. Four of them are also members in the Study Programme Committee of the Bachelor Programme in Software Engineering, which makes it easier to coordinate the two closely related programmes. The Study Programme Committee seems to work effectively and take the main responsibility of decisions and monitoring of the Programme and its implementation.

The VU Quality Management Centre carries out regular student surveys about the study process and the study subjects. Students can also give direct feedback to teachers, for instance by email. Unfortunately, just a small number of students (roughly 15–20 %, based on interviews with students) give any kind of feedback on their studies. While there are official feedback channels, the general feeling among the students seems to be that their comments and suggestions are not really taken into account when changing or improving the Programme – or the students are not aware of such measures. Therefore, the Study Programme Committee should encourage the students to give more feedback, for instance by explicitly, publicly and regularly notifying how the suggestions from the students have been processed and whether any changes have been made due to them.

The social partners of the Programme have a representative in the Study Programme Committee and the Master's theses defence committee (also, as chairman). Based on the meeting between the Expert Team and social partners, they seem to be quite satisfied with their possibilities to influence the contents and implementation of the Programme. This also applies to the graduates who have been invited to the Faculty to discuss the Programme and its improvements.

III. RECOMMENDATIONS

1. The majority of Master's theses must be made in the actual field of the Programme, Software Engineering.

2. The optional modules shall be revised such that the students of the Programme have to select the majority of optional subjects from Software Engineering.

3. There should be more optional subjects in Software Engineering. All the subjects shall be regularly provided to all the students of the Programme.

4. In order to make the entrance examination really selective, it should be made harder and more explicitly focused on Software Engineering.

5. In order to attack the relatively high age of the staff and its low scientific competence in Software Engineering, young active researchers in Software Engineering should be recruited to the Programme.

6. When evaluating quantity and quality of scientific publications of the staff, Microsoft Academic Search should be used in addition to the ISI Web of Science

IV. SUMMARY

The Master study programme in Software Engineering operates in one of the most central areas of IT industry, software development. The graduates of the Programme are employed well, and in most cases in positions that match the aims and objectives of the Programme. When compared with Bachelors in Software Engineering, the graduates of the Programme are employed in more business-oriented, managerial and specialized expert positions in industry. According to national surveys and comments from industry, still more Masters in Software Engineering will be needed in the labour market in the future.

The curriculum of the Programme covers most of the advanced subjects that are internationally considered essential for Software Engineering. There are optional subjects in the curriculum so that students can choose topics that they personally find interesting or relevant for their career. However, the number of optional subjects could be larger and the curriculum should be revised such that most of them have to be taken from the core of Software Engineering. It should also be guaranteed that all the students of the Programme have possibility to attend all the optional courses included in the curriculum and the study plan.

The Programme has 14 teachers from three departments of the Faculty of Mathematics and Informatics, most of them from the Department of Software Engineering. The Study Programme Committee has the main responsibility of quality assurance and coordination of the Programme, and seems to work effectively. Students and social partners of the Programme have a representative in the Study Programme Committee, and they seem quite satisfied with their possibilities to influence the content and implementation of the Programme. This also applies to the graduates who have been invited to the Faculty to discuss the Programme and its improvements.

Most teachers of the Programme have publications from the years 2008-2013. However, just a few teachers have research background in the scientific field of the Programme, Software Engineering. This has negative consequences, most notably, on Master's theses whose topics are in most cases not in the core of Software Engineering. The Master's thesis process, including the preliminary phases (research work), is solid but has to be improved such that the majority of the theses are made in the actual field of the Programme, Software Engineering.

Other related problems with staff are its relatively high age and low turnover. It is therefore recommended to recruit young active researchers in Software Engineering to the Programme. Concerning regular staff evaluations, the more relevant Microsoft Academic Search service should be used in addition to the ISI Web of Science when measuring the quality of scientific publications.

The premises provided by the Faculty for the Programme are adequate both in their size, quantity and quality. Also, the Programme is well equipped with modern computing infrastructure and wireless Internet connections. The library has enough literature in Computer Science, and there seems to be enough up-to-date text books in Software Engineering for the students of the Programme. It can also be acknowledged that the library has access to the central on-line sources of scientific literature in Computer Science, the digital libraries of ACM and IEEE.

There is a formal entrance examination to the Programme. The examination is, however, too easy and directed in half to other areas of Computer Science. In order to make the entrance

examination really selective for the Programme, it should be made both harder and more focused on Software Engineering.

There have been between 34 and 49 students annually admitted to the Programme during the years 2008 to 2012. Most students are admitted to state-funded study places, and a vast majority of the enrolled students have a Bachelor degree in Software Engineering from Vilnius University. In these years, the number of state-funded study places has varied between 34 and 46 and the number of applicants between 50 and 83, so there have been enough applicants to the Programme. What might be slightly alarming is that in 2012 both the number of state-funded places and the number of applicants clearly dropped when compared to the previous year (from 43 to 34 and from 73 to 50, respectively).

On the average, about one third (33 %) of the students enrolled to the Programme in 2008-2012 have dropped out. The main reason for drop-out and termination of studies is the high demand of software specialists in IT companies, which tempts students to get a job already during their studies (often already on Bachelor level). On the other hand, this can also be seen as a sign of good labour market relevance of the Programme.

The Programme follows the general regulations of Vilnius University which state that the results of examinations shall be entered into the Studies Information System within five working days after the examination. Such a short deadline is too tight, especially for this Programme with typical examination questions being of such manifold nature that they usually require a lengthy essay-type answer. In order to enabling more adequate examinations (in Software Engineering), it is recommended that the Faculty makes a statement to the University for extending the 5-days deadline of examination results.

For supporting student mobility, the Faculty has signed 76 Erasmus exchange agreements with foreign universities and other higher educational institutes. Unfortunately, the students of the Programme do not take advantage of such wide opportunities: in 2009-2013 just nine students in total have been in Erasmus exchange. Since international experience and contacts are important for the students of this Programme, they should be encouraged to more exploit their possibilities for Erasmus exchange.

Regular student surveys are conducted about the study process and the study subjects. Students can also give direct feedback to teachers, for instance by email. Unfortunately, just a small number of students of the Programme give any kind of feedback on their studies. Therefore, the Study Programme Committee should encourage the students to give more feedback, for instance by publicly notifying how the suggestions from the students have been processed and whether any changes in the Programme have been made due to them.

V. GENERAL ASSESSMENT

The study programme *Software Engineering* (state code – 621I30001) at Vilnius University is given **positive** evaluation.

Study programme assessment in points by evaluation areas.

No.	Evaluation Area	Evaluation Area in Points*
1.	Programme aims and learning outcomes	3
2.	Curriculum design	4
3.	Staff	3
4.	Material resources	4
5.	Study process and assessment (student admission, study process student support, achievement assessment)	3
6.	Programme management (programme administration, internal quality assurance)	3
	Total:	**20**

*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. Jukka Paakki

Grupės nariai:
Team members: Prof. Rolf Backofen

Prof. Jerzy Marcinkowski

Vida Juozapavičienė

Lukas Jokūbas Jakubauskas

Studijų kokybės vertinimo centras

VILNIAUS UNIVERSITETO ANTROSIOS PAKOPOS STUDIJŲ PROGRAMOS
PROGRAMŲ SISTEMOS **(VALSTYBINIS KODAS – 621I30001) 2014-03-21**
EKSPERTINIO VERTINIMO IŠVADŲ NR. SV4-100 IŠRAŠAS

<...>

V. APIBENDRINAMASIS ĮVERTINIMAS

Vilniaus universiteto studijų programa *Programų sistemos* (valstybinis kodas – 621I30001) vertinama **teigiamai**.

Eil. Nr.	Vertinimo sritis	Srities įvertinimas, balais*
1.	Programos tikslai ir numatomi studijų rezultatai	3
2.	Programos sandara	4
3.	Personalas	3
4.	Materialieji ištekliai	4
5.	Studijų eiga ir jos vertinimas	3
6.	Programos vadyba	3
	Iš viso:	**20**

* 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)

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IV. SANTRAUKA

Programų sistemų magistro studijų programa yra susijusi su viena pagrindinių IT pramonės šakų – programinės įrangos kūrimu. Programos absolventai lengvai randa darbą ir daugeliu atvejų užima tokias pareigas, kurios atitinka programos tikslus ir siekius. Palyginti su programų sistemų bakalauro absolventais, šios programos absolventai pramonėje užima tokias pareigas, kurios labiau orientuotos į verslą, vadovaujančios ir specializuotų kompetencijų. Pagal nacionalinius tyrimus ir pramonės atstovų komentarus, ateityje darbo rinkai reikės dar daugiau programų sistemų magistrų.

Studijų kokybės vertinimo centras

Programos studijų turinys apima daugelį dalykų, kurie tarptautiniu mastu laikomi Programų sistemų pagrindiniais dalykais. Siūloma pasirenkamųjų dalykų, kad studentai galėtų pasirinkti jiems patiems įdomias arba jų būsimai profesinei veiklai naudingas temas. Tačiau pasirenkamųjų dalykų galėtų būti daugiau, o studijų turinį reikėtų pertvarkyti taip, kad dauguma dalykų būtų susiję su Programų sistemų esme. Taip pat reikia užtikrinti, kad visi programos studentai galėtų lankyti visus studijų turinyje ir studijų plane siūlomus pasirenkamuosius dalykus.

Programoje dirba 14 dėstytojų iš trijų Matematikos ir informatikos fakulteto katedrų, dauguma jų iš Programų sistemų katedros. Daugiausia už kokybės užtikrinimą ir programos koordinavimą yra atsakingas Studijų programos komitetas, jo veikla laikoma efektyvia. Studentai ir socialiniai partneriai turi savo atstovus Studijų programų komitete ir atrodo, kad yra gana patenkinti galimybe daryti įtaką programos turiniui ir jos įgyvendinimui. Tai taip pat taikoma absolventams, kurie buvo pakviesti į fakultetą aptarti programos ir jos gerinimo klausimų.

Dauguma programoje dėstančių dėstytojų teikė publikacijas 2008–2013 metais. Tačiau tik keli dėstytojai turi mokslinių tyrimų patirties programos srityje – Programų sistemose. Tai turi įtakos, ypač magistro baigiamiesiems darbams, kurių temos dažnai nėra susijusios su esminiais Programų sistemų dalykais. Magistro baigiamųjų darbų rašymo procesas, įskaitant preliminarias stadijas (mokslo tiriamąjį darbą), yra geras, bet reiktų patobulinti tai, kad dauguma magistro baigiamųjų darbų būtų susiję su tikrąja studijų programos Programų sistemos sritimi.

Kitos su personalu susijusios problemos yra vyresnis amžius ir maža personalo kaita. Todėl rekomenduojame programoje įdarbinti daugiau jaunų aktyvių mokslininkų, dirbančių Programų sistemų srityje. Kalbant apie reguliarų personalo vertinimą, kartu su „ISI Web of Science" platforma reikėtų naudoti ir aktualesnę „Microsoft Academic Search" sistemą mokslinių publikacijų kokybei nustatyti.

Fakulteto programai skiriamų patalpų dydis, skaičius bei kokybė yra tinkama. Taip pat yra aprūpinama modernia kompiuterine infrastruktūra ir belaidžiu interneto ryšiu. Bibliotekoje pakanka literatūros apie kompiuterijos mokslą ir, ekspertų nuomone, yra užtektinai modernių vadovėlių apie Programų sistemas programos studentams. Taip pat patvirtinama, kad bibliotekoje yra galimybė naudotis centriniais internetiniais mokslinės literatūros ištekliais apie kompiuterijos mokslą, skaitmeninėmis ACM ir IEEE bibliotekomis.

Studijų kokybės vertinimo centras

Stojantieji į šią programą laiko formalų stojamąjį egzaminą. Tačiau jis yra per lengvas ir iš dalies nukreiptas į kitas kompiuterijos mokslo sritis. Tam, kad programos stojamasis egzaminas iš tikrųjų padėtų atrinkti tinkamus kandidatus, jis turi būti pasunkintas ir labiau koncentruotas į Programų sistemas.

Kasmet nuo 2008 m. iki 2012 metų į programą buvo priimta nuo 34 iki 49 studentų. Dauguma studentų priimama į valstybės finansuojamas vietas ir dauguma įstojusiųjų turi Vilniaus universiteto Programų sistemų bakalauro laipsnį. Šiais metais valstybės finansuojamų vietų skaičius kito nuo 34 iki 46, o stojančiųjų – nuo 50 iki 83; taigi į programą pretendavo įstoti gana daug studentų. Šiokį tokį nerimą keliantis veiksnys yra tas, kad 2012 m. tiek valstybės finansuojamos vietos, tiek kandidatų skaičius, palyginti su ankstesniais metais, pastebimai mažėjo (atitinkamai nuo 43 iki 34 ir nuo 73 iki 50).

2008–2012 metais vidutiniškai apie trečdalį (33 proc.) į programą priimtų studentų nebaigė studijų. Pagrindinė nebaigtų studijų ir studijų nutraukimo priežastis – didelė programų specialistų paklausa IT bendrovėse, tai gundo studentus įsidarbinti dar nebaigus studijų (kartais net ir bakalauro studijų). Kita vertus, tai gali būti ženklas, kad programa gerai atitinka darbo rinkos poreikius.

Vykdant šią programą vadovaujamasi bendrais Vilniaus universiteto nuostatais, kuriuose numatyta, kad egzamino įvertinimas į studijų informacinę sistemą įvedamas per penkias darbo dienas nuo egzamino laikymo. Toks laikotarpis yra per trumpas, ypač šiai programai, kurioje standartiniai egzaminų klausimai būna įvairūs, į kuriuos paprastai reikia parašyti ilgą, rašinio pobūdžio atsakymą. Kad būtų sudarytos galimybės vykdyti adekvatesnį egzaminavimą (Programų sistemų), rekomenduojame fakultetui prašyti Universiteto pailginti penkių dienų terminą egzaminų rezultatams įvesti.

Skatindamas studentų judumą, fakultetas su užsienio universitetais ir kitais aukštojo mokslo institutais yra pasirašęs 76 *Erasmus* mainų sutartis. Deja, studentai nepasinaudoja tokiomis plačiomis galimybėmis, pavyzdžiui, 2009–2013 m. tik 9 studentai iš viso dalyvavo *Erasmus* mainų programoje. Kadangi tarptautinė patirtis ir ryšiai šios programos studentams yra svarbūs, jie turėtų būti skatinami aktyviau naudotis savo galimybėmis dalyvauti *Erasmus* mainų programose.

Studijų kokybės vertinimo centras

Studentų apklausos apie studijų procesą ir studijų dalykus vykdomos reguliariai. Studentai taip pat gali tiesiogiai išreikšti atsiliepimus dėstytojams, pavyzdžiui, elektroniniu paštu. Deja, tik maža dalis programos studentų teikia kokio nors pobūdžio grįžtamąjį ryšį apie savo studijas. Todėl Studijų programos komitetas turėtų paskatinti studentus teikti daugiau atsiliepimų, pavyzdžiui, viešai skelbdamas, kaip studentų pasiūlymai buvo priimti ir ar dėl jų programoje buvo įgyvendinti kokie nors pokyčiai.

III. REKOMENDACIJOS

1. Dauguma magistro baigiamųjų darbų turėtų būti susiję su tikrąja studijų programos Programų sistemos sritimi.

2. Reikėtų persvarstyti pasirenkamuosius studijų dalykus ir skatinti programos studentus rinktis daugelį pasirenkamųjų dalykų, susijusių su Programų sistemomis.

3. Į programų sistemų programą reikėtų įtraukti daugiau pasirenkamųjų dalykų. Visi dalykai turi būti reguliariai dėstomi visiems programos studentams.

4. Siekiant, kad stojamasis egzaminas tikrai padėtų atrinkti tinkamus kandidatus, reikia jį pasunkinti ir labiau sukoncentruoti į Programų sistemas.

5. Kad būtų išspręstas klausimas dėl santykinai vyresnio personalo amžiaus ir nedidelės mokslinės kompetencijos Programų sistemose, turėtų būti įdarbinta jaunų aktyvių mokslininkų iš Programų sistemų srities.

6. Vertinant personalo mokslinių leidinių kokybę ir kiekybę, greta „ISI Web of Science" platformos reiktų naudotis ir „Microsoft Academic Search" sistema.

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Paslaugos teikėja patvirtina, jog yra susipažinusi su Lietuvos Respublikos baudžiamojo kodekso[1] 235 straipsnio, numatančio atsakomybę už melagingą ar žinomai neteisingai atliktą vertimą, reikalavimais.

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[1] Žin., 2002, Nr.37-1341.

Studijų kokybės vertinimo centras

Vertėjos rekvizitai (vardas, pavardė, parašas)

Studijų kokybės vertinimo centras