STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

VILNIAUS GEDIMINO TECHNIKOS UNIVERSITETO
STUDIJŲ PROGRAMOS
KOMPIUTERIŲ INŽINERIJA
(valstybinis kodas – 621H69001)
VERTINIMO IŠVADOS
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EVALUATION REPORT
OF *COMPUTER ENGINEERING*
(*state code - 621H69001*)
STUDY PROGRAMME
at VILNIUS GEDIMINAS TECHNICAL UNIVERSITY

Experts' team:

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Išvados parengtos anglų kalba
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Studijų programos pavadinimas	*Kompiuterių inžinerija*
Valstybinis kodas	621H69001
Studijų sritis	Technologijos mokslų studijų sritis
Studijų kryptis	Elektronikos ir elektros inžinerija
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Antroji
Studijų forma (trukmė metais)	Nuolatinė (2 metai)
Studijų programos apimtis kreditais	120 ECTS
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Kompiuterių inžinerijos magistras
Studijų programos įregistravimo data	2007-06-05

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INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	*Computer Engineering*
State code	621H69001
Study area	Technological sciences
Study field	Electronics and electrical engineering
Type 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 Computer Engineering
Date of registration of the study programme	5th of June, 2007

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I. INTRODUCTION

1.1. Background of the evaluation process

The evaluation of on-going study programmes is based on the **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 (hereafter – SKVC).

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

On the basis of external evaluation report of the study programme SKVC takes a decision to accredit study programme either for 6 years or for 3 years. If the programme evaluation is negative such a programme is not 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 areas 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 have been provided by the HEI before, during and/or after the site-visit:

No.	Name of the document
1	Projects related with Computer Engineering (2012 – 2015)
2	List of research and publications by teaching staff in Computer Engineering
3	List of visited laboratories

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

The master's degree studies in Computer Engineering have been carried out at Vilnius Gediminas Technical University since 2007. The Computer Engineering is the second cycle Master's studies programme. The graduates of the programme receive a master degree in Computer Engineering. There is also a bachelor level programme in Computer Engineering, which is being implemented in the same faculty.

External evaluation of Vilnius Gediminas Technical University (VGTU) study programme has been conducted on 2012 by an international expert group. Former external evaluation of the "Computer Engineering" study programme (hereinafter CE study programme) was conducted by an international team of experts – (team leader) prof. dr Toomas Rang, prof. dr Tilmann Krueger, doc. dr Sergey Olegovich, prof. dr Dangirutis Navikas and Monika Simaškaitė (student member).

The expert group has analysed the Self Evaluation Report (hereafter – SER), the study programme aims and learning outcomes, curriculum of the study programme, quality assurance (management) of the SP, study process, staff, also other evaluation areas and criteria.

1.4. The Review Team

The review team was completed according *Description of experts' recruitment*, approved by order No. 1-01-151 of Acting Director of the Centre for Quality Assessment in Higher Education. The Review Visit to HEI was conducted by the team on 11th November, *2015.*

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1. **Prof. Dr. Edmund Handschin (team leader),** *professor emeritus at Technical University of Dortmund, Germany;*
2. **Prof. Dr. Tadeusz Skubis,** *professor at Silesian University of Technology, Faculty of Automation, Electronics and Informatics, Poland;*
3. **Prof. Dr. Toomas Rang,** *professor at Tallinn University of Technology, Faculty of Information Technology, Estonia;*
4. **Prof. Dr. Dainius Balbonas,** *Head of the Electronics and Electrical Engineering department at Šiauliai University, Lithuania.*
5. **Mr. Rytis Koncevičius,** *students' representative from Vytautas Magnus University.*

II. PROGRAMME ANALYSIS

2.1. Programme aims and learning outcomes

The programme aims are well and clearly defined. Topics of the programme are pointed out: to provide the newest knowledge from the computer engineering (CE), special knowledge in the field of CE necessary for application of newest technologies, and development of new products and services, also to develop abilities to creatively apply theoretical knowledge and scientific results, and improve professional competences. The programme delivers the master degree in CE.

The learning outcomes are defined in categories knowledge, understanding, special skills and general abilities. The outcomes are well-chosen to form specialists in the field of electrical and electronic engineering. Both aims and learning outcomes of the programme of the second cycle of CE are publicly accessed in electronic version on https://medeine.vgtu.lt/programos/programa . Learning outcomes are delivered to students also in oral form by teachers, in most cases at the beginning of lessons in each semester. A shortened version of study programme aims and learning outcomes is added to the Diploma Supplement of a graduate. It was verified during the visit that most of declared aims and outcomes are achieved.

Programs aims and learning outcomes are fitted to the public needs and labour market. According to SER, programme and learning outcomes are constantly updated and improved to meet special requirements of study programmes, as the programme is annually reviewed. It can be verified that teachers who attended meeting with the evaluation team, indicated that they have made amendments in last few years or they amended the learning methods. The current industry needs are submitted by social partners to the Study Programme Committee which is responsible for monitoring learning outcomes. Social partners-representatives are also members of CE study programme committee and Master's Degree Conferring Committee. The Faculty community maintains close cooperative relations with manufacturing companies and state institutions. An Alumni Club, involving graduates into faculty life is active at VGTU. They can suggest ideas concerning programme improvements and modifications, but the feedback from alumni should be gained more actively. The evaluation team got an impression that the Alumni are ready to share their industrial experience, and they know university realities, so one can expect that their opinions are competent, actual and well balanced. University should be fully opened regarding this matter.

As mentioned, this programme is coordinated alongside with the social partners. Representatives took part in meeting with the evaluation team and confirmed their interest and activities in the modification of this study programme. They expressed the view that this programme is needed for labour market. Some examples were indicated showing that due to

changes in enterprises new specialists will be needed in near future. The study programme coincides with professional requirements, and has academic level. Specialists related to computer science have the best employment opportunities in Lithuania, what is confirmed by in-land and US statistics, as well as it was underlined by employees during the meeting.

It should be mentioned that some of the topics of thesis are proposed by external stakeholders. Content of thesis correspond to the competences of graduates, and is useful for real needs of industrial firms. Graduates find the job according to their education in modern computer firms of computer engineering profile.

Learning outcomes of CE study programme are formulated by evaluating the requirements for the competences of experts of electrical and electronics engineering. Learning outcomes in a study programme are divided into groups: knowledge, (Z1, Z2, Z3 and specialized knowledge – Z4.1), understanding (S1, S2, S3), special skills (SG1, SG2, SG3 and SG3.1), and general abilities (BG1, BG2, BG3), characterized in SER §13 – 16.

Programme aims and learning outcomes are adequate for the second level studies and for qualifications MA in Computer Engineering. Declared qualifications are consistent with the second level studies. The programme aims and learning outcomes elaborated in VGTU are comparable with the ones used in leading universities of developed countries.

The name of the programme: "Computer Engineering", programme aims clarified in SER (§11), learning outcomes defined in SER (§12-16), content described in study subjects (Annex 8.1) and qualifications declared (MA) are fully compatible with each other.

A small remark could be listed - students could be more acquainted with aims of the CE study programme. Faculty should evidence any improvements of programme and reasons of any changes. Other than that, this area has very good and improved standards since last accreditation.

2.2. Curriculum design

The curriculum designs meet legal requirements specified in "Study Cycle Descriptions" approved by Order of LR Minister of Science and Education (SER §24), and in international directives (§25). Lithuanian legislation is harmonized with international legislation, so the 2nd cycle study programme prepares specialists of qualification level VII. Programme meets formal requirements regarding the distribution of ECTS. Subjects are steadily arranged and they are not repetitive. Distribution of workload between semesters is correct. The sequences of the subjects are appropriate. At the beginning subjects of study field are undertaken, and later elective and other subjects are being taught. Study subjects are complementary, and not redundant.

Qualifications of graduates allow to solve various complicated interrelated tasks in areas of several related professional activities, mainly in electronic and electrical engineering.

Graduates are able to apply latest knowledge and expert assessment in areas of electronic and electrical industry as well as in neighbouring branches. They are able to apply new science achievements in the practice, to make professional research, and to perform creative application of theoretical knowledge and scientific research results.

Study programme subjects cover specialized obligatory issues of signals and their processing, microwave and optoelectronic devices, mathematical modelling, computer system simulation, microcontrollers and their programming, computer system security, information security management, embedded systems. Four optional subjects provide for students a real choice of different issues: virtual instrumentation, numerical electrodynamical methods, design of high speed analogous IC, modern telecommunication technologies. This set of subjects is enriched by mandatory subjects defined by University (fundamentals of research and innovations) and one optional subject chosen from set of 6 subjects defined by the faculty, closely connected with the core of study.

The learning outcomes are achieved by lessons in direct contact with the teacher and by self-teaching. However, it is not entirely clear for the evaluation team, how learning outcomes are achieved by individual learning, or what kind of a system is at base for monitoring the relation of individual learning and achievability of learning outcomes.

Curriculum is designed in such way that not only graduates from first level Computer Engineering (BA) can undertake the programme of second cycle, but also from other universities. However majority of these students came from the first cycle of CE programme at VGTU.

The study programme consists of 120 ECTS credits. Duration of this study programme is 4 semesters. ECTS credits are properly allocated to the subjects and to attainable learning outcomes. The content of subjects is consistent with the second level studies and with expectations from graduate distinguished by MA degree.

The study programme includes one specialization: Computer Technologies. Specialization subjects provide 48 credits, and additionally thesis – closely connected with the specialization – gives 39 credits. In comparison, subjects of the 2nd cycle SP have a more developed scientific level than the subjects of 1st cycle. Naturally, this is the right construction, because the first cycle SP forms the basis for the 2nd cycle, but there is no substantial repetition in terms of content. The programme may be also easily adapted to the preparation of graduates to a PhD studies, upon design of an individual study plan (9 credits) and optionally chosen courses (6 credits). Discussions during meetings with students and alumni showed that students have opportunity to propose changes in the content of the curriculum. Students suggested that ECTS numbers allocated to some difficult subjects are too low. Review team recommend to discuss this

question with students and carefully check allocation ECTS to subjects. The preparation of the thesis is evenly distributed thorough semesters 1-3 (3 credits in each semester), and the 4th semester is fully concentrated on this final work (30 credits). This distribution of work for the thesis preparation is assessed as right and effective.

The evaluation team can verify that the subject content and methods of achieving of learning outcomes are well fitted to the intended learning outcomes. It is worth mentioning that some lectures are held in English by foreign professors. The SER description of each module presents learning outcomes which are more detailed apart from the general learning outcomes. Topics of each study subjects are detailed enough as well. They are based on Faculty research results, and take into consideration modern contexts and up-to-date achievements of computer engineering, telecommunication and electronics. They comprise, among others, embedded systems, programmable devices, security of microprocessor and computer systems, and also digital and analogous integrated circuits – such elements and systems are today a basis of modern control systems, instrumentation, computer technologies and advanced applications.

It can be concluded that the scope of this programme is well considered and fitted to reach learning outcomes. The content of the programme regards current performances in electronics and information technologies. Thus the programme content is actual, comparable with other ones applied in universities abroad.

2.3. Teaching staff

The study programme is worked out by highly qualified staff of practical and academic experience. The assessing team recognized that teachers of the CE study programme are well familiarized with the Self Evaluation Report, and are aware of current demands concerning the quality of education process. The university teachers meet requirements set forth in Law on Science and Studies of the Republic of Lithuania, and other related (SER, §74). The number of teachers implementing the study programme varies slightly every year, but most of them form a stabile core of the team. They are engaged into projects and scientific research in computer engineering area, thus they constantly actualize their ability to teach progressively and to gain the professional qualification.

Qualifications of the teaching staff, both scientific and didactic, are high enough to ensure declared learning outcomes. The qualifications are based on own performed research and long-time teaching at university. The staff of second cycle CE study programme participated in variety of research projects funded by MITA, Research Council of Lithuania and industrial enterprises (in last 5 years 18 projects). The teachers also carried out projects funded by EU, devoted to development of study programs and universities (in the last 5 years 4 projects). The

scientific activity of teachers correspond to the subjects they teach. University teachers take part in international cooperation, by outgoing visits (57 in the years 2010 - 2015) and incoming visits (37 in the years 2010 – 2015). A halve of the teachers realizing the CE study programme took part in mobility programme at the side of outgoing visits during last 5 years.

The teaching staff of the CE study programme consists of 12 university teachers, among them is 6 professors and 6 docents, working full time. Because the number of students is relatively small (17 – 22 in the last 5 years), the number of university teachers compared to the number of students ratio is substantial, making possible the close contact of teachers with students. The ratio of university teachers to students studying according to the CE study programme is very favourable, which positively flows into learning outcomes achievements. In other words the evaluation team believes this ratio is high enough to ensure learning outcomes. The evaluation team found that the number of teachers is sufficient to deliver learning outcomes basing on cross-references in curriculum, workload, discussion with teachers and administration. The contact of students with the teachers can be very tight, and what is more, content presentation is diversified by significant number of teachers engaged into programme realization. This is a valuable feature of the teaching staff.

As mentioned, teaching staff is adequately prepared to realize the study programme: their didactic activity is closely bounded with scientific interests, they are responsible for subjects according to their competences. The programme is provided fully and it is understandable by the students.

The mean age of teachers is relatively low and the age of individual teachers is nearly evenly distributed in the range ~30…~60 years. Teacher's turnover is rather minor – currently it does not have any impact on quality of the CE study programme. Staff seems to be stable in terms of age and distribution of qualifications.

Teachers of the CE study programme study are promoted to higher posts, e.g. there is a high probability that in the next 2 - 3 years one docent will become a professor. The structure of age of teachers is advantageous, enabling fluent development of the team. Teachers having published 15 publications of a good level in the study area and meeting other requirements can pass attestation giving possibility to become a Full Professor. During the attestation teachers are evaluated for their flexibility and opinion prevailing among students.

Conditions of professional development of teaching staff accessed by the University are good. Faculty provides courses aiming to upgrade teachers skills focusing on scientific researches. All teachers participate in scientific conferences in Lithuania or abroad, and also in qualifying scientific studies related to study programme modules. The development is based on many practical projects realized for the industry and outer institutions. The science background

is enhanced by obligatory scientific work, comprising 30% of total working time for academic teachers. Methodological approach is also developed by continuous and close contact with students. Teachers can participate in courses of foreign languages and information technologies.

Projects realized by teaching staff are tightly connected with the CE study programme. Experience and know–how are delivered to students clearly and in necessary details. The knowledge delivered to students is practical, directly useful for application and adaptable to new challenges in area of IT. Older teachers of good academic and practical experience transfer the experience also to younger teachers, ascending to higher university posts.

The teachers of the CE study programme are permanent university teachers. Every 5 years each teacher has obligatory internship, what strongly flows into updating its knowledge. Teachers are appointed for tenure of 5 years following an open competition. At the University there is established the procedure of checking a conformance to qualification requirements and performing the attestation of teachers. During the last 5 years all teachers were attested, based on their scientific and practical activity, scientific papers, monographs, textbooks, teaching materials, reports at in-land and abroad conferences. Certification includes also the evaluation the methodological, pedagogical, organisational and other activities of candidates. The evaluation team can confirm that practically all teachers are able to speak English and some of them also speak other languages. All teachers of the Faculty of Electronics have good experience and appropriate qualifications for the study programme realization.

As strength of teacher's team we point out the high level of their qualifications, good cooperation with students, regarding the advanced research in the subject contents and practical subject matter of the final theses. The evaluation team can also point out a a weakness which considers the University in general. We point out that there is insufficient financing for both – the participation in scientific conferences and low financial support of subject programme improvements. Though, it seems as this issue is rather common among Lithuanian higher education institutions. In any case, the evaluation team considers the teaching staff as one of the strongest points of this study programme.

2.4. Facilities and learning resources

The VGTU provided for disposal of the Faculty of Electronics a building with the necessary infrastructure. This current building has 12 classrooms of different sizes. Classrooms intended for giving lectures are equipped with stationary multimedia equipment and computers. This equipment is modern, in good state and making possible the effective education process performances.

Laboratories are fully matched to the study programme and are adequately provided. The number of workstations is adequate to the student's number. The evaluation team in particular have a high opinion on technological laboratories (embedded systems, sensors of magnetic fields), included to the CE study programme realization.

To disposition of Computer Engineering students there are 270 computers throughout laboratories and departments in Faculty of Electronics. This quantity is very high in relation to students number. Computers are equipped with modern general and specialized software, for computer graphics, programming, calculations and simulation of different processes. The software in laboratories is legal, with adequate number of inputs, also the software is annually updated. The access to computers in laboratories is limited to the times indicated in schedules and sometimes it can lead to some inconveniences for the students.

University computers are connected to the local network and to the Internet. Students can use their own computers by high – speed Wi-Fi connection. The quality of connections, net accessibility and reliability during the visit were satisfactory.

Technical and sanitary conditions of CE study programme realization are good. All premises correspond to modern requirements of work safety and hygiene.

Students of CE study programme can use for free electronics components provided by Electronics Fond established in the Faculty of Electronics, by JSC INOKO. Students realize practical tasks useful for local enterprises mainly in the space of their theses. Such directing of theses is adequate for the CE study programme.

Students can use the rich resources of VGTU library, comprising the access to 26 databases, (among them are world most important for computer engineering program, as IEEE, Science Direct, EndNote Web, RefWorks), 23774 e-journals and over 254000 titles e-books. Among them there are 773 e-journals and 2455 e-books, in particular helpful for the second cycle of CE study programme. Patent database is also accessible. The important part of the resources there is University Repository, designed to store and preserve VGTU authors' research articles, conference proceedings, dissertations and study guides. The University Library offers also VGTU Library created databases (5 items). The access to resources is easy and professionally arranged. Work conditions in the library are comfortable.

Information on resources, current opportunities of free trial databases and bibliographic help are accessed by the web site.

The list of new purchases is formed by the order of Departments, thus there is an opportunity to enrich the resources with the newest items needed for second cycle CE study programme.

Academic teachers of Electronics Faculty publish study materials (lecture slides, methodical materials, laboratory work schedules) on the Intranet and VGTU Moodle virtual environment (http://moodle.vgtu.lt).

The assessing team confirms, that material basis of the Faculty of Electronics realizing the CE study programme corresponds with economic situation of the University, and is sufficient for successful implementation of CE second cycle programme. It can be mentioned that VGTU will have a new building soon for their Electronics faculty, which is currently still under construction.

Strengths of the programme are adequate size and quality premises, good access to the bibliographic resources and high awareness of necessity of current updating the laboratories. However, the access for students to the professional computer programmes in laboratories should be more flexible.

2.5. Study process and students' performance assessment

The study process is carried on the quality system implemented in the VGTU two years ago. The system orders all activities and procedures of the study. Now it is still trained, but positive results of its implementation are evident.

Admission to the second cycle Computer Engineering study is stress-free and easy, there are no entrance examinations. For the second level study students can be enrolled directly if they studied at first level CE or adjacent study field. The main criterion of the enrolment is based on weighted average of the main studies (in last 5 years the limit value was 7.26…7.63). Only (17 – 30)% of applicants meet the criterion, and these are enrolled. They must have bachelor's degree and minimum determined knowledge of the study programme. If an applicant studied in an adjacent study field but his knowledge is not complete to study second cycle CE programme study (the lack expressed in ECTS is up to 10), there is a possibility to take required courses and examinations before the end of the first semester of master's study. The Faculty authorities currently analyse the numbers and ratio of enrolled students who completed studies successfully, examination results in relation to enrolment results, dropout of students in each course and causes of the dropout.

The ratio of graduates to enrolled students ranges from 0.67 up to 1.00 in last four years, in which graduates finished the study programme. The coefficient of the success is relatively high, ca. 83%. The main reason for termination of the studies are – work in companies, lack of motivation and personal life circumstances.

Information on admission to the study programme is easily accessed by Internet and provided in different VGTU brochures, or can be found directly at the admission commission.

The study process is submitted to the achievement of learning outcomes. Organisation of the study process is good enough to ensure proper delivery of the programme. Information about study process is delivered to the students in comprehensive and various ways (participation of programme representatives in different events presenting the studies, University web page, Faculty web page, written materials, news-board).

Students are well informed on the assessment formula of students' achievements. In each description of the modules the assessment criteria are provided. At the beginning of each course of study programme all weighted coefficients of the assessment components are brought to mind of the students. The system of assessment encourages students to work more evenly during the semester. It provides a comprehensive and objective assessment of study results. The assessment system itself (timetables, exams, schedules, grades) is clear. During the interview with the students, they confirmed their awareness about assessment criteria. They know where to find these criteria (where they are published) and confirmed that teachers inform them at the beginning of each subject.

Study process is evaluated according to the "Specifications of the procedures for the knowledge assessment of VGTU students".

All mandatory tasks, such as monitoring, homework, midterm, laboratory work, are presented to students during the semester. Examinations are held in written form, and students have opportunity to get acquainted with their assessment sheets and discuss in details the test results. Examination results are published in the University information system "Medeine". The evaluating team states that result assessment system is fair, effective, and is friendly to the students.

Science and applied research activities of students are planned in the CE study programme for the students of the second cycle. They can participate also in thematic working groups lead by teachers. The results of students scientific and applied science activity are announced at the Conference of Young Scientists organized by the Faculty. The students are obligated to publish at least one paper during their studies. Papers are based mainly on research performed during working out the thesis. Faculty provides the possibility to publish them in its own academic book. However, students have no information how the research achievements could be patented. Review team suggests initiating among the students an interest in patenting.

Faculty offers mobility programmes for students and teachers, within ERASMUS and EUKLA programmes. Students of Computer Engineering have the opportunity to study part of subjects abroad. The basis of the international education are agreements signed by the VGTU authorities with 37 European and 7 Turkish universities (Erasmus programme), as well as with the South Korea and Germany. The Faculty of Electronics participates in the international

exchange). The number of students willing to leave for exchange programmes is high, and there is always a competition to take most popular places.

The VGTU ensures support in the study process and students life, in different forms, e.g.: participation in conferences, scientific projects and thematic working groups. Individual consultations for students are provided to discuss their doubts and discover vagueness. Teachers tend to meet individual needs and interests of students.

The evaluation team states, that the academic and social support provided by Faculty is on a good level.

Graduates find a job in their speciality quite fast, so this testifies that the programme is well harmonized with the market needs, and learning outcomes are attained. The social partners employing the graduates of the CE study programme have highly assessed their ability to undertake advanced engineering tasks of current industrial needs. During the meeting with employers it was confirmed that most of graduate students meet their expectations.

Nevertheless, the number of CE study programme graduates of VGTU is lower than expected by the innovative companies of Lithuania.

The evaluation team states that these are the following strengths of this evaluation area: admission requirements are well established, the University ensures an adequate level of academic and social support, assessment system of student's achievements is clear, publicly available, and students are involved into scientific research. However, as a weakness we point out a relatively low number of current students and a reasonable amount of students terminating their studies. The team would also recommend the enhancement of the international exchange for CE students.

2.6. Programme management

Making decisions and the monitoring of their implementation are adequately established, both at the level of the University and the Faculty. Details are precisely described in SER (§175-181). The second cycle EC study programme is supervised by the Electronic Department. On the level of Faculty the Study Programme Committee (SPC)_works supervising newly prepared and renewed programs and their subject modules. The management of the study programmes and the process of decision making are regulated by VGTU Senate, VGTU general faculty provisions, VGTU general faculty council provisions, VGTU study provisions, VGTU study committee provisions and VGTU faculties' study committees provisions. The documents properly allocate the implementation of study programme and responsibilities for decisions regarding this study programme. The system for the formation of university second cycle study programmes, the

study programme structure, studies structure, and order of the study programmes formation is clear and consistent.

Information about the development of the CE study program is found in the university information system, covering all university activities. The management process is computerized and currently updated. The information is used for plan and decision making, students' admission plans, study and teaching plans, teaching loads distribution, evaluation of study results, diploma registration, distribution of scholarships and dormitories, different statistics, students enrolment, scheduling.

During the on-site visit, it was verified that the social partners have significant impact on the improvement of programme quality. Opinions of students, academics, employers and alumni are considered while upgrading the programme, its specific courses and study materials. Cooperation with the foreign partners also makes influence into the programme quality. At the University level the programme is supervised according to the study quality management system based on requirements of European University Association (EUA) post-secondary education quality standards. This system is an essential part of strategic management.

In the management of the CE programme, an essential role is played by the internal quality system which University possesses. Number of internal documents regulating the assurance of its running is shown in the SER.

The main stakeholders have an influence into evaluation and improvement of programme quality. List of employers that are being involved into programme implementation and updating is given in the SER (§203-205). Employers are also involved in the study process of the programme, e.g. as a chairman of the qualifying degree award commission.

The knowledge on effectiveness and efficiency of the quality system implemented to the Computer Engineering study programme is completed by surveys, also involving main stakeholders (32 representatives). All internal parties are effectively involved in management of CE study programme. Teachers are involved in management of study process by initiating inclusion of new subjects, changes in their volume, sequence of study subjects etc. Evidence of such activities was indeed confirmed by the evaluation team. Thus the team concludes that the internal assurance measures are effective and efficient. Though a recommendation could be made - to improve the feedback gathered from the alumni and also the surveys filled bythe students.

Taking in consideration that this programme was previously evaluated 3 years ago, the current evaluation team can conclude that most of the recommendations were implemented and the programme has improved a lot since last accreditation.

III. RECOMMENDATIONS

1. Visiting team recommends to make more visible the impact of research on the programme.

2. The Faculty should be more opened on the contact with alumni, also to gain more feedback from the graduates.

3. The Faculty should document evidence regarding any improvements of programme and also reasons of any changes.

4. The Faculty should provide possibilities for the students an access to computers in laboratories outside the regular lessons schedule.

5. The allocation of ECTS into moduli should be carefully analysed, to better balance the difficulty of subjects with the ECTS number.

6. Students should be more acquainted with the aims and learning outcomes of the CE study programme, and informed on the self-evaluation report and the after visit external evaluation report.

7. Faculty authorities should pull students into a patent process, showing them how to look for items of patenting capability in their research. The interest of patenting should be engrafted in student's awareness.

IV. SUMMARY

The programme aims and learning outcomes are adequate for the second level studies and for MA qualifications in Computer Engineering. Declared qualification is consistent with the second level studies. The programme aims and learning outcomes elaborated in VGTU are comparable with the ones applied in leading universities of developed countries.

Curriculum design is well developed as the subject content and methods of achieving intended learning outcomes are well fitted. Descriptions of modules contain all needed information in the right order. Also the ECTS system is well implemented as the subject topics are closely connected with the research performed at the Faculty, which is the strong side of the programme. The scope of the programme is well considered and fitted to reach its learning

outcomes. The content of the programme regards current performances in electronics and information technologies.

The evaluation team in particular has a high opinion on technological laboratories (embedded systems, sensors of magnetic fields, electronic control circuits). The following strengths of the programme are seen: well established admission requirements, adequate level of academic and social support, clear and publicly available the assessment system of student's achievement, and involving of students into research.

Academic teachers engaged into the CE study programme realization are certified. They have proved their methodological, pedagogical, organisational competences.. All teachers have good experience and appropriate qualifications for this study programme realization.

As a strong point of this teachers' team, it can bepointed out that there is a high level of their qualifications, good cooperation with students, regarding of advanced research in the subject contents and practical subject matter of the final theses. Though certain steps should be taken in order to solve out the issue – insufficient financing for both the participation in scientific conferences and low financial support of programme subject improvements.

Students of CE study programme can use the rich resources of VGTU library. Among them there are items particularly useful for the second cycle of CE programme study. Work conditions in the library are comfortable, and the access to resources is easy and professionally arranged. Regarding the premises, the main strong points would be - adequate size and quality premises, good access to the bibliographic resources and high awareness of necessity of current updating laboratories. The evaluation team confirms, that the material basis of the Faculty of Electronics is sufficient for successful implementation of CE second cycle programme.

Regarding the study process, the students are quite satisfied with this area. There is enough academic and social support from the teachers and the Faculty. However certain steps should be made in order to increase the admission number of students for this programme. Also certain means should be taken in consideration in order to better solve the reasons behind student drop-outs. An increase of outgoing numbers for the exchange programme would also be appreciated.

The programme management includes an internal quality system which is running effectively. The majority of essential stakeholders are involved into the programme improvement in different ways. It can be concluded that the programme management have implemented most of the recommendations made by the previous evaluation team. They made significant changes in terms of programme learning outcomes and the core of the teaching staff. Nevertheless, this programme should be constantly developed in the future.

V. GENERAL ASSESSMENT

The study programme Computer Engineering (state code – 621H69001) 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	4
2.	Curriculum design	3
3.	Teaching staff	4
4.	Facilities and learning resources	3
5.	Study process and students' performance assessment	3
6.	Programme management	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. Dr. Edmund Handschin
Grupės nariai: Team members:	Prof. Dr. Tadeusz Skubis
	Prof. Dr. Toomas Rang
	Doc. Dr. Dainius Balbonas
	Mr. Rytis Koncevičius

VILNIAUS GEDIMINO TECHNIKOS UNIVERSITETO ANTROSIOS PAKOPOS STUDIJŲ PROGRAMOS *KOMPIUTERIŲ INŽINERIJA* (VALSTYBINIS KODAS – 621H69001) 2015-12-17 EKSPERTINIO VERTINIMO IŠVADŲ NR. SV4-360 IŠRAŠAS

<...>

V. APIBENDRINAMASIS ĮVERTINIMAS

Vilniaus Gedimino technikos universiteto studijų programa Kompiuterių inžinerija (valstybinis kodas – 621H69001) vertinama **teigiamai**.

Eil. Nr.	Vertinimo sritis	Srities įvertinimas, balais*
1.	Programos tikslai ir numatomi studijų rezultatai	4
2.	Programos sandara	3
3.	Personalas	4
4.	Materialieji ištekliai	3
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)

<...>

IV. SANTRAUKA

Studijų programos *Kompiuterių inžinerija* tikslai ir numatomi studijų rezultatai atitinka antrosios pakopos (magistrantūros) studijas ir kompiuterių inžinerijos magistro kvalifikacinį laipsnį. Nurodyta kvalifikacija atitinka antrosios pakopos studijas. VGTU kruopščiai parengti programos tikslai ir numatomi studijų rezultatai yra panašūs į išsivysčiusių šalių stipriausių universitetų tikslus bei rezultatus.

Programos sandara yra gera, nes dalykų turinys ir numatomų studijų rezultatų siekimo metodai tinkamai suderinti. Modulių aprašuose tinkama tvarka pateikta visa reikalinga informacija. ECTS kreditų sistema taip pat tinkamai įgyvendinama, kadangi dalykų temos yra glaudžiai susijusios su fakultete atliekamais moksliniais tyrimais, kurie yra šios programos stiprybė. Programos apimtis yra pakankama, kad būtų galima pasiekti numatomus studijų rezultatus. Programos turinys susijęs su šiuolaikiniais pasiekimais elektronikos ir informacinių technologijų srityje.

Ypač gerai ekspertų grupė vertina technologijų laboratorijas (įdiegtas sistemas, magnetinio lauko jutiklius, elektronines valdymo grandines). Ekspertai įžiūri šias programos stiprybes: tinkami priėmimo reikalavimai, pakankamo lygio akademinė ir socialinė parama, aiški ir viešai skelbiama studentų pasiekimų vertinimo sistema ir studentų dalyvavimas moksliniuose tyrimuose.

Studijų programos *Kompiuterių inžinerija* dėstytojai yra atestuoti. Jie įrodė savo metodinius, pedagoginius ir organizacinius gebėjimus. Visi dėstytojai turi gerą patirtį ir tinkamą kvalifikaciją, reikalingą šiai studijų programai įgyvendinti. Šios dėstytojų komandos stiprybe galima laikyti jų aukšto lygio kvalifikacijas, gerus ryšius su studentais, atsižvelgimą į pažangius mokslinius tyrimus rengiant dalykų turinį ir baigiamųjų darbų praktines temas. Tačiau reikia imtis tam tikrų veiksmų norint išspręsti nepakankamo finansavimo, susijusio su dalyvavimu mokslinėse konferencijose ir programos dalykų tobulinimu, problemą.

Studijų programos *Kompiuterių inžinerija* studentai turi galimybę naudotis turtingais VGTU bibliotekos ištekliais. Tarp jų yra *Kompiuterių inžinerijos* programos antrosios pakopos studentams ypač naudingų priemonių. Darbo sąlygos bibliotekoje yra patogios, ištekliai lengvai prieinami ir profesionaliai sutvarkyti. Kalbant apie patalpas, privalumai yra pakankamas jų dydis ir kokybė. Be to, yra lengvai prieinami bibliografiniai šaltiniai. Stiprybė yra ir tai, kad suvokiama, jog reikalingos šiuolaikinės, atnaujintos laboratorijos. Ekspertų grupė patvirtina, kad Elektronikos fakulteto materialioji bazė yra pakankama, kad būtų galima vykdyti *Kompiuterių inžinerijos* antrosios pakopos programą.

Studentai yra visiškai patenkinti studijų eiga. Dėstytojai ir fakultetas suteikia jiems pakankamą akademinę ir socialinę paramą. Tačiau reikėtų imtis kai kurių veiksmų, skirtų padidinti į šią programą priimamų studentų skaičių. Be to, reikėtų apsvarstyti, kokios priemonės padėtų naikinti studentų nubyrėjimo priežastis. Būtų gerai padidinti išvykstančiųjų pagal mainų programas skaičių.

Programos vadyba apima vidinio kokybės užtikrinimo sistemą, kuri veiksmingai įgyvendinama. Daugelis pagrindinių socialinių dalininkų įvairiais būdais dalyvauja programos tobulinimo procese. Galima daryti išvadą, kad programos vadovybė įgyvendino didžiąją dalį

rekomendacijų, kurias pateikė ankstesnį vertinimą atlikusi ekspertų grupė. Atlikti svarbūs programos numatomų studijų rezultatų ir dėstytojų branduolio pakeitimai. Tačiau ateityje programą reikėtų nuolat tobulinti.

<…>

III. REKOMENDACIJOS

1. Ekspertų grupė rekomenduoja aiškiau parodyti mokslinių tyrimų poveikį programai.
2. Fakultetas turėtų atviriau bendrauti su alumnais, taip pat stengtis dažniau gauti absolventų grįžtamąjį ryšį.
3. Fakultetas turėtų dokumentais įforminti informaciją apie atliktus programos patobulinimus ir pakeitimų priežastis.
4. Fakultetas turėtų užtikrinti studentams galimybę naudotis laboratorijose esančiais kompiuteriais pasibaigus įprastam paskaitų laikui.
5. Reikėtų atidžiai išnagrinėti ECTS kreditų paskirstymą pagal modulius, kad dalyko sunkumas atitiktų kredito skaičių.
6. Reikėtų geriau supažindinti studentus su studijų programos Kompiuterių inžinerija tikslais ir numatomais studijų rezultatais, savianalizės suvestine ir išorinio vertinimo išvadomis, pateiktomis pasibaigus vizitui.
7. Fakulteto valdžia turėtų įtraukti studentus į patentavimo procesą, parodydama jiems, kaip ieškoti tyrimams temų, kurios suteiktų galimybę juos patentuoti. Noras gauti patentą turi būti įdiegtas studento sąmonėje.

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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)