SKVC

STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

ŠIAULIŲ UNIVERSITETO
STUDIJŲ PROGRAMOS
SIGNALŲ TECHNOLOGIJA
(valstybinis kodas - 621H67001)
VERTINIMO IŠVADOS
————————————————————

EVALUATION REPORT
OF *SIGNAL PROCESSING*
(*state code - 621H67001***)**
STUDY PROGRAMME
at ŠIAULIAI UNIVERSITY

Experts' team:

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Išvados parengtos anglų kalba
Report language – English

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DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	*Signalų technologija*
Valstybinis kodas	621H67001
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	Robotikos ir kibernetikos magistras
Studijų programos įregistravimo data	2010-05-03, Nr. 635

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INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	*Signal Processing*
State code	621H67001
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 in Robotics and Cybernetics
Date of registration of the study programme	May 3, 2010, Nr. 635

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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 byOrder 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 documentshave been provided by the HEIbefore, during and/or after the site-visit:

No.	Name of the document

1.3. Background ofthe HEI/Faculty/Study field/ Additional information

Šiauliai University (ŠU) is the biggest university in the Northern Lithuania with about 4000 students, 300 academic staff, 6 faculties and 2 institutes. The University was found in 1997 after the merger of Šiauliai Pedagogical Institute and Šiauliai Polytechnic Faculty of Kaunas

University of Technology. ŠU has been approved as a university since 1997. The mission of the university is to provide high level studies and research opportunities at international level combined with regional relations. ŠU is an active member in many international organisations, cooperates with many international partner universities and participates regularly in a variety of scientific research and educational international programs.

Signal Processing (hereafter – SP) is the academic programme under evaluation and leads to the Master in Robotics and Cybernetics degree. It is a programme offered by the Faculty of Technology and Natural Science and supervised by the Department of Electronics and Electrical Engineering (DE&E).

The SP programme is offered in full time mode with the duration of 2 years and it is designed with a structure based on the European directives for Higher Education (Bologna Process). It awards 30 ECTS per semester and 60 ECTS per year. Thus this is a 2 years master programme with 120 ECTS.

The last assessment of the SP programme was carried out by an external international expert team and took place in 2012. A summary of the conclusions of the assessment report is provided in Appendix 5 of the Self-Evaluation Report (SER) with the Follow-Up Action Plan showing the achieved results.

1.4. The Review Team

The review team was completed according *Description of experts' recruitment*, approved by order No. 1-01-151of Acting Director of the Centre for Quality Assessment in Higher Education. The Review Visit to HEI was conducted by the team on *22nd October, 2015.*

1. **Prof. Dr. László T. Kóczy (team leader),** *Széchenyi István University and Budapest University of Technology and Economics, Professor, Hungary;*
2. **Prof. Dr. Luis Torres,** *UPC Polytechnic University of Catalonia, Professor, Spain***;**
3. **Prof. Dr. Tilmann Krüger,***Hochschule Mannheim, University of Applied Sciences, Professor, Germany;*
4. **Mr.Edvardas Linkevičius,***representative of social partners' at TEO LT, Head of Technology and IT development, Lithuania.*
5. **Mr. Paulius Varonenka,** *students' representative from Vilnius University, Lithuania.*

II. PROGRAMME ANALYSIS

2.1. Programme aims and learning outcomes

The programme aims are generally set in the SER: to train for engineering in robotics and cybernetics giving deeper and newest knowledge combined with skills to use it as well as to develop analytical skills to find problems, to define the task for their solutions and to form other skills for advanced engineering. The evaluation team proposes that a more detailed presentation of the programme aims would be valuable.

The SER gives a clear and ordered Table 2.1 containing the Learning Outcomes (LO) listed according to the following groups: knowledge and understanding, engineering analysis, engineering design, investigation, engineering practice, making judgements, communication and team-working, and lifelong learning. There are all together 27 concrete learning outcomes listed, which are arranged in accordance with EUR-ACE Framework standards. These Learning Outcomes were updated in 2015. In the SER (Table 2.2) a matrix of correlations between the subjects of SP and the anticipated learning outcomes is given. The learning outcomes for *Engineering Practice* are given in very general terms. E2 (practical skills) should contain information about topics like programming, hardware design and realisation, PCB layout. LO's A3 (awareness of forefront of robotics), E4 to E6 (engineering practice) and F1, F2, F6 (management) are solely related to the two subjects Research and Thesis work. These LO-s should be given in more detail, while the rather high number of LO-s should be reduced.

The demand of SP graduates in Northern Lithuania around Šiauliai is represented in the SER generally as related to important industrial companies as well as the missing automation skills in the whole Lithuania.

Aims and anticipated learning outcomes of the Programme are available in the Šiauliai University Academic Information System (https://uais.cr.ktu.lt/suis) which can be accessed only with access code and password. So it seems that it is expected that first of all that only students with a bachelor degree of ŠU in Electronics and Electrical Engineering will apply for admission because "outsiders" do not possess the access codes. Nevertheless, for applicants from outside of ŠU there is a more general description of the programme available on the general website of the University, thus the learning outcomes are still accessible at a general level for the public.

Applicants with a bachelor degree in other engineering or physics disciplines must complete a supplement course in Electronics, Circuit Theory, Digital Devices, Microprocessors, and Digital Signal Processing.

As reported by the Lithuanian speaking members of the team also the presentation of the "Signal Processing" programme on the ŠU website it is written in a very general and broad

way. The team recommends a less limited and more precisely formulated information there about the aims and LO's of the programme in the Lithuanian as well as in the English website.

The team recommends to discuss the name of the programme and also the degree anew. As international habits are concerned a more widely user degree like "Master of Science in Electronic Engineering (MSEE)" could be valuable, especially for international marketing aspects.

2.2. Curriculum design

According to the SER the Curriculum Design (CD) complies with the national local legislation and the local regulations for the master programmes. More specifically, the total volume of the academic and individual work hours of the study subjects and the respective volume of the individual study subjects conform to the legal acts of the University Academic Regulations. The main characteristics of the academic programme are that the SP Programme has the duration of 2 years (4 semesters) with a total of 120 ECTS, the compulsory subjects have 6 ECTS and the programme foresees 1 thesis project. Students can take also free electives from their own or other faculties of the university. The number of subjects per semester is 5 making in total 30 ECTS per semester.

From the detailed information about the subjects provided in SER (Appendix 1) the experts may verify that the content of the subjects and/or modules are consistent with the type and level of the studies. However, there are two curricula tables given in SER, table 2.4 for running programme and 2.5 for programme starting 2016 . In both tables the erroneous ECTS figures should be corrected, both tables should give a sum of 120 ECTS, rather than 114.

In the presentation of Master's Degree Programmes[1], it is stated that the language of instruction is English. The content of Appendix 1 of SER is however different: for some modules the only given teaching form is Lithuanian (*Methodology of Experiment, Measurement Methods, Optimisation, Sensor Networks, Theory of Information Transfer).*

The staff confirmed that all of these subjects could be presented in English as soon as there are enough foreign students applying for. Up to today only some of these subjects have been presented to foreign students, partially from ERASMUS programme.

Also the plan of in-class hours is missing for *Image Processing*, *Advanced DSP*, *Theory of IT*. The subjects cover at a satisfactory level all engineering fields proposed by the programme and include theoretical lectures which account for 65% (running SP, new: 60%) of the

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[1]http://www.su.lt/index.php?option=com_content&view=article&id=8758&Itemid=17439&lang=en

programme, research and final degree project work which account for about 35% and 40%, respective. It is estimated that this distribution of time between theoretical and practical work is appropriate and it is close to the international practice.

One weakness noted is that in many cases the proposal of reference books is small or consisting of quite old ones (for example in Appendix 1 pages 15 (only one, 1997), 18 (none), 34, 61 (1980 …2000). Some suggestions for changes of the recommended literature:

Module   Literature

T121M100   [1] Digital Image Processing, 3rd Ed. 2008, instead of 2nd ed. 2002

           [2] Digital Image Processing with MATLAB, 2nd ed. 2009, instead of 1st ed. 2003

T120M001   [1] Introduction to Biomedical Engineering, 3rd Ed. 2011, instead of Ed. 2000

           due to lots of updated chapters, a look into historical development

T121M151   [-] No international literature is given. An usable example could be:

           Theory of Information Transfer 2006 ed., ISBN 978-3540047612

In the SER Appendix 1 there is a detailed list of the subjects provided with information about the syllabus, the assessment methodology, references and grading system. From the information given it is estimated that the subjects, contents and methods proposed are suitable for the achievement of the target LO. Students and teachers have access to the results of research of previous graduates; however, the experts have found no information about exploitation or publishing of the research results (LO F4).

The content of the programme reflects some of the latest achievements in related science and technologies at a very good level. This has been seen during the visits in the laboratories and confirmed by the employers and alumni during the meetings with them. Nevertheless it should be mentioned that the areas have been chosen in a somewhat eclectic way, so that they fit the research and teaching interest of the available staff. Despite some flaws and recommendations provided within this area, the panel still thinks that the curriculum design is reasonably good.

2.3. Teaching staff

The staff providing the study programme exceeds the legal requirements. The composition of the staff consists at present of 3 professors, 2 associate professors, and 1 lecturer with PhD or DSc and none with MSc only, summing in 6 lecturers with at least PhD, which statistics satisfies the legal requirements. More specifically, the Order of the Ministry of Education and Science requires that not less than 80% should be holders of doctoral degrees (SP: 100%) and not less than 20% of subjects from main subject field should be provided by

professors (SP: 70 - 80%). Both criteria are satisfied. It is a risk that 2 of the very active 3 professors are in the retirement age (65 -70 years) only partially mitigated by an associate professor coming in 2016. There is hope that young doctors of the department will join the teaching staff. Due to further restructuring of the faculties and offered programmes we have no fear that it runs as planned. One professor already retired and was replaced, and in 2016 an associate professor is coming, as shown in the following table:

Year	<35	35-49	50-64	>65
2014	0	2	2	2
2015	1	2	2	1
2016	1	3	2	1

From the information provided in the CVs presented in Appendix 3, it may be seen that the qualifications of the staff conform to the Description of the requirements for Master programs. The professors and associate professors teaching the main subjects have a professional experience of more than 10 years and all teachers have at least 13 years of teaching experience. The staff shows a significant participation in the third cycle (PhD education) process. This shows that the staff qualifications are adequate to ensure successfully the target Learning Outcomes.

The SER (Table 2.6) shows that the teaching and contact hours have an acceptable level. Detailed data from the workload of the teachers are missing, e.g. for other study programmes or administrative work. Due to the low number of SP students an intensive teaching process with effective guiding for research work is realistic.

Further, from the information provided by the staff the contact hours during teaching periods are in the area of 12 hours per week, but partially higher due to other programmes. Whereas this load is rather high, especially for teachers with external workload, it does not provide enough time to staff for research work and publications. But more hindering are missing financial resources claimed by important international publishers. This is reflected by the individual list of publications where the majority of articles mentioned are Lithuanian conference proceedings papers. There are some good but local journal articles and several international contributed book studies. We could not find any single major international journal paper (such as any IEEE Transactions). While attending oversees international conferences might be costly, this is not true for publishing journal papers. One of the teachers said that 70% of cost for participating on an international conference was paid by themselves. The University should provide an environment where staff members have less teaching load and are encouraged to do research with internationally accepted results. If possible, it is recommended that the teaching load of the staff would be decreased.

Due to the inconsistent numbering of the entries in Appendix 3 of SER, it is at least difficult for the team to find out enough details to rate performance and aptitude of the teaching

staff. Also for internal staff development as well as for effective marketing the team would like to recommend for the future a new version of Appendix 3 containing all the following items with consistent numbering for all CV's given there: 1. Name; 2. Date of birth; 3. Education; 4. Academic titles; 5. Work experience (all, also such which take place at the same time); 6. Most significant refresher courses / training cases / seminars (during the last 5 years); 7. Most significant scientific, methodical papers, patent applications (including English translation of title in parentheses); 8. Research activities; 9. Taught subjects (if subjects taught in other languages than Lithuanian: all stated in parentheses behind each subject); 10. Author/Coauthor of teaching books, software modules, hardware modules; 11. Pedagogical work experience (years); 12. Practical work experience (years); 13. Participation in international programmes (e.g. Erasmus); 14. Fields of research; 15. Participation in PhD procedures (advisor, consultant, defense/examination committee); 16. Additional information (e.g. Personal web sites, products or prototypes developed, subject related hobbies like amateur radio license); 18. Mother tongue(s); 19. Other languages (structured in understanding, speaking and writing). The tables of all teachers should have the same outfit and contain all 19 items. If there is no valuable content of any item, it should be marked by a hyphen to show that it was not only forgotten. This collection of CV's should be updated regularly.

In the international mobility area, the staff has opportunities to go to other international universities. However, very limited number of professors made use of this opportunity. Some of the staff attends international conferences to present research results. This lack of international mobility threatens the international vision of the staff and of the University in general and should be improved.

It is added also that the presence of foreign visiting academic staff is minor (3, 6, 2, 0 in the last four years). It is advised to invite possibly more often visiting lecturers from other universities or the industry, mainly from abroad, in order to give some specialised courses to students.

2.4. Facilities and learning resources

According to the information provided by the SER for SP 5 classrooms, 3 laboratories (1 with 8 computers) and 1 computerised classroom have been used – more than enough for maximum class size of 7 students.

The equipment of the laboratories was seriously improved in the last 3 years. Also companies offer their highly specialized laboratory facilities for research work. This is reflected in the quality and actuality of Master thesis results the team has studied (see LO's D4, D5, F1, F2, F3).

The Central Library of the university is not far away from the faculty building; it was renovated in 2008 and is available to students. While the premises of the library are indeed in very good conditions, the evaluators have seen that the library provides to students only a limited variety of books, textbooks and periodical publications concerning the programme. The databases and the electronic catalogues are accessible from home. The library contains about 60 English textbooks related to SP subjects. The faculty offers electronic access to many scientific data bases, whereas access to major data bases like IEEE Explorer could only be accessed via colleagues studying at KTU or VGTU in former times. The accessibility was cancelled this year. IEEE Xplore access should be reactivated as soon as possible. The number of printed books and periodicals should be improved. As regards some of the reference books proposed to students are quite old (as it was indicated in 2.2 section of this report.). This should be corrected (the books exchanged) because most of the subjects of the programme deal with changing technology. It could be added finally that students have easy access in printing and copying or scanning facilities as well as in computers rooms with suitable software. During the meeting with students almost all of them expressed their great satisfaction for all the facilities and learning resources which are available.

2.5. Study process and students'performance assessment

The admission requirements to the programme are analytically and clearly explained. The admission regulations for the second cycle programs are published at the university web-site and the admission assessment is organised according to the students' admission rules. The assessment consists of examination of the average mark of the BSc studiesand the final bachelor work or final exams of the candidates.Due to SER the entrance to *Signal Processing* Master's study programme is open to people with Bachelor's qualification degree in Electronics and Electrical Engineering. Applicants of other Technological (Engineering) area studies fields or Physical area studies fields, who do not have these qualifications, must complete supplement courses containing 5 subjects of first cycle studies: Electronics, Circuit Theory, Digital Devices, Microprocessors, Digital Signal Processing. This is valuable for keeping the high level of dependent modules. The ranked competition results are announced in the website of the university. Some information for students coming from Electrical Engineering is presented in a short form in subjects which are based on subjects of Electronics Engineering programmes.

The number state-funded places are limited to 5 or even less now. Very few students study SP paying the fees themselves. Some of them get a 50% discount from the faculty. All students which have dropped out during the first semesters have done it on a voluntary basis. It can be seen that the admission process applied is transparent and it ensures a high quality of the

entrant Bachelor graduates, especially due to a perfect fitting of level 1 experience to SP subjects, e.g. *Digital Signal Processing* to *Signal Processing*. The competition rank of admitted students from 2012 to 2014 is shown in Table 2.13. Information about the SP programme is presented at the university webpage, open to outside people only in a limited form.

The feedback of alumni and students is very positive. The students are very satisfied with the study process and their study programme in general. No complains or suggestions for improvement were given regarding the study programme or assessment methods. They are particularly satisfied from the fact that the academic programme is adapted in a way to give them the possibility to work and study at the same time. A question is open for discussion on how a student can perform his academic load of 40 academic (30 calendar) hours per week parallel to his work with the elevated requirements of Master's Programs. Nearly all students have taken this approach. It has been shown that sometimes the research work is done at companies as part of their work there. Although they do not have enough free time because they are working in business, they have easy access to laboratories, computer rooms and libraries during and after universities hours.

One of achieved aims of study programme is to prepare the graduates for the research and experimental development activities and PhD degree studies. The students take part on research as important part of their studies (running: 10%, new 15% without thesis work [additional 25%]), most of it is done in the laboratories of Department of Electronics and Centre of Biomedical Engineering. All students are encouraged to prepare research papers for publishing. Most research papers are published in Šiauliai University Journal of Young Scientists. The best students had been attracted to participate in the projects, which are carried out at the department.

The number of Erasmus outgoing students is rather low. During the on-site visit it has been seen, that students are not informed well enough about the mobility programme, neither they are motivated to participate. Administration should encourage students to take part in mobility programmes, because many companies see good possibilities for usable arrangements.

Students' performance assessment is regulated by rules of study module results evaluation. This contains the conditions when additional fees must be paid and under which conditions studying the 2nd year of SP is permitted. More than half of the credits foreseen for a semester must be earned for continuation of the studies in the next semester.

The University provides an adequate social support. There is a psychologist and a lawyer offering consultations free of charge. Students and their family may access medical services of the university, there is an availability to take a rest in rest bases. The Department has a working student representation, where students can get academical or social information. It

also organizes events. There is an availability for a gym or a sports hall. Students can live in dormitories.

Final theses are defended at a public meeting of the qualification commission consisting of 6 members from the Faculty, different enterprises and other universities (KTU, VGTU). (Including professors and industrial experts). The topics of the final degree projects in 2014 and 2015 meet the expectations, 10 of 11 were finished just in time with their study duration (SEP table 2.14), almost all of them were employed during their studies.

2.6. Programme management

ŠU has implemented a quality management system UNIQMAS for organisation, strategic and quality management consisting of 4 levels: university (Dept. of Strategic & Quality Management), faculties (study programme committees), departments, teachers.

The responsibilities for the implementation of the SP programme are clearly described and appropriately allocated. According to information provided by SER on the University level, the Senate discusses and approves study programmes as well as changes in their structure and approves the internal system for study quality assurance. The Department of Strategic and Quality Management designs and develops the system for study quality assurance, analyses the quality of studies in the University by carrying out surveys of students, teaching staff and employers, counsels on aspects of assurance of quality in studies. The University Work Group for Internal Expertise of Study Programmes Descriptions and Counselling carries out primary expertise reading of prepared documents (before submitting them to the SKVC), ensures feedback to academic subdivisions. Šiauliai University Department of Non-academic Activities is responsible for monitoring the study programme's graduates' integration into the labour market; support, and mediation when integrating into the labour market.

On the Faculty level the Faculty Council develops new study programmes and submits it to the Senate for approval, approves changes in programmes being delivered, discusses and makes decisions on publishing matters. The Faculty Dean's Office organises and controls the study process, draws and approves timetables of lectures and examinations for each semester, prepares documents related to the quality of study programmes delivered at the faculty, organises special days dedicated to the quality of studies, when matters of study quality are discussed. The Dean issues decrees regulating monitoring of the quality of study programmes which are compulsory to subdivisions, staff and students. The Faculty Study Programme Assessment Committee is responsible for constant supervision and control of study programmes being delivered at the Faculty.

On the level of the Department, study programmes are prepared and perfected, course-books, teaching aids, conspectuses, other learning facilities needed for studies written by teaching staff are approved, matters of distribution of teachers' work load, stages of preparation of graduation theses, appointment of research advisers are solved. Members of the Department deal with and assess quality of studies, preparation of graduates for practical work, work out suggestions on improvement of education of specialists. The Programme Committee is responsible for implementation of the Programme's aims and constant monitoring of its quality. The Programme Committee consists of 4 teachers, 2 social stakeholders, a student of the Programme, and a graduate employed at a place fit to the specialisation.

On the teachers' level, each staff member is responsible for the maintenance of academic ethics, the quality of his subjects including contemporary study material, in-classroom work, subject-related and methodical support to a student aiming at learning outcomes of a study subject, application of methods, order of interim and final assignments, selection of ways to assess students' obtained knowledge, and objectiveness in assessment. Research advisers of master theses are responsible for competent consultations for students writing master theses during both individual consultations and primary defences of the theses. Assessment of quality of the programme is being constantly carried out meeting the social stakeholders and teachers. However, there should be meetings with students as they would also have an opinion on their needs.

Students are responsible for personal learning outcomes and the personal quality of their study, the reasonable usage of time, consultations with a research adviser of the master thesis, selection of the place for practical placement, and the observation of the requirements set by the academic community to ensure the quality of studies. The greatest responsibility and also the largest impact on the management of studies is made by members of the Students' Representation (ŠUSA) delegated to the Senate and its committees. The Students' Representation operating in the Faculty is delegating not less than 20 % of all its members to the Faculty Council.

Supervision and administration of the SP is well regulated by the ŠU documents available, especially by the dean and the Study Committee. An informational base of SP is accumulated in University subdivisions at various levels, it is effectively shared among the subdivisions.

The Department accumulated data related to the implementation of the Programme, namely, lists of themes of master theses; deadlines of stages for preparation of graduation theses, data on students' and potential employers' opinions, success of graduates' employment, career

and continuation of studying, students' participation in scientific research activities, annual reports of the Department, minutes of sittings.

The Dean's Office stores statistics of students' and teachers' mobility, data on students' progress and drop-out, support to students, documents on distribution of scholarships, annual reports on Faculty performance, minutes of sittings of the Dean's Office and Faculty Council. Main data is included into annual reports of the Department and the Dean's Office; the latter is publicly available.

The data on implementation of the study programme (for details see: SER 135) is stored in a centralised way since the beginning of the implementation of the SP in the Academic Information System of ŠU. It contains personal data of the students, descriptions of study subjects (including LO's, topics, teachers' names, etc.). External parties have access only to the brief descriptions of study subjects.

Information on the quality of studies is collected at the Department at the end of each semester (on-line students' survey), the quality of the subjects and their delivery are assessed. When during the internal assessment weaknesses are identified, efforts are made to renew the study subjects, to enrich learning resources and facilities.

As mentioned also in 2.5 the number of outgoing Erasmus students is not satisfactory, the number of foreign incoming and outgoing teachers is very low and also there is not enough international collaboration in the educational programs. The same applies for the collaboration in international research projects.

It is proposed to improve and increase the overall marketing activities like distribution of printing information leaflets and the participation in international educational fairs. Visits to high-schools where the advantages of studying this programme could be explained, might benefit the enrolment of new students in the future.

Taking the local possibilities into account the Faculty has a very good relation with the industry concerning this programme. The industry is involved in the study programme planning even if the formal participation of employers in the design of the programme could be improved. A lot of influence was achieved due to the fact that some teachers are working in related companies, too. All of the employers were satisfied with the acquired skills of the graduates. An even more active participation of the employers in the programme design and in the proposal of final projects could be beneficial for the employability of the graduates.

The staff load in the programme is another weak point as it was mentioned previously. The staff is overloaded and they have not enough time for professional development. The management committees should consider this problem and ask for more funding for employment of more staff or better funding of the staff freeing them from the necessity of working outside.

The situation as it is now strongly affects the professional development of the staff, the performance of their work and the overall quality of the learning outcomes, the study process and the programme management.

To summarize it could be said that this programme made significant changes since last evaluation and without a doubt it should be continuously developed further to reach even better results.

III. RECOMMENDATIONS

1. Renew and update the recommended literature lists for all subjects mentioned in 2.2 of this report and make the referenced literature available or accessible to students and teachers.

2. Explore and augment the possibilities of increasing publication and international research related activities (including travelling to major international conferences, research oriented faculty exchanges, sabbaticals and internships, and publish journal articles in high level international journals, such as the IEEE Transactions series) teachers. Involve students in the internationalisation as much as possible.

3. Efforts should be made to potentiate English teaching activities, especially for young faculty members, also by marketing the programme at international level and attracting more foreign students.

4. Promote international mobility of teachers and students, by using Erasmus and other opportunities.

5. Continue improving the laboratories and equipment, especially by using the existing (and future) industrial connections, establishing new practice items following the continuous development of the field.

6. Explore and augment the possibilities of scholarships and trainee programmes, especially to ease financial pressure on employed full time students (see e.g. dhbw.de).

7. Increase the marketing activities for students in schools and colleges, as well as for projects in the industry.

IV. SUMMARY

The programme aims and learning outcomes reflect the necessary elements of a master course; they are well defined, they are clear for teaching staff, students and employers. The programme and the curriculum are in accordance with national and international regulations, are consistent and cover a valuable selection of important areas in the wide field of Signal

Processing. There is a public access to the Study Programme aims and expected learning outcomes, although the access seems to be rather limited. Currently there are programme aims and learning outcomes publicly available on the website, which are formulated partially in a very general way.

Regarding the curriculum design, a sound structure of the Study Programme ensures the achievement of the planned learning outcomes and qualifications by the students. The number of credits and their respective distribution is fully in accordance with the regulations. Thus it meets all legal requirements.

Some literature recommended to students is outdated, especially in the fast developing fields. In some cases it could be easily updated, such as the basic textbooks referred to often have a corrected and partly extended new edition, which could substitute the presently recommended old edition. For some modules only Lithuanian sources are mentioned as references, whereas all modules are offered in English language.

The teaching staff entirely fulfils the legal requirements with a good level of the Study Programme teaching staff qualification. Teachers carry out research activities in a wide field where signal processing is used. Whereas many teachers of the Study Programme are over 60 years old there is a valuable strategy of including valuable younger teachers for teaching and programme actualisation. There is a driving force for more international academic activities, research and publications of international importance, but the financial resources restrict this heavily. Also the access capabilities to international electronic data bases are too much limited, especially as the utterly necessary access to IEEE Explorer was completely cancelled. This should be changed as soon as possible, it is recommended that the University would join other universities in a consortium and thus the costs of subscription would decrease.

The on-site visit has shown a serious improvement and modernisation of the laboratories, well reflected in the master theses. The laboratories are adequate for the programme. The way of improving the actuality and resources of them has shown impressive results so far, partially due to the support of social partners and projects. The libraries, computer rooms and reading rooms at the University and Faculty are in a good condition and accessible for a reasonable period during daytime. Teachers widely use free electronic resources, also for the support of students. On the other hand the necessary possibility to access international literature and important databases like IEEE Explorer for master students and academic staff is quite poor.

The study process is running effectively achieving good results in time. The arrangement of lessons and laboratories between teachers and students is perfect, confirmed by the students, graduates and social partners. The social support to students provided by the University is sufficient. A specific action plan for attracting students to study under the Study

Programme seems to be missing generally. Also there is a rather low level of student involvement in the international academic mobility. A systematic follow-up of the alumni professional career development is missing as well. The feedback of alumni and social partners is very positive and confirms that the acquired knowledge and methods of the graduates are practically used and helpful in business. Graduates and employers have shown a general satisfaction with the study programme. Systematic measures on the improvement and actualisation of the curriculum design based on the feedback from employers/graduates have brought the programme an impressive step forward; these links should be intensified. Graduates' competences related to the ability to communicate in a professional international environment are not properly supported by the student involvement in the international academic mobility. In some of the courses more practice could be of benefit.

The programme management is well organized and satisfactory performed. Social partners have shown some interest in development of amount and form of scholarship, especially the local military base is offering such opportunities which should be fully used. However, the possibilities of students' scholarships are not promoted and do not reach a desirable level. The wide field of possibilities of international experience should get explored and structures should get developed to convince the students that the opportunities available are feasible on the long term and will present a financial compensation, even though students are afraid of travelling abroad because of being employed.

Nevertheless the panel can verify that this programme has indeed implemented most of the recommendations based on the previous evaluation and hopefully it will be developed further on.

V. GENERAL ASSESSMENT

The study programme Signal Processing (state code – 621H67001) at Šiauliai University is given **positive** evaluation.

Study programme assessment in points by evaluation areas.

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

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

Grupės vadovas: Team leader:	Prof. Dr. László T. Kóczy
Grupės nariai: Team members:	Prof. Dr. Luis Torres
	Prof. Dr. Tilmann Krüger
	Mr. Edvardas Linkevičius
	Mr. Paulius Varonenka

ŠIAULIŲ UNIVERSITETO ANTROSIOS PAKOPOS STUDIJŲ PROGRAMOS
SIGNALŲ TECHNOLOGIJA **(VALSTYBINIS KODAS – 621H67001) 2015-12-17**
EKSPERTINIO VERTINIMO IŠVADŲ NR. SV4-357 IŠRAŠAS

<...>

VI. APIBENDRINAMASIS ĮVERTINIMAS

Šiaulių universiteto studijų programa *Signalų technologija* (valstybinis kodas – 621H67001) vertinama **teigiamai**.

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

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

2 - Patenkinamai (tenkina minimalius reikalavimus, reikia tobulinti)

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

4 - Labai gerai (sritis yra išskirtinė)

<...>

IV. SANTRAUKA

Studijų programos Signalų technologija tikslai ir numatomi studijų rezultatai atspindi būtinuosius magistrantūros kurso elementus; jie apibrėžti, aiškūs dėstytojams, studentams ir darbdaviams. Programa ir studijų turinys atitinka nacionalinius ir tarptautinius reglamentus, dera tarpusavyje ir apima daug naudingų bei svarbių plačios signalų technologijos srities aspektų.

Šios studijų programos tikslai ir numatomi studijų rezultatai yra viešai skelbiami, nors priėjimas, atrodo, yra gana ribotas. Šiuo metu interneto svetainėje paskelbti tikslai ir numatomi studijų rezultatai iš dalies yra suformuluoti labai apibendrintai.

Kalbant apie programos sandarą, logiška studijų programos struktūra užtikrina, kad studentai pasieks numatytus studijų rezultatus ir įgys kvalifikacijas. Kreditų skaičius ir atitinkamas jų paskirstymas visiškai atitinka reglamentus. Taigi programa atitinka visus reikalavimus.

Kai kuri studentams rekomenduojama literatūra yra pasenusi, ypač tų sričių, kurios greitai tobulėja. Kai ką galima nesunkiai atnaujinti, pavyzdžiui, yra išleistos pataisytos ir iš dalies papildytos naujos dažnai naudojamų pagrindinių vadovėlių laidos, kuriomis būtų galima pakeisti seno leidimo vadovėlius. Studijuojant kai kuriuos modelius pateikiamos nuorodos tik į lietuviškus šaltinius, nors visi moduliai siūlomi anglų kalba.

Dėstytojai visiškai atitinka teisės aktų reikalavimus – jų kvalifikacijos lygis atitinka šios studijų programos dėstymo reikalavimus. Dėstytojai atlieka mokslinius tyrimus plačioje srityje, kurioje naudojama signalų technologija. Kadangi daugelis šios programos dėstytojų yra vyresni kaip 60 metų, taikoma naudinga jaunų dėstytojų įtraukimo į dėstymo ir programos įgyvendinimo procesą strategiją. Skatinama tarptautinė akademinė veikla, tarptautinės svarbos moksliniai tyrimai ir publikacijos, bet finansiniai ištekliai smarkiai riboja šią veiklą. Galimybės naudotis tarptautinėmis elektroninėmis duomenų bazėmis yra pernelyg mažos, ypač visiškai panaikinus tiesiog būtiną priėjimą prie IEEE Explorer duomenų bazės. Šią padėtį reikia kuo skubiau keisti, tad rekomenduojama, kad Universitetas su kitais universitetais sudarytų konsorciumą – taip sumažėtų prenumeratos kainos.

Per vizitą paaiškėjo, kad laboratorijos iš esmės patobulintos ir modernizuotos – tai rodo baigiamieji darbai. Laboratorijos yra tinkamos šiai programai įgyvendinti. Tai, kokiu būdu buvo gerinami jų ištekliai ir sąlygos jose, iki šiol davė įspūdingus rezultatus, iš dalies tai lėmė socialinių partnerių parama ir projektai. Universiteto ir fakulteto bibliotekos, kompiuterių klasės bei skaityklos yra geros būklės ir dienos metu prieinamos pagrįstą laiką. Dėstytojai plačiai naudojasi nemokamais elektroniniais ištekliais, taip pat ir studentų rėmimo tikslu. Antra vertus, magistrantūros studentai ir dėstytojai turi visai mažai galimybių naudotis tarptautine literatūra ir svarbiomis duomenų bazėmis.

Studijų procesas vyksta sėkmingai, ilgainiui pasiekiami geri rezultatai. Puikiai išdėstytos paskaitos ir suderintas dėstytojams bei studentams laboratorijose skirtas laikas – tai patvirtina studentai, absolventai ir socialiniai partneriai. Universitetas teikia studentams pakankamą socialinę paramą. Iš esmės Universitetas neturi konkretaus veiksmų plano, skirto pritraukti studentus į šią studijų programą. Studentų dalyvavimo tarptautinėse akademinio

judumo programose lygis taip pat labai žemas. Taip pat neatliekama sisteminga tolesnės alumnų profesinės karjeros stebėsena. Alumnų ir socialinių partnerių grįžtamasis ryšys yra labai geras; jis patvirtina, kad absolventų įgytos žinios ir metodai yra panaudojamos praktikoje ir naudingos versle. Absolventai ir darbdaviai iš esmės yra patenkinti šia studijų programa. Sisteminės studijų turinio tobulinimo ir įgyvendinimo priemonės, pagrįstos darbdavių ir (arba) absolventų grįžtamuoju ryšiu, suteikė įspūdingą postūmį šiai programai; minėti ryšiai turėtų būti stiprinami. Absolventų kompetencijos, susijusios su gebėjimu bendrauti tarptautinėje profesinėje aplinkoje, nėra tinkamai pastiprinamos studentų dalyvavimu tarptautinio akademinio judumo programose. Galėtų būti stipresnis kai kurių dalykų praktinis mokymas.

Programos vadyba gerai organizuota ir tinkamai įgyvendinama. Socialiniai partneriai parodė tam tikrą susidomėjimą stipendijos dydžio ir formos pakeitimais, ypač vietos karinė bazė siūlo tokias galimybes, ir jomis reikėtų visiškai pasinaudoti. Tačiau su studentų stipendijomis susijusios galimybės neskatinamos ir pageidaujamo lygio nepasiekia. Reikėtų pasinaudoti plačiomis tarptautinės patirties galimybėmis, kurti struktūras, padėsiančias studentus, kad suteikiamos galimybės ilgainiui yra įvykdomos ir apsimokės finansiškai, net jei studentai ir bijo vykti į užsienį, nes dirba.

Vis dėlto ekspertų grupė gali patvirtinti, kad daugelis rekomendacijų, susijusių su ankstesniu šios studijų programos vertinimu, tikrai įgyvendinta ir programa bus toliau tobulinama.

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III. REKOMENDACIJOS

1. Atnaujinti rekomenduojamos literatūros sąrašus, susijusius su visais šių vertinimo išvadų 2.2 dalyje nurodytais dalykais, ir užtikrinti, kad nurodyta literatūra būtų prieinama studentams bei dėstytojams.
2. Tirti publikavimo ir su tarptautiniais moksliniais tyrimais susijusios dėstytojų veiklos galimybes (įskaitant dalyvavimą svarbesnėse tarptautinėse konferencijose, į mokslinius tyrimus orientuotus dėstytojų mainus, specialias atostogas, straipsnių skelbimą aukšto lygio tarptautiniuose žurnaluose, pvz., IEEE Transactions series) ir jas padidinti. Kuo labiau įtraukti studentus į tarptautiškumo didinimo procesą.
3. Reikėtų pasistengti sustiprinti anglų kalbos mokymą, ypač jaunų dėstytojų, taip pat reklamuojant šią programą tarptautiniu lygiu ir pritraukiant daugiau studentų.

4. Skatinti dėstytojų ir studentų tarptautinį judumą pasinaudojant Erasmus programa bei kitomis galimybėmis.

5. Toliau tobulinti laboratorijas ir įrangą, ypač pasinaudojant esamais (ir būsimais) ryšiais su pramonės įmonėmis, kuriant naujus praktikos elementus atsižvelgiant į nuolatinę pažangą šioje srityje.

6. Ištirti ir padidinti su stipendijomis bei mokymo programomis susijusias galimybes, ypač galimybę palengvinti nuolatinių studijų studentų finansinę naštą (žr. pvz. dhbw.de).

7. Didinti reklamą mokyklų moksleiviams ir kolegijų studentams ir žinomumą apie galimybę atlikti projektus / praktiką / stažuotes.

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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)