STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

KAUNO TECHNOLOGIJOS UNIVERSITETO
STUDIJŲ PROGRAMOS
IŠMANIOSIOS TELEKOMUNIKACIJŲ TECHNOLOGIJOS
(valstybinis kodas - 621H64001)
VERTINIMO IŠVADOS
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EVALUATION REPORT
OF *SMART TELECOMMUCATION TECHNOLOGIES*
(*state code - 621H64001*)
STUDY PROGRAMME
at KAUNAS UNIVERSITY OF TECHNOLOGY

Experts' team:

1. **Prof. Dr. László T. Kóczy (team leader),** *academic,*

2. **Prof. Dr. Luis Torres,** *academic,*

3. **Prof. Dr. Tilmann Krüger,** *academic,*

4. **Mr. Edvardas Linkevičius,** *representative of social partners',*

5. **Mr. Paulius Varonenka,** *students' representative*.

Evaluation coordinator -

Mr. Edgaras Baumila

Vilnius
2015

DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	***Išmaniosios telekomunikacijų technologijos***
Valstybinis kodas	621H64001
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	Telekomunikacijų inžinerijos magistras
Studijų programos įregistravimo data	1997-05-19, Nr. 565

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INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	***Smart Telecommunications Technologies***
State code	621H64001
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 Telecommunications Engineering
Date of registration of the study programme	19 May, 1997, No. 565

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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

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

Kaunas University of Technology (KTU) is one of the biggest universities in Lithuania with about 12000 students, 13 faculties and 73 departments. The mission of the university is to provide high level studies and research opportunities at international level suitable for a

sustainable development and growth of the country. KTU is an active member in many international organisations and participates regularly in a variety of scientific research and educational international programs.

The academic programme under evaluation is the Master of Smart Telecommunications Technologies (hereafter – STT). STT is a program offered by the Faculty of Electrical and Electronics Engineering and supervised by the Department of Telecommunications.

The STT programme is offered in Full-Time mode with a 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. STT is a 2 years master programme with 120 ECTS.

The last assessment of the STT programme was carried out by an external international expert team and took place in 2012. Two members of the 2015 expert team, were also members of the 2012 evaluation committee. The programme was accredited for three years with some remarks and recommendations. A summary of the conclusions of the 2012 evaluation process assessment report is provided in the SER.

Taken into account the recommendations, the second-level study programme Telecommunications was unified with the second-level study programme Telecommunications Systems and renamed to Smart Telecommunications Technologies (STT) in 2014 by the order of Faculty Council No V-10-TF-08-2013/4 on 11 December, 2013.

Taking into account this background context, the second-level study programme which is currently evaluated is actually the previous Telecommunications master programme which ran during the period 2012-2015 after the last evaluation took place. In this context, the current evaluation report follows quite closely the 2012 evaluation report and basically emphasizes the main updates encountered during the last three years. Many of the conclusions and recommendations given before are still in effect.

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 *20th 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 Smart Telecommunications Technologies programme of KTU (previous name was Telecommunications Master programme) has been taught since 1992 at the Faculty of Telecommunications and Electronics. This second-level study programme is provided at the Faculty of Electrical and Electronics Engineering. The students who graduate acquire the qualification of the master in telecommunication engineering. During the period being assessed the studies were not organized in the part-time study form.

The aim of the program is to prepare masters students, who are able to apply engineering methods to modern telecommunications and information technologies and are ready for advanced engineering careers or Ph.D. studies. In addition the aim of the programme is to prepare masters students who are able for critical analysis of systematically integrated knowledge, possess scientific investigation skills and are able to work in interdisciplinary teams that develop innovative products, services or are carrying scientific research projects.

The aim of the Smart Telecommunications Technologies programme is directly related to the Description of General Requirements for Master Studies, approved by the Minister of Education and Science of Lithuania on June 3rd, 2010, order No. V-826 and by the Description of Study, Approved by the Minister of Education and Science of Lithuania on November 21st, 2011, order No. V-2212. The STT programme complies also with International initiatives and projects such as *Dublin Descriptors* (2004), and the *EUR-ACE Accreditation Standards for European Engineering Programmes* (2008).

The objectives of the programme are to train students to take deep theoretical and technological knowledge of telecommunication engineering, to train students to use new technologies and methods that are applied to investigate living objects, and to teach students the principles of the operation monitoring equipment and the ability to investigate the application of new and emerging technologies in telecommunications engineering.

A very good and detailed study has been made of the needs of the public sector and labour market. A variety of questionnaires have been sent to many Lithuanian

telecommunication companies to find out about needs of the national labour market. In addition, a complete search study on the needs of the European market in the Telecommunication sector has been carried out as well. However, in order to broaden the future market potential of actual Lithuanian master graduates, as there is no doubt about the importance of the globalization telecommunications market, the study should have taken into account the global market beyond the European perspective as well. Some hints about the research needs in both the Lithuanian and European context would have helped to focus on this area. A vision about possible labour market needs in emerging countries would have been welcome. The needs of these global markets should be taken into account to redefine the programme aims and learning outcomes in the mid-term future.

Although it is rather difficult to find a perfect match with other universities, a very good comparison was made in 2012 against European universities offering related Master programmes such as KTH Royal Institute of Technology, Tampere University of Technology and Linköping University, among others. However, as stated in the previous 2012 report, the inclusion of some prestigious US universities, such as, for example, The Massachusetts Institute of Technology and Purdue University in the study would have provided in the new programme an added value for the actual evaluation period. As a matter of fact it is not proposed that the STT programme should follow those curricula in every detail, but a large amount of useful information could be nevertheless collected from studying the related curricula of world leading universities.

The learning outcomes of the study programme of STT fall into six groups: 1) knowledge and understanding, 2) engineering analysis skills, 3) engineering design skills, 4) investigation skills, 5) engineering practice skills, and 6) transferable skills. The intended learning outcomes of the study programme are consistent with the recommendations for the accreditation of engineering programmes described in the EUR-ACE standards. The learning outcomes of the study programmes correspond with level 7 of the Lithuanian Qualifications Framework, provisions of the Law on Higher Education and Research and the goals and objectives set out in the main Bologna process documents. The learning outcomes of Engineering group of study fields are also formulated in accordance with the ENAEE standard and SEFI recommendations.

The SER provides a good summary of strengths and weaknesses of the programme aims and learning outcomes as well as some proposals for improvement.

2.2. Curriculum design

According to the SER the Curriculum Design (CD) complies with the national legislation and the local regulations for the master programs. 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 program are that the STT Programme has a duration of 2 years (4 semesters) with 120 ECTS. Theoretical studies take 72 ECTS credits (60%), scientific research and final degree project 48 ECTS credits (40%). Study subjects are divided into four categories: general core and compulsory study field related subjects (42 ECTS), electives study subjects (18 ECTS credits), individual research (48 ECTS) and optional subjects (12 ECTS).

From the detailed information about the subjects provided in SER Annex 4.1, it can be verified that the content of the subjects and/or modules are consistent with the type and level of the studies. Study programme is in general coherent but some remarks would need to be taken into account as noted in the following.

The 2012 evaluation committee suggested changing the name of the Telecommunication programme because the name was too general and it did not provide detailed information about the specific features of the contents. Following this recommendation, the name of the programme was changed from Telecommunications to "Smart Telecommunications Technologies" which is probably a more adequate and appealing name. However this new name still may provide some confusion as the modules content have not changed very much and the word "Smart" creates some confusion in this context. Although it is perfectly understood that to change the name twice in such a short period of time may produce some negative effects, it is recommended that a more adequate name, fitting to the modules content and the learning outcomes, might be considered in the near future. A name such us Information and Communications Technologies might be considered.

It can be appreciated from the modules content that some subjects are taught at an introductory level which most likely should have been introduced in the first-degree programme. In particular the course Signal Modelling and Processing in Telecommunications is taught at a rather basic level. This is due to the fact that students with degrees from different universities and with different telecommunication backgrounds are admitted to the programme. Although these students are required to have basic undergraduate bridging courses if needed, there is some risk to jeopardize the content needed in the STT Master programme as the students might not have time to be exposed to more advanced contents.

Some names of the courses are misleading and may confuse the organization of the STT master programme. In particular two modules use the name *Next Generation* while another is

using *Smart.* The name *Next Generation* does not reflect very much which is the actual content of the module.

Six new modules have been added to the STT programme starting in 2015-2016. These additions provide a very good added value to the programme. In particular, those modules are:

- Telecommunication Network Design and Analysis
- Internet of Things and Services for Smart Environments
- Processing of Measurement Results
- Cloud Computing and Security
- Multimedia and Television Broadcasting Systems
- Mathematical Equations of Telecommunications Processes

Regarding text books, it has been noted that some textbooks are in Lithuanian which indicates a good involvement of national faculty in the field. However, it is recommended that besides the Lithuanian books, also more English books should be used which would provide a double added value. First, as the options are much wider, the students would have access to the latest developments in the Telecommunications area. Second, the students would be exposed to all technical English terms in the field that would offer additional skills, as all the updated literature is in English. English text books would serve as well to attract international students.

In addition, some of the English text books recommended are (somewhat) outdated and should be updated. Some examples follow in the next paragraph (in brackets the outdated reference). Of special importance are the modules under the name Next Generation that should have the latest updated references. Some comments are provided for specific modules.

- Next Generation Intelligent Networks: Reference books (2010)
- Security of Telephony Information and VoIP: To refer to Telephony information is probably too restrictive.
- Open Programmable Telecommunication Systems: Reference books (2005)
- Wireless Networks and Satellite Systems: English book references (2005)
- Smart Mobile Communication Networks and Applications: Reference books (2010)
- Electronic and Cyber Security and Protection: Reference books (2004)
- Fibre-Optic Communication Systems: Reference books (2002).
- Signal Modelling and Processing in Telecommunications: This module introduces very basic contents (Fourier analysis, correlation, etc.) that most likely students should have learnt in advance.

- Innovation and Innovative Technologies: More contents on entrepreneurship should be introduced. Reference books are quite old.

- Broadband Telecommunication Networks: Name may be misleading. It is a course on IP communications.

Systems Modelling and Identification: Reference books (2006). A reference book from 2008 is provided in Lithuanian. This module seems more a control systems course than a telecommunications course. The teaching of this module in the specific telecommunications engineering technologies field needs to be considered.

Processing of Measurement Results: (Reference books 1986). It is not clear that the teaching of this module in its actual form may provide an added value to the STT study programme. In addition, some basic contents (Fourier transform, Discrete Fourier transform, Correlation analysis, etc.) are also taught in the course Signal Modelling and Processing in Telecommunications.

State of the art topics such as SDN (software defined networks), NFV (network functions virtualisation) and VCPE (Virtual Customer Premises Equipment) should be included in the programme.

According to the self-evaluation report, most of the modules are taught in both, Lithuanian and English. However, from the on-site visit, it has been confirmed that generally, only courses where Erasmus students are present are taught in English. An effort should be made in order to have more English courses. This would be a very good added value for the students as they would be exposed to more English terms and increase their English skills. In addition, teaching more courses in English would be a valuable experience to attract more international students.

The present programme does not foresee any internship in telecommunications companies during the last semester. A well designed internship programme might attract more students, both locally and internationally, as well as be attractive for the companies themselves.

The STT programme, as it is established now, may not be entirely fulfilling the expectations of the students who want to enrol. Prove of this is that, according to the self-evaluation report, only 6 students were enrolled in the first course during the period 2014/2015. Even though the option for Telecommunication Engineering courses worldwide is declining, 6 is a very low number and some measures, including a thorough review of the STT programme and more international advertisement should be taken to attract more students, both local and international ones.

As a general conclusion on the master programme, it can be stated that the curriculum design is quite good, despite the detail criticism, which mainly refer to ideas how the programme

could be made even more attractive. Thus, some changes in the programme may prove useful in order to increase the attraction of the studies to both national and international students. In addition, in order to increase the international activities of the University and to be able to attract foreign students in the future, English teaching activities should be further potentiated.

2.3. Teaching staff

The composition of the teaching staff of the STT program in 2014-2015 consists of 13 lecturers: 2 professors, 8 associate professors, 3 lecturers. The staff is well prepared and is adequate for the implementation of the programme. Most of the teaching staff holds a Ph.D. degree that assures a high level academic staff. The staff providing the study programme almost meets 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 and not less than 20% of subjects from main subject field should be provided by professors. The first criterion is satisfied. However, the second criterion during the preparation of the SER might have not been fulfilled, as the professors only gave 15% of the lectures. The decrease of the ratio during the assessed period (2010-2015) is explained by the change of academic staff as 2 professors have retired. However this ratio seems to be legally fulfilled now, as from 2015/2016 study year, a new professor will be working in the new STT programme. Better efforts should be made in the future in order to monitor the fulfilment of legal requirements such as professors teaching 20% of the study field subjects' criterion.

In order to assure a high quality academic teaching staff, all the lecturers have to pass a professional qualification every five years in accordance with the "*Description of the procedure for organising performance evaluation and competitions to fill the positions of teachers and research staff members*" confirmed by order of Senate V3-S-41, 4 July, 2013. From the information provided in the self-evaluation report, the entire faculty succeeded in this qualification process. The results of this qualification process ensure the learning outcomes.

The academic workload of each faculty staff member consists of 3 parts: pedagogical workload 720 hours ±10 %; research activities 500 hours ±10%; expert and methodical activity 220 hours ±10 %. This load is rather high and does not provide enough time to staff for research work and publications. If possible, it is recommended that the teaching load of the staff would be decreased in order to have more time for research activities.

In the research context, the teaching staff of the programme is quite intensively involved in research activities. However, and in spite of the fact that staff has available a reasonable number of hours for research activities, it must be mentioned that the teaching staff is not involved wide enough in national and international research directly related to the

telecommunication engineering field. (Some outstanding research activities were observed in the biomedical engineering area, which is related but not entirely overlapping with the area of this programme.) Efforts should be made by both, the University to provide the adequate environment, and the teaching staff to increase their involvement in high quality international research, especially among the junior faculty members. Of special interest is the publication of telecommunications research activities in specialized journals such as e.g. the IEEE Transactions, and to participate in European projects.

In the international mobility area, the staff members have opportunities to visit other international universities. However, only a very limited number of professors and teachers made use of this opportunity. Only a part 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, they should be much more involved in international mobility and cutting edge research efforts. Publications at high level should be strongly promoted.

It has been also noted that the presence of foreign visiting academics is quite limited. It is advised to invite more often visiting lecturers from other universities or the industry, mainly from abroad, in order to give some specialised courses to students. Erasmus is the easiest way to sponsor such short time visits.

2.4. Facilities and learning resources

According to the information provided by the SER and confirmed by the on-site visit, the space allocated to each student and the corresponding studying conditions are good enough to assure a comfortable learning environment.

It has been assessed very positively that, following the recommendation of the last evaluation committee, some equipment has been updated during the evaluation period. Laboratories are very good and still continuously improving.

As regards to the available software, it is good and no special needs have been noted at present. However as the technology in this field changes quickly it is generally advised to follow up and update the software needs in the next coming years, in a similar way as it was done in the past three years.

The university makes available to students the central library and subsidiary libraries in the Faculties. KTU library has a well-organized internet page, and also subscribes to a number of online publication databases that can be accessed by all students from the University computers, or from home computers connected through VPN network.

From the on-site visit the evaluators saw that the library provides to students a rich variety of books, textbooks, periodical publications, databases and electronic catalogues are

accessible from home. However the library does not offer electronic access to data bases like IEEE Explorer and this should be reactivated as soon as possible. (It is recommended that KTU joins a consortium with VGTU, Šiauliai University and Klaipėda University, and they jointly subscribe the IEEE Explorer which is essential for EE related studies.) The number of printed books and periodicals, although adequate, could be improved, especially by acquiring recent publications and updated editions.

Students have easy access to printing and copying or scanning facilities as well as to computer rooms with suitable software. During the meeting with students almost all of them expressed their great satisfaction for all the facilities and learning resources they have available.

2.5. Study process and students' performance assessment

The admission requirements are well founded. The admission to the STT second cycle study programme and to the electronics faculty is carried out according to the General Regulations for General Admission to the Second-Level. The admission is granted by the faculty admission commission organized by the order of the Rector of KTU.

The basic requirement for admission to the programme is the bachelor's qualification degree or equivalent in electrical engineering, electronics engineering, or informatics engineering. Those who have finished university studies in one of the telecommunication, electronics and electrical engineering study areas are admitted into the master programme "Smart Telecommunication" without additional requirements. Students with different backgrounds have to carry out additional studies (bridging courses) during the first year. This is a well-designed process that assures the adequate background for entering into the STT master programme. However, efforts should be made in order to avoid the repeated introduction of basic materials already taught in the first year programme.

The detailed information about the second cycle of Smart Telecommunications Technologies study programme is published at the University website.

The studies are organized in autumn and spring semesters, and each lasts 16 weeks, according to the schedule announced in the University Internet page and the annual KTU Study Programmes edition, following the individual plans and timetables. The organization of the study process ensures an adequate provision of the programme and the achievement of the learning outcomes.

According to the information provided by the students, almost all students are working full time at the same time when they are studying. Although this is a very well understood situation, and is a practice in the whole of Lithuania, it presents some risks for the students in respect to the study process, especially for the internationalization of the programme (as

employed students are not willing to take part in any mobility programme, fearing the loss of their jobs, or a loss of income during the time of traveling.). As a solution to this, a well-designed programme of scholarships should be made available to the students such as they would be able to fully concentrate on their studies, rather than earning money. According to the self-evaluation report, the most talented students are attracted to the scientific research activities that are carried out under the guidance of the lecturers. However, from the information found during the on-site visit, not much involvement of students in research activities is observable. This might be also a result of the full time employment of most master students.

During the on-site visit it was found, that students have close relationship with teachers. Teachers use their time to consult students on academic topics. Students are also able to give feedback about the study subjects during the contact hours.

The students are very much satisfied with the study process and their study programme in general. No complaints or suggestions for improvement were given regarding the study programme or assessment methods. They are particularly satisfied with the fact that the academic programme is adapted in a way to give them the possibility to work and study at the same time. Although they do not have enough free time because they work, they have easy access to laboratories, computer rooms and libraries during and after university hours.

Students have the opportunity to participate in the international mobility programmes. However, as explained in the self-evaluation report and confirmed during the on-site visit, the number of participating students is almost nil. According to the students, no information is provided on mobility programmes. The number of incoming students in mobility programmes is also a very limited. Some further actions by the Faculty of Telecommunication and Electronics to promote these international exchanges, incoming and outgoing, would be very welcome. Particular actions could be the increase of the student's stipend, or the Faculty budget, necessary to cover travel and living expenses and to increase the number of international institutions involved in the mobility plan. In addition, some additional efforts to advertise more intensively the advantages of going abroad would be very useful for the students.

2.6. Programme management

The responsibilities for the implementation of the STT programme are clearly described and appropriately allocated. According to the information provided by SER the administration of the programme is under the responsibility of the Vice Rector for Studies assisted by the Academic Department. The responsibilities for specific tasks like the innovation and improvement of the programme are given to the Faculty Study Programme Committee (SPC). The highest body of the faculty academic self-governance is the Faculty Council elected in 2011,

and includes faculty employees, students and one employer's representative. The members of the council are responsible for the programme organisation. The implementation of the programme is under the responsibility of the SPC which collaborates with the University Senate Studies Committee, the Academic Departments and finally with the Faculty Council. In general, it can be concluded that the responsibility for the implementation of the program is given to a variety of bodies which include students and staff.

According to the information provided by the SER, the Document Management System of the University collects the data and the management of the study program. The data collected are mainly related to the final degree projects, statistics for mobility of students and teachers, students' academic records, etc. These data are analysed and used for quality improvement activities. These data are also available in the university web page.

The system of internal quality assurance the program is based on the System of Internal Study Quality Assurance (SIQAS) approved by the university senate in 2004. According to the information provided by the SER the structure of the programme is annually revised and renewed. This is good practice that should be continued. The students regularly evaluate the performance of the staff and the study modules. The lecturers have a feedback of these evaluation results.

Regarding the evaluation performance of the staff and the study modules by the students, starting in 2013, round tables have been organized, where students and lecturers who coordinate the modules, have the opportunity to express their opinions and assess the quality of the lectures, lecturers work, and to identify positive and negative aspects of the programme. However, it has been confirmed that a very limited number of students are participating in these round tables and in general in the programme management. Almost no students fill up the staff evaluation questionnaire. The administration management should be able to develop strategies to involve students in the programme management more intensively.

According to the opinion expressed by the social partners, the formal participation of employers in the design of the programme is limited. Although the great majority of employers were satisfied with the acquired skills of the graduates, it was stated during the meeting with them, that no one among the employers' representatives participated in the formulation of the learning outcomes, and in general they do not participate in any university committee. A more active participation of the employers in the program design and in the proposal of final projects would be more beneficial for the employment possibilities of the graduates.

III. RECOMMENDATIONS

1. Take into account the global market beyond the Lithuanian perspective and permanently renew the curriculum by including very up to date and hot topics in the curriculum.

2. Consider in the future to change the name of the programme to Information and Communications Technologies.

3. Renew the recommended literature lists for all subjects mentioned in section 2.2 of this report.

4. The staff should much more intensively being involved in international, cutting edge research and corresponding publications.

5. IEEE Explorer should be reactivated as soon as possible (by joining university consortium and thus reducing the costs of subscription).

6. Staff teaching load should be decreased to enable more research. Good research results should be rewarded by the university.

7. Efforts should be made to potentiate English teaching activities, especially for young faculty professors.

8. Staff mobility should be increased in both directions.

9. Student mobility should be increased, even by compensating financial losses involved with the unpaid leave of students who are employed.

10. Students and employers (social partners) should be more intensively involved in the programme management.

11. The marketing activity of the department should be more intensive, involving potential foreign students, thus providing classes in English.

IV. SUMMARY

The programme is in accordance with national and international regulations; it is consistent and covers all most important areas of the field. The programme aims and learning outcomes are clearly defined. The number of credits and their respective distribution is fully in accordance with the regulations. A good and detailed study has been made of the needs of the public sector and labour market as well as of well-known European and overseas Universities with similar Telecommunication programmes.

The literature recommended to students is generally suitable, but in some cases it is outdated, these titles should be exchanged (especially reference books change virtually every year, they should be annually refreshed.) Sometimes it is sufficient if the most recent corrected and maybe extended edition of the same book is replacing the older edition. Efforts should be

made to increase the number of English textbooks to be used in the courses, not substituting Lithuanian language literature but complementing it. Efforts should be made to potentiate English teaching activities, especially for young faculty professors.

The teaching staff does not carry out enough research activity, especially cutting edge international research and corresponding publications are almost completely missing. Although there is a certain number of even impact factor journal articles authored by the staff involved, these are essentially Lithuanian publications, and often the articles are in reality (extended) conference papers which had been presented at one of the related annual national conferences (with international character). Participation at major international congresses, such as conferences and especially world congresses organised by the IEEE are almost completely missing, similarly, there have been no IEEE Transaction papers authored by any of the staff members. There should be considerably more involvement in international research, including co-authoring papers with foreign researchers in the field.

One of the reasons for the lack of cutting edge publications is that there is not enough mobility of both of staff and students, and this is also true for incoming visitors. There are Erasmus mobility opportunities for staff members and KTU staff involved in other programmes does use these mobility funds. In the frame of visits at other European and overseas universities there is usually a possibility to get involved in ongoing research projects, and thus the first steps to really international publications may be done. Similarly, the presence of foreign visitors from high level higher educational institutions might play an important fertilising role in the internationalisation and in the intensification of research. The number of foreign visiting professors has been also very limited and thus should be potentiated in the future.

The learning facilities are adequate, mostly even good, and the corresponding study conditions are good enough to assure a comfortable learning environment. One major problem is that at present the access to IEEE Explorer is missing from the library and this most important should be reactivated as soon as possible. During the past years the IEEE Explorer was available, and stopping the subscription to it brings great disadvantages to both the teaching staff members and the students, especially when they work on their respective projects and theses. It is understood that the subscription to IEEE Explorer is feasible for a consortium of universities, so it is recommended that KTU contact in this matter VGTU, Siauliai University and Klaipeda University, which are all interested in having this most important source for electrical and electronics engineers available. Other digital data bases are available.

The students and social partners, should be involved much more intensively in the programme management. It would be important that industrial partners, prospective employers and the like be represented in the Study Programme Committee meetings and a formal

mechanism be established where suggestion for the inclusion of new up to date fields in the curriculum can be easily managed. The students do not feel a strong enough motivation of participating in the evaluation of classes and teachers and because of this, they very seldom send a feedback to their teachers that could be later used in the improving of the study programme. The students have no knowledge of any formal participation opportunities in the study programme management, which might be the fault of the insufficient communication with student representatives.

It is also important to note that the study programme has made strong efforts to improve the quality of the programme since the last evaluation took place in 2012. These efforts have resulted, particularly, in a more adequate curriculum design and improved learning facilities.

V. GENERAL ASSESSMENT

The study programme Smart Telecommunications Technologies (state code – 621H64001) at Kaunas University of Technology 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
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KAUNO TECHNOLOGIJOS UNIVERSITETO ANTROSIOS PAKOPOS STUDIJŲ PROGRAMOS *IŠMANIOSIOS TELEKOMUNIKACIJŲ TECHNOLOGIJOS* (VALSTYBINIS KODAS – 621H64001) 2015-12-17 EKSPERTINIO VERTINIMO IŠVADŲ NR. SV4-355 IŠRAŠAS

<...>

V. APIBENDRINAMASIS ĮVERTINIMAS

Kauno technologijos universiteto studijų programa Išmaniosios telekomunikacijų technologijos (valstybinis kodas – 621H64001) 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 programa *Išmaniosios telekomunikacijų technologijos* atitinka nacionalinius ir tarptautinius reglamentus, yra nuosekli ir apima visas svarbiausias šios krypties sritis. Programos

tikslai ir numatomi studijų rezultatai yra aiškiai apibrėžti. Kreditų skaičius ir paskirstymas visiškai atitinka reglamentus. Atliktas išsamus viešojo sektoriaus ir darbo rinkos poreikių tyrimas, taip pat panašias telekomunikacijų programas vykdančių Europos ir užsienio universitetų studija.

Studentams dažniausiai rekomenduojama tinkama, bet kartais pasenusi literatūra. Šiuos pavadinimus reikėtų pakeisti kitais (ypač dažnai iš esmės keičiasi vadovėliai, kasmet reikėtų nurodyti naujus vadovėlius). Kartais pakanka tą pačią senesnės laidos knygą pakeisti neseniai pataisytu ir galbūt papildytu leidiniu. Dėstant dalykus reikėtų pasistengti naudoti daugiau angliškų vadovėlių, ne pakeisti literatūrą lietuvių kalba, o papildyti ją. Reikėtų stengtis sustiprinti anglų kalbos mokymą, ypač jaunų fakulteto dėstytojų.

Darbuotojai nepakankamai dalyvauja mokslinėje veikloje, visų pirma beveik neatlieka pažangių tarptautinių mokslinių tyrimų ir neskelbia jų rezultatų. Nors dėstytojai ir yra paskelbę kažkiek straipsnių didelį svorį turinčiuose žurnaluose, tai daugiausia lietuviški leidiniai; tikrovėje dažnai šie straipsniai yra (išplėsti) konferencijų dokumentai, kurie buvo pateikti vienoje iš susijusių metinių nacionalinių konferencijų (turinčių tarptautiškumo požymių). Beveik nedalyvaujama svarbesniuose tarptautiniuose kongresuose, pavyzdžiui, konferencijose ir IEEE organizuojamuose pasaulio kongresuose, be to, dėstytojai nėra publikavę savo straipsnių IEEE tinkle (*IEEE Transaction papers).* Reikėtų daugiau dalyvauti tarptautiniuose moksliniuose tyrimuose, įskaitant bendrus straipsnius su šios srities užsienio tyrėjais.

Viena iš priežasčių, kad mažai skelbiama pažangių publikacijų, yra mažas dėstytojų ir studentų judumas, Tą patį galima pasakyti ir apie atvykstančiuosius. Galimybių pagal *Erasmus* judumo programą yra, ir kitų programų dėstytojai pasinaudoja judumui skirtomis lėšomis. Vykstantieji į kitus Europos ar užsienio universitetus dažniausiai turi galimybę dalyvauti vykdomuose mokslinių tyrimų projektuose, ir tai gali būti pirmieji žingsniai link tarptautinių publikacijų. Svarbų vaidmenį tarptautiškumo ir mokslinių tyrimų didinimui gali turėti atvykstantieji iš aukšto lygio užsienio aukštųjų mokyklų. Tiek pat svarbus ir studentų judumas, kadangi taip studentai įgyja daug daugiau užsienio kalbų įgūdžių nei kalbų paskaitose; taigi jie gali bendrauti su užsienio universitetų dėstytojais ir studentais bendramoksliais ir plačiau susipažinti su naujausiais pokyčiais profesijos srityje bei naujausiomis tendencijomis. Iš užsienio atvykstančių dėstytojų taip pat labai nedaug, ateityje jų turėtų būti daugiau.

Mokymosi priemonės yra tinkamos, daugelis netgi labai geros, o studijų sąlygos pakankamai geros, kad užtikrintų patogią mokymosi aplinką. Viena labai svarbi problema yra ta, kad šiuo metu bibliotekoje nėra galimybės naudotis *IEEE Explorer;* ši galimybė turėtų būti juo skubiau atnaujinta. Anksčiau *IEEE Explorer* buvo prieinama, jos prenumeratos nutraukimas sukėlė daug nepatogumų dėstytojams ir studentams, ypač jų veiklai, susijusiai su projektais ir

baigiamaisiais darbais. Manoma, kad prenumeruoti *IEEE Explorer* įstengia tik universitetų konsorciumas, taigi rekomenduojama, kad KTU šiuo klausimu susisiektų su VGTU, Šiaulių universitetu ir Klaipėdos universitetu, kurie (visi) yra suinteresuoti naudotis šiuo elektros ir energetikos inžinieriams svarbiausiu šaltiniu. Kitos skaitmeninės duomenų bazės yra prieinamos.

Studentai ir socialiniai partneriai turėtų daugiau dalyvauti programos vadybos procese. Svarbu, kad pramonės sektoriaus partneriai, galimi darbdaviai ir pan. dalyvautų studijų programos komiteto posėdžiuose ir būtų sukurtas oficialus mechanizmas, padedantis spręsti naujų, šiuolaikinių sričių įtraukimo programą klausimus. Studentai neturi pakankamai stiprios motyvacijos dalyvauti vertinant paskaitas (seminarus, praktinius užsiėmimus) ir dėstytojus ir dėl to jie labai retai pateikdavo dėstytojams grįžtamąjį ryšį, kuris vėliau būtų panaudotas studijų programos tobulinimo tikslu. Studentai nieko nežino apie galimybę oficialiai dalyvauti studijų programos vadybos procese, ir taip gali būti dėl nepakankamo bendravimo su studentų atstovais.

Be to, svarbu pažymėti, kad nuo paskutinio šis studijų programos įvertinimo, atlikto 2012 m., įdėta daug pastangų programos kokybei pagerinti. Šių pastangų dėka ypač pagerėjo programos sandara ir mokymosi priemonės.

<…>

III. REKOMENDACIJOS

1. Atsižvelgti ne tik Lietuvos, bet ir pasaulinę rinką nuolat atnaujinti studijų turinį, į jį įtraukiant pačius naujausius ir aktualiausius dalykus.
2. Ateityje apsvarstyti programos pavadinimo keitimo (į *Informacinės ir komunikacinės technologijos*) klausimą.
3. Atnaujinti visų šių vertinimo išvadų 2.2 dalyje nurodytų dalykų rekomenduojamos literatūros sąrašus.
4. Darbuotojai turėtų daug aktyviau dalyvauti pažangiuose tarptautiniuose moksliniuose tyrimuose ir skelbti publikacijas.
5. Reikėtų kuo skubiau iš naujo aktyvuoti *IEEE Explorer* duomenų bazę (sudarant universitetų konsorciumą ir taip sumažinant prenumeratos išlaidas).
6. Dėstytojų krūvį reikėtų sumažinti, kad jie galėtų atlikti daugiau mokslinių tyrimų. Už gerus tyrimų rezultatus aukštoji mokykla turėtų atlyginti.
7. Reikėtų stengtis, kad būtų sustiprintas anglų kalbos mokymas, ypač jaunų fakulteto dėstytojų.
8. Reikėtų didinti dėstytojų judumą (atvykstamąjį ir išvykstamąjį).

9. Studentų judumą reikėtų didinti netgi kompensuojant galutinius nuostolius, kuriuos patiria dirbantys studentai, negaunantys apmokamų atostogų.

10. Studentai ir darbdaviai (socialiniai partneriai) turėtų būti labiau įtraukiami į programos vadybos procesą.

11. Katedros veikla, susijusi su rinkodara (reklamavimu), turėtų būti daug intensyvesnė, apimanti galimų studentų iš užsienio pritraukimą, taigi ir paskaitų anglų kalba teikimą.

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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)