STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

KAUNO TECHNOLOGIJOS UNIVERSITETO
STUDIJŲ PROGRAMOS *Elektros inžinerija* (612H62001)
VERTINIMO IŠVADOS

EVALUATION REPORT
OF *ELECTRICAL ENGINEERING* (612H62001)
STUDY PROGRAMME
at *KAUNAS UNIVERSITY OF TECHNOLOGY*

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Išvados parengtos anglų kalba
Report language - English

Vilnius
2014

DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	*Elektros inžinerija*
Valstybinis kodas	612H62001
Studijų sritis	Technologijos mokslų studijų sritis
Studijų kryptis	Elektronikos ir elektros inžinerija
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Pirmoji
Studijų forma (trukmė metais)	Nuolatinė (4 metai)
Studijų programos apimtis kreditais	240 ECTS
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Elektros inžinerijos bakalauras
Studijų programos įregistravimo data	1997 m. gegužės 19 d. įsak. Nr. 565.

INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	*Electrical engineering*
State code	612H62001
Study area	Technological sciences
Study field	Electronics and electrical engineering
Kind of the study programme	University Studies
Study cycle	First
Study mode (length in years)	Full-time (4 years)
Volume of the study programme in credits	240 ECTS
Degree and (or) professional qualifications awarded	Bachelor in Electrical Engineering
Date of registration of the study programme	May 19, 1997 No. 565 of Education and Science Minister of the Republic of Lithuania

CONTENTS

I. INTRODUCTION

The objective of this report is to summarize the results of the international evaluation of bachelor study programme named *Electrical Engineering* (612H62001) that is assigned to the study field *Electrical and Electronic Engineering* (H600). Last evaluation took part in November 2010 and the study programme Electrical Engineering was accredited for a period of three years. During the years 2011-2013 the programme was hosted at Kaunas University of Technology, Faculty of Electrical and Control Engineering and implemented mainly by the Department of Electrical Power Systems and the Department of Electrical and Control Equipment. Due to organizational changes, imposed on January 2, 2014 currently the programme is implemented by the Department of Electrical Power Systems.

The programme was started under the current title in May 19, 1997 in the Register of Study and Educational Programmes by the Order No. 565 of Education and Science Minister of the Republic of Lithuania. The programme offers two specializations: 1) *Electrical and Control Equipment* and 2) *Energy Converters and Control*. The evaluation was based on the self-assessment report prepared in September 2013 and information obtained during onsite visit. The programme offers Bachelor of Electrical Engineering degree.

Current accreditation took part on March 24, 2014 and it performed by the international panel of experts: Prof. dr. Krzysztof Kozłowski (team leader), Prof. dr. Lyudmila Zinchenko, Dr. Olev Martens, Dr. Rolandas Urbonas, Paulius Simanavičius. Entire team took all decisions concerning final evaluation report anonymously.

Abbreviations:

SER	Self – Evaluation Report
BA	Bachelor
KUT	Kaunas University of Technology
MA	Master

II. PROGRAMME ANALYSIS

1. Programme aims and learning outcomes

According to Lithuania Labour Exchange, the graduates of *Electrical Engineering Programme* have opportunities of employment in Lithuania and are hired by different branches of industry, medical sector and other institutions. This programme is popular among the KUT applicants. In average the admission of 30 study places of *Electrical Engineering Programme* in last three years takes place. This number was bigger before the year 2009 but this is due to less number of high school graduates and what is stated in the SER, due to the possibilities to study in foreign higher education institutions. This fact, however, is hardly to observe taking a low interest of spending one semester abroad by Lithuania students under ERASMUS programme.

Besides the bachelor study programme of *Electrical Engineering* offered by KUT, this study programme is implemented at Šiauliai University and Klaipéda University. The last university offers *Electrical Engineering* study programme that is directed more to control systems and reflects regional industry needs. The study programme of *Electrical Engineering* at Šiauliai University is more orientated to electrical power. In comparison KUT programme of *Electrical Engineering* since 2014 is offering two specializations: *Electrical and Control Equipment* and *Energy Converters and Control* (previously three specializations were offered). This makes the study programme at KUT different to two other programmes run in the country.

The content of learning outcomes is clearly defined and is composed of 22 clauses specified in Table 2.1.1 of the SER. These learning outcomes are evenly distributed among study subjects of the programme. These links are given in table 2.1.2 of the SER. Current learning outcomes were update by clauses A1 and E2 as it was stated in Recommendations No. 3 and No. 6, respectively. The updates of new learning outcomes include ability to work in the innovative environment, to accept innovations, and to understand the scientific and mathematical principles underlying the branch of electrical engineering and understand the key aspects and concepts of the branch of electrical engineering. They made the learning outcomes more apparent.

In summary, learning outcomes are well defined, public available, meet the needs of the labour market, consistent and compatible. Two new specializations *Electrical and Control Equipment* and *Energy Converters and Control* are unique. Other electrical

engineering study programmes in Lithuania do not offer these specializations. At the same time there are allowing deeper specialization in the electrical engineering study programme.

2. Curriculum design

The structure of the programme study *Electrical Engineering* corresponds to the Requirements of General Technology Study Field (Engineering) Regulations. The duration of full-time studies is 4 years, and of part time studies 6 years. In total students can obtain 240 ECTS credits and graduates are awarded the degree bachelor in *Electrical Engineering*. The structure of *Electrical Engineering* programme for both types of studies consists of four parts: general subjects of university studies, subjects of the study field (core subjects of engineering, mathematics and physical science subjects, social science subjects, core field subjects, final degree project), major field subjects (specialization alternatives, professional practice) and optional subjects.

General elective courses are English, French, German and Russian language, respectively. Study subject are spread evenly and their sequence is clearly designed such as students have appropriate earlier knowledge to study subsequent subjects. A small acceptable overlapping between subjects plays didactic role and allows students to understand fully the merits of subsequent study subjects.

The content of the proposed study subjects are appropriate for the achievements of the defined learning outcomes. The evaluation team has formulated this positive statement because self-evaluation team carefully observed recommendations formulated during the previous evaluation. According to the Recommendation No. 1 the list of study subjects was modified removing some study subjects such as *Protective Relaying and Automation of Distributed Generation Systems*, *Hydraulics and Hydropower Plants*, *Self-Contained Supply Systems and Equipment* and adding study subject *Sensors*. Following the Recommendation No. 4 the theme of Mechatronics is included in two study subjects: *Electric Drives and Automation Micromachines*. Next referring to the Recommendation No. 5 the study subjects, such *as Electric Power Systems and Enterprises, Electrical Power Engineering, Microprocessor Based Devices and Controllers* and lastly *Sensors* were enriched of aspect of smartness. Finally, observing the Recommendation No. 9, the old-fashioned literature in Russian was removed from the list of recommended literature of study subjects. In general, the study programme of *Electrical Engineering* has about 55% of the total contact hours that are allocated for the theoretical lectures and 45% - for practical and laboratory classes. However, during the meeting

with students, they expressed their wish to have more laboratory hours. Additionally, there are suggestions concerning the content of the study programme to be more focused on state of the art of smart systems and soft skills that are required later on in their professional life. Professional practice plays important role in achieving learning outcomes, in particular, those related to engineering practice and students expressed their expectations to have more laboratories and practical training. Dispute of internal regulations imposed by KUT rector, the evaluation team suggests increasing the number of hours of practical training.

3. Staff

The teaching staff, according to the SER, serves the *Electrical Engineering* study programme and consist of 35 teachers: 11 of them are professors, 21 – associate professors, and 3 – other teachers. It is appropriately composed and is sufficient to attain the aims and learning outcomes of the programme.

Since the last accreditation 7 young teachers started their jobs (in the period of 2010 – 2013). During the same period 9 teachers were retired. Currently 1 teacher is less than 30 years old, 10 are in the range 31-40 years old, 7 are in the range 41-50 years old, 11 in the range 51-65 years old and 6 are more than 65 years old.

All teachers have qualifications in compliance with general regulations of technological sciences (engineering). Teaching load of full time associate professors and other teachers is 700 – 800 hours. In average in last three years relation of the number of students to the number of teachers is around 2, thus students are not anonymous and have easy access in case of any problems to their teachers.

In general the staff experience is adequate to the BA study programme. The teachers are selected based on the competition procedure to take academic positions for a work on a five – years contract basis. Their teaching experience is very solid. Students confirm that their pedagogical skills are high and appropriated. Teachers wrote a number of textbooks and learning materials that are available at library and at Internet. Some of the textbooks were available during on site visit and the evaluation team was able to verify how solid teaching material is.

The academic staff of the study programme is active in publishing research results both in journals and conference proceedings; nevertheless the number of publications is decreasing looking at the data provided in Table 2.3.4 of the SER. Most of the publications are in local

journals and conference proceedings published by KUT. Indeed conferences are international but they are not IEEE conferences for example (none of the teaching staff is a member of IEEE). Possible publications at IEEE Transactions and IEEE conferences would have a very positive impact on conferences organized by the Department of Electrical Power Systems. It is stated in the SER that all academic staff participates in the research projects, however from the Table 2.3.2 it is visible that a limited number of teachers participate in these projects. Most of them funded by the Research Council of Lithuania and the number of EU funded projects is rather limited.

Another insufficiency in the professional development is seen in the international exchange of teachers that is very limited both with respect in the number of teachers that participate in it and the number of institutions they are visiting. It seems that the number of incoming teachers is higher (looking at Table 2.3.4) then the number of outgoing teachers.

The turnover of teachers is still a complicated issue. It seems that there is no a strategic plan concerning new staff continuation. For example during the meeting with teaching staff 2 out of 5 Ph. D. students expressed their interest in staying at university. They would like to go to industry. From the last accreditation the workload was decreased but the evaluation team suggest continuation of this changes, due to the fact that still some of the teachers have quite a heavy workload and this does not allow them to take part in the research projects.

It seems that not many teachers are involved in projects and also research activity is not sufficient. Maybe it could be referred to new administrative changes, although as yet it is not a critical point. Staff mobility may be improved regarding international conferences. In general majority of the students are satisfied with the teaching.

4. Facilities and learning resources

Premises for the studies within the Department of Electrical Power Systems are sufficient in number and occupancy rates. The technical and hygiene conditions of premises are good. Improvements of premises are observed since the last accreditation since a number of classrooms and laboratories were renovated. Auditoriums are equipped with modern multimedia facilities and a computer network connection was improved. Computer classrooms are equipped with new hardware and software. New laboratory equipment was purchased and the most of educational laboratories were updated. 20 new textbooks published by the teachers serve as a support of the *Electrical Engineering* programme. The evaluation team visited number of laboratories and confirmed their good organization and quality. This in turn allows

obtaining defined learning outcomes. List of modern laboratories is provided in the SER. Among them there are laboratories of Electromechanical materials, Electrical measuring, Electrical machines, Automatic control, and Electromagnetic field. More complete list of laboratories can be found at SER, page 24. There is a strategic plan for continuing modernization of the learning facilities and major founds came from University infrastructure reorganization project and part of support was appointed from EU support funds and Lithuania national budget for education facilities modernization. This long time plan is well formulated and guarantees continuous improvement of the facilities serving the study programme Electrical Engineering. The new building that is equipped with a big electricity transformer circuit is almost ready, it is very well recognized by the international panel. The university library and department library serve electrical engineering study programme and has monographs, textbooks, manuals in different languages with very convenient opening hours. Teachers and students can access databases of the virtual library among them Compendax, Inspec, IEEE and others.

Professional practice (10 weeks duration) for students is organized now by a new Department of Electrical Power Systems and gathers major Lithuanian industry in the country and is in compliance with the program aims and learning outcomes. This is again continuous process that has to be improved due to the fact that students do not choose professional practice places in other cities or countries due to high living expenses. It may be easier to organize it under umbrella of a new ERASMUS+ framework that seems to be more flexible and open to practical training for students and graduates.

5. Study process and student assessment

Admission system to the study programme at KUT is following the rules of the Association of Lithuanian Higher Education. It seems to be rational, flexible and competition based. The minimum passing grade for the year 2013 was 15 for applicants who are state financed or paid study-places. The new Department of Electrical Power Systems takes part in the activities of coordination of the admission process. Among many ways to do that one can mention presentations of the study programme during the open days and the biggest exhibition in Baltic States named Learning, Studies, Career. Nevertheless the popularity of the study programmes in the field of technologies has a tendency to decline in Lithuania. The number of admitted student is not too high, regardless of the efforts done by the Department of Electrical

Power Systems. This is probably due to the fact that not all students pass minimal competition grade.

The study process accepted in general by the students (such opinion was expressed by them during the meeting with students), namely the student workload, schedule of study classes and schedule of examination sessions are sufficiently even, convenient and rational. The student drop-out rate is monitored permanently because is reaching up to 50%. It occurs during the first year of studies (in particular during the first semester) according to the Table 2.5.2 of the SER. Several actions were undertaken in order to reduce drop-out of students, among them, supplementary courses in mathematics, suspending of scholarships for students not attending classes and other described in the SER, page 30. These are positive actions in opinion of the evaluation team.

In general, students are not involved in research' projects, some of them participate at annual conference of young scientists and at the annual exhibition of young researchers "Technorama". It is due to the fact that low preparedness was given to undergraduate students to do research, because it is not really necessary for bachelor students to participate in research projects. However, it could motivate them to think about the second cycle later on.

Since last accreditation nobility of outgoing students increased and due to bilateral agreements with some Western European countries (among them Sweden, Denmark, Spain and Germany) students went to these countries (before East European universities were chosen by the students). Still the percentage of outgoing students is rather low in spite of the fact that exchange programmes are advertised widely. Most of the students like to stay in Kaunas and study there. They are somehow afraid that may miss some study courses that are not offered at a foreign institution while there are at the study programme at KUT. It means that they are satisfied with the study process. Taking into account that new ERASMUS+ programme just started, the evaluation team encourages students to participate in it.

Students are informed about changes in the study programme and this information is relevant, consistent and available. During on site visit we found that the psychological, sports, health and cultural support is fair and suitable. The rules of student financial support are clear for students. The major support forms is social support for the whole semester that is a state managed. There is a possibility to get a one-time social support from the faculty. A small number of students get scholarships for good results. Provision with dormitories is good. Students have a free time zone in the Department.

Students' achievements assessments criteria are well designed and applied. The requirements for the final thesis are fair and students assess, them as rational. The procedure of final thesis assessment is clearly defined. The topics of final theses, as well as intermediate projects are in compliance with the programme aims and learning outcomes. The grades of the final theses in most of the cases are adequate to their quality.

Both students and stakeholders expressed their opinion that the graduates start their professional activities with rather good knowledge and practical abilities that are demanded in the industry. During the meeting with students some of them expressed opinion that it would be practical to pass a license up to 1KV during studies. This opinion was discussed with stakeholders. They do not agree because, different licenses are offered to the workers by companies. In the opinion of the evaluation team the lowest license may by offered at the end of BA study programme.

6. Programme management

The study programme administration and quality assurance is controlled and coordinated by Vice-Rector for studies with help of the Department of Academic Affairs. The study programme is improving sustainably by the Study Programme Committee. It consists of experienced professionals and administrators, this guarantees proper programme management. Internal quality assurance is a regular process, as the study programme is revised and renewed once a year. The stakeholders are within the process in developing the programme. As an example according to their suggestions a new subject *Sensors* was added to the study programme, the theme on smart electrical grid was introduced into a study subject *Electric Power Systems and Enterprises* as well as the themes of final degree projects are being chosen by the students in the time of their professional practice in recent years. New cooperation agreements with different companies were initiated and as a result students can have their professional practice in these companies. The stakeholders participate in the diploma defense and offer new equipment. They are also interested in hiring graduates. In general cooperation with external stakeholders has a positive impact for the improving changes of study programme.

Somehow in contrary to that students do not feel as being active in the study process. They do not know what is a study programme committee and who is a student member of this committee. Perhaps it is due to the recent organization changes. Students fill out questionnaires

in order to evaluate the quality of teaching and content of subjects. Unfortunately only 20% of the students do that therefore the feedback, if any, is very low.

The Study Programme Committee of Electrical and Control Engineering Faculty was monitoring the study programme till the end of 2013. This committee in accordance with the Recommendation No. 8 took into consideration feedback from students who filled in questionnaires about quality of subjects teaching. Now due to organizational changes at KUT there is a new study Council Committee that is handling 10 BA and 9 MA programmes. In this new body there is no any professor as well as student representative from the study programme of *Electrical Engineering* as a member. The evaluation team expresses some doubts about functionality of this system starting from the beginning of 2014. The New Study Council Committee has only one student representative from MS programme, but there are some employers representatives in this body. This Council should prepare a new strategy to attract students to study this programme. Feedback from students at the Council level at present (since 2014) is not clear.

In summary all recommendations formulated during the last accreditation in 2010 were implemented that results in better current study programme.

III. RECOMMENDATIONS

1. The number of students is steady but low, therefore more efforts (for example participation of students in fairs and meetings at secondary high schools) should be made in direction to attract applicants to *Electrical Engineering* study programme.
2. A strategic plan concerning teachers' turnover should be developed.
3. More students should fill in questionnaires about the quality of the study subjects and their feedback from the programme management should be visible. It seems that students do not have influence on the study programme.
4. The new Council Committee is handling 19 study programmes. There should be student and teaching staff representatives of this study programme in this body. The functionality of this council is not clear.
5. Mobility of the students should be increased in particular in view of a new ERASMUS + programme.
6. Mobility of the teachers should be increased significantly.
7. Teachers are encouraged to be more involved in research projects and consolidate their efforts to publish their results in high rank journals, for example, IEEE journals.
8. Laboratory hours should be increased and more practical training (besides just observing) should be offered.
9. Programme content should be focused on state of the art of smart systems and soft skills.

IV. SUMMARY

Current evaluation of the *Electrical Engineering* study programme took part in March 2014, after the first international evaluation that was done in November 2010. The self-evaluation team made a lot of efforts to prepare a new document that includes deep analysis and contains answers to the recommendation formulated during the previous visit. All answers are solid and improvements are clearly visible. Recommendations stated in the previous section are mainly drawbacks that were observed during the visit. Some of them are actually a continuation from the previous visit (3, 5, 6, 7 and 9) due to the fact any study programme implementation is always a continuous process. It means that members of the evaluation team clearly see the progress and effort made since the last accreditation.

The content of learning outcomes is clearly defined and is composed of 22 clauses. These learning outcomes are evenly distributed among study subjects of the programme. They are implemented in the study programme. The updates of new learning outcomes, since the last accreditation, include ability to work in the innovative environment, to accept innovations, and to understand the scientific and mathematical principles underlying the branch of electrical engineering and understand the key aspects and concepts of the branch

of electrical engineering. They made the learning outcomes more apparent. The learning outcomes are well defined, public available, meet the needs of the labour market, consistent and compatible. Two new specializations *Electrical and Control Equipment* and *Energy Converters and Control* are unique. Other electrical engineering study programmes in Lithuania do not offer these specializations. At the same time there are allowing deeper specialization in the electrical engineering study programme.

The content of the proposed study subjects are appropriate for the achievements of the defined learning outcomes. *Electrical Engineering* study programme is in compliance of industry and society needs. However, during the meeting with students, they expressed their wish to have more laboratory hours. Additionally, there are suggestions concerning the content of the study programme to be more focused on state of the art of smart systems and soft skills that are required later on in their professional life.

The teaching staff serves the *Electrical Engineering* study programme and consist of 35 teachers: 11 of them are professors, 21 – associate professors, and 3 – other teachers. It is appropriately composed and is sufficient to attain the aims and learning outcomes of the programme. All teachers have qualifications in compliance with general regulations of technological sciences (engineering). Teaching load of full time associate professors and other teachers is 700 – 800 hours. In general the staff experience is adequate to the BA study programme. Supporting teaching staff has good qualification and they do good teaching that is recognized and acceptable by students.

Teachers are encouraged to be more involved in research projects and consolidate their efforts to publish their results in high rank journals, for example, IEEE journals. Another insufficiency in the professional development is seen in the international exchange of teachers that is very limited both with respect in the number of teachers that participate in it and the number of institutions they are visiting. It seems that the number of incoming teachers is higher then the number of outgoing teachers. The turnover of teachers is still a complicated issue. It seems that there is no a strategic plan concerning new staff continuation. For example during the meeting with teaching staff 2 out of 5 Ph. D. students expressed their interest in staying at university.

Premises for studies within the Department of Electrical Power Systems are sufficient in number and occupancy rates. The technical and hygiene conditions of premises are good. Improvements of premises are observed since the last accreditation since a number of classrooms and laboratories were renovated. Auditoriums are equipped with modern

multimedia facilities and a computer network connection was improved. There is a strategic plan for continuing modernization of the learning facilities. The new building that is equipped with a big electricity transformer circuit is almost ready, it is very well recognized by the international panel. The university library and department library serve electrical engineering study programme and has monographs, textbooks, manuals in different languages with very convenient opening hours. Teachers and students can access databases of the virtual library among them Compendax, Inspec, IEEE and others.

Admission system to the study programme at KUT is following the rules of the Association of Lithuanian Higher Education. It seems to be rational, flexible and competition based. *Electrical Engineering* graduates, in general, are satisfied with the study programme, are able to find a job according to their education. Students are informed about changes in the study programme and this information is relevant, consistent and available. During on site visit we found that the psychological, sports, health and cultural support is fair and suitable. The rules of student financial support are clear for students. Mobility of the students should be increased in particular in view of a new ERASMUS + programme.

The Study Programme Committee of Electrical and Control Engineering Faculty was monitoring the study programme till the end of 2013. Now due to organizational changes at KUT there is a new study Council Committee that is handling 10 BS and 9 MS programmes. In this new body there is no any professor as well as student representative from the study programme of *Electrical Engineering* as a member. The evaluation team expresses some doubts about functionality of this system starting from the beginning of 2014. The New Study Council Committee has only one student representative from MS programme, but there are some employers representatives in this body. This Council should prepare a new strategy to attract students to study this programme). More students should fill in questionnaires about the quality of the study subjects and their feedback from the programme management should be visible. It seems that students do not have influence on the study programme. Stakeholders are active members in the study' process, they cooperate with KUT, offer equipment, training places and jobs.

Finally, evaluation team suggest to put some effort asking public institutions together with the Department to find measures as how to increase an amount of students scholarships for good result as well as the number of scholarships.

V. GENERAL ASSESSMENT

The study programme Electrical engineering (state code – 612H62001) at Kaunas University of Technology is given **positive** evaluation.

Study programme assessment in points by evaluation areas.

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

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Grupės nariai:
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Dr. Olev Martens

Dr. Rolandas Urbonas

Paulius Simanavičius

Santraukos vertimas iš anglų kalbos

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V. APIBENDRINAMASIS ĮVERTINIMAS

Kauno technologijų universiteto studijų programa *Elektros inžinerija* (valstybinis kodas – 612H62001) vertinama **teigiamai**.

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

* 1 - Nepatenkinamai (yra esminių trūkumų, kuriuos būtina pašalinti)
2 - Patenkinamai (tenkina minimalius reikalavimus, reikia tobulinti)
3 - Gerai (sistemiškai plėtojama sritis, turi savitų bruožų)
4 - Labai gerai (sritis yra išskirtinė)

<...>

IV. SANTRAUKA

Studijų programos *Elektros inžinerija* vertinimas vyko 2014 m. kovą, po pirmojo tarptautinio vertinimo, kuris buvo atliktas 2010 metais. Savianalizės grupė daug dirbo ir parengė naują dokumentą, kuriame pateikiama gili analizė ir atsakymai į rekomendacijas, kurios buvo suformuluotos lankantis anksčiau. Visi atsakymai yra svarūs, o atlikti patobulinimai aiškiai matomi. Ankstesnėje dalyje pateiktos rekomendacijos yra daugiausia trūkumai, kurie buvo pastebėti vertinimo metu. Kai kurie iš jų tęsia ankstesnio apsilankymo rekomendacijas (3, 5, 6, 7 ir 9), todėl kad studijų programa įgyvendinama nuolat. Ekspertų grupės nariai aiškiai mato padarytą pažangą ir pastangas po paskutiniojo akreditavimo.

Studijų rezultatų turinys yra aiškiai apibrėžtas, jį sudaro 22 punktai. Šie studijų rezultatai tolygiai paskirstyti programos studijų dalykams. Jie įgyvendinti studijų programoje. Po paskutinės akreditacijos studijų rezultatai atnaujinti ir įrašyta naujų: gebėjimas dirbti inovatyvioje aplinkoje, priimti naujoves ir suprasti mokslinius ir matematinius principus, kuriais pagrįsta elektros inžinerijos šaka, suprasti pagrindinius elektros inžinerijos šakos aspektus ir sąvokas. Todėl studijų rezultatai tapo aiškesni. Jie yra

gerai apibrėžti, viešai prieinami, atitinka darbo rinkos poreikius, yra nuoseklūs ir suderinti. Dvi naujos specializacijos *Elektros ir valdymo įtaisai* bei *Energijos keitikliai ir jų valdymas* yra unikalios. Kitos elektros inžinerijos studijų programos Lietuvoje šių specializacijų nesiūlo. Taip siūloma gilesnė elektros inžinerijos studijų programos specializacija.

Siūlomų studijų dalykų turinys yra tinkamas nustatytiems studijų rezultatams pasiekti. Elektros inžinerijos studijų programa atitinka pramonės ir visuomenės poreikius. Tačiau susitikus su studentais, paaiškėjo, kad jie norėtų turėti daugiau valandų dirbti laboratorijose. Be to, yra pasiūlymų dėl studijų programos turinio – daugiau dėmesio skirti išmaniųjų sistemų sričiai ir socialinio pobūdžio įgūdžių plėtojimui, kurių reikia profesinėje veikloje.

Studijų programą *Elektros inžinerija* vykdo 35 dėstytojai, iš jų 11 profesorių, 21 docentas ir 3 kitos kvalifikacijos dėstytojai. Pedagoginis personalas yra tinkamai suformuotas ir jo pakanka programos tikslams bei studijų rezultatams pasiekti. Visi dėstytojai turi reikiamą kvalifikaciją, kuri atitinka bendrąsias technologijos mokslų (inžinerijos) taisykles. Visu etatu dirbančių docentų ir kitų dėstytojų dėstymo krūvis yra 700–800 valandų. Apskritai, dėstytojų patirtis yra pakankama bakalauro studijų programai vykdyti. Pagalbinio pedagoginio personalo kvalifikacija yra tinkama, ir jie dėsto gerai, ką pripažįsta ir tam pritaria studentai.

Dėstytojai skatinami aktyviau dalyvauti mokslinių tyrimų projektuose ir stengtis savo darbo rezultatus skelbti aukšto rango žurnaluose, pavyzdžiui, IEEE žurnaluose. Kitas profesinio tobulėjimo trūkumas – dėstytojų tarptautiniai mainai, kurie yra labai riboti tiek dėl dalyvaujančių dėstytojų skaičiaus, tiek dėl įstaigų, kuriose jie lankosi, skaičiaus. Atrodo, kad atvykstančių dėstytojų yra daugiau, nei išvykstančių. Dėstytojų kaita vis dar sudėtingas klausimas. Susidaro įspūdis, kad nėra strateginio plano dėl naujų darbuotojų. Pavyzdžiui, susitikimo su dėstytojais metu tik 2 doktorantai iš 5-ių išreiškė susidomėjimą likti universitete.

Patalpų studijuoti pakanka. Jų techninės ir higienos sąlygos yra geros. Pastebėta, kad patalpos nuo paskutinio akreditavimo pagerėjo, nes dalis auditorijų ir laboratorijų buvo atnaujintos. Auditorijos aprūpintos šiuolaikine multimedijų įranga, pagerintas prisijungimas prie kompiuterių tinklo. Kaip paaiškėjo, planuojama toliau modernizuoti materialiąją bazę. Naujas pastatas, kuriame įrengta galinga elektros transformatorinė, beveik paruoštas. Tai labai teigiamai vertina tarptautiniai ekspertai. Pagal programą *Elektros inžinerija* studijuojantys asmenys gali naudotis universiteto ir katedros bibliotekomis. Jose yra monografijų, vadovėlių įvairiomis kalbomis, jų darbo valandos yra labai patogios. Dėstytojai ir studentai turi prieigą prie virtualios bibliotekos duomenų bazių, pavyzdžiui, *Compendax*, *Inspec*, IEEE ir kitų.

Priėmimą į studijų programą KTU vykdo vadovaudamasis Lietuvos aukštųjų mokyklų asociacijos taisyklėmis. Programa, regis, yra racionali, lanksti ir konkurencinga. *Elektros inžinerijos* absolventai yra patenkinti studijų programa ir gali rasti darbą pagal savo išsilavinimą. Studentai informuojami apie studijų programos pokyčius, ir ši informacija yra aktuali, sisteminga bei prieinama. Vizito universitete metu nustatėme, kad psichologinė, sporto, sveikatos ir kultūros pagalba yra teisinga ir tinkama. Finansinės paramos studentams taisyklės yra aiškiai jiems suprantamos. Studentų mobilumas galėtų būti didesnis, ypač pagal naują „ERASMUS+“ programą.

Elektros ir valdymo inžinerijos fakulteto Studijų programos komitetas stebėjo studijų programą iki 2013 m. pabaigos. Dabar dėl organizacinių pokyčių KTU sukurtas naujas Studijų tarybos komitetas, kuris tvarko 10 bakalauro ir 9 magistro programas. Šiame naujai sukurtame komitete profesorių nėra, taip pat nėra studijų programos *Elektros inžinerija* studentų atstovų, kurie būtų komiteto nariai. Vertinimo grupė abejoja šios sistemos, kuri pradėjo veikti nuo 2014 metų, funkcijomis. Naujajame Studijų tarybos komitete yra tik vienas magistrantūros programos studentas ir keli darbdavių atstovai. Taryba turėtų parengti naują strategiją, kaip pritraukti studentus studijuoti šią programą. Daugiau studentų turėtų užpildyti anketas apie studijų dalykų kokybę, o jų grįžtamasis ryšys turėtų atsispindėti programos vadyboje. Atrodo, kad studentai neturi įtakos studijų programai. Dalininkai yra aktyvūs studijų proceso nariai, jie bendradarbiauja su KTU, siūlo įrangą, praktikos ir darbo vietas.

Galiausiai, vertinimo grupė siūlo imtis priemonių ir prašyti viešųjų institucijų kartu su katedra ieškoti būdų, kaip padidinti studentų stipendijų sumą geriems rezultatams pasiekti, taip pat padidinti stipendijų skaičių.

III. REKOMENDACIJOS

1. Studentų skaičius yra stabilus, tačiau nedidelis, todėl reikia imtis priemonių (pavyzdžiui, studentams dalyvauti mugėse ir susitikimuose vidurinėse mokyklose), kurios padėtų pritraukti daugiau studentų rinktis *Elektros inžinerijos* studijų programą.
2. Parengti strateginį planą dėl dėstytojų kaitos.
3. Daugiau studentų turėtų užpildyti anketas apie studijuojamų dalykų kokybę, o grįžtamasis ryšys turi atsispindėti programos vadyboje. Susidaro įspūdis, kad studentai įtakos studijų programai neturi.
4. Naujas tarybos komitetas tvarko 19 studijų programų. Šiame komitete turėtų dalyvauti šios studijų programos studentų ir dėstytojų atstovai. Šios tarybos funkcijos nėra aiškios.

5. Didinti studentų judumą, ypač pagal naują „ERASMUS+“ programą.
6. Reikia ženkliai didinti dėstytojų judumą.
7. Skatinti dėstytojus aktyviau dalyvauti mokslinių tyrimų projektuose ir skelbti darbų rezultatus aukšto rango žurnaluose, pavyzdžiui, Elektros ir elektronikos inžinierių instituto (toliau – IEEE) žurnaluose.
8. Didinti laboratorijų darbo valandas ir siūlyti daugiau praktinių mokymų (ne tik stebėjimo).
9. Programos turinys turi būti sutelkiamas į išmaniųjų sistemų ir socialinio pobūdžio gebėjimų šiuolaikiškumą (minkštieji įgūdžiai).

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