STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

Vilniaus Gedimino technikos universiteto
STUDIJŲ PROGRAMOS
Elektronikos inžinerija **(621H61003)**
VERTINIMO IŠVADOS

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EVALUATION REPORT OF
Electronics Engineering (621H61003)
STUDY PROGRAMME
at *Vilnius Gediminas Technical University*

Grupės vadovas:
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Išvados parengtos anglų kalba
Report language - English

Vilnius
2014

Studijų programos pavadinimas	Elektronikos inžinerija
Valstybinis kodas	621H61003
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	Elektronikos inžinerijos magistras
Studijų programos įregistravimo data	1997-05-19

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INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	Electronics Engineering
State code	621H61003
Study area	Technological sciences
Study field	Electronics and electrical engineering
Kind of the study programme	University Studies
Study cycle	Second
Study mode (length in years)	Full-time (2 years)
Volume of the study programme in credits	120 ECTS
Degree and (or) professional qualifications awarded	Master of Electronics Engineering
Date of registration of the study programme	1997-05-19

CONTENTS

I. INTRODUCTION

This evaluation report is based on the self-evaluation report (SER) for the MA study programme "Electronics Engineering" provided by Vilnius Gediminas Technical University (VGTU) and the on-site visit to the University.

Previous external assessment of study programme was carried out on November 10, 2011. Study programme was assessed by an international team of experts organized by Centre for Quality Assurance, and was lead by Prof Dr Edmund Handschin (Technical University of Dortmund, Germany). Other members present were Mindaugas Karaliūnas (Vilnius University, Lithuania), Prof Dr Laszlo Koczy (Budapest University of Technology and Economics, Hungary), Prof Dr Toomas Rang (Tallinn University of Technology, Estonia), Prof. habil. Dr Juozas Vidmantis Vaitkus (Vilnius University, Lithuania), and Dr Anthony Vickers (University of Essex, United Kingdom). After the assessment according to SKVC (Centre for Quality Assessment in Higher Education) Director's Order No. SV6-20 of 28/05/2012 (State Gazzete, 2012, No. 61-3107), the study programme was accredited till August 31, 2014.

The study programme is carried out by the Department of Electronic Systems. The self-evaluation report of Vilnius Gediminas Technical University has been prepared in 2012/13 and submitted in October 2013. The remote evaluation was performed in April 2014. The on-site evaluation was carried out by the entire evaluation team on May 2, 2014 on the premises of Vilnius Gediminas Technical University.

All decisions concerning the final evaluation report have been taken unanimously by the entire team.

Abbreviations:

SER   Self-evaluation report
MA   Master studies
VGTU   Vilnius Gediminas Technical University

II. PROGRAMME ANALYSIS

1. *Programme aims and learning outcomes*

Preparation of higher education specialists in electronics engineering (EE) has crucial importance for the Lithuanian new industry, and it covers the specialization of computerized electronic system, Avionics, as well as Micro and Nano Electronics). During the next decade the need for highly qualified electronics engineers duplicates probably in 2020. Therefore the programme is based on the academic and/or professional requirements, public needs and the needs of the labour market. Regarding the Programme aims and learning outcomes, the experts agree that they are well defined and clear, and published on the VGTU website, as well a content of them are included into the Diploma Supplement.

The name of the programme, its learning outcomes, content and the qualifications offered are compatible with each other. All are compatible, only it is confusing that the subject "High Power Electronics Semiconductor Devices" is included in the formation of Expected Learning Outcomes, but it is absent in the study program.

The Statements on evaluation of programme aims and learning outcomes are evaluated in such way: the formulation of the *Electronics Engineering* programme aims and learning outcomes corresponds to the requirements of *EUR-ACE Framework Standards for the Accreditation of Engineering Programmes*, 5/11/2008), *Shared 'Dublin' descriptors for Short Cycle, First Cycle, Second Cycle and Third Cycle Awards*), *The European Qualifications Framework for Lifelong Learning*) *ECTS User Guide* requirements. As the Lithuanian legislation is harmonized with international legislation, it is clear the *Electronics Engineering* 2nd cycle study programme is very well suited for the preparation of specialists of necessary qualification level. Therefore it is possible to conclude that they are consistent with the type and level of studies and the level of qualifications offered and fully correspond to the requirements. The experts could verify this information during the on-site visit.

The main learning outcomes for this programme describe:

„1. To provide the newest knowledge from electronics engineering and related fields, necessary for specialists that develop electronic equipment and computerized electronic systems, and to develop the ability to critically assess and apply the acquired knowledge.

2. To provide specialized knowledge in the field of electronics engineering, necessary for application of newest technologies and independent development of new products and services,

and train to perform applied research that gives new results in the field of electronics engineering.

3. To develop the abilities to creatively apply theoretical knowledge and scientific research results and to improve professional competence throughout life-long learning."

It is provided the development of skills: a) to develop, maintain and improve the modern embedded intelligent electronic systems having a possibility to realize different innovations including the artificial neural networks, b) to design modern integrated circuits including the nanoscale devices.

The analysis of the World demand of specialists was used to direct the studies plans and required outcomes corresponding to the international skill development level.

The team members agree that the aims and learning outcomes are well presented in the analysis of the all study plan, the programme aims and expected learning outcomes correspond with each other and the study courses are well shown and are coherent according to SER Table 3.4.

2. Curriculum design

The curriculum design meets the legal requirements of the Lithuanian government and the European rules for Higher Education. It comprises 120 ECTS credits with a duration of two years. The final theses allocated 39 credits acquires from three each semester (I-III) final works and the final work at IVth semester. The study subjects and/or modules are spread evenly, their themes are almost not repetitive. It must be noted that there are a few repetitive subjects (e.g., related with the radar systems), although relatively that is not bad, because it related to optional courses, but some doubts appears concerning the recommended references, that are different and very similar.

The content of modules is consistent with the type and level of the studies. The remark has to be addressed to the study modules related with the "Microcontrollers and their Programming" that are, according the presented material in the SER, not enough upgraded to the contemporary level.

The presented content and methods seems appropriate for the achievement of the intended learning outcomes, the recommended references are modern in the most cases, but the additional references that are presented in the module "Theory of Radar and Ground Systems" are rather

old. One of the references recommends to use the handbook published in 1984 in Russian language ("P. Davydov et al. Radiolocation in aviation - Aviatsionnaya radiolokatsiya, Moscow, Transport publ. It should be noted that it does not consist the latest materials because the same authors published a new version of this handbook in 2008). The same could be said about another recommended book: V.Grachev and V.Klein. Radioelectronics in contol of air transport, as the same team published new manuals in 2003 and 2006.

The scope of the programme is sufficient to ensure learning outcomes and is well presented in the Table 3.4 of the SER. The content of the programme reflects the latest achievements in science, art and technologies: e.g., a) the course "Very large scale integration (VLSI) circuits" subject delivers latest knowledge about sub-micronic and nanometric Si-CMOS, and SiBi-CMOS, SiGe, GaAs technologies, VLSI circuits synthesis and analysis methods, layout design technologies, modeling and computer-aided design systems and tools, digital, analog and mixed VLSI circuits topology analysis and their optimization algorithms; b) the course "Analysis and Synthesis of Electronic Circuits" includes the modern software for automated design of electronic circuits based on Kleitz, W. Digital Electronics: a practical approach. McGraw Hill Edition. 2008; c) the embedded system course is based on the ARM Microcontroller Interfacing: Hardware & Software (Electrical Engineering) WaARM Microcontroller Interfacing: Hardware & Software (Electrical Engineering) W.A.Smith; and etc.

The visual material presented in the modules declares the presentation of the latest achievements.

3. Staff

During last three years seven full professors are involved in the study process, a number of associated professors increased from 6 to 14 what is related to the establishing of avionics specialization, according the recommendations of previous expertise. The number of students is around 30, the ratio of students and teaching staff is optimal. The courses related to the electronics are teached by professors and associated professors, only the course "Open Source Means for Science, Business and Management" is prepared by a simple lecturer. All data and the staff dynamics are presented in the table 4.1.

9 from 24 of academic staff members participated in the international exchange visits, conferences or workshops. During the last three years two professors participated in 8-9 trips, that shows exceptional activity, but 16 staff members do not participate in any international

exchange or visit activity (three of them visited foreign scientific centers during the earlier years).

The staff meets the formal legal requirements, but the level of the research must still be increased in order to achieve the international level. The average Hirsh index (how many scientific papers are cited in the ISI data base journals, and the times of citations equals to this index) is only 2, i.e., in an average only two papers over 20 years period was cited 2 times, including the self-citations) and only 3 staff representatives have h=4-5, and most publications are in the local journals "Informatica" ISSN 0868-4952, "Electronics and electrical engineering" ISSN 1392–1215; Aviacijos Technologijos (Aviation Technologies). 2013 1(1). ISSN2029-9974 online. p. 61 -63 [In Lithuanian]. This index show that the visibility of research at VGTU in a field of Electronics is rather low and the Department has to consider on publishing in the IEEE, Academic Press, Springer and similar editions.

The qualification of the teaching staff can ensure the learning outcomes of this programme. The number of the teaching staff corresponds to ensure learning outcomes, as well as the teaching staff turnover is able to ensure an adequate provision of the programme. The younger generation of staff is involved, but it is necessary to involve them into the international visits programme.

The higher education institution creates conditions for the professional development of the teaching staff necessary for the provision of the programme, especially it works well to introduce new facilities (at the Sunrise valley) for the program realization upgrading.

The teaching staff is involved in the research programs, mostly on national level supported by Lithuanian research council and Ministry of economy programs, there is a few participations in the international project, but this international level is still rather weak.

4. Facilities and learning resources

The facilities and learning resources correspond to ensure realization of studies according the data presented in Self Evaluation Report. The experts believe that the material base is enough to ensure the successful implementation of this programme. The visit to the laboratories showed the significant improvement of the laboratory in the field of avionics (in comparison with the past visit), and corresponds to the today requirements, but some new imitator programs in avionics (the control of the all electronics infrastructure in the airports) would be desirable. Other laboratories were upgraded, including the embedded systems, but this field in the world changes

faster than the laboratories are upgraded. New facilities related to the micro- and nano-electronics wait of the Sunrise facilities building up in the next year. It was demonstrated the programming facilities to design the modern microelectronics devices with the nanoscale components that were realized during the preparation of the final works and were transferred to the technological centers in other countries.

However it is worth mentioning, that it was not given enough information in the SER and during the on-site visit what contribution for the electronics engineering programme was given from the projects:

a) The Development of a Training Base of Aviation Specialists: Purchase of Training Equipment and Construction of the Laboratory Building. Contract No VP3-2.2-ŠMM-16-V-01-003. Supervisor: J. Stankūnas. Researchers: D. Rudinskas, I. Suzdalev. Under implementation in 2012–2014.

b) The Update of the Training Equipment Necessary for Practical Training of Aviation Specialists in Antanas Gustaitis' Aviation Institute of Vilnius Gediminas Technical University. Contract No VP3-2.2-ŠMM-16-V-01-001. Supervisor: J. Stankūnas. Researchers: D. Rudinskas, I. Suzdalev. Under implementation in 2009–2013.

The library resources are renewed and create the possibility to get manuals for studies. As it was pointed out during the discussion with students and in the library, the main source of information is the databases that are available at the Faculty library or at the Vilnius university National Communication Center.

Nevertheless, it is clear shown the weakness of the material resources and their use are understood by the SER preparation group and the way to improve the situation is presented, and related to the new financing period in Lithuania. Thus the evaluation team strongly believes they have a decent strategy regarding the further development of the material base for this programme.

5. Study process and student assessment

The admission requirements are well-founded, but the absence of a threshold to apply for studies for MA does not increase the level of the studies. The organisation of the study process should ensure an adequate provision of the programme and the achievement of the expected

learning outcomes. It was made clear that students are encouraged to participate in research and some were involved in projects (though the students admitted that they did not get paid for that).

Measures are taken to allow students to have the opportunity to participate in student mobility programmes. Some students participated in mobility projects and two students of the study program were abroad at the moment. The most popular choices for the exchange were in Turkey and the faculty has close relationship with Applied Science University of Stralsund in Germany. The mobility cases are generally admirable for master students, due to the fact that most of them are working during the studies.

The higher education institution ensures an adequate level of academic and social support, the students are provided with all the needed information concerning the university study programme. There were no complaints regarding the study process from the students. There are social and academic supports, and some of students get social scholarships.

The assessment system of students' performance is clear, adequate and publicly available, students find all the information on the VGTU website.

The stakeholders seemed quite pleased with the level that the graduates receive during the studies and students had great possibilities to get a job after the studies. The graduates all had jobs and were happy with the professional career possibilities in their field.

6. Programme management

The program management corresponds to ensure realization of studies according the data presented in Self Analysis Report. The meetings with the students, the graduates and the employees explained that the level of the specialists and the conditions for the studies are good, but the necessity to match studies and the work in other institutions or companies creates some problems. Students and the graduates expressed a possibility to improve the situations if the Departments would have more intensive collaboration with the industry and more R&D projects that could involve the students in the projects' staff.

The stakeholders are included in the programme committees according the SER, but during the visit it was not possible to receive the evidence that the collaboration with the stakeholders is systematic. Also, as the alumni organization is absent for the faculty, the analysis of the study results is difficult. Thus the programme graduates should be involved in this programme more actively.

The some aspects related to the program management could be improved or analyzed more correctly. It was given in the SER the information that „Study problems are periodically discussed in the presence of the Heads of Departments" on the University level, but how it realized was not commented, and it was understood that the discussions are going on the faculty level.

Also the SER report included some misunderstandings related to the description of the existing the committees involved in the program analyze discussions. The reality was found is more simple and well understood in comparison to the SER report description. (It was given: „(page 10). The review of learning outcomes is monitored by the *Study Committee of Faculty*. Social partners participate in the activity of *the Committee of Studies. Electronics Engineering Study Programme Committee* includes social partner Dr A. Kleiza, Director of JSC "Šviesos studija", JSC "Gaudė" Director V. Rinkevičius is included in the Study Committee work of Electronics faculty. *All committees include representatives appointed by the student body*."

It must be noted that the SER was prepared rather poorly with many errors included. Several mistakes were found in the SER report (Table 2.1). The information of the assessed period should be documented more carefully with precision in order to prepare a clear SER for future external evaluations. However, as a positive thing, the SER group representatives still managed to present the corrected and facts regarding this programme during the on-site visit.

III. RECOMMENDATIONS

1. To increase attention to the level of research. Probably it could be useful to join the researchers groups in the Centre of Physical and Technological Sciences.

2. Motivate the staff to perform more intensive R&D work and present the results in the recognized international editions.

3. To involve the students in the R&D projects at faculty level and improve the internationalization of the studies via Erasmus programme.

4. To update and prolong the references in the study modules and upgrade the Microcontrollers and their Programming study modules to the present level for MA studies.

IV. SUMMARY

The name of the programme, its learning outcomes, content and the qualifications offered are compatible with each other. It can be concluded that they are consistent with the type and level of studies and the level of qualifications offered and corresponds to the requirements.

It is stated that the programme provides development of these skills: a) to develop, maintain and improve the modern embedded intelligent electronic systems having a possibility to realize different innovations including the artificial neural networks, b) to design modern integrated circuits including the nanoscale devices.

The programme management corresponds to ensure realization of studies according the data presented in Self Evaluation Report. The meetings with the students, the graduates and the employees explained that the level of the specialists and the conditions for the studies are good, but the necessity to match studies and the work in other institutions or companies creates some problems. Students and the graduates expressed a possibility to improve the situations if the Departments would have more intensive collaboration with the industry and more R&D (Research and Development) projects that could involve the students in the projects' staff.

The strength of the study programme Electronics Engineering is caused by the following: aims and learning outcomes are very well presented and clearly specified; the changes since the last review in 2011 are acknowledged and made evident during to-day's visit; the considerable and successful investments have been done in the laboratories. There is a good understanding of future EU support possibilities to establish the new campus. Overall impression by students, graduates and employers with respect to the study programme are very good. The regular

conferences in Vilnius for young students are appreciated as a strong element for career development. Many teachers are members of IEEE. Specialization of avionics electronic engineering has been successfully started in 2012. During last three years seven full professors are involved in the study process, a number of associated professors increased from 6 to 14 what is related to the establishing of avionics specialization, according the recommendations of previous expertise. The number of students is around 30, the ratio of students and teaching staff is optimal.

Only a part of academic staff participated in the international exchange visits or conferences, or workshops. Two professors during last three years participated in 8-9 trips, that show exceptional activity, but 16 staff members do not participated in any international visits activity during the last years. The younger generation of staff is involved, but it is necessary to involve them into the international exchange programmes or visits.

The teaching staff is involved in the research programs, mostly on national level supported by Lithuanian research council and Ministry of economy programs, there is a few participations in the international project, but this international level is quite weak.

The higher education institution ensures an adequate level of academic and social support, the students are provided with all the needed information concerning the university study programme. There are social and academic supports, and some of students get social scholarships. Some lectures, e. g., Microcontrollers and their Programming need to be updated in order to correspond to the requested MA level. No systematic communications with stakeholders with respect to the study programme are maintained. International publications and international research projects are not yet sufficiently developed. As a consequence the faculty is not able to sponsor the majority of MA students during their studies; the students are still forced to work in industry and study only in the evening. More efforts to increase the number of students are necessary to educate a sufficient number of graduates in the near future. Also it should be noted, that the SER has been rather poorly prepared with many mistakes and errors, it should be taken in account for the next evaluations in the future.

V. GENERAL ASSESSMENT

The study programme Electronics Engineering (state code – 621H61003) at Vilnius Gediminas Technical University is given **positive** evaluation.

Study programme assessment in points by evaluation areas.

No.	Evaluation Area	Evaluation Area in Points*
1.	Programme aims and learning outcomes	4
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:	**19**

*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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Team members: Prof. dr. Tilmann Krueger

                           Prof. dr. Toomas Rang

                           Prof. dr. Juozas Vidmantis Vaitkus

                           Paulius Simanavičius

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V. APIBENDRINAMASIS ĮVERTINIMAS

Vilniaus Gedimino technikos universiteto studijų programa *Elektronikos inžinerija (valst*ybinis kodas – 621H61003) vertinama **teigiamai**.

Eil. Nr.	Vertinimo sritis	Srities įvertinimas, balais*
1.	Programos tikslai ir numatomi studijų rezultatai	4
2.	Programos sandara	3
3.	Personalas	3
4.	Materialieji ištekliai	3
5.	Studijų eiga ir jos vertinimas	3
6.	Programos vadyba	3
	Iš viso:	19

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

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IV. SANTRAUKA

Studijų programos pavadinimas, studijų rezultatai, turinys ir suteikiama kvalifikacija tarpusavyje suderinti. Galima daryti išvadą, kad jie atitinka studijų tipą ir lygmenį bei suteikiamą kvalifikaciją ir reikalavimus.

Nurodoma, kad studijų programoje lavinami šie gebėjimai: a) kurti, prižiūrėti ir tobulinti modernias įterptines išmaniąsias elektronikos sistemas, galinčias įgyvendinti įvairias inovacijas, įskaitant dirbtinius neuroninius tinklus, b) projektuoti modernius integrinius grandynus, įskaitant nanometrus.

Sprendžiant iš savianalizės suvestinėje pateiktų duomenų, studijų programos vadyba – tinkama studijų vykdymui užtikrinti. Susitikimuose su studentais, absolventais ir darbdaviais paaiškėjo, kad specialistų lygis ir studijų sąlygos – geros, tačiau problemų kelia tai, kad studentams reikia derinti studijas ir darbą kitose institucijose ar įmonėse. Pasak studentų ir

absolventų, situacija pagerėtų, jeigu katedros glaudžiau bendradarbiautų su pramone ir būtų vykdoma daugiau tyrimų ir plėtros projektų, kurių darbuotojais galėtų būti studentai.

Elektronikos inžinerijos studijų programos stipriosios pusės yra šios: tikslai ir studijų rezultatai – labai gerai pateikti ir paaiškinti; po paskutinio vertinimo 2011 m. atlikti pakeitimai pripažinti ir akivaizdžiai matomi per šį vizitą; gana daug ir sėkmingai investuota į laboratorijas. Gerai suprantamos būsimos ES paramos teikiamos galimybės naujam kompleksui įkurti. Bendra studentų, absolventų ir darbdavių nuomonė apie studijų programą – labai gera. Reguliariai rengiamos jauniems studentams skirtos konferencijos Vilniuje laikomos svarbiu kopimo karjeros laiptais elementu. Daug dėstytojų yra IEEE nariai. 2012 m. sėkmingai pradėta avionikos elektronikos inžinerijos specializacija. Pastaruosius trejus metus studijų procese dalyvauja septyni etatiniai profesoriai, docentų skaičius išaugo nuo 6 iki 14. Tai susiję su avionikos specializacijos įsteigimu pagal ankstesnio vertinimo rekomendacijas. Programoje studijuoja apie 30 studentų, studentų ir dėstytojų santykis – optimalus.

Tik dalis akademinio personalo dalyvavo vizituose arba konferencijose ar seminaruose, susijusiuose su tarptautiniais mainais. Per pastaruosius trejus metus du profesoriai keliavo 8–9 kartus. Tai rodo išskirtinį aktyvumą, tačiau per pastaruosius trejus metus 16 darbuotojų nedalyvavo tarptautinėje veikloje. Jaunesnės kartos personalas dalyvauja, tačiau būtina juos labiau įtraukti į tarptautinių mainų programas arba vizitus.

Dėstytojai dalyvauja mokslinėse programose (dažniausiai nacionaliniu lygiu), kurias remia Lietuvos mokslo tarybos ir Ūkio ministerijos programos. Šiek tiek dalyvaujama tarptautiniuose projektuose, tačiau tarptautiškumas – gana silpnas.

Aukštoji mokykla užtikrina tinkamą akademinės ir socialinės paramos lygį. Studentams suteikiama visa reikiama informacija apie universiteto studijų programą. Taikomos socialinės ir akademinės paramos priemonės, kai kurie studentai gauna socialines stipendijas. Kai kurias paskaitas, pavyzdžiui, mikrovaldiklių ir jų programavimo, reikia atnaujinti, kad jos atitiktų pageidaujamą magistro lygmenį. Ryšiai su socialiniais partneriais studijų programos klausimais palaikomi nesistemingai. Tarptautinės publikacijos ir tarptautiniai moksliniai projektai dar nėra pakankamai išplėtoti. Dėl to fakultetas negali remti daugumos magistrantų per jų studijas. Studentai tebėra priversti dirbti pramonės srityse ir studijuoti tik vakarais. Būtina dėti daugiau pastangų studentų skaičiui didinti, kad artimoje ateityje būtų parengtas pakankamas absolventų skaičius. Taip pat atkreiptinas dėmesys, kad savianalizės suvestinė buvo gana prastai parengta, joje daug klaidų ir neatitikimų. Į tai reikėtų atsižvelgti per kitus vertinimus.

III. REKOMENDACIJOS

1. Skirti daugiau dėmesio mokslinės veiklos lygiui. Tikriausiai būtų naudinga prisijungti prie Fizinių ir technologijos mokslų centro tyrėjų grupės.

2. Motyvuoti personalą vykdyti aktyvesnę tyrimų ir plėtros veiklą bei pateikti jos rezultatus pripažintuose tarptautiniuose žurnaluose.

3. Įtraukti studentus į tyrimų ir plėtros projektus fakulteto lygmenyje bei didinti studijų tarptautiškumą per *Erasmus* programą.

4. Atnaujinti ir papildyti studijų modulių literatūros sąrašus bei atnaujinti mikrovaldiklių ir jų programavimo studijų modulius, kad jie atitiktų dabartinį magistro studijų lygį.

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