STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

Vilniaus universiteto

TELEKOMUNIKACIJŲ FIZIKOS IR ELEKTRONIKOS STUDIJŲ PROGRAMOS (62401T201, 621H61001)

VERTINIMO IŠVADOS

EVALUATION REPORT

OF *TELECOMMUNICATIONS PHYSICS AND ELECTRONICS* (62401T201, 621H61001)

STUDY PROGRAMME

at Vilnius University

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Išvados parengtos anglų kalba
Report language - English

Vilnius
2012

DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	***Telekomunikacijų fizika ir elektronika***
Valstybiniai kodai	62401T201, 621H61001
Studijų sritis	Technologijos mokslų
Studijų kryptis	Elektronikos inžinerija, Elektronikos ir elektros inžinerija
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Antroji
Studijų forma (trukmė metais)	Nuolatinė (2)
Studijų programos apimtis kreditais	120
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Elektronikos inžinerijos magistras
Studijų programos įregistravimo data	2007-02-19 Nr. 225

INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	***Telecommunications Physics and Electronics***
State code	62401T201, 621H61001
Study area	Technological Sciences
Study field	Electronic and Electrical Engineering
Kind of the study programme	University Studies
Study Cycle	Second
Study mode (length in years)	Full-time (2)
Volume of the study programme in credits	120
Degree and (or) professional qualifications awarded	Master of Electronic Engineering
Date of registration of the study programme	2007-02-19 Nr. 225

CONTENTS

I. INTRODUCTION

An external evaluation of the Telecommunication Physics and Electronics study programme at Vilnius University, has been conducted by an international expert group consisting of Prof. Dr. Palle Jeppesen (leader of the group), Prof. Dr. Igor Kabashkin, Prof. Dr. Luis Torres, Mr. Edvardas Linkevičius and Mr. Andrius Kučinskas. The group performed an on-line analysis of the self-evaluation report before the visit, and held meetings during the visit with the administrative staff of the Faculty of Telecommunications and Electronics, the workgroup in charge of the preparation of the self-evaluation report, teaching staff and students of the study programme, as well as with recent graduates and employers.

The Centre of the Studies Quality Assessment (SQAC) conducted a first official external evaluation of the Telecommunications Physics and Electronics study programme in 2003 whose outcome was made available to the international expert group. No further external evaluation has been carried out since then.

The main objectives of the international expert group have been to assess the information provided in the self-evaluation report, as well as to gather more facts and evidences in the on-site visit in order to perform a fair evaluation of the programme.

The international expert group would like to acknowledge the help and all facilities provided by the various Departments of the Faculty of Physics to perform the evaluation. The international expert group would like to acknowledge as well all the effort made by Centre for Quality Assessment in Higher Education and in particular Mr. Pranas Stankus who has allowed a very smooth evaluation process.

II. PROGRAMME ANALYSIS

1. Programme aims and learning outcomes

Telecommunication Physics and Electronics study programme has been developing for more than 50 years in VU when in 1961 the first graduates of “Radiophysics and Electronics” specialty finished at Vilnius University. In 1995 the name of “Radiophysics and Electronics” study programme was changed to “Telecommunications Physics and Electronics” and it has retained this name to this day.

During the assessment in 2003 it was noted that the programme was overloaded with study course units, too much attention was given to physics, too little to optics, and no management and economics training was provided. These observations are taken into account in the present programme, and significant changes have been made. 14 course units have been taken out of the programme, and only 6 new course units were introduced. Furthermore, the majority of the course units were revised.

The aims and learning outcomes of the Telecommunications Physics and Electronics study programme were established according to Dublin Descriptors, according to the decision No. 535 of May 4, 2010 of the Government of the Republic of Lithuania “On Approval of the Description of Lithuanian Qualifications Structure”, and according to the decree No. V-2212 of November 21, 2011 of the Minister of Education and Science of the Republic of Lithuania “On Approval of the Description of Study Cycles”.

The overall aims are:

- Competences directly related to the application of achievements in physics and mathematics in the fields of telecommunications and electronics;
- Knowledge of contemporary devices and systems within telecommunications and electronic engineering and the ability to construct systems;
- Comprehension of the contemporary global telecom spectrum allocation, planning and electromagnetic alignment of radio systems;
- Knowledge of the scientific and technological achievements, which are applied now or will be applied soon in telecommunications and electronics.

The learning outcomes focus on deeper understanding of the functioning principles of engineering equipment and the use of natural laws and mathematical relations to solve engineering problems. The main learning outcome is the ability to renew and extend knowledge and to apply it in the quickly changing electronics and telecommunications fields. In the list of specific learning outcomes are mentioned chaotic and fractal phenomena and ferroelectric and ionic capabilities. Theses subjects seem only remotely related to telecommunications and electronics and their place in the programme may be reconsidered.

The programme aims and learning outcomes are all clearly defined, and they are to a large extent consistent with the type and level of studies and the level of qualifications offered. They are also publicly accessible in Lithuanian and English on the University’s web pages.

However, the name of the programme (Telecommunications Physics and Electronics) does not exactly match the content or the qualifications the candidates are intended to achieve. It is not clear what is understood by Telecommunications Physics, and it is not clear whether the emphasis is put on Telecommunications, Physics or Electronics. Furthermore, there is a

contradiction between the name Telecommunications Physics and Electronics on one hand and on the other hand the names Electronic Engineering of the study field and Master of Electronic Engineering of the qualification degree. It should be attempted to find a more appropriate name for the programme.

No comprehensive or systematic study is reported in the SAR on the needs for candidates in the public or private sectors, neither in Lithuania nor in Europe or the rest of the world. However, from the meeting with alumni's and leaders from Lithuanian companies the expert group understood that employers are satisfied with the new candidates they employ. This is because of their broad theoretical background that allows them to learn new subjects quickly. On the other hand it was mentioned that their practical skills were more limited compared to candidates from certain other Universities. Some indications and visions about the future needs for candidates in the Lithuanian, European and global labour market including developing countries could be helpful for developing the programme in the mid-term future.

2. Curriculum design

The curriculum design of the Telecommunications Physics and Electronics Bachelor study programme is based on 120 credits and normalized to 2 years. The curriculum design meets all legal requirements. Theoretical and practical teaching according to the course schedule is implemented. Study programme is in general coherent but some remarks would need to be taken into account as noted in the following.

It is appreciated that the course Optoelectronics in Telecommunications has been updated and that the new course Nanoelectronics has been added to the programme. However, the courses Ferroelectrics - Future Materials of Information Technology, Fractal and Chaotic Dynamics, Ionics take as much as 15 credits; as hinted above the relevance of these courses in a Telecommunications Physics and Electronics study seems questionable and may be reconsidered.

Course titles such as Wireless Communications, Optical Communications, Photonics, Nanophotonics, Multimedia Communications could make the entire study more attractive. More courses on these subjects may give an added value to the programme and at least the first-mentioned four subjects offer amble opportunities for including device physics. In addition, an elective course is offered in the first semester which seems too early. No other elective courses are offered during the programme. One elective course in total seems too few. It might be appropriate to have the elective courses in the second year and to broaden the possible options.

As to the teaching methods, unfortunately no active use of electronic learning systems was reported or demonstrated.

Judging from a number of theses provided for evaluationthe programme cannot be said to reflect the latest achievements in science and technologies. To achieve such a demanding goal much more international research activities would have to form the basis for the thesis work; the expert group recognizes this would entail some serious economic challenges.

3. Staff

The staff of 16 teachers of the Faculty of Physics and other faculties work with the Telecommunications Physics and Electronics second cycle study programme students: 12 doctors and 4 habilitated doctors, 5 of them are full-time professors, 9 full-time associated professors and 1 part-time associated professor, 1 lector. This composition of the staff assures a high academic level.

Practical work experience of the teachers is approximately 31 years, teaching experience – 16 years. According to general requirements (the decree No. V-826 of June 3, 2010 of the Minister of Science and Education of the Republic of Lithuania), no less than half of the study field course units have to be delivered by researchers. In the present programme, all teachers of the study field course units have scientific degrees.

Only staff of the Faculty of Physics are involved in the study process. Lectures are delivered by habilitated doctors professors or doctors associated professors.

The staff providing the programme meets the legal requirements.

In advanced courses it should be considered to have young researchers giving a few lectures on their field of speciality in order to present examples of the research front to the students and in this way stimulate the students' interest for research.

The teachers also carry out research work, as well as work on projects of Lithuanian Academy of Science and various international projects. About 12 teachers have worked and are still working in projects since 2007. However, the level of research involvement should be enhanced. 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 younger teachers. Nonetheless, the experience and qualifications of the teaching staff are adequate to ensure the learning outcomes.

One full-time teacher works with 7.4 students of Telecommunications Physics and Electronics study programme. This student/teacher ratio is very favourable and is adequate to ensure the learning outcomes.

The average age of the teachers who work in Telecommunications Physics and Electronics study programme has been 53 years during the last five years. In the future this average age is likely to increase, one reason being that few Doctoral candidates stay in or return to VU to teach because of the low salary level compared to the private sector or foreign countries. This problem should be counteracted by making research and teaching at VU more prestigious and attractive, for example by winning more research projects that could allow salary increases to project leaders and in general a better research environment.

In the international mobility area, the staff has opportunities to go to other international Universities. Four teachers had internships in foreign research and study institutions during the last 5 years. The level of international mobility is rather limited and threatens the international vision of the staff and of the University in general and should be improved.

It is appreciated Doctoral students of various departments also work with master students. Together with experienced teachers they deliver laboratory work, and thus transfer their practical knowledge to the students and also receive teaching skills.

The faculty has teachers who deliver their lectures in English. The choice, however, is very limited so far. The teachers are not confident enough to teach in English and it is claimed they lack economic stimulus to teach in a foreign language. In case of the younger staff, however, the University should ensure a mindset that makes it natural to teach in English independent of economic incentives. A long-term vision could be that all Master courses are taught in English. This would make it easier to attract foreign students and Lithuanian students would get a better command of English.

4. Facilities and learning resources

The space allocated to each student and the corresponding studying conditions seem sufficient both in their size and quality to assure a comfortable learning environment. Also good lab facilities including modern equipment were found in many cases. In particular there was an impressive selection of newer Cisco routers and switches available for student exercises and projects. However, although it is completely understood that the latest equipment may not be updated constantly for economic reasons, some laboratories were found outdated with regard to the state of the art in Telecommunications; especially fiber-optic equipment turned out to be rather limited and with great need to be expanded and updated.

It is pointed out in the self-evaluation report that the load on laboratories is huge and that the problems of equipment accessibility therefore are solved by working in shifts. Although such efficient use of the laboratories is appreciated it indicates there is a lack of education laboratory equipment for some subjects. This hinders the implementation of the students' practical training programme.

On the very positive side, the Department has signed cooperation agreements with an impressive list of companies. For example, establishment of the new Telecommunications Science Center, Cisco Academy and the planned new programming laboratory for smart phones, Huawei Authorized Network Academy, all seem very promising both from a research and an educational point of view.

Almost all textbooks are in Lithuanian which indicates a good involvement of national faculty in the field. However, 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 Telecommunication area. Secondly, the students would be exposed to all technical English terms in the field which would offer additional skills, as all the updated literature is in English.

The students carry out their placement in various organizations including labs at VU. In the self-evaluation report a considerable list is provided of organizations where the placements have taken place in recent years; this is very positive, VU should strive at having most of the placements outside VU in order to give the students the opportunity to become familiar with working in a company.

Concerning placement in companies it is reported in the SAR that only few companies want to receive students for placement because the companies are burdened with legal formalities. The University should formulate standard contracts that in a fair and balanced manner cover issues like confidentiality, intellectual property rights and publication rights.

Library facilities are very good; students have access to a great variety of books, journals, different teaching materials and databanks including the important IEEE (Institute of Electrical and Electronic Engineers) journals; access is possible both physical or via the Internet. The new building for the VU library will be opened in February 2013. Modern facilities and wide access to hard copy books and digital libraries of leading publishers will give new perfect opportunities for students and teachers for study and research activities.

5. Study process and student assessment

Persons who graduate in the first cycle physical, technological and biomedical university studies and possess a bachelor‘s qualification degree of these research areas are admitted to the second cycle Telecommunications Physics and Electronics study programme. Persons who graduate in other research areas need to attend introductory courses of the study programme and to present a thesis on the topic of physical or technological research areas. Applicants are rated according to their competition scores. Information for the competition score is taken from the diploma and its supplement. The competition score is formed from the results in General Physics, Higher Mathematics, Quantum Mechanics, Statistical Physics, entrance examination, additional scores for research production, and assessment of Bachelor thesis. The admission requirements are well-founded.

The number of applicants is around 40 and about 16-20 are admitted. According to the SAR studies at Vilnius University are quite hard; therefore students who lack strong motivation give up and leave their studies. Around 75% of admitted students successfully graduate from the programme; this is a very good percentage. The organization of the study process ensures an adequate provision of the programme and the achievement of the learning outcomes. However, the addition of some more related Telecommunication courses at the expense of some other courses as explained in the curriculum design section, would be more beneficial for the achievement of the learning outcomes.

Students are actively engaged in research activities and in writing corresponding research publications together with their supervisor. In 2011 there were 7 publications in journals with impact factor or in other reviewed journals. There were also presentations at national and international conferences and at an international student‘s scientific conference. Sometimes up to 50% of the students continue their studies towards a doctor’s degree at Vilnius University or some other University. All this is very positive.

Students have the opportunity to participate in international mobility programmes. However, as explained in the self-evaluation report and confirmed on the site-visit, the number of participating students is very limited. A survey among students suggests a few reasons. Most students claim they receive a good education at VU and think that Erasmus studies will make it difficult for them to catch up when they return to VU. The reasons for the small number of incoming students could be lack of publicity. Whatever the reasons, actions should be taken by the Faculty of Physics and its deparments to promote these international exchanges. Particular actions could be to increase the student’s stipend, or the Faculty budget, needed to cover travel and living expenses and to increase the number of international institutions involved in the mobility plan. In addition, some additional effort to advertise more intensively the Erasmus programme and the advantages of going abroad would be very useful for the students.

According to surveys the need for graduates of Telecommunications Physics and Electronics study programme is not going down and the graduates are received well by the companies. About 71% of the employers evaluate the qualifications of most graduates of the

programme as good or very good. The graduates when evaluating their preparedness for the labour market stress that at the beginning they lack practical skills, but they can learn new subjects quickly because of their good fundamental education. These opinions were confirmed in the meetings with employers and former students. Data on the employment or further studies of graduates have been registered. All graduates of 2009 found a job related to their studies; 2/3 of graduates of 2010 found a job related to their studies, 1/3 did not which is unfortunate but probably due to the difficult economic times. All in all, the professional activities of the majority of graduates meet the programme providers' expectations.

From meetings with the teachers and students the expert team got the impression that the communication between Faculty and students is informal and constructive. The expert group also appreciates that VU has planned to organize seminars delivered by experts from the telecommunication companies in order to introduce students to state-of-the-art telecommunication technologies and the professional life in a company. This in turn will help students make informed decisions about their further study and future job. Furthermore, VU offers a number of extra-curriculum activities such as choirs, instrument music bands and theatres where students can be involved independently. Finally, student events are supported financially and sports equipment is being purchased although for a modest sum. All in all, VU ensures an adequate level of academic and social support.

The students' achievement assessment criteria are made public at the beginning of the semester: during the first lecture, the lecturer introduces students to the study subject, purpose, themes, the individual work schedule of tasks and their impact on the final grade. The study programmes and their constituent subjects with the detailed descriptions of the purpose and the acquired knowledge and skills as well as evaluation and accreditation standards have been fully accessible to the students in the University's website since the beginning of January, 2009. In this context, the assessment system of students’ performance is clear, adequate and publicly available.

6. Programme management

The study programme is managed by the Study Programme Committee, which is formed from the departments of the Faculty of Physics, students’ self-government and representatives of social partners. The Study Programme Committee approves course unit descriptions approved in the department meetings, proposes to the Faculty Council to approve the changes in the programme or changes in the admission procedures. The heads of the department inform the Study Programme Committee about the shortcomings in the programme and possible ways of solution. The head of the department is in charge of the quality of course units related to the profile of the department and the study course of these course units. The course of the study programme is administered by the dean’s office, i.e. the dean and the vice-dean for academic issues. Programme administration issues are discussed in weekly meetings in the dean’s office. Hence, responsibilities for decisions and monitoring of the implementation of the programme are clearly allocated.

The dean’s office receives information about problems of the programme from students’ self-governance representatives. Surveys are organized to help to get feedback. The organization of surveys has changed; previously, surveys were organized for several course units in the form of paper questionnaires. Since the spring semester of 2008-2009 students are surveyed online after each semester. These surveys are organized by VU Quality Management Centre. The participation in the survey is obligatory. VU Quality Management Centre also organizes surveys about specific course units. The main goal of the survey is to provide conditions for every

student to express his/her opinion about the subject studied, and for teachers to get introduced to survey results and to improve their course units according to reasoned expectations of students. Every teacher can access his data base in the VU information system and find information about students' feedback of every course unit delivered in the "Surveys" field. The faculty administration is also introduced to survey results about the work of teachers; and the administration takes the opinion of students into account when evaluating teacher's performance. In this way information and data on the implementation of the programme are regularly collected and analysed and the outcomes of this internal evaluation are used to improve the programme. The internal quality assurance measures are effective and efficient.

As to external evaluation VU often receives informal feedback from companies, but no formal series of meetings dedicated to the feedback process is reported in the SAR beyond the fact that social partners are represented in the Study Programme Committee as mentioned above.

Students' satisfaction with the study programme is systematically monitored via questionnaires, although there is lack of participation in the quality assurance process. A very limited number of students are participating in the evaluation process of the programme and the teaching staff. The main reason presented by the students is the lack of confidence in the anonymity of the process. Adequate measures should be taken to assure this anonymity and to convince the students to participate in the process.

More than half of the students are satisfied with the Telecommunications Physics and Electronics study programme but some students have expressed dissatisfaction. This, it is stated in the SAR, can be partly related to the staff's orientation towards research rather than teaching activity. Therefore VU should encourage teachers' educational work – but without jeopardizing the teachers' motivation for research because a high research level is very important for research based courses and high quality thesis work.

In the assessment report no explicit vision is apparent for the future development of the program. Such a vision should be developed.

III. RECOMMENDATIONS

Programme aims and learning outcomes

1. Consider to find a more appropriate title for the Telecommunications Physics and Electronics programme.
2. Take into account the global need for candidates beyond the European perspective.
3. Take into account the needs of the possible labour market in emerging countries.
4. Take into account the research needs in both the Lithuanian and European context.

Curriculum design

1. Consider reductions in the courses Ferroelectrics - Future Materials of Information Technology, Fractal and Chaotic Dynamics and Ionics to make room for courses with titles such as Wireless Communications, Photonics, Nanophotonics, Optical Communications and Multimedia Communications.
2. A vision for the future development of the programme should be established.
3. It would be very advantageous if more international research activities formed the basis for the programme.

Staff

1. Strong efforts should be made to enhance the involvement of faculty staff in stays in international universities and research institutions.
2. Strong efforts should be made to enhance the involvement of faculty staff in cutting edge research activities.
3. In advanced courses consider to have young researchers give a few lectures on their field of speciality.
4. Strong efforts should be made to improve teachers' educational work without jeopardizing their motivation for high-quality research.
5. Strong efforts should be made to keep young doctoral candidates teaching at VU or to rehire them after stays at foreign Universities.
6. In case of the younger staff, the University should ensure a mindset that makes it natural to teach in English; a long-term vision could be that all Master courses are taught in English.

Facilities and learning resources

1. Strong efforts should be made to have the latest equipment in the laboratories. Especially the fiber-optic equipment needs to be improved.
2. Efforts should be made to increase the number of English textbooks to be used in the courses.

Study process and student assessment

1. Efforts should be made to strengthen the involvement of students in staff research activities.
2. Strong efforts should be made to strengthen the involvement of students in international mobility programmes.

Programme management

1. Adequate measures should be taken to increase the participation of students in the course evaluation process.
2. Adequate measures should be taken to involve the companies more directly in the programme management.

IV. SUMMARY

Programme aims and learning outcomes

The most important programme aims are the development of competences related to applications of physics and mathematics in the fields of telecommunications and electronics. The learning outcomes focus on deeper understanding of the functioning principles of engineering equipment and the use of natural laws and mathematical relations to solve engineering problems. The main learning outcome is the ability to renew and extend knowledge to adapt to the quickly changing electronics and telecommunications fields.

The programme aims and learning outcomes are all clearly defined and consistent with the type and level of studies and the level of qualifications offered. They are also publicly accessible. Employers are satisfied with the candidates because of their broad theoretical background that allows them to learn new subjects quickly. On the other hand their practical skills are more limited when they start their professional carrier. Visions for the future needs for candidates in the Lithuanian, European and global labour market including developing countries could be helpful and should be established.

Curriculum design

The curriculum meets all legal requirements and is in general coherent but some improvements can be suggested. The courses Ferroelectrics - Future Materials of Information Technology, Fractal and Chaotic Dynamics and Ionics take as much as 15 credits; this may be reduced in favor of courses with titles such as Wireless Communications, Optical Communications, Photonics, Nanophotonics, Multimedia Communications. The first-mentioned four titles offer amble opportunities for including device physics. Furthermore, the programme should be more based on international cutting edge research activities and a vision for the future development of the program should be developed.

Teaching staff

The staff has a good academic level, considerable teaching experience and it meets the legal requirements. More than half of the teachers work on national or international projects; the level of involvement in high quality international research should be increased. The student/teacher ratio is 7.4 which is very favourable and adequate to ensure the learning outcomes. Few teachers had internships in foreign research and study institutions during the last 5 years. The level of international mobility should be improved. The faculty has teachers who deliver their lectures in English, however more teachers should be encouraged to do so.

Facilities and learning resources

Very Good lab facilities including modern equipment were found in many cases. In particular there was an impressive selection of newer Cisco routers and switches. However, some laboratories were found outdated; especially fiber-optic equipment turned out to be rather limited and with great need to be expanded and updated. On the very positive side, the Department has signed cooperation agreements with an impressive list of companies. For example, establishment of the new Telecommunications Science Center, Cisco Academy and the planned new programming laboratory for smart phones, Huawei Authorized Network Academy, all seem very promising.

Almost all textbooks are in Lithuanian which indicates a good involvement of national faculty in the field. However, more English textbooks should be used. Library facilities are very good; students have access to a great variety of books, journals, different teaching materials and databanks including the important IEEE (Institute of Electrical and Electronic Engineers) journals; access is possible both physical or via the Internet

Study process and students' performance assessment

Persons who graduate in the first cycle physical, technological and biomedical university studies and possess a bachelor‘s qualification degree of these research areas are admitted to the study programme. Persons who graduate in other research areas need to attend introductory courses of the study programme and to present a thesis on the topic of physical or technological research areas. Applicants are rated according to their competition scores. Information for the competition score is taken from the diploma and its supplement. The competition score is formed from the results in General Physics, Higher Mathematics, Quantum Mechanics, Statistical Physics, entrance examination, additional scores for research production, and assessment of Bachelor thesis. The admission requirements are well-founded.

The number of applicants is around 40 and about 16-20 are admitted. Around 75% of admitted students successfully graduate from the programme; this is a satisfactory percentage. The organization of the study process ensures an adequate provision of the programme and the achievement of the learning outcomes.

Students have the opportunity to participate in international mobility programmes. Unfortunately, the number of participating students is very limited and should be increased. The students' achievement assessment criteria are made public at the beginning of the semester and the assessment system of students’ performance is clear, adequate and also publicly available.

Programme management

The study programme is managed by the Study Programme Committee. Responsibilities for decisions and monitoring of the implementation of the programme are clearly allocated.

The dean’s office receives information about problems of the programme from students’ self-governance representatives. Students are surveyed online after each semester; the surveys are organized by VU Quality Management Centre. The participation in the survey is obligatory. VU Quality Management Centre organizes surveys about specific course units. The data are regularly collected and analysed and the outcomes are used to improve the programme. The internal quality assurance measures are effective and efficient. As to external evaluation VU often receives informal feedback from companies.

Students’ satisfaction with the study programme is systematically monitored via questionnaires, although the participation in the process is too low and should be improved. More than half of the students are satisfied with the programme but some students have expressed dissatisfaction. This, according to the SAR, can be partly related to the staff’s orientation towards research rather than teaching activity. If possible, the University should encourage teachers’ educational work without jeopardizing their motivation for research.

V. GENERAL ASSESSMENT

The study programme *Telecommunications Physics and Electronics* (state codes – 62401T201, 621H61001) at Vilnius 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	3
2.	Curriculum design	3
3.	Staff	3
4.	Material resources	4
5.	Study process and assessment (student admission, study process, student support, achievement assessment)	4
6.	Programme management (programme administration, internal quality assurance)	3
	Total:	**20**

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

Grupės vadovas: Team leader:	Prof.dr. Palle Jeppesen
Grupės nariai: Team members:	Prof.dr. Igor Kabashkin
	Prof.dr. Luis Torres
	Mr. Edvardas Linkevičius
	Mr. Andrius Kučinskas

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V. APIBENDRINAMASIS ĮVERTINIMAS

Vilniaus universiteto studijų programa *Telekomunikacijų fizika ir elektronika* (valstybinis kodas – 62401T201, 621H61001) 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

Programos tikslai ir studijų rezultatai

Svarbiausi programos tikslai yra gebėjimų, susijusių su fizikos ir matematikos žinių taikymu telekomunikacijų ir elektronikos srityse, kūrimas. Mokymosi rezultatai koncentruojasi ties gilesniu supratimu inžinerinės įrangos funkcinių principų ir gamtos dėsnių ir matematinių santykių naudojimu sprendžiant inžinerines problemas. Pagrindinis mokymosi rezultatas yra gebėjimas atnaujinti ir plėsti žinias, siekiant prisitaikyti prie greitai kintančių elektronikos ir telekomunikacijų sričių.

Programos tikslai ir studijų rezultatai yra visi aiškiai apibrėžti ir atitinka studijų rūšį ir lygį ir siūlomų kvalifikacijų lygį. Jie taip pat viešai paskelbti. Darbdaviai patenkinti absolventais dėl jų plataus spektro teorinio išsilavinimo, kurio dėka jie greitai išmoksta naujus dalykus. Iš kitos pusės, jų praktiniai įgūdžiai yra ribotesni jų profesinės karjeros pradžioje. Numatymas būsimų poreikių absolventams Lietuvos, Europos ir pasaulinėje darbo rinkoje, įskaitant besivystančias šalis, galėtų būti naudingas ir turėtų būti vykdomas.

Studijų turinio struktūra

Studijų turinys atitinka visus teisinius reikalavimus ir iš esmės yra nuoseklus, tačiau gali būtų pasiūlyti keletą patobulinimų. Kursai: Segnetolektra - informacinės technologijos ateities medžiagos, Fraktalinė ir chaotiška dinamika ir Jonika turi net 15 kreditų; šis skaičius galėtų būti

sumažintas, daugiau laiko suteikiant tokiems dalykams, kaip Belaidės komunikacijos, Optinės komunikacijos, Fotonika, Nanofotonika, Multimedijos komunikacijos. Pirmi keturi dalykai suteikia plačias galimybes prietaisų fizikos įtraukimui. Be to, programa turėtų labiau remtis tarptautine pažangiausia mokslinių tyrimų veikla ir reikėtų sukurti programos tolesnio vystymo viziją.

Pedagoginis personalas

Personalas pasižymi geru akademiniu lygiu, didele pedagogine patirtimi ir tenkina teisinius reikalavimus. Daugiau nei pusė dėstytojų dalyvauja nacionaliniuose ar tarptautiniuose projektuose; dalyvavimo aukšto lygio tarptautiniuose moksliniuose tyrimuose lygis turėtų būti didinamas. Studento/dėstytojo santykis yra 7.4, kuris yra labai teigiamas ir deramas studijų rezultatų pasiekimui užtikrinti. Vos keletas dėstytojų stažavosi užsienio tyrimų ir studijų institucijose per pastaruosius 5 metus. Šis tarptautinio mobilumo lygis turėtų būti pagerintas. Fakultete dirba pedagogai, dėstantys savo paskaitas anglų kalba, tačiau daugiau dėstytojų turėtų būti skatinami tai daryti.

Priemonės ir mokymosi ištekliai

Labai geros laboratorijos priemonės, įskaitant šiuolaikišką įrangą daugeliu atvejų. Pažymėtinas įspūdingas naujesnių Cisco maršrutizatorių ir perjungiklių rinkinys. Tačiau pastebėjome, kad kai kuriose laboratorijose įranga yra pasenusi; ypatingai optinio pluošto įranga buvo ganėtinai ribota ir privalo būti praplėsta ir atnaujinta. Labai pagirtina, kad Katedra pasirašė bendradarbiavimo sutartis su įspūdingu sąrašų įmonių. Pavyzdžiui, naujojo Telekomunikacijų mokslo centro, Cisco akademijos įsteigimas ir planuojama nauja programavimo laboratorija išmaniesiems telefonams, Huawei įgalioto tinklo akademija, visa tai skamba labai daug žadančiai.

Beveik visi vadovėliai yra lietuvių kalba, kas rodo aktyvų dalyvavimą nacionalinio fakulteto personalo šioje srityje. Tačiau reikėtų naudoti daugiau angliškų vadovėlių. Bibliotekos infrastruktūra yra labai gera; studentai gali rasti didelę įvairovę knygų, žurnalų, įvairios mokymo medžiagos ir duomenų bankų, įskaitant svarbius IEEE (Elektros ir elektronikos inžinerijos instituto) leidžiamus žurnalus; visa tai prieinama tiek fiziškai, tiek per internetą.

Studijų procesas ir studentų vertinimas

Asmenys, baigę pirmos pakopos fizikos, technologijų ir biomedicinos universiteto studijas ir įgiję bakalauro kvalifikacinį laipsnį minėtose tyrimų srityse, priimami į studijų programą. Kitų mokslinių tyrimų sričių absolventai privalo išklausyti studijų programos įžanginius kursus ir pateikti darbą fizinių ir technologinių mokslinių tyrimų srities tema. Stojantieji vertinami pagal jų konkursinius balus. Informacija apie konkursinį balą gaunama iš diplomo ir jo priedo. Konkursinį balą sudaro Bendrosios fizikos, Aukštosios matematikos, Kvantinės mechanikos, Statistinės fizikos rezultatai, stojamasis egzaminas, papildomi taškai už mokslinio tyrimo darbą, bakalauro darbo įvertinimas. Studentų priėmimo reikalavimai yra gerai pagrįsti.

Stojančiųjų skaičius yra apie 40, o priimama 16-20 studentų. Apie 75 procentai priimtų studentų sėkmingai baigia programą; tai yra patenkinamas procentas. Studijų proceso organizavimas užtikrina reikiamą programos išdėstymą ir studijų rezultatų pasiekimą.

Studentai turi galimybę dalyvauti tarptautinėse mobilumo programose. Deja jose dalyvaujančių studentų skaičius yra labai mažas ir turėtų būti didinamas. Studentų pažangos

vertinimo kriterijai yra viešai skelbiami semestro pradžioje ir studentų pažangos vertinimo sistema yra aiški, tinkama ir taipogi viešai prieinama.

Programos valdymas

Studijų programai vadovauja Studijų programos komitetas. Atsakomybės už programos vykdymo sprendimus ir kontrolę yra aiškiai paskirstytos.

Dekanatas gauna informaciją apie programos problemas iš studentų savivaldos atstovų. Kiekvienam semestrui pasibaigus studentai apklausiami internetu; apklausas organizuoja VU Kokybės valdymo centras. Dalyvavimas apklausoje yra privalomas. VU Kokybės valdymo centras rengia apklausas apie konkrečius kurso vienetus. Duomenys reguliariai renkami ir analizuojami, o gautos išvados naudojamos programai tobulinti. Vidaus kokybės užtikrinim priemonės yra veiksmingos ir efektyvios. Kalbant apie nepriklausomą vertinimą, VU dažnai gauna informatyvius komentarus iš įmonių.

Klausimynų pagalba sistemingai tikrinama, ar studentai patenkinti studijų programą, nors dalyvavimas šiame procese yra per lėtas ir reikalauja patobulinimo. Daugiau nei pusė studentų patenkinti programa, tačiau kai kurie studentai išreiškė nepasitenkinimą. Tai, pasak SAR, gali būti dalinai susiję su personalo orientavimusi į mokslinius tyrimus, o ne pedagoginę veiklą. Jei įmanoma, Universitetas turėtų skatinti dėstytojus užsiimti pedagogine veikla, nepakenkiant jų motyvacijai vykdyti mokslinius tyrimus.

III. REKOMENDACIJOS

Programos tikslai ir studijų rezultatai

1. Pabandyti sugalvoti tinkamesnį pavadinimą Telekomunikacijų fizikos ir elektronikos programai.
2. Atsižvelgti į pasaulinį poreikį absolventams už Europos ribų.
3. Atsižvelgti į galimos darbo rinkos poreikius besivystančiose šalyse.
4. Atsižvelgti į tyrimų poreikius tiek Lietuvos, tiek Europos kontekste.

Studijų turinio struktūra

1. Apsvarstyti galimybę mažinti tokius kursus, kaip Segnetolektra - informacinės technologijos ateities medžiagos, Fraktalinė ir chaotiška dinamika ir Jonika, kad daugiau laiko galima būtų skirti tokiems kursams, kaip Belaidės komunikacijos, Fotonika, Nanofotonika, Optinės komunikacijos ir Multimedijos komunikacijos.
2. Reikėtų nustatyti būsimo programos vystymo viziją.
3. Būtų labai pažangu, jei daugiau tarptautinių mokslinių tyrimų veiklos sudarytų programos pagrindą.

Personalas

1. Reikėtų stipriai pasistengti, kad fakulteto personalas vyktų į tarptautinius universitetus ir tyrimų institucijas.

2. Reikėtų dėti dideles pastangas, kad fakulteto personalas aktyviau dalyvautų pažangiausių mokslinių tyrimų veikloje.
3. Apgalvokite galimybę leisti jauniems tyrėjams išdėstyti keletą paskaitų jų specialybės srityje pažengusio lygio kursų studentams.
4. Reikėtų dėti dideles pastangas, siekiant patobulinti dėstytojų pedagoginį darbą, nedarant žalos jų motyvacijai dalyvauti aukštos kokybės moksliniuose tyrimuose.
5. Reikėtų dėti dideles pastangas, siekiant išlaikyti jaunus doktorantus, kad šie dėstytų VU arba vėl juos pasamdyti, šiems grįžus iš užsienio universitetų.
6. Jaunesnio personalo atveju, Universitetas turėtų užtikrinti tokią mąstyseną, kad dėstyti anglų kalba yra natūralu; ilgalaikė vizija galėtų būti visų magistrantūros kursų dėstymas anglų kalba.

Priemonės ir mokymosi ištekliai

1. Reikėtų dėti dideles pastangas, kad laboratorijos būtų aprūpintos naujausia įranga. Ypatingai, šviesolaidžio įranga reikalauja atnaujinimo.
2. Reikėtų pasistengti padidinti kursų metu naudojamų angliškų vadovėlių kiekį.

Studijų procesas ir studentų vertinimas

1. Reikėtų dėti pastangas, siekiant stiprinti studentų dalyvavimą tarptautinėse mobilumo programose.
2. Reikėtų dėti dideles pastangas, siekiant stiprinti studentų dalyvavimą tarptautinėse mobilumo programose.

Programos valdymas

1. Reikėtų imtis tinkamų priemonių, siekiant sustiprinti studentų dalyvavimą kurso vertinimo procese.
2. Reikėtų imtis tinkamų priemonių, kad verslo įmonės aktyviau dalyvautų programos valdyme.