



STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

KAUNO TECHNOLOGIJOS UNIVERSITETO
STUDIJŲ PROGRAMOS *Robotika* (612H67001)
VERTINIMO IŠVADOS

EVALUATION REPORT
OF *ROBOTICS* (612H67001)
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	<i>Robotika</i>
Valstybinis kodas	612H67001
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	Robotikos ir kibernetikos bakalauras
Studijų programos įregistravimo data	2011-03-10 LR ŠM Ministro įsakymas Nr.SR-990

INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	<i>Robotics</i>
State code	612H67001
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 of Robotics
Date of registration of the study programme	By order No.SR-990 of 10-03-2011 by Minister of Education and Science of the Republic of Lithuania

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CONTENTS

CONTENTS	3
I. INTRODUCTION.....	4
II. PROGRAMME ANALYSIS	5
1. Programme aims and learning outcomes.....	5
2. Curriculum design	6
3. Staff	8
4. Facilities and learning resources	9
5. Study process and student assessment.....	10
6. Programme management	11
III. RECOMMENDATIONS	13
IV. SUMMARY	Klaida! Žymelė neapibrėžta.
V. GENERAL ASSESSMENT	15

I. INTRODUCTION

The objective of this report is the evaluation of the “Robotics” study program (612H67001) taught at Kaunas University of Technology.

This is undergraduate (B.A.) programme. Kaunas University of Technology has long traditions of education and research in automation and robotics and the region is well known by the strong industrial background. Nowadays there are many fast developing companies and start-ups and necessity for production automation and especially for wider use of robots is growing both in the whole of Lithuania and in the EU. Developing the “Robotics” programme is in good accordance with the broadly recognized fact that wider use of robots is one of the key elements of increasing production efficiency. Therefore, the programme focuses on real and future oriented needs of the society.

The expert team visited Kaunas University of Technology on 25th February, reviewing the “Robotics” program. The following report is based on the SER provided by the Kaunas team well in advance on on-site discussions.

The following team carried out the evaluation: Prof. Dr. László T. Kóczy (team leader), Ass. Prof. Dr. Marios Kasinopoulos, Prof. Dr. Mart Tamre, Prof. Dr. Roma Rinkevičienė, Dr. Artūras Klementavičius and Gražvydas Jakaitis who all visited Kaunas University of Technology.

The experts observed that the programme under evaluation was started in 2011, thus, the first class of students has not yet graduated, neither have they started to work on their final thesis projects.

II. PROGRAMME ANALYSIS

1. Programme aims and learning outcomes

The programme aims and learning outcomes are well defined, clear and publicly accessible. Main aims of the Robotics study programme according to the SER are to provide electrical, electromechanical, electronics, automatic control, robots programming, modelling and control, image processing and pattern recognition knowledge, to develop their capacity to analyse and evaluate the application of robotic capabilities, select the robot hardware, software, modelling and design of robotic systems, knowledge of computer vision and robotics targeting systems to deal with the application of robotics production and social sector issues and to prepare for second level (master) studies.

It should be mentioned that the aims are discussed and well reasoned on the ground of the current situation in Robotics R&D tendencies all over the world and of the local situation both in the industrial sector and at the University itself. There are a number of large international and several local companies (or local representatives of mother companies) like Allen Bradley, SEW Eurodrive, Lenze, Omron, Danfoss, Siemens, and ABB which are active in the Robotics field. These are also represented in the laboratories in connection with this programme and are also collaborating with the staff members in various industrial development projects. Therefore, it is our strong belief that the aim of the programme deserves attention of these numerous companies and is right targeted. Although the involvement of the companies in the improvement of the programme and analysis of the learning outcomes could be stronger as only few stakeholders were aware about the programme specific learning outcomes. It is also worth mentioning that a reasonably good connection of the staff with some companies allows targeting real industrial needs. The EU programme Horizon2020 emphasizes the importance of Robotics in future production and service areas and therefore it could be foreseen increase of the need of this kind of specialist in coming years. The labour cost has been low in new EU states long time but it is increasing fast nowadays as we live in joined market area. Without wider use of robots and respective wider preparation of the specialists, it is hard to be successful. It could be concluded that the programme focuses on the rapid growing sector and the aims will come more valuable in some years. The estimation of the needs of robotic engineers in Lithuania “more than 20 specialists/year” (SER, page 22) seems to be underestimated.

Nevertheless, the experts observe that the programme might be too much specialised at this early phase of studies, and for the future it could be considered a merger with some related B.A. programmes where the Robotics could be one of the sub-specialisations. Several stakeholders present, representing robotics related companies have expressed their opinion of the

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Robotics specialisation being more reasonable at M.A. level, where several closely related B.A. graduates (Control Engineering, Mechatronics, etc.) could be admitted. This opinion is supported with the fact that there are only limited numbers of workplaces available for the Robotics B.A. students but higher demand for the wider background automation and control students that was confirmed by the stakeholders.

Nevertheless, this programme and the current name unambiguously attract the students, which fact is supported by the increasing number of admissions.

The SER provides a clear formulation of the learning outcomes, containing engineering analysis abilities and skills, engineering design skills, research abilities and engineering work abilities, further transferable personal skills. The formulation of the comprehensibility of the learning outcomes seems to be on good level.

The programme focuses more on preparing specialists with necessary knowledge and skills to serve and maintain robots in big factories and to design and control automated lines with robots. This is surely the production industry need and consistent with EU programmes Factory of the Future, etc. Abovementioned is also in good correlation with the programme level (B.A.). It could be foreseen that the specialists from the first level would like to have an option to continue towards deeper robotics. The relative low number of students might be a problem in longer term and we believe that companies' deeper involvement in communicating the speciality to secondary school students could be also in their interest. Considering that, the programme has only three years history the programme is very well balanced and the staff involvement and commitment is high. However currently it is impossible to assess the knowledge and skills of the graduates because the programme has run only three years and first graduates will only come in after a year.

A weakness, which is noted by the reviewers, is a rather high number (24) of learning outcomes. A more comprehensive and focused list would be more appropriate

2. Curriculum design

The overall curricular design of the program is very good and clearly satisfies the programme requirements. Subject and programme Learning Outcomes, content of subjects and laboratory equipment to support the subjects, are very appropriate and compatible with each other for the Robotics programme. However there is always room for improvement especially in Robotics which is a field of high technology with frequent changes.

The curriculum meets both EU and national legal requirements. There are missing references to and comparison with similar curricula in other EU countries. The courses are well balanced and

the learning outcomes are achievable and real. The structure of learning outcomes is good and well reasoned to achieve the total aim of the programme. The total volume of the academic and individual work hours of the study subjects and the respective volume of the individual study hours conform to the legal acts of the University Academic Regulations

Duration of the studies is 4 years in full-time (6 years in part-time) and workload is 240 credits. The programme contains 38 subjects in total. Five percent of the study programme is allocated for free elective courses. In order to permit the students to a deeper study of the field, core robotics related subjects (24 credits, 10%) are included into the programme. Therefore it could be noted that the main part of the programme has a common basis with electrical, electromechanical, automatic control programmes.

The following minor changes might further increase the quality of the programme: Economics is taught as the Micro- and Macroeconomics course and the Fundamentals of Management course, but there are few subjects on project management and entrepreneurship and eco-engineering, intellectual property law and other related topics becoming more and more important in the fast changing world. There were no references made in the SER, as well as in the laboratories to CAM and CNC programming was found and production related robotics is weakly represented. The subjects related to advanced and new robotics directions (service robotics, medicine and human related robotics, rehabilitation robotics, unmanned systems and robotics navigation, new robot sensing methods, etc.) could be better represented in the programme and the programme development in this direction could be appreciated by the students as well as by the companies.

Students mentioned about the Informatics subject covering only the basic programming languages not sufficient for solving more complex and advanced robot programming tasks. They can get however an extra instruction in these subjects upon request.

The expert team paid the special attention to the very good infrastructure of the laboratories of electric drives and control and to Festo laboratory and the up-to-date equipment mostly donated by sponsoring companies. The students have a good practical base in these laboratories for the courses and independent work, which assures the good outcome skills of the programme. The programme subjects related to industrial robots and developing robot programming skills for industrial robotics are quite weakly supported with the respective laboratories and seems to be more theory related. Worth to mention is also the motivated support staff for the laboratories, where the students can get all required practical assistance.

We found that the involvement of the companies in the curriculum design could be improved and there is a little feedback reaching the University in conjunction from with the programme from the stakeholders' side.

There is a compulsory practical training foreseen in the last semester, which has not yet been reached by any student and therefore the feedback from the practice is missing up to now.

3. Staff

The staff providing the study programme satisfy all qualification requirements as well as and the specialisations related to the subjects they teach. The qualification of teachers is relatively high and there are involved at the programme 38 lectures (8 full professors, 20 associate professors, 6 lecturers with doctor's degree and 4 other lecturers). Professors and associate professors dominate in giving the courses (they give more than 70% of the amount of the course hours). The teaching methods used, like power point presentations, tutorials, practical demonstrations etc, according to information provided by students are very appropriate and the relations between students and teachers are excellent. Teachers are always available to help students who unfortunately spent many hours working in various companies.

The staff mobility is good. Some teacher, in the framework of the Erasmus program, research projects and training courses visit various countries like Poland, Belarus, Germany, France, Turkey and some others. This is a significant strength for the program because the international educational and or research experience acquired by the staff can be beneficial not only for the staff but also for the students. It is strongly believed that this practice should be continued and improved and additional mobility should be achieved.

There is sufficient teaching and practical experience of the teachers, conforming to their respective positions. The programme is new (2.5 years old); therefore, the staff is still dynamically developing and forming. Good sign is that there are PhD students present at the Faculty, who might be considered as the future staff members. However the actual number of PhD students is quite insufficient for replacing all aging staff members. This problem points back to the university-industry collaboration which might also attract more young researchers.

Publications are in general at satisfactory level, considering this is a bachelor programme. Certain members of the staff are publishing their work in scientific journals and participate in international and local conferences. However, the intensity of overseas conference participation and publication in world leader scientific periodicals could be improved in time for professional development of the teaching staff. Recent international publications are quite few,

although there are some. The main reason is the availability of sufficient funding and time and this is a problem that has to be faced by the programme administration.

The same is the situation with the long term international research projects, although collaboration relations with the local industry seem good and strong. The staff did not complain about being overloaded, but our impression was that they had insufficient time for more research because of the teaching load.

4. Facilities and learning resources

The available laboratory base is strong in the PLC & control systems field. It is also sufficient in robotics as well, thus the programme aims and learning outcomes are achievable. General laboratories for the electrical engineering students are also of high quality. All of the laboratories are constantly monitored and can be only accessed by special magnetic cards or receiving permission. It must be noted that the establishment of laboratories specialized in pneumatic and electric automation was funded by the social partners Festo. Some of the laboratories are also training sites for the industry personnel and for continuing education courses provided by the international experts and the department staff in tight collaboration, which is a guarantee for the high standards. Interested students have almost unlimited access to the laboratories, even for the extracurricular activities. The robotics laboratory would benefit from acquiring more real industrial and service and mobile robots, rather than small size hobby and educational ones. Because of lack of funding, however, the Robotics programme students do not have access to various materials, parts, and workshop equipment they would like to use for their course or individual and often innovative privately motivated projects.

The experts found that the general picture of the computer classes and the equipment (and also the programming software which is used particularly for Robotics) is quite good. Also there is a clear strategy for further improvements and developments that are ongoing.

The number of computer workplaces in laboratories and for the individual work is sufficient for the available students on the programme; respective computer software licenses are present to perform general programming and simulating tasks for robots.

The laboratory of Robotics have also recently installed two ABB industrial robots IRB120 with full access from 8 PC based working places, 50 licenses of ROBOSudio for programming and simulation of robots work, also they acquired some mobile robots (KHEPERA, Koala, E-puck, Robotino).

The library offers electronic access to major scientific databases (e.g. IEEE Explore and Springer Link). However the stock of printed books and periodicals should be updated.

Opening hours are too restricted, students would like to use the library at late hours, maybe even 24 hours a day during the examination period. The experts understand that a new library building will be built soon, and the regulations of the library will be also changed. There are almost no books in the Lithuanian language, but lecture notes in Lithuanian are provided to the students.

A visible renovation of major parts of the faculty building has been carried out in connection with the recent merger of two faculties into one Faculty of Electrical and Control Engineering. At the same time common student areas called free zones have been established with seats and tables. The area is used as a common place for student project and companies presentations providing thus a nice opportunity for the dissemination of the learning outcomes.

5. Study process and student assessment

The admission requirements to the program are clearly explained, well founded, and based on the competition. They are reflected on the University web site. The structure of the academic year is conventional: with two semesters and two exam periods. The timetable is constructed for both students' and teachers' convenience. Reviewers feel concern about the number of admitted students as the number of secondary school graduates will decrease at least 2-3 years more in Lithuania due to the demographic situation. However, it is a good fact, the knowledge level of admitted students has increased and thus no additional tutorial support is needed now, in contrary to some years ago.

No rapid increase of the number of students in this programme in the coming years may be expected. It would be expected that companies' deep involvement in promoting the programme for schoolchildren could help in this situation. Companies mentioned only involvement in the University organized Open Days, which may be insufficient. Students together with the staff take part in several student events: young scientist's exhibition KTU Technorama organized by the University, international competitions of autonomous mobile robots Robot Intelligence, student science organizations etc. Despite this fact the students emphasized on the meeting with the reviewers that they would like to have more practical activities and resources available for this kind of activities (they mentioned need for better access to different sensors, motors, microcontrollers to develop some new robotic systems).

Students are generally satisfied with the programme and motivated. The relationship and communication between the staff and students is cordial and mutually positive. The students can also engage in their individual projects, although the number of materials from which they could produce robotic models, could be increased.

There is limited assessment type feedback from the students, and it is difficult to carry it out in an anonymous way, because of the small numbers of the students on the programme, but in some cases, the teachers have reacted positively and did some changes based on these assessments. It is noted also that Moodle is widely used by students which find it extremely useful. Staff also is widely using Moodle for delivering to students notes and other academic information.

There has been so far no Erasmus mobility among the students but they expect some during the next study year. The International Department should help with the recognition of the credits acquired from the study abroad. Not having Erasmus students so far is probably due to the following two reasons. One is the fact that the program is much specialised and it is not easy to find similar courses in other countries especially in English language. Another reason is the fact that the program is new and there is no tradition about Erasmus exchanges and previous experience to push new students to such experiences.

There have been no foreign visiting professors present as far delivering courses for the programme, one visiting professor from Poland is expected during the next academic year and this is insufficient for developing international relations

6. Programme management

The management of the programme is well organized and regularly monitored. The information and data on the implementation of the programme are regularly collected and analysed using internal self-assessment procedure, which involves students and staff. The Study Programme Committee meets regularly and discusses the programme with teachers. Professors and teachers from other departments involved in the programme feel good engagement in the improvement of the programme. It should be mentioned that even some basic course (Physics and Theoretical Mechanics) modules are adjusted according to the programme specifics. This kind of good feedback and course teachers' engagement and commitment has led to considerable decrease of student fail rate in basic courses. Students have opportunity to assess the subject content and the quality of teaching by completing the assessment questionnaire in students' personal electronic desktops in the University's academic information system. This is done at the end of each semester in order to have feedback. It must be mentioned that there was no clear information whether the student's suggestions resulted in any important changes. However this is probably due to the fact that the program is running only 2 years and there was not enough time for major changes.

The SER describes how the feedback and respective improvement of the programme is organized to take into account employers opinion and their need from the company's perspective. On the meeting with the employers the reviewers could not notice well-functioning the feedback system from the employers. Only few of the 10 company representatives mentioned that they are aware about the programme content though there was interest to participate on discussions about the programme and at least two companies declared that they are ready to give their feedback if they would be asked. Therefore there is a clear need to have regular meetings organised between the students and company representatives.

A final comment regarding the rather low number of entrant students is that the program management should improve the marketing strategy. For example distribute more printed material about the program in secondary schools, distribute through fairs & conferences or newspapers the expected demand in the local and international market of Robotics engineers, advertise more the content of the program in web-pages etc.

III. RECOMMENDATIONS

1. Take efforts to increase the number of admitted students, both at national and possibly international level. (E.g. by participation at international educational fairs, promotional events, etc.).
2. Consider a merger with closely related other B.A. programmes, and consider also the introduction of a Robotics M.A. programme for graduates of various specialisations (control engineering, mechatronics, etc.).
3. Give motivation to staff and attempt acquiring more funding for making possible more intense participation in major international scientific conferences and research programmes.
4. Carry out a survey on the future demand of graduates in robotics, based on a realistic estimation calculated together with the interested companies.
5. Develop a stronger laboratory base specialised on the industrial and mobile robots and for industrial and research robotics needs.
6. Use your available resources (laboratories and equipment) in more efficient ways, basing as many as possible courses on the resources.

IV. SUMMARY

The programme aims and learning outcomes are well defined, clear and publicly accessible. The programme deserves the attention of numerous companies in the region and in the whole of Lithuania. A reasonably good connection of the staff with some companies allows targeting real industrial needs. The programme focuses on preparing specialists with necessary knowledge and skills to serve and maintain robots in production factories, there is less stress on robot development at the moment. More focus on robotics related development would be advisable.

The curriculum meets both EU and national legal requirements and students are also satisfied with it. Special attention should be paid to the good infrastructure of the laboratories. Up-to-date equipment is mostly donated by sponsoring companies, which assures the good outcome skills of the programme. Worth to mention is also the motivated support staff for the laboratories, where the students can get all required practical assistance. There is a compulsory practical training foreseen in the last semester that has not yet been realised, this will expectedly improve the stakeholders' feedback to the curriculum.

There is sufficient teaching experience of the teachers, conforming to their respective positions. The programme is new, therefore the staff is still dynamically developing and forming. Good sign is that there are PhD students present at the Faculty, who might be considered as future staff members. Professors and associate professors dominate in giving the courses. Publications are at a more or less satisfactory level, however, the intensity of overseas conference participation and publication in world leader scientific periodicals could be encouraged. Teachers should participate in the Erasmus programme.

The available laboratory base is strong, especially in PLC and control systems, while it is acceptable in the specific robotics field and thus it is compatible with the programme aims. General laboratories for Electrical Engineering students are also of high quality. Some of the laboratories are also training sites for the international experts, which is a guarantee for the high learning standards. Because of lack of funding, however, students do not have access to all various materials, parts, and workshop equipment they would like to use for their individual often individually motivated projects. The number of computer workplaces in the laboratories and for the individual work is sufficient. The library offers electronic access to major scientific databases (e.g. IEEE Explore and Springer Link), although the stock of printed books and periodicals is could be increased.

The admission requirements to the program are clearly explained, well founded, and based on the competition. The timetable is constructed for both students' and teachers' convenience. Reviewers feel concern about the number of admitted students, which is rather low. Students are generally satisfied and motivated. The relationship and communication between the staff and students is cordial and mutually positive. There has been as far no Erasmus mobility among the students, they plan some during the next study year.

The management of the programme is well organized and regularly monitored. The Study Programme Committee meets regularly and discusses the programme with the teachers and students. However, only few of the company representatives mentioned that they are aware about the programme content though there was an interest to participate more on discussions about the programme development.

As mentioned before currently it is impossible to assess the knowledge and skills of the graduates because the first graduates will only come in after a year. Although the programme is quite young, it seems to be on the right track with a well prepared plan for the near future.

V. GENERAL ASSESSMENT

The study programme *Robotics* (state code – 612H67001) 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	4
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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Gražvydas Jakaitis

Santraukos vertimas iš anglų kalbos

<...>

V. APIBENDRINAMASIS ĮVERTINIMAS

Kauno technologijų universiteto studijų programa *Robotika* (valstybinis kodas – 612H67001) vertinama **teigiamai**.

Eil. Nr.	Vertinimo sritis	Srities įvertinimas, balais*
1.	Programos tikslai ir numatomi studijų rezultatai	3
2.	Programos sandara	3
3.	Personalas	4
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)

<...>

IV. SANTRAUKA

Programos tikslai ir studijų rezultatai yra gerai apibrėžti, aiškūs ir viešai prieinami. Programa susidomėjo daug bendrovių regione ir visoje Lietuvoje. Pakankamai geri dėstytojų santykiai su kai kuriomis bendrovėmis leidžia tikslingai numatyti realius pramonės poreikius. Programa pagrindinį dėmesį skiria specialistams, turintiems reikiamų žinių ir įgūdžių prižiūrėti ir eksploatuoti robotus pramonės gamyklose, rengti. Šiuo metu mažiau dėmesio skiriama robotų kūrimui. Rekomenduojama daugiau dėmesio skirti su robotika susijusiai plėtrai.

Studijų turinys atitinka Europos Sąjungos ir nacionaliniuose teisės aktuose nurodytus reikalavimus. Studentai juo yra patenkinti. Ypatingą dėmesį reikėtų skirti gerai laboratorijų infrastruktūrai sukurti. Atnaujintą įrangą daugiausia dovanuoja remiančios bendrovės. Tai garantuoja puikius programos rezultatus. Verta paminėti motyvuotą pagalbinį laboratorijų personalą, kuris studentams suteikia visą reikalingą praktinę pagalbą. Numatytas privalomas

praktinis mokymas paskutiniame semestre, tačiau jis dar nebuvo įgyvendintas, tačiau tikimasi, kad jis turėtų pagerinti socialinių dalininkų grįžtamąjį ryšį apie studijų programą.

Dėstytojų dėstyimo patirtis yra pakankama, ji atitinka pareigas. Programa yra nauja, todėl personalas vis dar dinamiškai vystosi ir formuojasi. Geras ženklas – fakultete esantys doktorantai, kurie gali būti laikomi būsimais darbuotojais. Dalykus daugiausia dėsto profesoriai ir docentai. Publikacijos yra daugiau ar mažiau patenkinamo lygio, tačiau reikėtų aktyviau dalyvauti konferencijose užsienyje ir skelbti publikacijas pasaulio pirmaujančiuose mokslo periodiniuose leidiniuose. Dėstytojai turėtų dalyvauti *Erasmus* programoje.

Esama laboratorijų bazė yra stipri, ypač programuojamų loginių valdiklių (PLC) ir valdymo sistemų, ji tinka konkrečiai robotikos sričiai, todėl atitinka programos tikslus. Bendrosios laboratorijos, skirtos elektros inžinerijos studentams, taip pat yra aukštos kokybės. Kai kurios laboratorijos naudojamos kaip mokymo klasės tarptautiniams ekspertams, kas garantuoja aukštus mokymosi standartus. Tačiau dėl nepakankamo finansavimo studentai, jei jie norėtų įgyvendinti individualius, asmeniškai motyvuotus projektus, negali naudotis visomis medžiagomis, detalėmis ir dirbtuvių įranga. Kompiuterizuotų darbo vietų skaičius laboratorijose ir savarankiškam darbui yra pakankamas. Biblioteka siūlo elektroninę prieigą prie pagrindinių mokslinių duomenų bazių (pvz., *IEEE Explore* ir *Springer Link*), nors spausdintų knygų ir periodinių išteklių fondas galėtų būti didesnis.

Priėmimo į programą reikalavimai yra aiškūs, pagrįsti ir remiasi konkurencija. Grafikas sudarytas taip, kad būtų patogus tiek studentams, tiek dėstytojams. Vertinimo ekspertams susirūpinimą kelia pakankamai mažas priimtų studentų skaičius. Studentai apskritai yra patenkinti ir motyvuoti. Darbuotojų bei studentų santykiai ir bendravimas yra draugiškas ir abipusiškai teigiamas. *Erasmus* mobilumo programa dar nepasinaudojo nė vienas studentas, tačiau kai kurie jų planuoja ją pasinaudoti ateinančiais studijų metais.

Programos vadyba organizuota gerai ir nuolat stebima. Studijų programos komitetas reguliariai susitinka ir aptaria programą su studentais ir dėstytojais. Tačiau tik nedaugelis iš įmonių atstovų nurodė, kad jie žino programos turinį, nors buvo išreikštas noras aktyviau dalyvauti diskusijose dėl programos kūrimo.

Kaip minėta anksčiau, šiuo metu neįmanoma įvertinti absolventų žinių ir įgūdžių, nes pirmieji absolventai studijas baigs tik po metų. Nors programa yra gana nauja, atrodo, kad pasirinktas kelias yra teisingas ir ji turi gerai parengtą ateities planą.

III. REKOMENDACIJOS

1. Stengtis padidinti priimamų studentų skaičių nacionaliniu ir galimai tarptautiniu lygiu, pavyzdžiui, dalyvaujant tarptautinėse mokslo mugėse, reklaminiuose renginiuose ir kt.
2. Apsvarstyti galimybę sujungti su kitomis panašiomis bakalauro programomis. Aptarti galimybę įvesti robotikos magistro laipsnio programą, kurią rinktųsi įvairių specializacijų absolventai, pvz., valdymo inžinerijos, mechatronikos ir t. t.
3. Motyvuoti personalą ir bandyti gauti didesnę finansavimą, kas leistų aktyviau dalyvauti pagrindinėse tarptautinėse mokslinėse konferencijose ir mokslinių tyrimų programose.
4. Atlikti tyrimą dėl robotikos srities absolventų poreikio ateityje, paremtą realiu skaičiavimu kartu su suinteresuotomis įmonėmis.
5. Kurti stipresnę laboratorijų bazę, specializuojantis pramoninių ir mobiliųjų robotų srityje ir siekiant patenkinti pramonei ir moksliniams tyrimams skirtų robotų poreikį.
6. Efektyviau naudoti turimus išteklius (laboratorijas ir įrangą) ir numatyti, kad jais būtų naudojama, studijuojant kuo daugiau dalykų.

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