STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

KAUNO TECHNOLOGIJOS UNIVERSITETO

STUDIJŲ PROGRAMOS *Elektronikos inžinerija* (621H61002)

VERTINIMO IŠVADOS

EVALUATION REPORT

OF *ELECTRONICS ENGINEERING* (621H61002)

STUDY PROGRAMME

at *KAUNAS UNIVERSITY OF TECHNOLOGY*

Grupės vadovas: Team leader:	Prof. Dr. Edmund Handschin
Grupės nariai: Team members:	Prof. Dr. Tilmann Krüger
	Prof. Dr. Toomas Rang
	Prof. Dr. Juozas Vidmantis Vaitkus
	Paulius Simanavičius

Išvados parengtos anglų kalba
Report language - English

Vilnius
2014

DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	*Elektronikos inžinerija*
Valstybinis kodas	621H61002
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, Nr. 565 LR Švietimo ir mokslo ministro įsakymas „Dėl aukštojo mokslo studijų programų įregistravimo“.

INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	*Electronics engineering*
State code	621H61002
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) or part-time (3 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, decree No. 565 by Minister of Education and Science of the Republic of Lithuania „On registration of higher education programmes“

Vilnius
2014

CONTENTS

Vilnius
2014

I. INTRODUCTION

Kaunas University of Technology (further KTU) performs bachelor, master and doctoral studies. It's mission is to provide research-based studies of international level with innovative technologies. Since November 2010 KTU is a Public enterprise. KTU consisted of 12 faculties.

Since February 2014 – and of course in its details not contained in the self-assessment report – the Faculty of *Telecommunications and Electronics* and the Faculty of *Electrical & Control Engineering* have been combined to the new Faculty of *Electrical & Electronics Engineering*. Also the structure of this new faculty is different: it contains 4 departments: *Electronics Engineering*, *Automation*, *Electrical Power Systems* and *Telecommunications*. New are two Centres in the faculty: *Telematics Research Centre* and *Laboratories Centre*. The Department of Electronics Engineering is performing the study programme *Electronics Engineering* (further EE). EE is accredited since 2002 till September 2014.

The evaluation report is based on the self-assessment report (SER) signed by the KTU Rector Prof. Dr. Petras Baršauskas, composed under coordination of Head of self-assessment group Prof. Dr. Dangirutis Navikas (Head of Department of Electronics Engineering), Assoc. Prof. Dr. Žilvinas Nakutis (Department of Electronic and Measument Systems) and by the team consisting of Prof. Dr. Hab. Algimantas Valinevičius (Dean of the Faculty of Telecommunications and Electronics), Assoc. Prof. Dr. Darius Andriukaitis (Department of Electronics Engineering), Prof. Dr. Vytautas Dumbrava (Head of the Department of Signal Processing), Prof. Dr. Vytautas Markevičius (Department of Electronics Engineering), Assoc. Prof. Dr. Vytautas Knyva (Head of the Department of Electronic and Measument Systems), Assoc. Prof. Dr. Vaidotas Marozas (Signal Processing Department), Dr. Arūnas Marma (JSC „Arevita“ production manager), and Mindausgas Čepėnas, the student member of the self-evaluation team. This evaluation report covers the 2nd cycle study programme titled Electronic Engineering (State code: 621H61002) offered by Kaunas University of Technology (KUT).

The previous Study Programme evaluation was carried out by the group of international experts leaded by Prof. Dr. Edmund Handschin in 2011. The expert team included the following members: Prof. Dr. Laszlo Koczy, Prof. Dr. Toomas Rang, Prof. Dr. Anthony Vickers, Prof. habil. Dr. Juozas Vaitkus, Mindaugas Karaliūnas. The recommendations of the 2011 review are summarized in appendix 4.5 of the SER.

The 2nd cycle study programme leading to a *Master of Electronics Engineering* degree with 120 ECTS credits was registered *1997-05-19, decree No. 565 by Minister of Education and Science of the Republic of Lithuania „On registration of higher education programmes“ (State news, 1997, Nr. 49-1188) 2001-08-02, decree No. 1187 by Minister of Education and Science of the Republic of Lithuania „ On registration of higher education programmes “ (State news, 2001, Nr. 69-2485)2007-02-19, decree No. 225 by Minister of Education and Science of the Republic of Lithuania „ On registration of higher education programmes in study and learning programmes register“*and accredited first *2002-04-30, No. 785 until next external evaluation*, second *2009-08-31, No.1-73, Accredited until 2011-12-31* and valid now by decision *2012-03-20, No. SV6-12, Accredited until 2014-09-01.*

The evaluation visit took place at KUT on Tuesday, April 28, 2014.

II. PROGRAMME ANALYSIS

1. Programme aims and learning outcomes

The programme aims are defined in the self-assessment report as related to Lithuania Republic Government programme set in 2005 November 22 resolution No. 1270 „National Lisbon strategy implementation program“(State news 2005, No. 78-2823) and being in compliance to international directives.

The study programme is based on a clear modular description of the learning contents. The learning outcomes are well defined, clear and publicly accessible, e.g. at http://uais.cr.ktu.lt/plsql/mod_dest/stp_report_ects.card_ml?p_valkod=621H61002&p_year=2014&p_lang=EN and structured in *Knowledge and Understanding*, *Analysis/Design/Practice of Engineering*, *Investigations* and *Transfer of skills*. Study programme fits the needs of the professional life very well. The learning outcomes are all achievable.

The programme aims and learning outcomes are University studies of second cycle leading to a *Master of Electronics Engineering*. They are targeted to design, expert, consultancy, research and educational work and are based on professional activity investigation in European context to meet the academic and professional requirements, public needs and the needs of the labour market. So the research projects can be more scientific or more application oriented.

The name of the programme, its learning outcomes and its curriculum are compatible with each other. The programme is characterized by a good guidance to self-determined research project handling in higher-level projects.

The learning outcomes are directed to deliver a wide base to allow employment in the whole range of electrical and electronic engineering. The programme delivers an in-depth knowledge and understanding of the principles of electronic branch of engineering combined with ability to solve problems that are unfamiliar, incompletely defined, and have competing specifications as well as the ability to formulate and solve problems in new and emerging areas of their specialisation. Beyond that it is possible to specialize especially in the fields of Power and Control due to modules of the other Master study programmes *Electrical energy*, *Electrical Power Engineering*, *Energy Engineering and Management*, *Control Engineering* and *Control Technologies*. The orientation in project studies supports analytic, modelling and experimental investigations leading to critical evaluation of achieved data and to drawing of right conclusions. To achieve and keep the ability to investigate the application of new and emerging technologies in electronic branch of engineering is highly demanding in the areas of international activities as well as financial support necessary for up-to-date laboratories.

The programme has to satisfy the EE market requirements in Central and West Lithuania because it is the only EE Master programme offered there. Bachelors from Klaipėda or Šiauliai universities can apply, too. Kaunas city and region electronics related enterprises, existing and planned high technology parks and valleys create good employment possibilities for the graduates.

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. Theoretical studies take 60 percent, scientific research 40 percent. The intended 800 contact hours out of an workload of 3200 hours in total give a good balancing of guiding and self-studying of the student.

The programme has well developed study plan giving both the core electronic engineering study as well as breadth through free electives. The study subjects are related to general core courses and elective courses of the tracks *Electronics Technologies*, *Embedded Systems* and *Radio Communication Systems*. The student can freely choose his electives independent of his intended track, 6 from the specialized elective study subjects of the programme, 2 free. The number of offered modules in the Electives 1, 2, 3 is too high – so not all happen all years and the teaching load cannot be precisely planned. The tracks *Embedded Systems* and *Radio Communication Systems* do not contain the necessary amount of elective courses so the student is forced to choose courses from *Electronics Technologies* track, too. The students present regularly the results of the last two weeks during their project work and learn much about project management and presentation, too. The final year project students are encouraged to publish their work through student conferences. An annual exhibition showcases the most successful projects. There is only little feedback from alumni and stakeholders to improve the curriculum. One item of feedback is the wish for an higher content of laboratory work in the programme.

The intended learning outcomes are not fully defined in the description of study subjects in Appendix 4.1 (e.g. no statement of the relations of the individual module learning outcomes to the general programme learning outcomes for the EE programme in *Research Project 1*, *Final Degree Project*, *Digital Signal Processing*, *Electronics Projects Management* et al.). The given data in Appendix 4.1 are not fully consistent (e.g. the *Surface Acoustic Wave Devices* are only a subclass of *Acousto-electronic Devices* [T171M501]). Also the TPL values given for weekly contact hours for theory, tutorials and laboratory in Table 4 of the EE report are in the region of 200 to 400 instead of values in the region 3 to 4; they are not consistent (e.g. T121M001 *Digital Signal Processors*: Table 4 quotes 80 contact hours in all and 302 weekly contact hours, but Appendix 4.1 states 32 contact hours for lessons and 32 contact hours for labs resulting in 64 contact hours in all or 4 per week.)

The intended learning outcomes of the offered study subjects are spread evenly, their themes are not repetitive with exceptions quoted in the self-evaluation report (SEP: 58).

In the SEP appendices in the description of some modules the individual learning outcomes are not clearly associated with the programme learning outcomes, especially in the subjects descriptions (SEP: App. 4.1) belonging also to other programmes, e.g. projects (T000M006, T000M007, T000M008) or digital signal processing (T121M501). Not all modules have a very clear set of module learning outcomes.

The content of the study subjects is consistent with the type and level of the studies, the content of the subjects are appropriate for the achievement of the intended learning outcomes and the scope of the programme is sufficient to ensure learning outcomes. The methods of the study subjects shown as TPL have a relation in contact hours of more than 3 to 1 for theory (T) versus laboratories (L), the individual workload is stated as being 3 times that of contact hours, so the laboratory content (less than 10 percent) of the EE programme is too low for a master

course in Electronics Engineering. To compensate this, the students have and use the capabilities to augment their practical experience using the laboratories. The content of the EE programme reflects achievements in science and technologies.

3. Staff

As base for the calculation of staff load it is assumed that the EE programme starts once each academic year on the 1st of September (autumn semester) and all the core and EE specific elective modules are offered once a year.

The mutual dependencies, recording and planning requirements of load descriptions like workload, module responsibility, academic hours, contact hours, research and publication activities are not clearly evaluated, recorded or developed.

The *contact hours* in the module description do not correspond to the relevant description rules for SER. So they are shown in italics in the following examples:

1. The Appendix 4.2 shows that important parts of the *contact hours* are not performed by the academic staff or some study objects have not happened in the last academic year 2012-2013. Two examples:

- Assoc. Prof. Dr. P. Kaškonas delivers 6 *contact hours* per year but stands for 64 (T: 48; L: 16) hours in T170M607 plus 64 (T: 32; L: 32) hours in T170M012;

- Assoc. Prof. Dr. V. Knyva delivers 38 *contact hours* per year but stands for 64 (T: 48; L: 16) hours in T170M016 plus 64 (T: 32; L: 32) hours in T180M005 plus 64 (T: 32; L: 32) hours in T191M501.

2. The Appendix 4.2 shows also that some lecturers have an extremely high teaching load. As two examples:

- Prof. Dr. V. Deksnys has had 1171 *contact hours* in the last academic year 2012-2013, 165 of which have been performed in the EE programme well fitting to the requirements of T121M001 (T: 32; L: 32) and T110M107 (T: 32; L: 32).

- Assoc. Prof. Dr. V. Marozas has had 1156 *contact hours* in the last academic year 2012-2013, 246 of which have been performed in the EE programme only partially related to the requirements of T121M501 (T: 32; L: 32).

3. For the academic year 2012-2013 for the EE programme provided *contact hours*, stated in Appendix 4.2, are not easy to understand. The contact hours for each study subject are (except for the research projects) in the region of 64. An example:

- Assoc. Prof. Dr. D. Andriukaitis has performed two study subjects (T170M004: T 32, L 16; T170M105: T 48) with 96 contact hours but performed 285 *contact hours* in EE programme resulting in 189 *contact hours* for research projects *et al*.

4. Some of the academic staff cited in Appendices 4.1 and 4.2 have a lot of scientific experience, but have reached a high age and are included in the EE programme with a relative high load of contact hours. Two examples:

- Assoc. Prof. Dr. A. Dumčius, born 1943, was sole responsible for T170M100 with 64 contact hours. In the academic year 2012-2013 he has given 864 *contact hours*, 188 in the EE programme.

- Assoc. Prof. Dr. R. Anilionis, born 1946, is sole responsible for T170M610 teaching 64 contact hours. In the academic year 2012-2013 he has given 652 *contact hours*, 118 in the EE programme.

A solution has been realized in the following example:

- Prof. Dr. habil. V. Augutis, born 1943, is responsible for T110M501 in combination with Prof. Dr. D. Gailius, born 1971. In the academic year 2012-2013 he has given 727 *contact hours*, 106 in the EE programme.

In the meetings KUT made clear that the term *contact hour* in Appendix 4.2 does not meet the definition of contact hours as times of personal contact of the lecturer in lessons (T=theory), exercises (P), laboratories (L) and project modules of the students corresponding to the modules described in Appendix 4.1. Instead it should be interpreted as *academic hours*.

The in item 82 of the self-evaluation report claimed limits of 700 to 800, max. 960 hours of annual academic workload of a full-time lecturer are not met. Even the contact hours – only a part of the academic workload – is higher than the allowed maximum:

- Prof. Dr. V. Deksnys has had 1171 *contact hours* in the last academic year 2012-2013

- Assoc. Prof. Dr. V. Marozas has had 1156 *contact hours* in the last academic year 2012-2013

and the limit of 800 is exceeded or reached by 4 furthermore lecturers.

The qualification of the academic staff (2012-2013: 5 professors, 11 associate professors) is adequate to ensure the learning outcomes of the EE programme. The legal requirements for formal qualification and research activities are fully met. The 5 professors have realized 25 percents rsp. 30 credits in 2012-2013.

The department has a clear strategy for staff turnover. But now one professor has retired, two will follow end of the actual semester. The department has declared in the meeting that it is guaranteered that open positions will be filled immediately, that there are enough capabilities to get lecturers for the offered modules and the necessary quote of 20 percents is at no risk. This task becomes easier due to the merging of the two faculties and the bigger Department of EE. Fitting teachers knowledge and subject requirements at staff turnover is sometimes difficult to match. The age structure and the workload of some members of the academic staff is not fitting the requirements of the programme.

The staff is rather not sufficient bound in scientific networks and international projects. The number of international publications is going down since 2008 by more than 50%. Even if some of the projects with industry have to be hidden for two years the publishing of research results is by far too low. The mobility of teachers is not sufficient and should be increased too. More international research activities by the teaching staff should be acquired, the value of lower wages of research people in Lithuania is not noticeable taken into account. The major reason for

missing research activities is the high workload of teaching staff because it is generally too high and therefore not leaving sufficient time for research.

4. Facilities and learning resources

The classroom and laboratory capabilities are sufficient for the EE programme but should get improved for better performance and broader range. A few examples:

- The computer classroom (room 505) has 24 workplaces equipped with computers and MATLAB for the module *Digital Signal Processing* (T121M501). But it has only a single screen per PC – not efficient enough for working with support from technical literature.

- The measurements lab. (room 434) for the module *Measurements, Transducers and Sensors* (T110M501) has 6 computerized workplaces (single screen) with 6 oscilloscopes, but less than 6 sets of other instrumentation. It also lacks equipment of MEMS sensors and measurement communication protocols.

- The IT lab. (room 457) for the module *Power Electronic Systems* (T170M501) contains some power regulator boards, but no microcontroller with PWM peripherals and power stages.

- The IT lab. (room 457) for the module *Measurements Transducers and Sensors* (T110M501) has 8 computerized workplaces (single screen) but only one set of other devices (oscilloscope, spectrum analyzer, function generator and prototypes for diverse measurements).

The support of the laboratories by semiconductor companies reflects international standards. Some industrial programmes have led to an actualisation of some laboratories. For example are donations of semiconductor companies in the areas crucial for staying on-line in the fast developing area of embedded design and information technology. Also important are concepts of the semiconductor companies to support students with free or very cheap processor boards, often including modern other devices like MEMS sensors. These concepts have not found their way into modules of the programme. The laboratory equipment has got some serious improvements but needs some additional serious improvements in the future – the average investments in the last 6 years of 84.000 LT (24.000 EUR) for renewal and the intended investments of 1.753.000 LT (508.000 EUR) in total for all laboratories of the faculty seem not sufficient to keep on-line further in the fast exploding areas with increasing complexity and cross-linking (e.g. smartphones, multimedia systems and play stations). This can be shown by a few examples:

- The module *Digital Signal Processing* (T121M501) is supported only by Matlab in a computer classroom (there no DSP hardware), whereas the module *Digital Signal Processors* (T121M001) is restricted to TI single core floating-point DSP *TMS320C6713* (IT lab., room 457, 4 places) and ADI Blackfin ADSP-BF531/ -548 (Embedded systems lab., room 318, 6 places). Also the TI development software is CCS version 3.3 – actual version is 6.0 (5.4: May 2013, 5.5: Sept. 2013). The full version of CCS 6.0 would contain software development tools for the whole span of TI's processor families from ultra-low power MSP430 to multicore DSP&ARM.

- The IT lab. has also two DSP kits for video applications. Investments in this area would enable KUT to offer modules with stronger hardware-software interaction and multicore concepts, e.g. DSP and ARM in one chip.

- In the IT laboratory a DLP development system would be valuable for *Systems of Video Information* (T170M607).

Actually the lecturers can – and do – compensate suboptimal equipment with teaching efforts for achieving the intended learning outcomes, but fully up-to-date hardware and software resources in the whole range of embedded systems are necessary to keep the teaching workload lower, laboratory rsp. research more effective and experience on an actual and international level.

There have been serious efforts to improve the literature support by e-books or intranet (e.g. Moodle) activities, but the review of study subject descriptions in Appendix 4.1 has shown that for a lot of recommended literature no exemplar is in the KTU library, more in the methodical cabinet of the department. It was declared and also confirmed by the students in the meetings that this is no real problem – the module descriptions should contain all the information about the availability of all the documents which are cited in them to make sure that the students find easily the necessary access to the literature mentioned even before the first lesson.

5. Study process and student assessment

The admission requirements are well-founded, the majority of entrants were admitted into state-founded places and til 2012 admission was for full-time studies. The number of admitted students was max. 24 in the years 2008 to 2012. The annual fee of 3.200 EUR is relative high for Lithuanian income average (about 6.300 EUR p.a.) and especially for young students.

The number of applicants is relatively low. The problems of getting enough applicants free to study without job obligations are well described in item 137 of the self-analysis report. It can be seen that most of the students are regionally bound. The reasons have to get analyzed, why students think that they can work in parallel to their studies, whereas their study load is in the region of 25 to 30 study hours per credit and up to 30 credits have to get achieved within 16 weeks resulting in 50 study hours per week.

For full-time students without parallel work the organisation of the study process ensures an adequate provision of the programme and the achievement of the learning outcomes. Due to the tiny number of part-time students the organisation of their study process has not been investigated. But it seems that the consideration of part-time studies has shifted a big amount of teaching into afternoon/evening/Saturday times resulting in disadvantages for full-time students. The outcoming engineering quality of students is limited due to work overload of a high percentage of the students based on job (and money) requirements.

The students participate in scientific and applied research activities due to their project subjects and the offered employment at KTU in research projects or as laboratory assistants for 0.25 load.

For teaching the modules of the programme the laboratories are well equipped and were following the fast developing markets, e.g. in the area of embedded systems. They are open for the students in the times that are not used by module-contained laboratory exercises.

The students have opportunities to participate in a wide range of offered student mobility programmes. The faculty has bilateral agreements with 15 European universities. Unfortunately the use of these programmes is very small. In the years 2009 to 2012 in the ERASMUS programme have been 4 welcomed and 8 outgoing students for the countries Bulgaria, Denmark, England and Iceland. The students asked have shown that most of them are highly regionally bound.

It is shown that KTU ensures an adequate level of academic and social support with a well-defined structure. There is a good tuition support by the teachers. The learning facilities are good (literature, laboratories, practical work). The links between theoretical lessons and laboratories have become closer. Students are provided with all the needed information concerning the university study programme, social and academic support. Some of them get social scholarships. Individual academic support is given to student who come from college studies in the same field. In the faculty the students have the possibility to get at least four different offers of one-time scholarship from partners.

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

The professional activities of the majority of graduates meets the programme providers' expectations. 10% of graduates questioned continue their studies in third cycle (doctoral) studies. The employability of the EE masters of this programme is high. The stakeholders seemed quite pleased with the level that the graduates receive during the studies.

A high content of bachelors from engineering colleges with no significant problems show that KTU is well performing the adapting necessities. The offered bridge courses are nearly not used due to very high time and cost requirements – and they are not really necessary due to the possibility of consideration of industrial experience working as bachelor.

6. Programme management

The start-up of programme management is well organized. The programmes of the faculty (FTE) are developed and supervised by the Study Programme Committee (SPC). The quality of lectures is controlled by the board of department teachers. The process of the Study Programme (SP) administration and its quality assurance is reflected in the academic information system (AIS). The processes are controlled according to ISO 9000 standard requirements and quality best practices from other schools of higher education.

As shown the outcomes of internal and external evaluations of the programme are used for the improvement of the programme. Most of the stakeholders met in the meeting are not

familiar with the learning outcomes and the curriculum of the programme. There is little feedback from the graduates/alumni and employers to improve the study programme. So there e.g. are no effective organization of the alumni or the stakeholders and no annual events for them. Also the participation of the students in semester evaluation of study subjects' quality is insufficient – all actions to improve this have failed so far.

On the other hand there are no complains of the companies about the quality of the graduates of this programme. There are social partners with signed agreements concerning internship and research projects (e.g. final degree project).

It was not found whether there exists a planning for staff resources and how the visible risks would get handled. Also missing is a clear design how results of quality evaluations influence the organisation, the didactical behaviour, the curriculum, the investments in money and persons, and the presentation of the modules. Programme management lacks a clear strategy how to implement the necessary changes.

The internal information channels are highly complex due to the hierarchical structure of the university. There are some discussions to create an internal faculty information system, where lecturers could access decisions and documents of institutions as well as feedback from graduates and social partners. The access methods of teachers to students' questioning results enable the teachers to consider the results immediately.

After the good start-up it is important that the programme management gets further developed within the next years and that more effective ways will be found to get helpful information from students, alumni and stakeholders fast, broad and deep going.

III. RECOMMENDATIONS

1. The number of contact hours of each lecturer in each academic year should be limited to 400.

2. Research, publications and laboratory facilities should become improved towards international university and engineering levels.

3. The disadvantages for full-time students in the time schedule, because of focus on part-time studies should get minimized.

4. Quality assurance and programme management should get further developed and realized to combine comprehensive and timely surveys at all participants, fast feedback to programme optimization with long-term programme and structure development.

IV. SUMMARY

The master programme *Electronics Engineering* offered by Kaunas University of Technology at the Kaunas campus is a well-designed and successfully running programme.

The academic content of the programme consists of 3 different tracks: E*lectronics Technologies*, *Embedded Systems* and *Radio Communication Systems*. The programme has a deepening character and is targeted to design, expert, consultancy, research and educational work, both for employability at a higher level and for doctoral studies.

The programme learning outcomes are clearly stated and are based on European directives. The aims and learning outcomes of the study programme are publicly available. The learning outcomes are all achievable. The subjects learning outcomes are analytically described and comply with the programme learning outcomes. Detailed information regarding the programme and subjects learning outcomes appears in the web-page of the EE Programme. The study programme fits the needs of the professional life very well.

The Curriculum Design (CD) complies very well with the national local legislation and the local regulations for the master programs. The subjects are consistent with the type and level of the studies. Remarkable is the orientation of study projects including soft skills like two-week presentation and publishing. The links between theoretical lessons and laboratory work have become closer so far. The employers are very satisfied from the skills acquired by the graduates but would like a higher laboratory percentage in the study subjects. This shows that the proposed curriculum design is appropriate. One weakness noted is that the number of modules in the Electives is too high and not evenly distributed over the 3 tracks – so not all happen all years and the teaching load cannot get precisely planned.

The qualifications of the staff are adequate to ensure successfully the target learning outcomes and their composition satisfies all legal requirements. From the information provided by the staff the contact hours during teaching periods are about 14 hours, but for some quite higher. This load is too high and does not provide enough time to staff for research work and publications. The staff exchanges and international mobility of the staff in general is quite low and it is due to lack of motivation and lack of time. It is recommended that the targeted number of contact hours should be in the range of 200 to 300 and strictly limited at 400 for each teacher

and academic year. In the clear strategy of staff turnover the staff structure should get improved concerning age as well as workload and experience mapping to study subjects.

During the on-site visit the evaluation expert team has verified that the learning facilities and laboratory equipment available are suitable for the needs of the programme. The laboratory equipment has got some serious improvements, supported by industrial programmes. Much of literature and papers is electronically accessible. To increase efficiency of teaching and learning as well as being prepared for new technologies and employment requirements the research, publications and laboratory facilities should become improved further towards international university and engineering levels.

The admission requirements to the programme are analytically and clearly explained. The whole admission process applied is transparent and it ensures a high quality of entrant Bachelor graduates from university and colleges. The number of students is practically limited to the free places because the tuition fee of about 3.200 Euro is too high for Lithuanian income average (about 6.300 EUR p.a.) and especially for young students. The tuition and the support by teachers are very efficient. The students declared they had not met any serious problems so far and that they were very satisfied with their studies, but the engineering quality of students is limited due to work overload of a high percentage of the students based on job (and money) requirements. The disadvantages for full-time students in the time schedule because of focus on part-time studies should become minimized.

The programme management is well organized, clearly described and appropriately allocated. The administration is distributed to the Faculty Council for quality assurance of studies and the Study Programme Committee for development and supervision of the programmes with highly hierarchical construction. The start-up of quality assurance and programme development leaves room for advancing feedback from students, graduates as well as stakeholders, to shorten delays and to develop a clear strategy how to implement the necessary chances. The overall policy and activities regarding the distribution of information related to the programme locally and abroad are insufficient. To improve staff, facilities and learning resources a look-ahead resource planning should be developed. As long as financial reasons limit the number of students more scholarships or trainee programmes should initiated as well as more jobs in research projects. Quality assurance and programme management should get further developed and realized to combine comprehensive and timely surveys at all participants, fast feedback to programme optimization with long-term programme and structure development.

V. GENERAL ASSESSMENT

The study programme *Electronics Engineering* (state code – 621H61002) at Kaunas University of Technology is given **positive** evaluation.

Study programme assessment in points by evaluation areas.

No.	Evaluation Area	Evaluation Area in Points*
1.	Programme aims and learning outcomes	3
2.	Curriculum design	3
3.	Staff	3
4.	Material resources	3
5.	Study process and assessment (student admission, study process student support, achievement assessment)	3
6.	Programme management (programme administration, internal quality assurance)	3
	Total:	**18**

*1 (unsatisfactory) - there are essential shortcomings that must be eliminated;

2 (satisfactory) - meets the established minimum requirements, needs improvement;

3 (good) - the field develops systematically, has distinctive features;

4 (very good) - the field is exceptionally good.

Grupės vadovas:
Team leader: Prof. Dr. Edmund Handschin

Grupės nariai:
Team members: Prof. Dr. Tilmann Krüger

Prof. Dr. Toomas Rang

Prof. Dr. Juozas Vidmantis Vaitkus

Paulius Simanavičius

Vilnius
2014

<...>

V. APIBENDRINAMASIS ĮVERTINIMAS

Kauno technologijų universiteto studijų programa *Elektronikos inžinerija* (valstybinis kodas – 621H61002) vertinama **teigiamai**.

Eil. Nr.	Vertinimo sritis	Srities įvertinimas, balais*
1.	Programos tikslai ir numatomi studijų rezultatai	3
2.	Programos sandara	3
3.	Personalas	3
4.	Materialieji ištekliai	3
5.	Studijų eiga ir jos vertinimas	3
6.	Programos vadyba	3
	Iš viso:	**18**

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

<...>

IV. SANTRAUKA

Kauno technologijos universiteto Elektronikos inžinerijos magistro studijų programa, vykdoma Kaune, yra gerai sudaryta ir sėkmingai vykdoma.

Akademinį studijų programos turinį sudaro 3 skirtingos kryptys: elektroninės technologijos, įterptinės sistemos ir radijo ryšio sistemos. Studijų programa – išsami, sutelkta į projektavimą, ekspertinę veiklą, konsultacijas, tyrimus ir švietimo veiklą, siekiant įsidarbinti aukštesniame lygmenyje arba tęsti studijas doktorantūroje.

Studijų programos studijų rezultatai – aiškiai nurodyti ir pagrįsti Europos direktyvų nuostatomis. Studijų programos tikslai ir studijų rezultatai – skelbiami viešai. Visų studijų rezultatų įmanoma pasiekti. Studijų dalykų studijų rezultatai – analitiškai apibrėžti ir atitinka studijų programos studijų rezultatus. Elektronikos inžinerijos studijų programos tinklalapyje pateikiama išsami informacija apie studijų programos ir dalykų studijų rezultatus. Studijų programa labai gerai atitinka profesinės veiklos poreikius.

Studijų programos sandara labai gerai atitinka nacionalinius vietos teisės aktus ir magistro studijų programoms keliamus vietos reikalavimus. Studijų dalykai atitinka studijų tipą ir lygmenį. Puiki studijų projektų orientacija, įskaitant bendruosius tarpasmeninius įgūdžius, pavyzdžiui, dviejų savaičių rezultatų pristatymas ir skelbimas. Iki šiol užtikrinti glaudesni ryšiai tarp paskaitų ir laboratorinio darbo. Darbdaviai labai patenkinti absolventų įgytais gebėjimais, tačiau norėtų, kad į studijų dalykus būtų įtraukta daugiau laboratorinio darbo. Tai rodo, kad

siūloma studijų programos sandara yra tinkama. Pastebėtas vienas trūkumas – pasirenkamųjų dalykų modulių skaičius yra per didelis ir jie nevienodai paskirstyti 3 kryptyse, t. y. ne visi jie dėstomi visais metais ir sunku tiksliai suplanuoti dėstytojų krūvį.

Personalo kvalifikacija – tinkama sėkmingai užtikrinti siektinų studijų rezultatų pasiekimą, o jos sudėtis atitinka visus teisinius reikalavimus. Sprendžiant iš personalo pateiktos informacijos, dėstytojams tenka maždaug 14 kontaktinių valandų, tačiau kai kurie iš jų kontaktinių valandų turi daugiau. Toks krūvis yra per didelis ir personalas neturi pakankamai laiko moksliniam darbui ir publikacijoms. Personalo mainai ir tarptautinis mobilumas apskritai yra mažas dėl motyvacijos ir laiko stokos. Rekomenduojama siekti, kad kontaktinių valandų skaičius būtų nuo 200 iki 300 bei griežtai neviršyti 400 valandų vienam dėstytojui per akademinius metus ribos. Aiškioje personalo kaitos strategijoje reikėtų tobulinti personalo struktūrą amžiaus, taip pat krūvio ir su studijų dalykais susijusios patirties prasme.

Per apsilankymą universitete vertinimo ekspertų grupė patikrino, ar materialieji ištekliai ir laboratorijų įranga atitinka studijų programos poreikius. Laboratorijų įranga buvo smarkiai tobulinta pagal pramonines programas. Dauguma literatūros ir dokumentų teikiami elektronine forma. Siekiant didinti dėstymo ir studijų efektyvumą bei atitikti naujus technologijų ir įsidarbinimo reikalavimams, reikėtų toliau tobulinti mokslinę veiklą, publikacijas ir laboratorijas, kad jos pasiektų tarptautinį universitetinį ir inžinerijos lygmenį.

Priėmimo į studijų programą reikalavimai analitiškai ir aiškiai paaiškinti. Visas priėmimo procesas – skaidrus ir užtikrina, kad į studijų programą būtų priimti gabūs universitetų ir kolegijų bakalauro studijų absolventai. Studentų skaičius praktiškai apsiriboja nemokamų vietų skaičiumi, nes mokestis už mokslą, siekiantis maždaug 3 200 eurų, yra per didelis vidutines pajamas gaunančiam Lietuvos gyventojui (apie 6 300 eurų per metus), o ypač jauniems studentams. Dėstytojų dėstymas ir parama – labai veiksmingi. Studentai nurodė, kad kol kas neturėjo jokių rimtų problemų ir yra labai patenkinti studijomis, tačiau studentų darbo kokybė inžinerijos srityje yra ribota dėl per didelio darbo krūvio, nes didelė dalis studentų turi dirbti (jiems reikia pinigų). Tvarkaraštis nepalankus nuolatinių studijų studentams, todėl reikėtų mažiau jį sutelktį į ištęstines studijas.

Studijų programos vadyba – gerai organizuota, aiškiai apibrėžta ir tinkamai paskirstyta. Administravimas yra paskirstytas Fakulteto tarybai, kuri atsakinga už studijų kokybės užtikrinimą, ir Studijų programos komitetui, atsakingam už studijų programų plėtrą ir priežiūrą, ir jis labai hierarchiškai organizuotas. Pradėjus vykdyti kokybės užtikrinimą ir tobulinti studijų programą, atsiranda poreikis greičiau rinkti studentų, absolventų ir suinteresuotųjų šalių atsiliepimus, siekiant mažinti vėlavimus ir parengti aiškią strategiją, kaip įgyvendinti būtinus pokyčius. Bendra politika ir veikla, susijusi su informacijos apie studijų programą, sklaida vietoje ir užsienyje yra nepakankama. Siekiant tobulinti personalą ir gerinti materialiuosius išteklius, išteklius reikia iš anksto planuoti. Kol finansinės priežastys riboja studentų skaičių, reikėtų skirti daugiau stipendijų arba vykdyti kvalifikacijos kėlimo programų, taip pat numatyti daugiau darbo vietų tyrimų projektuose. Kokybės užtikrinimą ir studijų programos vadybą reikėtų toliau plėtoti ir vykdyti, siekiant derinti visapusiškas ir laiku atliekamas visų dalyvių apklausas, greitus atsiliepimus apie studijų programos optimizavimą su ilgalaikiu studijų programos ir struktūros plėtojimu.

III. REKOMENDACIJOS

1. Kiekvieno lektoriaus kontaktinių valandų skaičius kiekvienais akademiniais metais turėtų būti ne didesnis kaip 400.

2. Reikėtų tobulinti tyrimus, publikacijas ir laboratorijas, kad jie būtų tarptautinio universitetinio ir inžinerijos lygio.

3. Nuolatinių studijų studentams nepalankus tvarkaraštis, reikia mažiau jį sutelkti į ištęstines studijas.

4. Reikia toliau plėtoti ir vykdyti kokybės užtikrinimą bei studijų programos vadybą, siekiant derinti visapusiškas ir laiku atliekamas visų dalyvių apklausas, greitus atsiliepimus apie studijų programos optimizavimą su ilgalaikiu studijų programos ir struktūros plėtojimu.

<…>

Vilnius
2014