STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

Kauno technologijos universiteto

STUDIJŲ PROGRAMOS *MECHATRONIKA* *(valstybinis kodas - 612H73001)* VERTINIMO IŠVADOS

EVALUATION REPORT OF *MECHATRONICS* (*state code - 612H73001*) STUDY PROGRAMME

at Kaunas University of Technology

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Išvados parengtos anglų kalba
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DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	***Mechatronika***
Valstybinis kodas	612H73001
Studijų sritis	Technologijos mokslai
Studijų kryptis	Gamybos inžinerija
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Pirmoji
Studijų forma (trukmė metais)	Nuolatinė (4)
Studijų programos apimtis kreditais	240
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Mechatronikos bakalauras
Studijų programos įregistravimo data	1997

INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	***Mechatronics***
State code	612H73001
Study area	Technological Sciences
Study field	Production and Manufacturing Engineering
Type of the study programme	University studies
Study cycle	First
Study mode (length in years)	Full-time (4)
Volume of the study programme in credits	240
Degree and (or) professional qualifications awarded	Bachelor of Mechatronics
Date of registration of the study programme	1997

CONTENTS

I. INTRODUCTION

1.1. Background of the evaluation process

The evaluation of on-going study programmes is based on the **Methodology for evaluation of Higher Education study programmes,** approved by Order No 1-01-162 of 20 December 2010 of the Director of the Centre for Quality Assessment in Higher Education (hereafter – SKVC).

The evaluation is intended to help higher education institutions to constantly improve their study programmes and to inform the public about the quality of studies.

The evaluation process consists of the main following stages: *1) self-evaluation and self-evaluation report prepared by Higher Education Institution (hereafter – HEI); 2) visit of the review team at the higher education institution; 3) production of the evaluation report by the review team and its publication; 4) follow-up activities.*

On the basis of external evaluation report of the study programme SKVC takes a decision to accredit study programme either for 6 years or for 3 years. If the programme evaluation is negative such a programme is not accredited.

The programme is **accredited for 6 years** if all evaluation areas are evaluated as "very good" (4 points) or "good" (3 points).

The programme is **accredited for 3 years** if none of the areas was evaluated as "unsatisfactory" (1 point) and at least one evaluation area was evaluated as "satisfactory" (2 points).

The programme **is not accredited** if at least one of evaluation areas was evaluated as "unsatisfactory" (1 point).

1.2. General

The Application documentation submitted by the HEI follows the outline recommended by the SKVC. Along with the self-evaluation report and annexes, the following additional documents have been provided by the HEI before, during and/or after the site-visit:

No.	Name of the document
1.	Action plan on solving problems defined by „Round table with students" (example from database)
2.	List of Start-up's
3.	Transcripts of records (examples taken from database)
4.	Marketing and communication activities for the study programmes in the field of Production engineering

5.	Module assessment summary (example from database)
6.	List of laboratories visited on 18th of November at KTU

1.3. Background of the HEI/Faculty/Study field/ Additional information

Kaunas University of Technology (KTU) is a public research university located in Kaunas, Lithuania. With almost 11,000 students, it stands as the largest technical university in the Baltic States. It offers 135 academic studies (bachelors, masters and doctorates), 39 of which are taught in English.

KTU has 135 study programmes, of which 54 are Bachelor's, 63 are Master's and 17 scientific fields of Doctoral studies. One of these Bachelors' is the Mechatronic Bachelors' programme to be assessed. According to the Self Evaluation Report SER, the programme was created and started in 1997. The programme is aimed to provide well-balanced set of knowledge of mechanical, electronics and informatics engineering, develop abilities and practical skills to design and implement mechatronic systems and processes according to the SER. It is 240 credits aligned with ECTS. The Bachelor programme is taught in Lithuanian and English.

The previous external evaluation of the programme was carried out in 2008. It was assessed and accredited, with four recommendations to improve the programme. It was recommended to:

1. Revise the program so it will fully comply with the general requirements,
2. Improve the laboratory equipment used in the studies,
3. Increase the availability of textbooks,
4. Deeper analysis of problems in the final degree project.

These four recommendations had a positive effect while making improvements in the structure and execution of the programme according to the SER.

The programme aims, learning outcomes, structure and content of the Programme and study subjects have been improved in order to satisfy the needs of employers as well as to satisfy the requirements of national and European legislation in the area of higher education according to the SER.

1.4. The Review Team

The review team was completed according *Description of experts' recruitment*, approved by order No. 1-01-151 of Acting Director of the Centre for Quality Assessment in Higher Education. The Review Visit to HEI was conducted on *16th November, 2016.*

1. **Dr. Oluremi Olatunbosun (team leader)**, *Head of Vehicle Dynamics Laboratory, School of Mechanical Engineering, University of Birmingham, United Kingdom;*
2. **Prof. Marti Casadesus,** *Full Professor, Department of Management, University of Girona, PhD in Industrial Engineering, Spain;*
3. **Prof. Mats Hanson,** *Professor in Mechatronics, Department of Machine Design, KTH Royal Institute of Technology (until 2014), Sweden;*
4. **Mr. Audrius Jasėnas,** *director of public organization "Intechcentras", Lithuania;*
5. **Ms. Dovilė Kurpytė,** *doctoral student of Vilnius Gediminas Technical University study programme Electrical and Electronics Engineering, Lithuania.*

Evaluation coordinator – Ms. Ina Šeščilienė.

II. PROGRAMME ANALYSIS

2.1. Programme aims and learning outcomes

The overall programme aim is perfectly in line with the vison and mission of KTU. (SER, page 4 *"The mission of Kaunas University of Technology is to provide research-based studies, to create and to transfer knowledge and innovative technologies for the sustainable development and innovative growth of the country, to provide open-minded creative environment inspiring leaders and talented individuals. The future vision of Kaunas University of Technology is to be one of the leading European University with knowledge and technology development and transfer-based activities…."*). The programme aim is to educate engineers who are able analyse, design, implement and integrate innovative technologies and educate leaders who have abilities and skills to do this. Mechatronic graduates will contribute to the innovative growth of the country as it's a great demand from the labour market to hire graduates in this area. That means that program should have the greatest support from the top management of KTU; University Council, Rector and rectors office, the Senate, Deans office, etc.

The Learning Outcomes (LO) are in six categories, the same as many engineering programs at KTU and they are aligned with EUR-ACE standards for the first cycle degree.
The LO was updated 2014 according to the Descriptor of the Study Fields of Engineering from the Minister of Education and Science in Lithuania.
The LO are clear and in line with the aims of the program even if the Field of Engineering is Production Engineering which is more narrow.

The LO should be more expressed in terms of what the students are able to do after graduation instead of formulations like "has knowledge, understands, awareness, etc." The

overall learning outcomes could be improved by clearly stating the student's abilities in innovative technologies, innovation skills and internationalization and English language skills.

Normally, Mechatronics is the inter- and cross-disciplinary synthesis of Mechanical-, Electrical-and Computer Sciences. In the light of the balance between the three, the computer science content is very weak. Programming and software is a very important part and there are no explicit LOs in this area.

Concerning publicity of the programme, the LOs are available on the webpage http://ktu.edu/en/programme/b/mechatronics and the information is aligned with the information in the Self Evaluation Report. Nevertheless it was hard to find the webpage by searching from the KTU main page.

The webpage https://apply.ktu.edu/courses/course/54-bsc-mechatronics for admission is very simple and the question is if it can attract the target group, young students? The Overview, Keywords and Program structure could be rephrased.

Program Structure, is lacking the information about the 33 credits that are allocated to natural sciences and mathematics. The webpage needs a link to http://ktu.edu/en/programme/b/mechatronics . The BSc. Program is presented more in detail on http://ktu.edu/en/programme/b/mechatronics. However, it was hard to find the webpage by searching from the KTU main page.

The web page gives very little information about the programme – only "*Modern technological equipment, various machines, robots, measuring and control equipment and even household appliances are becoming complex technical systems, which are developed based on the principles of mechatronics, i.e. by using the latest science achievements and opportunities of mechanics, electronics and informatics. Developers of these systems will be able to create and the future of world!"*. The page "ABOUT" the program urgently needs to be updated for a new admission cycle. The page "LEARNING OUTCOMES" needs a preamble to describe the importance of using LO. The page "STUDY MODULES" is the same as Table 2.2 in the SER. It is not linked to the course descriptions and course content from the STYDY MODULES page.

2.2. Curriculum design

The program is a full 4 year, 240 ECTS, full time study BSc. program and in line with the regulations and legislation. (SER p. 38 *"Structure of the Programme – which is 4 years in duration and 240 credits in its volume - fully corresponds Description of the General Requirements for first cycle study programmes. For Final degree project 18 credits are allocated. Together with two modules of practice (in total 15 credits) and two semester projects*

(12 credits) the final degree project serve as important subjects strengthening the abilities and practical skills of engineering activities and indicating the achievement of learning outcomes at the programme level. 39. The Programme structure which is in compliance with the regulations and legislations of studies according workload for individual studies and contact hours in auditorium").

KTU have a system where most of the normal coursework are delivered in 6 ECTS modules and sometimes 3 ECTS (final thesis and internships not included). Mechatronics could be taught in a more problem based and project organized way, often leading to modules larger than 3 to 6 ECTS. There is one promising example - the course Robotized Technological Complexes is 9 ECTS.

The scope and aim of a mechatronic program is to educate graduates that are be able to solve important problems in the society, using multi-, cross- and inter-disciplinary technologies and methods to design and implement smart systems and products. The students can be more motivated if already they are introduced to mechatronics as a topic in the first semester – this is proposed by *the CDIO™ INITIATIVE (an innovative educational framework for producing the next generation of engineers;* www.cdio.org).

The computer science and programming part seems to be very weak. Programming and software is a very important part but there are no basic courses in that area in the curriculum. It could replace the subject Physics 3 and or Chemistry.

The Program Director seems to be very active and eager to develop the program. The LO was updated 2014 and revised 2016 according to descriptors of Study Fields of Engineering (SER #32 on page 8).

The Mechatronic Institute (http://ktu.edu/en/institute-mechatronics/) is mentioned in the SER and members from the institute were present during the site visit. The institute is an important partner to ensure the integration of the latest achievements in the mechatronic area into the curricula and subjects.

In summary, the curriculum design, course content and teaching methods are sufficient to ensure that the Learning Outcomes will be achieved.

2.3. Teaching staff

The description in SER Section 2.3 about teaching staff is very extensive and well described in detail. However, there seems to be no information about the professors' research projects or CV

on the website (http://ktu.edu/en/faculty-mechanical-engineering-and-design/department-production-engineering).

The academic staff meets the legal requirement. Although, one can question if over 100 professors and other academic staff is needed to deliver the 4 year program with only around 30 students a year. There is no information about how committed and engaged they are for the specific Mechatronic program and courses. The lecturers' CVs are in the annexes supplied with the SER but too many lecturers are listed. It would be helpful if the SER would state which are the key lecturers for this programme.

The academic staff showed, during the site visit, a strong commitment to the Department and the Program. No problem with turnover was observed.

It seems that many subjects are taught to students from different programs at the same time. According to SER #64 page 16 *"The proper ratio of lecturers and students in the Programme at the lessons of different forms, accounting rules and regulation of teachers' workload are ensured by the Regulations of pedagogical work accounting 16. Nominal number of bachelor level students per one teacher is 10.22. Typically, lecturers are involved in an execution of several study programmes. At the same time, lecturers of this Programme give lectures to bachelor's and master's students of Mechanical Engineering, Production Engineering, Thermal Engineering, Transport Engineering and other programmes from different faculties".*

Lecturers of the programme are active in research projects (SER #70 page 17 *"Lecturers of Programme are active in research projects (in average 5 – 8 national and international projects are performed per year, totally 80 projects per 5 years)").* Lecturers are very active in producing textbooks according to the Self Evaluation Report.

The professional development of the lecturers in teaching, research and practical activities is regulated (SER #74 page 17). The SER #75 page 17 and the site visit gave clear indication that the lectures are participating in different courses, workshops and seminars to improve their professional knowledge and skills.

The age distribution of the staff is balanced and there is a good proportion between the young specialists and experienced professionals. 4 new young teachers have started working at the Department since 2013 and the department has 5 doctoral students and 1 post-doctoral researcher ensuring future succession of those nearing retirement.

Some part-time lecturers are from the industry which is very good (SER p.60 *"13% of the teaching staff has halftime employment contracts, it means that they are working in the industry or projects and could transfer their practical knowledge to the program M students").*

2.4. Facilities and learning resources

The study process is organized in a traditional way in big auditorium (100`students) for theoretical subjects, classrooms for seminars (20 students) and laboratories (10 students). Most of the premises was renovated 2014 with new equipment according to the SER #83 page 20. Laboratory equipment and appliances necessary for the study process installed in educational laboratories are sufficient in relation to the student number and suitable for teaching applications.

However, an important part of training mechatronic graduates is the interaction between theory and practice (applications) - to go from idea to a prototype in a project organized setting. The program is lacking a Mechatronic student centred open rapid prototyping lab where the students can learn and use microcontrollers in different applications, a rapid prototyping lab for developing and testing mechatronic products.

Access to library, textbooks, computers and computer software are sufficient. Many textbooks are written by the lecturers as described in section 2.3 about teaching staff.

Industrial practice is included in 8th semester according to the SER #99 page 21.

2.5. Study process and students' performance assessment

The admission process to the first cycle of studies is central and uniform for KTU and Lithuanian HEI (SER p. 103 *"Admission to the study Programme Mechatronics is realised according to the Rules of admission to the first cycle and integrated studies at Lithuanian Higher Education Institutions approved by the president of Association of Lithuanian Higher Education Institutions for organization of common admission").* The number of admitted students has increased over the last six years from 15 in 2010 to 34 in 2015. That is good and makes the program sustainable. This is in spite of the total number of students in HEI in Lithuania decreasing, due to demographic and other reasons.

The students are very proud of the program, and claimed during the site visit that "our university and mechatronic program is the best in Lithuania".

Different study methods (lectures, presentations, group work, case analysis) are used during the four years of study including some Problem Based Learning (PBL) methods, for example T130B027 Robotized Manufaturing Systgems and T120B007 Microprocessor Technique.

Much effort been done in assuring the adequate achievement of program learning outcomes in each single course (subject). However, coordination between the responsible academic of each subject is needed, in order to ensure that each LO is correctly and continuously achieved and assessed.

The program is lacking a problem based, project organized interdisciplinary course in the first semester to motivate the students and show the nature of mechatronics and its use in industry and the society (CDIO Standard 4).

The students have a rich set of opportunities to participate in international mobility programs through 23 ERASMUS agreements. Unfortunately, only around two Lithuanian students a year use that opportunity. The number of incoming international students is around three students a year and can also be higher.

KTU presents on the webpage http://ktu.edu/en/students a rich set of academic and social support. All the mentor programs are voluntary although the student needs a supervisor for the thesis graduation project. The university program of career mentors started in Feb 2014 (SER 128 *"University programme of Mentors has been started at 10 February 2014. Mentors and tutors (members of University staff, representatives of industrial companies and students…").* The students have access to different tutors, advisors and mentors and it seems to be adequate. Tutors are normally elder students that could help in a particular subject. Academic advisor is a faculty member who guides in the academic and social process, research advisor is active in research and thesis projects. The Student Union has also a student mentor program.

The student achievement assessment system is well described in the SER. The assessment system is also on the web. The responsibilities for the implementation and monitoring of the programme are the same for many programs at the Department and clearly allocated: It is the Field's Study Programme Committee (FSCP) that is responsible for the strategy and development of the programme. This Committee, together with the Director of the study programme, monitors and revises annually the structure and content of the programme.

The KTU grading system, described as the Knowledge evaluations system, uses a 10 grade scale with 1 to 4 for fail and 5 to 10 for pass. The grading scale seems to be used in a proper way as the grades are distributed among the cohort and the students have to work hard to achieve the highest grade.

There is no information about how the KTU grading scale corresponds to the ECTS grading scale A to F on the web.

The placement of graduates is well and generally described in the SER section 2.5.5. Graduate students have responded to a questionnaire about their placement. 92% are working in Lithuanian industrial companies related to the study field. Average time for placement after graduation is 1,5 months.

However the alumni and social partners testified that graduates are attractive for the job market.

It is not clearly stated the possibility to continue with a master and PhD degree, to be fully employable in the mechatronic industry or continue in an academic path. An integrated 4 plus 2 years academic training could be relevant to develop and present for the bachelor cohort. That is also a possibility to increase the student number for the mechatronic master program.

2.6. Programme management

Programme management is very well described in the SER. There are a number of levels of decision-making - the KTU Senate, Vice Rector for studies, University Study Programme Committee, Faculty Council and Field Study Programme Committee (FSPC), Director of the study programme. (A chart over the decision making structure on the website or SER should help to understand the program management process.)

The responsibilities for the implementation and monitoring of the programme are clearly allocated and the same for several of the programs at the Department. It is the Field's Study Programme Committee (FSCP) that is responsible for the strategy and development of the programme. This Committee, together with the Director of the study programme, monitors and revises annually structure and content of the programme. Changes of programmes are approved by the Faculty Council where there is a representation of academics, students and social partners.

The process of the administration and the quality of the program is reflected in the Academic Information System (AIS). There is also an electronic document management system DVS. Both systems are a base for data and documents for an active internal quality assurance.

For external evaluation a university wide stakeholder feedback system is in use. The system with Social Partners is quite active and good for the development of the program and the placement. There seems to be an even greater potential to raise the quality of the program, if Social Partners can actively contribute in the learning process by providing real engineering problems to solve and resources to facilitate it.

Students evaluate the content of study subjects. *"Students evaluate content of study subjects and programmes by filling electronic questionnaire placed in the AIS on the University website in personal work fields of students. It is aimed that each study subject would be evaluated by the students which have selected it, putting their personal input to the improvement of the subjects. Long term results of the questioning are used by FSPC for study subject's certification, by attestation commission, Faculty administration for teacher performance assessment and by Student Union. General results of the questioning are discussed at the meetings of the Dean's office and Departments. The summarized statistics of the questioning are presented publicly"* (SER, #181 page 30).

The students have a low motivation to fill in electronic questionaries for its own rights and purpose. Students reported that the results from the exams will be delayed if they did not fill in the form. The introduction to punishment action, if not filling in the forms, could have negative consequences for the quality and reliability of the result of the survey.

The main input for the improvement of the programme is the "Round table" meetings. They are used to analyse the obtained data, and defining actions plans. This is a good practice in order to improve, continuously, the quality of the programme. The student's (and Student Union's) participation is very active and fruitful.

The excellence in curricula, teaching methods, lab facilities, faculty competencies and student achievements need to be addressed. The programme management need to be more proactive to demonstrate the importance and excellence of the Mechatronic Bachelor (and Master) Programme, internally but most important externally.

The management and students need to show signs of excellence, internally for motivation and externally to attract attention to the program, its faculty, students and graduates.

2.7. Examples of excellence *

* if there are any to be shared as a good practice

No explicit example of excellence is mentioned in the self-evaluation report or was stated or showed at the site visit.

III. RECOMMENDATIONS

1. Reconsider old traditional teaching methods. Join and learn from the CDIO initiative (www.cdio.org). The 12 Standards and the CDIO syllabus helps to create a more integrated problem based interdisciplinary curriculum and new learning activities.

2. Introduce a project organized introductory course in semester 1 *"that provides the framework for engineering practice in product, process, and system building, and introduces essential personal and interpersonal skills"*(CDIO standard 4).

3. It is recommended to align the responsibility to teach and train the students in each LO by coordinating the main lecturers responsible for each of them. It is important that each single LO will be correctly and continuously achieved and assessed in a proper way.

4. The interaction with industry could be more active. Take all opportunities to collaborate with the network of alumni and social partners that already exists.

5. Strengthen the Computer Science and Programming part of the curriculum.

6. Continue to develop and support the English training, both written and oral.

7. Continue to fight for a multi- or interdisciplinary mechatronic program (SER p. 58. *Recent formal requirements of study programmes are not adopted for multidisciplinary programmes*). An introductory mechatronic course (subject) in semester 1 will be a first step.

8. All the webpages connected to the Mechatronic Bachelor program need to be improved, especially the webpages that will attract students apply to the program.

9. Add information about how the KTU grading system corresponds to the ECTS grading scale A to F on webpages.

10. Develop a mechatronic student centred open prototyping lab, open 7:24, where the students can learn and use microcontrollers in different applications, a rapid prototyping lab for developing and testing mechatronic products, used from the first day of studies.

The Mechatronic prototyping lab should also be used as a showroom (signs of excellence) when attracting new students and social partners to the program.

11. Support extra or co-curricular activities where all students, from different programs together with faculty and staff can participate in for examples competitions, fieldtrips, conferences, hobbies etc.

12. The programme management need to be more proactive to demonstrate the importance and excellence of the Mechatronic Bachelor (and Master) Program, internally but most important externally.

IV. SUMMARY

The main strengths and weakness of the bachelor programme in *Mechatronics* at KTU, according to each one of the analysed standards, are:

4.1 Programme aims and learning outcomes

Strengths:

The overall programme aims are perfectly in line with the vison and mission of KTU. That means that program should have the greatest support from the top academic and administrative management of KTU.

Weaknesses:

The overall learning outcome could be improved by clearly stating the student's abilities in innovative technologies, innovation skills and internationalization and English language skills.

4.2 Curriculum Design

Strengths:

The curriculum design has a good balance between compulsory and elective courses in terms of number of credits. The overall six categories of Learning Outcomes (LO) are well defined according to international engineering standards.

Weaknesses:

As mechatronic engineers normally are working in the interdisciplinary field of the design and creation of innovative, complex products, they need to be trained to do so – currently there are too many traditional lectures. The program is lacking courses that combine and include different disciplinary fields, for example in the beginning of year 1. The program is lacking Computer Science and Programming subjects or integrated in other subjects. The Learning Outcomes are not shared and aligned enough among the faculty, even if the LO are discussed annually in Department meetings. English as the international professional engineering language needs to be improved at all levels.

4.3 Teaching staff

Strengths:

The academic staff (teaching staff) is well prepared, motivated and have a student centred learning approach. Lecturers are very active in producing textbooks.

Weaknesses:

The teaching staff is not aware of the contribution of programme Learning Outcomes from other subjects to avoid overlaps. The interaction with industry could be more active. Take all opportunities to collaborate with the network of social partners that already exists.

4.4 Facilities and learning resources

Strengths:

The Department of Production Engineering have a large number of laboratory facilities, around half of them with an education focus and half of them with applied research focus.

Weaknesses:

The level of research and learning activities in the labs seems to be very low and could certainly increase. There is a lack of an open rapid prototyping mechatronic lab, including programming of embedded controllers.

4.5 Study process and students performance assessment

Strengths:

The number of admitted students has increased over the last six years from 15 in year 2010 to 34 in year 2015. That is good and makes the program sustainable.

Weaknesses:

The total number of students in HEI seems to decrease for demographic and other reasons, which can be a threat in the near future. Much effort has been done in assuring the adequate achievement of program learning outcomes in each single course (subject). However, **coordination** between the academics responsible for the subject is needed, in order to ensure that each LO is correctly and continuously achieved and assessed. The webpages for admitting students are not appealing to prospective students.

4.6 Programme management

Strengths:

The *Round Table* concept for continuous improvements of courses, programme, faculty and facilities.

Weaknesses:

The SER report, or a summary of it, was distributed neither for the students nor for the stakeholders. No examples of excellence in curricula, teaching methods, lab facilities, faculty competencies and student achievements was presented in the SER nor at the site visit. The programme management need to be more proactive to demonstrate the quality, importance and

excellence of the Mechatronic Bachelor (and Master) Program, internally but most important externally.

V. GENERAL ASSESSMENT

The study programme *Mechatronics* (state code – 612H73001) at Kaunas University of Technology is given **positive** evaluation.

Study programme assessment in points by evaluation areas.

No.	Evaluation Area	Evaluation of an area in points*
1.	Programme aims and learning outcomes	3
2.	Curriculum design	3
3.	Teaching staff	3
4.	Facilities and learning resources	3
5.	Study process and students' performance assessment	3
6.	Programme management	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:	Dr. Oluremi Olatunbosun
Grupės nariai: Team members:	Prof. Marti Casadesus
	Prof. Mats Hanson
	Mr. Audrius Jasėnas
	Ms. Dovilė Kurpytė

<…>

V. APIBENDRINAMASIS ĮVERTINIMAS

Kauno technologijos universiteto studijų programa *Mechatronika* (valstybinis kodas – 612H73001) 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 universitete vykdomos bakalauro studijų programos *Mechatronika* pagrindinės stiprybės ir silpnybės pagal kiekvieną išanalizuotą sritį:

4.1 **Programos tikslai ir studijų rezultatai**
Stiprybės
Programos tikslai puikiai atitinka KTU vizijos ir misijos nuostatas. Tai reiškia, kad studijų programą turėtų aktyviai palaikyti KTU akademinė ir administracinė vadovybė.
Silpnybės
Reikėtų tikslinti studijų rezultatus, aiškiai nurodant studentų gebėjimus inovacinių technologijų srityje, inovacinius įgūdžius, tarptautiškumą ir anglų kalbos įgūdžius.

4.2 **Programos sandara**
Stiprybės

Programos sandaroje išlaikyta pusiausvyra tarp privalomiesiems ir pasirenkamiesiems dalykams skiriamų kreditų skaičiaus. Visos šešios studijų rezultatų kategorijos yra tinkamai apibrėžtos pagal tarptautinius inžinerijos standartus.
Silpnybės
Mechatronikos inžinieriai paprastai dirba tarpdalykinėje inovacinių, sudėtingų produktų projektavimo ir kūrimo aplinkoje, todėl studentus reikia mokyti šių dalykų, tačiau šiuo metu skaitoma pernelyg daug tradicinių paskaitų. Studijų programoje trūksta dalykų, kuriuose būtų derinamos skirtingos kryptys, pavyzdžiui, pirmųjų metų studijų plane trūksta kompiuterių mokslo ir programavimo dalykų (arba reikėtų, kad jie būtų integruoti į kitus dalykus). Fakulteto dėstytojai nepakankamai dalijasi ir derina informaciją apie studijų rezultatus, nepaisant to, kad kasmet studijų rezultatai aptariami katedros posėdžiuose. Reikia gerinti anglų kalbos, kaip tarptautinės profesinės inžinerijos kalbos, įgūdžius visais lygiais.

4.3 **Personalas**
Stiprybės
Akademinis personalas (dėstytojai) yra pasirengęs gerai, motyvuotas, taiko į studentus orientuotus mokymosi metodus. Dėstytojai labai aktyviai rengia vadovėlius.
Silpnybės
Dėstytojai nežino apie kitų dalykų studijų rezultatus, kad galėtų išvengti jų dubliavimosi. Bendravimas su pramonės atstovais galėtų būti aktyvesnis. Reikia išnaudoti visas galimybes ir bendradarbiauti su jau esamu socialinių partnerių tinklu.

4.4 **Materialieji ištekliai**
Stiprybės
Gamybos inžinerijos katedra turi daug laboratorijų, beveik pusė iš jų skirtos mokymui(si), kitos – taikomiesiems moksliniams tyrimams.
Silpnybės
Mokslinių tyrimų ir mokymosi veikla laboratorijose yra neaktyvi, tad būtina ją suaktyvinti. Trūksta atviros greitojo prototipavimo mechatronikos laboratorijos, įmontuotų valdiklių programavimo.

4.5 **Studijų eiga ir jos vertinimas**
Stiprybės
Per pastaruosius šešerius metus priimtų studentų skaičius padidėjo nuo 15-os 2010 metais iki 34-ių 2015 metais. Tai geras ženklas, garantuojantis studijų programos tvarumą.
Silpnybės
Bendras studentų skaičius aukštojoje mokykloje, atrodo, mažėja dėl demografinių ir kitų priežasčių, kas gali kelti grėsmę ateityje. Daug darbo skirta užtikrinant adekvatų studijų programos studijų rezultatų pasiekiamumą kiekviename kurse (dalyke). Tačiau būtina užtikrinti dėstytojų, kurie atsakinti už konkrečius dalykus, **koordinavimą,** norint pasiekti, kad kiekvienas studijų rezultatas būtų teisingai ir nuolat pasiektas ir įvertintas. Būsimiesiems studentams skirtas interneto puslapis nėra patrauklus.

4.6 **Programos vadyba**
Stiprybės
Apskritojo stalo diskusijos, siekiant užtikrinti nuolatinį dalykų, studijų programos ir materialinės bazės tobulinimą, dėstytojų kvalifikacijos kėlimas.
Silpnybės
Savianalizės suvestinė arba bent jos santrauka nebuvo išplatinta nei studentams, nei dalininkams. Nei savianalizės suvestinėje, nei vizito metu nebuvo pateikta studijų turinio, mokymo metodų, laboratorijų įrangos, dėstytojų kompetencijų ar studentų pasiekimų išskirtinės kokybės pavyzdžių. Programos vadyba turi būti aktyvesnė, siekiant atskleisti bakalauro (ir

magistrantūros) studijų programos *Mechatronika* kokybę, svarbą ir išskirtinumą tiek universiteto viduje, tiek, svarbiausia, išorėje.

<…>

III. REKOMENDACIJOS

1. Iš naujo apsvarstyti senus tradicinius dėstymo metodus, prisijungti prie CDIO iniciatyvos (www.cdio.org) ir pasinaudoti galimybe pasimokyti iš jos. 12 standartų ir CDIO mokymo programa padeda sukurti labiau integruotą, į problemų sprendimą orientuotą tarpdalykinį studijų turinį ir naujas mokymosi veiklas.

2. Į pirmąjį semestrą įtraukti įvadinį kursą (projekto forma), „*kuris numatytų produktų, procesų ir sistemų kūrimo inžinierių praktikos gaires ir ugdytų pagrindinius asmeninius ir bendravimo įgūdžius"* (CDIO 4-as standartas).

3. Rekomenduojama, kad studentai būtų mokomi ir lavinami atsižvelgiant į kiekvieną studijų rezultatą, koordinuojant pagrindinių dėstytojų, atsakingų už konkretų studijų rezultatą, veiklą. Svarbu, kad kiekvienas studijų rezultatas būtų tinkamai ir nepertraukiamai pasiektas ir tinkamai įvertintas.

4. Aktyviau bendrauti su pramonės atstovais. Išnaudoti visas galimybes ir bendradarbiauti su jau sukurtu alumnų ir socialinių partnerių tinklu.

5. Stiprinti studijų turinio dalį, susijusią su kompiuterių mokslu ir programavimu.

6. Toliau tęsti ir skatinti mokymą anglų kalba tiek raštu, tiek žodžiu.

7. Toliau siekti, kad Mechatronikos studijų programa taptų daugiadalykinė arba tarpdalykinė (Savianalizės suvestinės 58 p., *Dabartiniai formalūs studijų programos reikalavimai nėra nustatyti daugiadalykinėms studijų programoms*). Įvadinis mechatronikos kursas (dalykas) pirmajame semestre būtų pirmasis žingsnis.

8. Tobulinti visus interneto puslapius, susijusius su *Mechatronikos* bakalauro studijų programa, ypač tuos, kurie skirti pritraukti studentų studijuoti šioje studijų programoje.

9. Internetiniuose puslapiuose papildomai pateikti informaciją, kaip KTU vertinimo balais sistema atitinka ECTS vertinimo skalę nuo A iki F.

10. Įsteigti į Mechatronikos programos studentus orientuotą atvirąją prototipavimo laboratoriją, kuri veiktų nuo 7 iki 24 valandos, kurioje studentai galėtų mokytis ir naudoti mikrovaldiklius įvairiose taikomosiose programose, taip pat greitojo prototipavimo laboratoriją, skirtą mechatronikos produktams, kurie naudojami nuo pirmosios studijų dienos, kurti ir testuoti. Mechatronikos prototipavimo laboratorija taip pat turi būti naudojama kaip demonstravimo salė (kompetencijai parodyti), siekiant į šią studijų programą pritraukti naujų studentų ir socialinių partnerių.

11. Skatinti papildomas veiklas, kurias galėtų rinktis skirtingų studijų programų studentai ir kartu su fakulteto specialistais ir dėstytojais dalyvauti, pavyzdžiui, konkursuose, pažintiniuose turuose, konferencijose ir pan.

12. Studijų programos vadyba turėtų būti aktyvesnė siekiant parodyti *Mechatronikos* studijų programų (ir bakalauro, ir magistro studijų) svarbą ir išskirtinumą Universiteto viduje, ir, svarbiausia, išorėje.

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Paslaugos teikėjas patvirtina, jog yra susipažinęs su Lietuvos Respublikos baudžiamojo kodekso 235 straipsnio, numatančio atsakomybę už melagingą ar žinomai neteisingai atliktą vertimą, reikalavimais.

Vertėjos rekvizitai (vardas, pavardė, parašas)