STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

KAUNO TECHNOLOGIJOS UNIVERSITETO PANEVĖŽIO TECHNOLOGIJŲ IR VERSLO FAKULTETO STUDIJŲ PROGRAMOS *MECHANIKOS INŽINERIJA (valstybinis kodas – 612H30001)* VERTINIMO IŠVADOS

EVALUATION REPORT OF *MECHANICAL ENGINEERING* (*state code – 612H30001*) STUDY PROGRAMME at KAUNAS UNIVERSITY OF TECHNOLOGY PANEVĖŽYS FACULTY OF TECHNOLOGY AND BUSINESS

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Išvados parengtos anglų kalba
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2015

DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	***Mechanikos inžinerija***
Valstybinis kodas	612H30001
Studijų sritis	Technologijos mokslai
Studijų kryptis	Mechanikos inžinerija
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Pirmoji
Studijų forma (trukmė metais)	nuolatinė (4), ištęstinė (6)
Studijų programos apimtis kreditais	240
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Mechanikos inžinerijos bakalauro laipsnis
Studijų programos įregistravimo data	1997-05-19

INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	***Mechanical Engineering***
State code	612H30001
Study area	Technology Sciences
Study field	Mechanical Engineering
Type of the study programme	University studies
Study cycle	First
Study mode (length in years)	Full-time (4), part-time (6)
Volume of the study programme in credits	240
Degree and (or) professional qualifications awarded	Bachelor in Mechanics Engineering
Date of registration of the study programme	19-05-1997

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.

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

Kaunas University of Technology (KTU) was established in 1920 and is one of the leading technical universities in the Baltic countries. The university is responsible for about 150 study programmes covering all three levels for more than 10 000 students and has about 1000 academic staff members.

The university consists of 9 faculties, one of them the Faculty of Technologies and Business in Panevėžys (PFTB). The faculty was founded as a part of KTU in 1961 and consists of the Department of Technologies and the Department of Economics and Business and has 50 academic staff members of which 25 have full time positions. The faculty is hosting 14 study programmes covering Bachelor's and Master's levels with about 700 students. The Bachelor's degree programme in Mechanical Engineering (ME) at PFTB started in 1993 and has since then awarded 371 BSc degrees in ME. The ME programme is managed and developed in close cooperation with the Faculty of Mechanical Engineering and Design in Kaunas. The programme was last updated in 2014.

The first evaluation of the ME programme at PFTB was carried out in 2008 and the programme was accredited without reservations for the maximum period of six years. The evaluation team of 2008 also pointed out some weaknesses and provided some recommendations for improvements. Actions in line with the recommendations have been taken.

The ME programme at PFTB has a very close symbiosis with the local industry. The manufacturing industry in Panevėžys region relies heavily on graduates from PFTB. On the other hand, the knowledge, skills and abilities of the graduates perfectly match the needs of the industry of the region. The employers are very satisfied with the graduates and the graduates easily find positions in the local industry. Students also have no problem to find places for practical placement and jobs in the local industry. The recruitment of students is also very local, in principle all student of the programme are recruited from the Panevėžys region.

The self-evaluation report (SER) for the present evaluation was carried out by a self-evaluation team appointed by the order of the Rector. The self-evaluation team consisted of four associated professors, one lecturer, one student and one social partner and was headed by the local programme coordinator.

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 by the team on *25th February 2015.*

1. **Prof. dr. Olav Aarna** (team leader), *Adviser to the Management Board of the Estonian Qualifications Authority, Vice-Rector for Research at Estonian Business School, Estonia.*
2. **Prof. dr. Hartmut Ulrich**, *Professor for Mechatronics and Fluid Power Technology, Institute for Mechanical Engineering, University of Applied Sciences Ruhrwest,*

Germany.

3. **Prof. dr. Jolanta Janutėnienė,** *Head of the Department of Mechanical Engineering, Faculty of Sea Mechanics, Klaipėda University, Lithuania*.
4. **Prof. dr. Mikael Enelund,** *Professor at the Department of Applied Mechanics, Chalmers Universityu of Technology, Sweden*.
5. **Dr. Vaidas Liesionis**, *Marketing Director at Machinery plant "Astra" AB, Lithuania*.
6. **Mr. Eduardas Gvozdas**, *student of Vilnius University study programmes Laser Physics and Optical Technologies, International Business Economics and Management*.

Evaluation coordinator Ms. Natalja Bogdanova

II. PROGRAMME ANALYSIS

2.1. Programme aims and learning outcomes

The mandatory parts of the Bachelor's programme in Mechanical Engineering (ME) in Panevėžys are identical to the programme offered by the Faculty of Mechanical Engineering and Design in Kaunas. The programmes offered in Kaunas and Panevėžys have the same state code, the same main aim and in principle the same programme learning outcomes (LOs). The only difference concerning the programme aims, detailed aims and programme LOs is that the programme at PFTB offers a specialization in computer aided manufacturing. The same KTU website is used for both programmes. The website is not updated with information regarding the PFTB programme specialization. Moreover, interviews confirmed that the programme is controlled by the Faculty of Mechanical Engineering and Design in Kaunas as far as the programme manager, the Study Programme Committee and the Faculty Council are in Kaunas.

The main aim of the programme is "to provide fundamental knowledge in mechanical engineering, develop abilities, skills and competencies necessary to function effectively in developing products, components and technologies of mechanical nature, carry out research and management tasks, perform control, exploitation of mechanical systems and develop abilities to communicate and cooperate with professionals and non-professionals" (SER, p. 3 and 5), whereas the aim of the specialization offered at PFTB is "to provide graduates with the knowledge and practical skills required for working in computerized integrated manufacturing

conditions", (SER, p.6). This is consistent with the name ME as well as with the more detailed aims and the inherent meaning of the LOs.

The detailed aims of the programme and the inherent purpose of the LOs are in line with national standards and the EUR-ACE requirements for the first cycle degree programmes. It has to be mentioned that the programme LOs presented in the SER (p. 5-6) differ from those presented at the programme website as well as on the Service for Open Communication, Counselling and Guidance System (AIKOS) website. The LOs in the SER include, e.g. LOs in social sciences and humanities (LO A3) and biomechanical engineering (LO A8). Anyway, the main LOs are the same. This means that both programmes have the same shortcomings in the structure and formulation of the LOs.

The programme LOs' definitions are too complicated, not specific enough and difficult to assess. For example, LOs F1 and F2 include several different objectives that by nature are developed in different ways and through different courses. The LO F2 "is able to work independently and in mixed groups (teams)" combines two abilities, whereas the ability to work independently is best trained and assessed differently from the ability to work in mixed groups. In the LO F1 it is stated that the student should be able to communicate in both Lithuanian and at least one foreign language. For the same reasons those abilities are recommended to separate into two LOs. Moreover, the LOs should be further decomposed to give a clearer description of what the student is expected to know, understand and be able to do upon graduation. One example of this shortcoming is found in the LO A2 (SER, p.5) "Has fundamental knowledge of nature and phenomena of nature which are basic for mechanical engineering, understanding of quantitative expressions of those phenomena" is too vague and gives no explanation on what specific knowledge, skills and competence the student has. Another example is the LO A4 (SER, p.5) "Properties of engineering materials including biomaterials" which is far too general and gives no information on what the students know and are capable to do upon graduation.

Active verbs (or even verbs) are not used in the formulations of several LOs, which makes it difficult to assess whether the student has achieved the LOs. It is recommended to avoid formulations like: being able to understand and to have abilities. For instance, the LO B4 (SER, p.5) "Have abilities of information search in primary and secondary sources of information, including on-line search of information" may be written as "Are able to search for, evaluate and use information in primary and secondary sources including web based ones".

Individual courses contributing towards the programme LOs are indicated in Table 5 of the SER. However, the connections between the programme LOs and the individual courses LOs are inconsistent and weak and in several cases non-existing. For example, the degree project is

expected to cover all programme LOs. This is most likely not the case, e.g. the ability to work in mixed groups. Another example is the LO F1 "the ability to communicate in grammatically correct Lithuanian and at least one foreign language" that is indicated to be developed in the Philosophy course. During the interview with the teacher of the course, it became evident that this LO is not developed in the course.

The LOs have to be applicable to the entire student body and have to be described on the threshold level, not an aspirational level defining excellence. All programme LOs must be covered by the mandatory courses. Thus, an elective course in foreign language is does not guarantee the achievement of the LO with respect to the ability to communicate in a grammatically correct foreign language. The LO A8 "basics and consistent of biomechanical engineering, functional models of biomechanical systems and methods of modelling, materials for biomechanical systems" is indicated to be achieved in the semester project, professional practice and the degree project. The evaluation team found no evidence of LOs related to biomechanical or biomaterials in course descriptions (SER, ANNEX 4.1) or semester project reports or degree project reports available during the site visit.

During the visit it was made clear that the teaching staff in Panevėžys is not familiar with the LOs based approach. They considered the programme LOs as a paper product with no relevance for their teaching. Moreover, it was evident that the students were not aware of the programme and course LOs, although these are available at the KTU website.

The uncertainty in the formulation of the LOs and tentative implementation of the LOs based approach are to some extent caused by the lack of a national regulation defining generic LOs of types of degrees. During the visit, the evaluation team was explained that the corresponding ordinance was under preparation. This will most certainly facilitate the reformulation of the LOs.

2.2. Curriculum design

The programme in ME of 240 ECTS credits is offered in full-time mode as a four years programme (8 semesters of 30 credits each) and part-time as a six years programme (12 semesters 20 credits each). Each semester consists of 16 weeks of teaching and learning plus four weeks for examinations and the planned student workload for a semester is 800 hours. A 240 credits programme is rather long for a Bachelor's degree by international standards, well exceeding the 180 ECTS which is the requirement in many countries and also a baseline for the first cycle programmes in engineering in the EUR-ACE standards. Such duration allows the

programme to provide a large number of elective courses covering economics, sustainable development, personal development and entrepreneurship, and for the students to specialize in computer-aided manufacturing. The curriculum fully corresponds to the national requirements for a first cycle programme.

The content and teaching methods of the courses are appropriate for the achievement of most of the programme LOs. However, the students need to choose their elective courses with care to achieve the LOs regarding biomechanics, sustainability, communication in foreign language, and management. Training in teamwork is limited to the lab assignments and the programme does not guarantee that the students obtain skills in working in mixed teams. The introduction of a semester project from the academic year of 2014/15 is a positive development. Nonetheless, it is recommended to use it more for training in general engineering competences and transferable skills needed for the students to work efficiently in teams with complex problems. The semester project is an individual project with individual assessment but in order to address the programme LO regarding team work a team project would be more appropriate.

The content of the courses is consistent with the requirements to the first cycle programmes in ME. Yet, the volume of mathematics courses in terms of credits seems to be somewhat low: 12 credits of analysis and algebra, 6 credits of probability and 6 credits of numerical methods. In particular, the content regarding calculus in several variables is rather limited. The programme could be more adapted to the needs of the regional industry in computer aided manufacturing. To achieve this, a Bachelor's programme in ME needs to be developed in Panevėžys, independent from the programme offered by the Faculty of Mechanical Engineering and Design in Kaunas. The programme would benefit being more focussed on the most recent and sophisticated manufacturing technologies, e.g. CNC and additive manufacturing, and the use of modern CAD and CAM tools.

An interesting and promising initiative towards bringing more applications to the first year courses is taken by a teacher of the mathematics courses. Students are encouraged to bring their mathematics related practical problems into the class. The solutions are awarded with points that can raise the student's final grade. In general, the content of the programme reflects the latest achievements in science and technology. Nevertheless, the programme would benefit from modernizing mathematics courses and strengthening of students' programming skills. There is a potential for strengthening students' ability to handle complex problems by introducing one major project each study year. The projects should have increasing degree of uncertainty and difficulty. Such projects are also well suited for integrating training in transferable skills such as teamwork, communication, project management, product development

methodology, intellectual property rights etc. into the programme. This is more efficient than having separate and often isolated courses in the end of the programme aiming at the development of personal and general engineering skills.

2.3. Teaching staff

The programme has sufficient number (23) of teachers considering the volume of the programme and the number of students. The teaching staff consists of 3 professors, 12 associate professors and 8 lectures all of them having full-time positions. Even if the number of students would increase substantially the number will be sufficient. The qualification of teachers in the programme meets the legal requirements. About 75% of the teachers in the programme have scientific degrees and in general they are very experienced. Majority of the teachers are active in research but the number of scientific publications in reputable international journals and refereed conferences is low. There is a close and potentially beneficial cooperation among the teachers of mathematics, engineering, business and social sciences. To summarize, the qualification of the teaching staff is adequate to ensure the programme aims and LOs.

The average age of the teaching staff in the programme is 51 years and the faculty is planning to replace a professor close to retirement with a young PhD degree owner. The turnover is rather low but the teaching staff has appropriate composition in terms of age, gender and research interests to ensure adequate provision of the programme.

KTU provides relevant conditions for the competence development of the teaching staff in their research fields. Most of the teachers are also improving their competence in foreign languages, entrepreneurship, project management and IT. All full-time teachers of the programme have been successfully attested for their pedagogic, scientific and public activities during the evaluation period.

The teachers are aware of developing their teaching skills and students' feedback is taken seriously. However, since the same courses are taught at and controlled by the Faculty of Mechanical Engineering and Design in Kaunas, the possibilities to undertake any major course developments in Panevėžys are fairly limited. One admirable exception is the innovative development by a math teacher, to bring real world problems to the mathematics courses. From the interviews it was clear that the teachers were not sufficiently trained or aware of the LOs based approach with aligning LOs, teaching and students' assessment. At the moment the KTU has no structural unit to support teachers and provide pedagogical or didactical courses.

KTU has no system for recognizing excellence in teaching and the faculty management made it clear that research merits are much higher valued than teaching merits in the periodic evaluations and in promotions. The management claimed that teaching merits are taken into account in the labour contract discussions. In the interviews with teachers the evaluation team found no evidence that this has come through.

From interviews with teaching staff, alumni and social partners it became evident that teachers of the programme have very good contacts with companies in the Panevėžys region. They meet regularly to discuss courses' content, practical training issues and topics for the degree projects.

Interviews also demonstrated that the teachers are highly dedicated and have very supportive attitude towards the students. It was obvious that the students very much appreciate their teachers and the collegial way of teaching and learning.

2.4. Facilities and learning resources

The premises for studies are adequate both in size and quality. The students have access to good auditoria and well-equipped library. The laboratory equipment and computers are up-to-date as well as sufficient in quantity. The maximum numbers of students in classrooms and labs are regulated by occupancy norms that ensures safe learning environment for efficient teaching and learning.

The students have access to computers equipped with mathematics, design, analysis and manufacturing software for CAD and CAM. However, during the interviews with the students the evaluation team learned that the range of software was limited and somewhat out-of-date compared to the IT environment at the Faculty of Mechanical Engineering and Design in Kaunas. The evaluation team recommends considering to offer CAD software licenses also for students for the period of their studies at PFTB.

The metal workshop is adequately equipped and staffed with technicians. The visit confirmed that the workshop is in good order and suitable for students' practise. Adequate space for students' individual work and studying is also available.

The teaching materials (textbooks, books, electronic papers, journals, electronic databases) are adequate and available in the library and the access is well organized. The electronic library resources are available for students.

2.5. Study process and students‘ performance assessment

The admission requirements to the programme are well-founded. The programme admits students with at least 12 years secondary education on a competitive basis. Admission is conducted according to the Rules of Admission to the First Cycle and Integrated Studies in Lithuanian Higher Education.

During the last five years the number of freshmen students entering the programme has varied between 7 and 13. Such number of students does not guarantee the sustainability of the programme. Therefore the recruitment of new students must be prioritized at all levels of the KTU. Currently the recruitment of students is limited to the Panevėžys region. It was impossible to find the programmes in ME offered at PFTB searching for the ME programmes in Lithuania through the Service for Open Communication, Counselling and Guidance System (AIKOS).

High drop-out rate is another issue. The common explanation is the lack of motivation and/or low level of knowledge in mathematics and physics. Some measures, e.g. additional consulting hours have been taken to decrease the number of drop-outs but obviously more needs to done.

The faculty has many ERASMUS agreements and the management claims that the students are encouraged to participate in exchange programmes. In fact, during the evaluation period none of the ME students have been abroad as exchange student nor have the programme received any exchange students from foreign universities. During the visit the evaluation team learned that no courses are delivered in English and that international exchange of students is not on the agenda. The evaluation team concludes that the programme management’s efforts in promoting student mobility are insufficient.

The SER states that the students are encouraged to conduct research and the students are invited to attend annual student research conferences. Actually, the student participation in research is fairly modest.

The organization of the study process is adequate. A variety of teaching methods are employed. The assessment structure is well presented, clear and publicly available. A ten grades scale is used in grading the course results while the final grade is built up from several components, incl. the final exam. However, it is difficult to decide whether the LOs, teaching, learning and students’ assessment are constructively aligned. The relationship between different grade levels and the LOs seems to be missing. Further, it is unclear whether the LOs are described on threshold level that every student should reach or aspirational level that defines excellent achievements.

There are clear and publicly available guidelines for degree project, incl. organisation, LOs, structure, defence and assessment. Teachers, students and social partners can suggest the topics. During the visit the students confirmed that it is very easy to find topics for the degree projects and that they can propose their own topics. The titles of the degree projects confirm their relevance for the programme. As far as all the degree project reports presented for the evaluation team were written in Lithuanian and the English summaries generally were very weak it is difficult to judge about their level and quality. The evaluation team also found that the conclusions sections of the reports are in general insufficient. The supervisors and students claimed that they were fully aware of the guidelines and requirements for the degree projects, but the evaluation team did not find clear evidences for this.

The PFTB and the KTU provide an adequate level of academic and social support for students. According to the students' opinion, the Career Support Centre and the Study Information Centre are working fine and are helpful. Students' interests are represented by the Students Association and they are cooperating with administration and have representation in the boards at different management levels. However, during the visit the evaluation team learned that no students from Panevėžys were involved in the Study Programme Committee. The mentoring programme at PFTB is working fine and is very much appreciated by the students.

The dean's office, administration and the teachers have close cooperation with alumni and employers. They keep track of all graduates. It is evidenced that graduates easily find jobs relevant for their qualification. Most of them start as advanced CNC operators or CAD technicians, which they seem to be overqualified for. It has been explained that this allows them better adapt to the company needs and move to more advanced positions rapidly.

2.6. Programme management

General management and quality assurance of the study programmes is the responsibility of the vice-rector for studies with support from of Department of Academics Affairs. The programme manager is responsible for the content and quality of the study programme, incl. the programme aim and LOs, and courses' content. The programme manager also prepares proposals for changes in the programme or course content. The Study Programme Committee with 11 members (among them 4 professors, 3 representatives from employers and 3 students) advises the programme manager. The Study Programme Committee is the major body for the programme development and quality assurance. Changes in the programme are approved by the Faculty Council with 15 members among them 3 students appointed by the Student Union, one

representative from the employers and the dean of the faculty. The programme manager is also responsible for the implementation and follow-up of changes.

Responsibilities for taking decisions and monitoring of the programme implementation are formally clearly allocated. Nonetheless, since the Faculty Council, Study Programme Committee and Programme manager all are located in Kaunas and staffed by Kaunas faculty, the influence from the Panevėžys faculty, students and employers is very limited. During the visit, the evaluation team learned that one Study Programme Committee is responsible for more than 30 programmes. In practice such committee cannot have detailed knowledge about the needs of all programmes.

There is a local study coordinator in Panevėžys but the role and responsibilities as well as the relation to the programme manager are unclearly described (SER, p.32 item 140 and p.6 item 19). What is more, during the visit the evaluation team did not get a clear explanation of the role of the local study coordinator.

The programme does not take full advantage of having technology, business and social sciences in the same faculty. This could be used to integrate business, innovation and entrepreneurship aspects in the programme to a much larger extent. During the interviews, the evaluation team met a student developing his own product in the framework of the degree project. It became evident that the programme does not support sufficiently business aspects of the product development chain.

Information on the programme implementation is regularly collected and analysed. KTU has a common electronic course evaluation system. All courses are evaluated by students and the results are analysed. The best teachers are acknowledged based on the results of course evaluations. However, from interviews with the students the evaluation team found that many students do not care to fill in the questionnaire. The course evaluation results are discussed at teachers meetings, but feedback to the students on the results is not given. The Student Union has its own questionnaire on the students' perceptions on the programme, courses taught and the performance of teachers. The faculty and the departments get access to these results and discuss them.

The faculty organizes regular meetings with the business representatives of Panevėžys and the leaders of Municipality to discuss the needs for professionals in the region, practical placements issues and topics of degree projects. The internal quality assurance system is in use at PFTB and stakeholders are involved. Results are taken into account and used for improvements but as stated above, the Panevėžys faculty has very limited possibility to influence the programme aims, LOs and curriculum.

The recommendations of previous evaluation have been taken into account to some extent, but much more needs to be done when it comes to participation in international student exchange and the involvement of students in research activities.

2.7. Examples of excellence

The math teacher's initiative to include applications into the math courses by letting the students bring in their own real world problems and supporting them in solving the problems including taking it into account when grading the students is a pedagogical innovation that can be suggested as a role model for other teachers.

Very close and mutually beneficial relations with the industry and the municipality of the Panevėžys region are definitely an example of best practise. As a result of this, the knowledge, skills, abilities and attitudes of the graduates perfectly match the needs of the industry and the graduates quickly find appropriate job positions, students find practical placement in companies and topics for degree projects.

III. RECOMMENDATIONS

1. Develop and implement an independent Bachelor's programme in Mechanical Engineering at the Faculty of Technology and Business in Panevėžys with its own programme manager and Study Programme Committee. Formulate specific programme aims, learning outcomes, curriculum and course descriptions.

2. Put recruitment of students at the top of the agenda at all levels. Market the programme as being unique and highlight its close relation to the needs of industry.

3. Formulate programme learning outcomes focussing on the students' knowledge, skills, abilities and attitudes upon graduation. The programme learning outcomes should be externally verifiable and formulated in such a way that in the assessment process it can be determined if a student has achieved the learning outcomes. The learning outcomes should be defined on threshold level that every student should achieve. Make sure that the programme learning outcomes are covered and assessed in the mandatory courses. Train the teachers in the learning outcomes based approach.

4. Teach, train and assess general engineering competences such as team work, communication and project management on a demanding and more structured manner. For example, consider running the semester project as a team project and integrate teaching and learning of general competences into the project course. The project task may be taken from industry to integrate real world engineering experience into the curriculum.

5. Introduce methods and applications from mechanical engineering early in the curriculum. For example, the finite element method can be taught and utilized already in the mathematics and strength of materials courses in the year one and two. Programming is a key skill for a modern engineer and programming needs to be taught, integrated and utilized to a wider extent. Consider introducing a programming language, e.g., Python or Matlab, in the very beginning of the programme. The mathematics courses can be modernized to integrate symbolic and numerical calculations and elements of programming to enable students handle more applied problems.

6. Put substantial efforts and resources in creating an international study environment. Select a few courses to be taught entirely and only in English. Find international partner

universities and companies for agreements on short visits. Improve the command of English among students and staff.

7. Share teaching, lab and software resources with the KTU main campus. Consider offering CAD software licenses also for students for the period of their studies at PFTB.

IV. SUMMARY

The Bachelor's programme in Mechanical Engineering is carried out at the Faculty of Technologies and Business in Panevėžys, Kaunas University of Technology. The programme is in its mandatory parts, programme aims, learning outcomes and curriculum identical to the programme offered at the main campus in Kaunas. The programme in Panevėžys offers a specialization in computer aided manufacturing. The programme has strong links to the needs of the industry in the Panevėžys region. The employability of the graduates is high. Alumni as well as the employers are very much satisfied with the programme.

Currently, the programme is entirely dependent on and controlled by the Faculty of Mechanical Engineering and Design in Kaunas. The programme needs more autonomy to formulate programme aims, learning outcomes, curriculum and course contents. For the efficient development and implementation of an own programme, a local programme manager and Study Programme Committee with representatives of teachers, students and employers from Panevėžys as members are needed.

The learning outcomes need to be reformulated to reflect the programme specificity. At present, the programme learning outcomes (LOs) are not sufficiently well formulated, they are too vague, too complicated and difficult to assess. The reformulated programme LOs should be focussed on what the students know and are able to do upon graduation. Moreover, the LOs should be formulated in such a way to allow their assessment. To achieve this, active verbs should be used and the LOs must be sufficiently specific and contextualised. How the individual course of the programme contribute to the fulfilment of the LOs needs to be clarified and maintained through cooperation within the teaching staff of the programme.

The curriculum would benefit from being updated to include more of the most recent and sophisticated manufacturing technologies, e.g. CNC and additive manufacturing, and the use of up-to-date CAD and CAM tools. As well, the social sciences, business aspects and entrepreneurial skills should be better integrated into the programme taking advantage of the synergy with the neighboring Department of Economics and Business.

The teaching staff is very dedicated and supportive. All teachers have expert knowledge in their fields of teaching. The students are motivated and hardworking. The collegial relations between teachers and students are successful. However, the influence of students on the programme development and quality assurance needs to be strengthened. The management needs to create incentives for the students to fill in the course questionnaires and provide feedback to the students on the results of the course evaluations.

The library, auditoria and laboratory facilities are adequate with up-to-date equipment. The number of computers is sufficient and the computers are equipped with mathematics, design, analysis and manufacturing software. However, the range of software is somewhat limited and some are out-of-date.

The number of students is too low to have a sustainable programme and the reformed programme has to be marketed all over Lithuania. International student exchange is non-existing. Student exchange must be on top of the agenda for the programme to prepare the students for the global nature of engineering work with both global cooperation and competition. The conditions for incoming students must become better and some courses must be taught in English for all students. Support for students who wish to go abroad need to be improved significantly.

V. GENERAL ASSESSMENT

The study programme *Mechanical engineering* (state code – 612H30001) at Kaunas University of Technology Panevėžys Faculty of Technology and Business 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	2
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	2
	Total:	**16**

*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. Olav Aarna

Grupės nariai:
Team members: Prof. dr. Hartmut Ulrich

Prof. dr. Jolanta, Janutėnienė

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KAUNO TECHNOLOGIJOS UNIVERSITETO PANEVĖŽIO TECHNOLOGIJŲ IR VERSLO FAKULTETO PIRMOSIOS PAKOPOS STUDIJŲ PROGRAMOS *MECHANIKOS INŽINERIJA* (VALSTYBINIS KODAS – 612H30001) 2015-06-15 EKSPERTINIO VERTINIMO IŠVADŲ NR. SV4-144 IŠRAŠAS

<...>

V. APIBENDRINAMASIS ĮVERTINIMAS

Kauno technologijos universiteto Panevėžio technologijų ir verslo fakulteto studijų programa *Mechanikos inžinerija* (valstybinis kodas – 612H30001) vertinama **teigiamai**.

Eil. Nr.	Vertinimo sritis	Srities įvertinimas, balais*
1.	Programos tikslai ir numatomi studijų rezultatai	2
2.	Programos sandara	3
3.	Personalas	3
4.	Materialieji ištekliai	3
5.	Studijų eiga ir jos vertinimas	3
6.	Programos vadyba	2
	Iš viso:	**16**

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

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IV. SANTRAUKA

Mechanikos inžinerijos bakalauro studijų programą vykdo Kauno technologijos universiteto Panevėžio technologijų ir verslo fakultetas. Privalomaisiais dalykais, studijų programos tikslais, studijų rezultatais ir studijų turiniu ši studijų programa identiška Kauno technologijos universitete vykdomai programai. Pagal Panevėžio fakultete vykdomą studijų programą galima įgyti kompiuterizuotos gamybos specializaciją. Studijų programa atitinka Panevėžio regiono pramonės sektoriaus poreikius. Baigusieji šią studijų programą turi geras įsidarbinimo galimybes. Programos absolventai ir darbdaviai labai patenkinti studijų programa.

Šiuo metu studijų programa visiškai priklausoma nuo Kauno mechanikos inžinerijos ir dizaino fakulteto, kuris ją kontroliuoja. Studijų programai reikėtų suteikti daugiau autonomijos nustatant studijų tikslus, studijų rezultatus, studijų ir dalykų turinį. Kad Panevėžio fakultetas galėtų savarankiškai kurti ir įgyvendinti šią studijų programą, reikia paskirti vietinį programos vadovą ir įsteigti studijų programos komitetą, sudarytą iš Panevėžio dėstytojų, studentų ir darbdavių atstovų.

Studijų rezultatus reikėtų performuluoti, kad jie atspindėtų šios studijų programos specifiškumą. Šiuo metu studijų rezultatai nėra aiškiai apibrėžti, jų apibrėžtys pernelyg painios, rezultatus sunku įvertinti. Studijų rezultatuose turi būti nustatyta, ką studentai turi išmokti ir kokį darbą galės dirbti baigę studijas. Studijų rezultatai turi būti suformuluoti taip, kad būtų galima juos įvertinti. Todėl apibrėžiant studijų rezultatus, reikėtų vartoti aktyviuosius veiksmažodžius; studijų rezultatai turi būti pakankamai konkretūs ir išsamūs. Svarbu paaiškinti, kaip atskirų studijų programos dalykų rezultatai padeda pasiekti studijų rezultatus, ir užtikrinti, kad tai suvoktų dėstytojai.

Programos sandarą reikėtų atnaujinti ir į ją įtraukti daugiau dalykų apie naujausias ir sudėtingiausias gamybos technologijas, pavyzdžiui, kompiuterizuotą staklių valdymą (CNC), kompiuterizuoto dizaino (CAD) ir kompiuterizuotos gamybos programinės (CAM) įrangos naudojimą. Programos turinį reikėtų papildyti socialinių mokslų, verslo ir verslumo ugdymo dalykais bendradarbiaujant su to paties universiteto Ekonomikos ir verslo fakultetu.

Dėstytojai yra labai atsidavę darbui ir padeda studentams. Visi dėstytojai turi savo srities profesinių žinių. Studentai motyvuoti ir darbštūs. Dėstytojai ir studentai bendradarbiauja tarpusavyje kaip kolegos. Tačiau studentams turėtų būti suteikta galimybė aktyviau dalyvauti studijų programos plėtros ir kokybės užtikrinimo procese. Fakulteto vadovybė turėtų skatinti studentus pildyti dalykų vertinimo anketas ir aptarti su jais dalykų vertinimo rezultatus.

Biblioteka, auditorijos ir laboratorijos yra tinkamos ir aprūpintos šiuolaikiška įranga. Kompiuterių skaičius pakankamas, juose įdiegta matematikos, dizaino, analizės ir gamybos programinė įranga. Tačiau programinė įranga galėtų būti įvairesnė, be to, kai kuri jau pasenusi.

Studentų skaičius per mažas, kad programa galėtų būtų vykdoma ir ateityje, todėl programą reikia pertvarkyti ir viešinti visoje Lietuvoje. Studentai nedalyvauja tarptautinėse mainų programose. Studentų mainai turėtų tapti studijų programos prioritetu, kad studentai būtų parengiami inžinieriaus darbui tarptautinėje rinkoje, gebėtų bendradarbiauti ir konkuruoti. Reikėtų sudaryti geresnes sąlygas atvykstantiems kitų šalių studentams, kai kuriuos dalykus visiems studentams dėstyti anglų kalba. Rekomenduojama teikti daugiau pagalbos studentams, norintiems išvykti studijuoti į užsienį.

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III. REKOMENDACIJOS

1. Nepriklausomai kurti ir vykdyti Mechanikos inžinerijos bakalauro studijų programą Panevėžio technologijų ir verslo fakultete, paskirti už jos vykdymą atsakingą asmenį ir įsteigti studijų programos komitetą. Apibrėžti specifinius studijų programos tikslus, studijų rezultatus, studijų turinį ir dalykų aprašus.

2. Prioritetu turi tapti studentų pritraukimas. Reikia didinti studijų programos žinomumą, pabrėžti jos unikalumą ir paklausumą pramonės sektoriuje.

3. Suformuluoti programos studijų rezultatus orientuojantis į studentų žinias, įgūdžius, gebėjimus ir lūkesčius. Užtikrinti, kad programos studijų rezultatus būtų galima patikrinti išoriškai ir vertinant nustatyti, ar studentui pavyko juos pasiekti. Numatomi studijų rezultatai turi būti suformuluoti atsižvelgiant į jų minimalų pasiekimo lygį, kurį turi pasiekti kiekvienas studentas. Svarbu užtikrinti, kad programos studijų rezultatai atsispindėtų privalomųjų dalykų aprašuose ir kad būtų galima įvertinti, ar jie pasiekti. Mokyti dėstytojus į studijų rezultatus orientuoto modelio.

4. Ugdyti bendrąsias inžinieriaus kompetencijas, pavyzdžiui, gebėjimą dirbti komandoje, bendravimą ir projekto valdymą, ir taikyti griežtus ir struktūriškus šių kompetencijų vertinimo kriterijus. Pavyzdžiui, semestro projektą pavesti atlikti komandai ir, vykdant projektą, ugdyti bendrąsias kompetencijas. Projekto užduotys gali būti imamos iš pramonės sektoriaus, kad studijų turinys nebūtų atitrūkęs nuo tikrovės.

5. Supažindinti studentus su mechanikos inžinerijos metodais ir taikymo sritimis pradiniame studijų etape. Pavyzdžiui, baigtinių elementų metodas gali būti dėstomas ir naudojamas matematikos ir medžiagų atsparumo dalykuose pirmame ar antrame kurse. Šiuolaikinis inžinierius turi mokėti programuoti, todėl programavimo dalykas turėtų būti integruotas ir išsamesnis. Ankstyvajame studijų etape reikėtų dėstyti programavimo kalbas, pavyzdžiui, *Python* ar *Matlab*. Matematikos dalykas turėtų būti šiuolaikiškesnis, jis turi apimti skaitinius ir simbolinius skaičiavimus, programavimo elementus, kad studentai išmoktų spręsti taikomąsias užduotis.

6. Skirti pakankamai pastangų ir išteklių kuriant tarptautinio mokymosi aplinką. Kai kuriuos dalykus dėstyti tik anglų kalba. Užmegzti partnerystės ryšius su tarptautiniais universitetais bei įmonėmis, susitarti dėl trumpalaikių vizitų. Gerinti studentų ir dėstytojų anglų kalbos žinias.

7. Keistis mokymo, laboratorijų ir programinės įrangos ištekliais su Kauno mechanikos inžinerijos ir dizaino fakultetu. Studentams suteikti leidimą naudotis kompiuterizuoto dizaino (CAD) programine įranga studijų Panevėžio fakultete laikotarpiu.

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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)