STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

KAUNO TECHNOLOGIJOS UNIVERSITETO STUDIJŲ PROGRAMOS *APLINKOSAUGOS INŽINERIJA* (*valstybinis kodas – 612H17001*) VERTINIMO IŠVADOS
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EVALUATION REPORT of STUDY PROGRAMME *ENVIRONMENTAL ENGINEERING* (*state code – 612H17001*) STUDY PROGRAMME at KAUNAS UNIVERSITY OF TECHNOLOGY

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Išvados parengtos anglų kalba
Report language – English

DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	*Aplinkosaugos inžinerija*
Valstybinis kodas	612H17001
Studijų sritis	Technologijos mokslai
Studijų kryptis	Bendroji 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	Aplinkos inžinerijos bakalauras
Studijų programos įregistravimo data	1992-12-16

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INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	*Environmental Engineering*
State code	612H17001
Study area	Technological Sciences
Study field	General 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 of Environmental Engineering
Date of registration of the study programme	16-12-1992

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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	Paper on Market need for Environmental engineers, 20.04.2016
2	Document about Marketing of Environmental Engineering study programmes
3	Description on up-dated study programme Management

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

Kaunas University of Technology (KTU) has evolved from the higher education courses established in 1920. KTU consists of 9 faculties, 10 research institutes, library and departments of administration and support. Structure and activities of the KTU are oriented towards research in the

area of sciences and technologies. KTU offers study programmes in six main fields: engineering, physical and social sciences, arts, humanities and biomedicine.

The first-cycle study programme in *Environmental Engineering* (Programme) is provided by the Faculty of Chemical Technology. The Department of Environmental Technology is in charge of the Programme delivery. Other structural units of KTU also participate in delivering the Programme. The previous evaluation of this Programme was conducted in 2012 and the programme was accredited for three years. The following recommendations were formulated:

- the unbalance between chemistry oriented subjects and engineering subjects should be abolished;
- the name of the programme may be more appropriate as "Environmental Chemistry" unless the faculty decides to adjust and rebalance the content of the curriculum towards more engineering related topics;
- an improvement of the practical skills of the students according to labour market is needed;
- higher involvement of the students on the evaluation process of the programme is required;
- higher involvement of students to scientific research and student mobility programmes is necessary.

The self-evaluation report (SER) for the external evaluation has been prepared by the self-analysis preparation group established by the Faculty of Chemical Technology Dean's order, No. V22-F-02-137, October 9, 2015. The group of eight members included a student representative and an employer's representative.

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 *2ⁿᵈ May 2016.*

1. **Prof. dr. Olav Aarna (team leader),** *International expert for quality assessment in HE, Adviser to the Managerial Board of Estonian Qualification Authority Kutsekoda, Vice-Rector for Research and Development, Estonian Business School, Estonia.*
2. **Prof dr. Judit Padisák,** *Director of Institute of Environmental Sciences, University of Pannonia, Hungary.*
3. **Prof. dr. Soon-Thiam Khu,** *Professor of Urban Water System Engineering, School of Engineering, Monash University Sunway Campus, Australia.*
4. **Ms. Lina Šleinotaitė-Budrienė,** *expert for environment protection, director of JSC "Ekokonsultacijos", Lithuania.*
5. **Ms. Inga Bačelytė,** *Master student of study programme "Applied ecology", Aleksandras Stulginskis University, Lithuania.*

II. PROGRAMME ANALYSIS

2.1. Programme aims and learning outcomes

The aim of the Programme is to train graduates with broad basic competences in environmental engineering. The Programme objectives are defined in terms of four expected competences of graduates (SER, p. 19):

1. broad basic competences based on mathematics, natural sciences and engineering principles;
2. capability to integrate perspectives of social sciences and humanities in the context of complex environmental issues;
3. ability to analyse and design relevant solutions for environmental problems;
4. ability to maintain professional competence throughout his/her life-long learning.

The Programme aim and objectives are clear and well defined, and are broadly in-line with the KTU's strategy and also the vision of the Faculty of Chemical Technology. Whilst objectives (1), (2) and (3) can be evaluated and verified by comparing the Programme structure, expected learning outcomes (LOs), subject contents, and assessment methods, objective (4) is difficult to ascertain. It may be more prudent to devise and define a set of essential skills, if attained, would enable the graduates to carry out life-long learning on their own.

As revealed from the survey on the market needs and employability of graduates conducted by the SER team, and from the interviews with the students and the social partners, the Programme meets the labour market needs. The Programme graduates may either start their career according to the obtained qualification or continue their studies on Master's level.

The Programme fulfils relevant academic and professional requirements. However, the name of the Programme, its LOs, the content and the qualifications offered are only partially compatible with each other since one of the basic area of environmental issues, the soil component, is missing. The graduates of the Programme are expected to have knowledge in waste water treatment, waste management, reduction of gaseous emission exhausts, but also a strong core in general (process, mechanical, electrical and construction) engineering. This provides prerequisites for successful professional carrier as well as work in a team (SER, p. 21). After a detailed examination of the curriculum and the subject courses offered, the expert team revealed that although water environment and air environment are covered adequately, the same cannot be said for the soil. There is an element of soil under the course of ''Treatment of Polluted Sites'', but this is deemed insufficient. The task of an environmental engineer is not simply preventing pollution but also remediating polluted sites, that can be air, water or the solid phase (soil, rock). Success of any remediation can be judged only by having a clear understanding on the natural (original) status that needs knowledge of this status. For this reason, students must also gain knowledge on soil

(formation, types, structure, properties). Therefore, the expert team strongly recommends revising the Programme assuring balanced coverage of all three basic elements of environment – air, water and soil.

The learning outcomes (LOs) of the Programme are formulated according to the *EUR-ACE Framework Standards for the Accreditation of Engineering Programmes* with respect to the first cycle programmes, and referring to the environmental engineering context. The 18 LOs are grouped into five categories: knowledge and understanding, engineering analysis, engineering design, investigation, engineering practice and transferable skills.

An important aspect needing revision is linking the Programme LOs with subjects. The tendency is to cover all the Programme LOs with maximum number of subjects, while having forgotten that all these LOs need to be assessed properly. In the subject descriptions (52 altogether) LOs are listed in detail, but teaching and assessment methods are almost or exactly the same for different LOs. This indicates that the LOs are not incorporated intrinsically at subject level.

This is particularly true in the coverage of Engineering Design LOs C1, C2 and C3. For example, C1 "has the ability to apply their knowledge and understanding to develop and realise designs to meet defined and environmental requirements"; in a three credit subject "Building and Engineering Structures" with LO No.4 "Ability to solve design tasks in the field of civil engineering, to collect, analyse and evaluate data necessary for the design of structures and constructions, to choose adequate solutions" is covered by individual practical exercise. Moreover, this three credit subject has 10 LOs, which is unrealistic to achieve and assess.

Another example of inappropriate relation between the Programme LOs and subject description is the Final Degree Project. It has the aim "to acquire knowledge and practical skills in solving particular engineering tasks in the speciality related engineering systems, as well as in providing theoretical background to these decisions". The aim and four LOs of the Final Degree Project are not contextualised, i.e. are irrelevant of the Environmental Engineering context. At the same time they are declared to cover all 18 LOs of the Programme, which is unrealistic, especially taking into account that all this has to be assessed.

The above issues point towards the need to take a <u>constructive alignment approach</u> in designing the Programme aims and expected LOs, subject LOs, delivery mode, and students' assessment. Starting from 1 September 2016 the Programme design should follow the requirements of *General Regulation of Technological Sciences (Engineering) Study Field* with six categories of LOs compatible with the EUR-ACE structure. The expert team recommends review the Programme aim and LOs following the principle of constructive alignment.

2.2. Curriculum design

The curriculum design meets the legal requirements for first cycle study programmes in Environmental Engineering, and is sufficient to ensure the Programme LOs. The subject courses are spread evenly and the topics are not repetitive. The content of the subject courses ensures a good coverage of topics in Environmental Engineering, while maintaining consistency with the type and level of a first cycle studies. The subject courses delivery methods modules are appropriate for the achievement of the intended LOs. As mentioned in p.2.1, the assessment methods should be further elaborated.

The curriculum has been revised following the recommendations of previous external evaluation (see p. 1.3). In particular, the unbalance between chemistry oriented subjects and engineering subjects has been minimised wherever possible. This issue has been addressed by adding a number of engineering subjects and removing some chemistry oriented subjects. The expert team agrees that the current set of subjects provides for a better environmental engineering programme. The students and alumni interviewed seemed to be satisfied with such changes.

There is a number of good teaching practices and one such good practice was "colloquium" defence element in the course of Inorganic Chemistry. Such good practice ought to be disseminated to other courses and adopted where practical and feasible.

Although, basically the content of the Programme reflects the latest achievements in science and technology, certain aspects should be considered revising the Programme. One of the outcomes of the discussion group (SER, p. 38) was the need for students to embody systems thinking and critical technical analysis approach. Nevertheless, the Programme design does not indicate how to attain these LOs. Although, there is a subject course "Principles of Sustainable Development", the concept of sustainable development should run across many courses in an environmental engineering programme. The expert team recommends considering ways to include sustainable development issues in many third and final year courses. Such considerations should be viewed in conjunction with the Constructive Alignment approach (see p. 2.1).

2.3. Teaching staff

The Programme is provided by qualified academic staff meeting the legal requirements. All academic staff members have PhD degree or equivalent, and based on the scope and number of publications (SER Annex A2) demonstrate different degree of experience in scientific research during the evaluation period. The scientific achievements of the Programme teachers are adequate.

The number and composition of the teaching staff is also adequate to ensure the Programme delivery. The staff providing core and major field subjects comprises of four professors, nine

associate professors and five lecturers, with pedagogical experiences ranging from two to 40 years. This composition is adequate to ensure transfer of pedagogical knowledge from professors to lecturers and meeting teaching demands in the foreseeable future. Though the qualification of the teaching staff is adequate to ensure achievement of intended LOs, they need systematic training constructive alignment and LOs based approach (see p. 2.1 and 2.6).

It is very encouraging to know that a considerable number of teaching staff are involved in marketing the Programme, which demonstrates commitment of the staff and the institution to ensure sustainability of the Programme. The expert team encourages KTU and Faculty to tap into the international market to increase the student numbers. However, this must be accompanied by a systematic increase in the number of subject courses delivery in English as well as English proficiency training for the teachers. The expert team also commends the Department's efforts in developing the entrepreneurial culture of teaching staff.

In the area of pedagogical training, many teachers in the Programme still employ traditional teaching methods. It was also noted that bureaucracy takes too much time from teachers and especially from those who are involved into administration process. While this is not an excuse for lack of continuous pedagogical improvement and embracement of information technologies in teaching, the expert team hope to see progress in adoption of new teaching methods such as active learning or "flip learning". **Moodle** could be utilised more, not only in terms of expanding list of courses available but also in terms of more interactive delivery of tasks. Teaching staff should also be encouraged to participate in pedagogical training activities thereby adopting and developing new methods of course delivery.

2.4. Facilities and learning resources

The premises for studies, such as classrooms, laboratories, and computing facilities are adequate both in size and quality for the delivery and practical training needs of the Programme. In addition, there are sufficient teaching materials (textbooks, books, periodical publications, databases) and they are readily accessible to students.

The "open access" principle adopted at the KTU and allowing the use of more than 800 pieces of research equipment for all researchers and students should be applauded. The opening of the Open Access Centre greatly facilitates the usage of specialised equipment which would otherwise be inaccessible without specialised training which many first cycle students do not have. It remains to be seen whether an increase in open access usage would lead to an enhancement in the quality and scope of final degree projects.

In the previous evaluation, it was reported that many students and some stakeholders from companies want to have more field work or practice. The issue of practice and industry oriented final degree projects have been resolved adequately by engaging with a network of businesses and social partners. The issue of field work ought to be discussed by the Study Programme Committee (SPC) with the intention to facilitate such practices in the future.

Moodle is highlighted in the SER as a depository of learning resources and this enhances the availability of study materials. Teachers did not take the opportunity to develop more innovative teaching and assessment tools in order to help students enhance their learning experience on Moodle. The expert team encourages the Department and the Faculty take measures to activate the use of this important resource to enhance student learning as well as staff-student interaction.

2.5. Study process and students' performance assessment

The student admission procedure is well formulated, publicly available and follows legal regulations. The number of students admitted has been between 11 and 22 during the evaluation period. The general organisation of the study process is satisfactory and ensures that the Programme can be delivered in an adequate manner and the LOs can be achieved. As mentioned earlier (see p. 2.3 and 2.4), the provision of Moodle is at a minimal level and this or other virtual learning platform should be explored to enhance student learning as well as staff-student interaction.

The students are given the opportunity to participate in applied research activities in the general areas of environmental engineering through their final degree projects. Currently, the students' participation in actual research projects seemed to be constrained by the academic staffs' ability to obtain research projects. The scope of the topics of the final degree projects must be significantly broaden to encompass problem-based learning, analytical skills and project management skills where possible. An essential component of any engineering curriculum is the Final Degree project. The expert team found the coverage of topics in the Final Degree project is rather narrow, with a majority of topics related to air pollution, which is in contradiction with very wide Programme aims. This would severely limit the students' scope of knowledge in environmental engineering as well as their future employability. While the expert team understands that there may be practical limitations such as laboratory equipment and staffs' research interests, this issue ought to be investigated. Another issue with the final degree projects is the range of grades awarded, which is very narrow. While this is in itself not necessary an area of concern, there is no evidence to demonstrate how these grades were formed.

Ten grade criterion scale is applied for assessing the final degree project. All members of the qualification commission participating in the thesis public defence give two separate grades for the

thesis and the defence. The lever coefficient for the defence grade may compose up to 0,2 of the final grade. Final grade is the arithmetic average grade of all grades given by the commission members. The average grade is rounded down or up integer number (SER, Annex 1). Unfortunately, there are no publicly available criteria for grading the thesis and the public defence.

The assessment system of students' performance seems clear to the students and publicly available on Moodle. Students and alumni seem to be satisfied that the current system is fair and they do not question the transparency of the process of assignment of grades. One of the areas which was mentioned by the students was the lack of availability and adequacy of feedbacks of assignments.

Moreover, the expert team has serious doubts about the adequacy of the of students' performance assessment system. The interrelation of the Programme LOs with the subjects LOs as well as the students' assessment methods are presented in the subject descriptions (SER Annex A1). Unfortunately, the assessment criteria used are not contextualised, i.e. it is not explained, what a particular grade means in the context of the subject course. The expert team recommends being more consistent and critical in implementing the constructive alignment of the Programme aim, LOs, subject LOs, teaching and learning, and student assessment.

In general, students have good opportunities to participate in student mobility programmes such as the Erasmus+ programme, and there is assistance in the form of international coordinator if the student wants to find a place abroad. Although the university has signed 314 agreements with many universities, only two students opted-in on the Erasmus+ programme in the period 2012-2015, and only one student came from abroad to attend the Programme. There is a need to look into this matter and provide further assistance to students if necessary and appropriate. The reason for this is that international student mobility provides an extra and valuable dimension to attract more students.

It is apparent that there is very good atmosphere among students and teaching staff, and the bond between some teaching staff and students are strong. This is not unexpected given the small cohort of graduating students as well as favourable staff-student ratio. It is also visibly apparent that alumni and stakeholders have full confidence in the Programme.

The Department has put in a lot of effort to improve the practical skills of the students according to the labour market's needs. The dialog with industrial representatives has been intense, with the aim to address the improvement of practical skill of students. The Programme aims at introducing at least one guest lecture from industry in each course, formulation of professional practice tasks based on industrial demand, participation of industry representatives in defence committees of thesis, etc. In the spring semester of 2016, a new series of invited lectures was

delivered to introduce the students with the current demands of labour market. A plan is also in place to develop the entrepreneurial skills of students and inculcate entrepreneurial culture amongst students.

Although professional activities of the majority of graduates meet the Programme providers' expectations, the stakeholders expressed a strong consensus that the graduates lack certain labour market relevant knowledge and their exposure to presentation skills is very limited. This was confirmed by some of the students being interviewed. Moreover, the stakeholders felt that there is a need to enhance the project management skills of these graduates.

2.6. Programme management

The quality management system at KTU, covering the areas of management and administration, student support, infrastructure and human recourses, management of studies, research and applied activities monitoring, analysis and improvement processes, are carried out in compliance with the Senate decisions, orders of the Rector, regulations, rules, and procedure descriptions. The study programme administration and quality assurance are managed by the Vice-rector for studies with the help of Departments of Academic Affairs, Study Programs, Student Affairs and other administrative units.

In 2013 KTU started and has been implementing the study programme management system renewal. Since 2014 the new Study Programme Committees (SPCs) have been established according to the groups of study fields. The Programme in Environmental Engineering is assigned to the SPC of Chemistry, Physics, Chemical Engineering, Environmental Engineering, Biotechnology, Food Science fields of study.

The Programme is managed, renewed and improved by this SPC. The committee cooperates with the Studies and Academic Culture Committee of the KTU Senate and has the Programme manager from the Department of Chemical Technology. Changes to the programme are approved by the Faculty Council. The SPC meetings are held as and when required, averaging 3–4 meetings per semester with more frequent meetings during the fall semester. It was mentioned that the fall semester is devoted to renew study subjects, with the study programmes accredited/re-accredited for the next academic year (SER, p. 30). Manager of the Programme carries responsibility for the content and quality of the Programme. The manager is responsible for forming of the Programme aim and LOs, prepares proposals for changes of the Programme or subjects content, consults students, teachers and administration on preparation of the Programme and subjects' content, individual study plans, analyses results feedback form students and teachers and prepares plans for further improvements (SER, p. 195).

From the previous description it is clear, that in the present programme management system the Programme manager is personally responsible for all strategic decisions, because the SPC is managing a larger group of diverse study programmes. This has led to the lack of wider ownership of the Programme, and limited involvement of internal and external stakeholders in the Programme design, development and implementation processes. The lack of ownership has severe consequences in strategic planning and implementation of changes to the Programme. Therefore, the expert team recommends establishing a dedicated SPC for each study programme, involving representatives of students, alumni and employers. The membership of the SPC should be made publicly available. Additionally, documented evidence about decisions taken by the SPC should also be made publicly available.

Information and data on the implementation of the Programme are collected and analysed. There is some evidence that teachers analyse students' results as a surrogate of LOs attainment, but they do not discuss the findings with the students. Thus, a process of feedback is apparently informal and not documented. The lack of documentation does not allow the programme committee to assess the effectiveness of course feedbacks as well as structural programme review.

Most of the problems encountered in this report with respect to the Programme aim and LOs, curriculum design, Programme delivery, and students' assessment are caused by the fact that the implementation of the LOs approach does not follow the constructive alignment paradigm (see p.2.1, 2.2 and 2.5). Therefore, the expert team recommends:

- the KTU management to organise university-wide systematic training and support of teaching staff in implementing the constructive alignment approach in programme design and delivery;
- the Study Programme Committee to follow the constructive alignment approach in the Programme design and implementation, and develop students' and other stakeholders' understanding of LOs based approach.

III. RECOMMENDATIONS

1. Ensure balanced coverage of all three major elements of the environment: air, water and soil in the Programme.
2. Constructive alignment principles must be embedded in programme structure, programme outcomes, course assessment methodologies and learning outcome. Teachers must be made aware of the principle when they structure their courses, and develop assessment criteria for their assignments.
3. Motivate teachers to utilise different modes of teaching including the virtual learning platform and to develop innovative teaching methods to enhance students' learning experience, incl. student-lead seminars.
4. The quality, breadth and topics of the final degree projects need to be enhanced. The programme aims are very wide but this is not reflected in the theses. The assessment criteria and grade rubric must be properly communicated to students and stakeholders.
5. Evidence of the workings of the Study Programme Committee needs to be better documented, monitored and reviewed. The composition and role of this committee have to be clearly communicated to all staff members and students.
6. Establish a dedicated Study Programme Committee for each study programme, involving representatives of students, alumni and employers.
7. KTU management to organise university-wide systematic training and support of teaching staff in implementing the constructive alignment approach in programme design and delivery.
8. Study Programme Committee to follow the constructive alignment approach in the Programme design and implementation, and develop students' and other stakeholders' understanding of LOs based approach.
9. International mobility of students should be enhanced.

IV. SUMMARY

The Programme aims and objectives are clear and well defined, and are broadly in-line with the KTU's strategy and also the vision of the Faculty of Chemical Engineering. The Programme objectives broadly conform to the national requirements for the first-cycle of studies (Bachelor degree). The Programme learning outcomes (LOs) are formulated in accordance with the EUR-ACE framework. The LOs of the individual subjects are well defined and contribute toward the Programme LOs. The curriculum design meets the legal requirements for first-cycle study programme in Environmental Engineering. The sequence of subject courses is also organised in a logical manner. The curriculum has been changed in accordance to the previous external evaluation recommendations. This issue has been addressed by adding a number of engineering subjects and removing some chemistry oriented subjects. As such, the current set of subjects provides for a better environmental engineering programme. The students and alumni interviewed seemed to be satisfied with such changes. The Programme meets the labour market needs. Nevertheless, the programme should be re-examined to ensure although balanced coverage of all three basic elements of environment – air, water and soil, and embed the subject and concept of sustainable development across many courses in the Programme. The most important issue to be solved is fully implementing the constructive alignment approach in designing the Programme aims and expected LOs, subject LOs, delivery mode, and students' assessment. Starting from 1 September 2016 the Programme design should follow the requirements of *General Regulation of Engineering Study Field.*

The Programme is delivered by an appropriate number of qualified academic staff meeting legal requirements. The age composition of the teaching staff is commensurate with adequate teaching experiences is adequate to meet teaching demands in the foreseeable future. However, many teachers are not aware the process of constructive alignment of programme aims with course learning outcomes. Therefore, it is recommended to offer teaching staff systematic training and support in implementing the constructive alignment approach in Programme design and delivery. It is very encouraging to know that a considerable number of teaching staff are involved in marketing activities and this demonstrates the commitment of the staff and institution to ensure the sustainable development of the programme. In the area of pedagogical training, teachers should be encouraged to adopt new teaching methods and make better usage of existing Moodle environment.

The teaching and learning environment is good in size and quality. The panel is impressed by the availability and accessibility of more than 800 pieces of research equipment for all researchers and students. The Open Access Centre greatly facilitates the usage of specialised equipment which would otherwise be inaccessible without specialised training. The organisation of

the study process is generally satisfactory and ensures that the Programme can be delivered in an adequate manner and the LOs can be achieved. The provision of Moodle is at a minimal level and this or other virtual learning platform should be explored to enhance student learning as well as staff-student interaction. The assessment system of students' performance seems clear to the students and publicly available on Moodle, while contextualised assessment criteria need to be developed to all subject courses offered.

The responsibilities for decisions, and monitoring and implementation of the Programme is clearly stated and Programme is managed by the Programme manager. This has led to lack of wider ownership of the Programme, which has severe consequences in strategic planning and implementation of changes to the Programme. Therefore, it is recommended to establish a dedicated Study Programme Committee for each study programme, involving representatives of students, alumni and employers. During the discussions with stakeholders, there was a strong consensus that graduating students do not have adequate presentation and project management skills.

V. GENERAL ASSESSMENT

The study programme *Environmental Engineering* (state code – 612H17001) 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	2
2.	Curriculum design	3
3.	Teaching staff	3
4.	Facilities and learning resources	3
5.	Study process and students' performance assessment	2
6.	Programme management	2
	Total:	**15**

*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. Judit Padisák**

Prof. dr. Soon-Thiam Khu

Ms. Lina Šleinotaitė-Budrienė

Ms. Inga Bačelytė

KAUNO TECHNOLOGIJOS UNIVERSITETO PIRMOSIOS PAKOPOS STUDIJŲ PROGRAMOS *APLINKOSAUGOS INŽINERIJA* (VALSTYBINIS KODAS – 612H17001) 2016-09-22 EKSPERTINIO VERTINIMO IŠVADŲ NR. SV4-209 IŠRAŠAS

<...>

V. APIBENDRINAMASIS ĮVERTINIMAS

Kauno technologijos universiteto studijų programa *Aplinkosaugos inžinerija* (valstybinis kodas – 612H17001) 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	2
6.	Programos vadyba	2
	Iš viso:	15

* 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

Bakalauro studijų programos *Aplinkosaugos inžinerija* tikslai ir uždaviniai yra aiškūs ir apibrėžti; jie iš esmės atitinka Kauno technologijos universiteto (KTU) strategiją ir Cheminės technologijos fakulteto viziją. Šios programos tikslai iš esmės atitinka pirmosios pakopos (bakalauro) studijoms keliamus nacionalinius reikalavimus. Numatomi studijų rezultatai formuluojami laikantis EUR-ACE inžinerijos programų akreditavimo standarto nuostatų. Numatomi atskirų dalykų studijų rezultatai yra apibrėžti ir prisideda prie numatomų programos rezultatų įgyvendinimo. Programos sandara atitinka teisės aktų reikalavimus pirmosios pakopos aplinkosaugos inžinerijos studijoms. Studijų dalykai išdėstyti nuosekliai. Atsižvelgiant į ankstesnio išorės vertinimo rekomendacijas, atlikti programos turinio pakeitimai: programa papildyta inžinerijos dalykais ir pašalinti kai kurie chemijos dalykai. Dabartinis dalykų rinkinys užtikrina geresnę studijų programos *Aplinkosaugos inžinerija* kokybę. Atrodo, kad studentai ir absolventai, su kuriais buvo kalbėtasi, yra patenkinti šiais pakeitimais. Programa atitinka darbo rinkos poreikius. Tačiau ją reikėtų persvarstyti siekiant užtikrinti, kad į studijas būtų vienodai įtraukti visi trys

pagrindiniai elementai – oras, vanduo ir dirvožemis, o į daugelį šios programos dalykų – tvaraus vystymosi tema bei koncepcija. Svarbiausias spręstinas klausimas yra visiškas darnaus išdėstymo metodo įgyvendinimas numatant programos tikslus ir numatomus studijų rezultatus, dalykų studijų rezultatus, dėstymo būdus ir studentų vertinimą. Nuo 2016 m. rugsėjo 1 d. šios studijų programos sandara turėtų atitikti *Inžinerijos krypčių grupės aprašo* reikalavimus.

Šią programą vykdo kompetentingas, teisės aktų reikalavimus atitinkantis akademinis personalas; dėstytojų skaičius pakankamas. Dėstytojų amžiaus struktūra yra tinkama, kad užtikrintų dėstymo poreikius netolimoje ateityje. Tačiau daugelis dėstytojų nėra susipažinę su darnaus programos tikslų ir numatomų dalykų studijų rezultatų išdėstymo ir derinimo procedūra. Todėl rekomenduojama sistemingai mokyti dėstytojus ir teikti jiems pagalbą, susijusią su darnaus išdėstymo metodo taikymu sudarant ir įgyvendinant šią programą. Daug vilčių teikia tai, kad nemažai dėstytojų dalyvauja rinkodaros veikloje – tai rodo jų ir universiteto įsipareigojimą užtikrinti šios studijų programos *ilgalaikiškumą*. Kalbant apie pedagoginio mokymo sritį, reikėtų skatinti dėstytojus įsisavinti naujus mokymo metodus ir geriau pasinaudoti esama *Moodle* aplinka.

Studijų aplinka (*materialieji ištekliai*) yra kokybiška ir pakankama. Ekspertų grupei padarė įspūdį tai, kad universitetas turi 800 vienetų mokslinių tyrimų įrangos, kuria gali naudotis visi tyrėjai ir studentai. KTU atviros prieigos centras labai palengvina naudojimąsi specializuota įranga – tai nebūtų įmanoma be specialaus mokymo. Studijų procesas organizuojamas iš esmės gerai ir užtikrina galimybę tinkamai dėstyti šią studijų programą bei pasiekti numatomus studijų rezultatus. *Moodle* aplinka užtikrinama minimaliai, taigi reikėtų ištirti galimybę naudoti šią ar kitą virtualią mokymosi aplinką siekiant sustiprinti studentų mokymąsi ir dėstytojų bei studentų bendravimą. Atrodo, kad studijų rezultatų vertinimo sistema studentams yra aiški ir viešai prieinama *Moodle* aplinkoje, nors visų siūlomų studijų dalykų vertinimo kriterijus reikia kontekstualizuoti.

Aiškiai nustatyta atsakomybė už sprendimus ir šios programos įgyvendinimo stebėseną; programai vadovauja programos vadovas. Dėl šios priežasties platesne atsakomybe (*ownership*) už šią programą nesidalinama, o tai turi sunkių pasekmių strateginiam planavimui ir programos pakeitimų atlikimui. Todėl rekomenduojama kiekvienai studijų programai steigti specialų atskirą studijų programos komitetą, į kurį būtų įtraukti studentų, absolventų ir darbdavių atstovai. Per pokalbius su socialiniais dalininkais stipriai išryškėjo bendra nuomonė, kad absolventai neturi pakankamai pristatymo ir projektų valdymo įgūdžių.

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III. REKOMENDACIJOS

1. Užtikrinti, kad studijų programa *Aplinkosaugos inžinerija* vienodai apimtų visus tris pagrindinius aplinkos elementus – orą, vandenį ir dirvožemį.

2. Programos sandaroje, programos studijų rezultatuose, dalykų vertinimo metodikoje ir numatomuose studijų rezultatuose turi būti įtvirtinti darnaus išdėstymo (*constructive alignment*) principai. Su šiais principais būtina supažindinti dėstytojus, kurie formuoja dalykų turinį ir nustato užduočių vertinimo kriterijus.

3. Skatinti dėstytojus taikyti įvairius mokymo būdus, įskaitant virtualią mokymo(si) aplinką, ir kurti naujoviškus mokymo metodus siekiant sustiprinti studentų mokymosi patirtį, įskaitant seminarus, kuriems vadovauja studentai.

4. Reikia gerinti studentų baigiamųjų darbų kokybę, didinti jų apimtį ir temų įvairovę. Šios studijų programos tikslai yra labai platūs, tačiau baigiamuosiuose darbuose tai neatsispindi. Studentams ir socialiniams dalininkams būtina tinkamai pranešti apie vertinimo kriterijus ir balų sistemą.

5. Turi būti geriau dokumentuojami, kontroliuojami ir persvarstomi studijų programos komiteto veiklos įrodymai. Visiems dėstytojams ir studentams turi būti aiškiai perduota informacija apie šio komiteto sudėtį ir funkcijas.

6. Kiekvienai studijų programai steigti specialų studijų programos komitetą, į kurį būtų įtraukti studentų, absolventų bei darbdavių atstovai.

7. KTU vadovybė (turi) universiteto mastu organizuoti sisteminį dėstytojų mokymą ir teikti pagalbą, susijusią su darnaus išdėstymo metodo taikymu sudarant bei įgyvendinant programą.

8. Studijų programos komitetas (turi) laikytis darnaus išdėstymo metodo, taikomo sudarant ir įgyvendinant šią programą, ir formuoti studentų bei kitų socialinių dalininkų supratimą apie studijų rezultatais pagrįstą požiūrį.

9. Turėtų būti didinamas tarptautinis studentų judumas.

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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)