



STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

**KAUNO TECHNOLOGIJOS UNIVERSITETO  
*APLINKOSAUGOS INŽINERIJOS PROGRAMOS*  
(621H17001)  
VERTINIMO IŠVADOS**

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**EVALUATION REPORT  
OF *ENVIRONMENTAL ENGINEERING* (621H17001)  
STUDY PROGRAMME  
at KAUNAS UNIVERSITY OF TECHNOLOGY**

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## DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	<i>Aplinkosaugos inžinerija</i>
Valstybinis kodas	<b>621H17001</b>
Studijų sritis	<b>Technologijos mokslai</b>
Studijų kryptis	<b>Bendroji inžinerija</b>
Studijų programos rūšis	<b>Universitetinės studijos</b>
Studijų pakopa	<b>Antroji</b>
Studijų forma (trukmė metais)	<b>Nuolatinė</b>
Studijų programos apimtis kreditais	<b>120</b>
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	<b>Aplinkos inžinerijos magistras</b>
Studijų programos įregistravimo data	<b>2009-08-17 , Nr.1-73</b>

## INFORMATION ON ASSESSED STUDY PROGRAMME

Name of the study programme	<i>Environmental Engineering</i>
State code	<b>621H17001</b>
Study area	<b>Technological Sciences</b>
Study field	<b>General Engineering</b>
Kind of the study programme	<b>University studies</b>
Level of studies	<b>Second</b>
Study mode (length in years)	<b>Full-time</b>
Scope of the study programme in credits	<b>120</b>
Degree and (or) professional qualifications awarded	<b>Master of Environmental Engineering</b>
Date of registration of the study programme	<b>August 17, 2009; No.1-73</b>

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The Centre for Quality Assessment in Higher Education

# CONTENTS

CONTENTS .....	3
I. INTRODUCTION.....	4
II. PROGRAMME ANALYSIS .....	4
1. Programme aims and learning outcomes.....	4
2. Curriculum design .....	5
3. Staff .....	6
4. Facilities and learning resources .....	6
5. Study process and student assessment.....	7
6. Programme management .....	7
III. RECOMMENDATIONS .....	8
IV. SUMMARY .....	9
V. GENERAL ASSESSMENT .....	10

## I. INTRODUCTION

The external assessment procedures of the study programme were initiated by the Centre for Quality Assessment in Higher Education in Lithuania nominating the external assessment peer group of Prof. Petras Punys (Lithuania – Chairman), Prof. Silke Ursula Wieprecht (Germany), Dr. Sarma Valtere (Latvia), M.Sc. Kęstutis Skrupskelis (Lithuania).

The basis for the evaluation report is the written Self-Assessment Report (SAR), its annexes and the site visit of the experts on 11th September 2012. During this visit the experts reviewed the organisation of the programme, the way in which the curriculum had been designed, the way the study quality was being assured, the qualification of the staff, facilities and learning resources, study process, students assessment and programme management.

The second-cycle study programme Environmental Engineering is provided by the Faculty of Chemical Technology, KTU. The Department of Environmental Engineering is in charge of Master level studies in this programme.

It has to be noted, that the KTU offers also an alternative MSc degree programme in Environmental Engineering entitled “Environmental Management and Cleaner Production”. According to the SAR, these programmes pursue different aims and have principal differences in their structure and the way of organization of the study process. The study programme under evaluation has a deepening character and is supposed to orient towards studies of environmental technologies, while the above mentioned has a widening character with core modules in environmental management. However, this report does not provide any comparison of both programmes.

## II. PROGRAMME ANALYSIS

### *1. Programme aims and learning outcomes*

The programme aims and learning outcomes are well defined, clear and publicly accessible. In general they are good; however there can be found similarities with the study programme of the bachelor level.

The previous external assessment (in 2002) highlighted a main disadvantage of the study programme: “*There are too many chemistry-oriented courses and too low attention is paid to the studies of environment*”. Now the Self Assessment Report (SAR) stipulates (p. 12): *In order to decrease number of chemistry-oriented subjects and increase the load of environment-oriented subjects programme developers regularly and repeatedly approached Study Programme Committee and Faculty administration, however only limited changes in this respect were performed.* This ambiguity should be settled.

According to the SAR some 12 to 14 graduates with a Master’s degree are graduating per year. However, neither information is provided on the placement of graduates nor any quantitative estimate is given regarding the need or demand of the labour market. Though interviewed senior administrators, teaching staff and stakeholders confirmed an existing niche in the labour market for the graduates holding a Master’s degree. In contrast to this, the labour market for the 1<sup>st</sup> cycle graduates is hardly existent.

Learning outcomes of the programme, its content and the qualifications offered are compatible with each other. However, the achieved knowledge of the students does not completely meet the self-defined aims of the study programme. The subjects of the programme do not cover the full spectra of a really interdisciplinary environmental engineering field. As the content of the programme is heavily oriented towards chemistry the name of as “Environmental Chemistry” could be more appropriate for this programme unless the faculty decides to adjust and rebalance the content of the curriculum towards more engineering oriented subjects.

This suggestion may be substantiated also as follows: “At many universities, Environmental Engineering programs follow either the Department of Civil Engineering or the Department of Chemical Engineering at engineering faculties. Environmental "civil" engineers focus on hydrology, water resources management, bioremediation, and water treatment plant design. Environmental "chemical" engineers, on the other hand, focus on environmental chemistry, advanced air and water treatment technologies and separation processes”.

## **2. Curriculum design**

The curriculum design meets legal requirements for MSc study programme *Environmental Engineering*.

Study subjects are spread evenly; however there are still too many (8) chemically oriented subjects in the second level programme. The names of these subjects are slightly different but the content of them overlap in number of sections and themes.

The subjects *P300M505 Chemical Analysis* and *P305M001 Methods of Environmental Chemical analyses* partly overlap each other, and both of them partly repeat the bachelor level subject *P300B503 Chemical Analysis*.

There is a set of quite theoretical subjects describing different instrumental analyses: *P300M601 Methods of Electrochemical Analysis*, *P400M230 Analytical and Preparative Chromatography*, *P390M001 Spectral analyses* and *P390M327 Spectroscopy of Organic compounds*. Even the subject *T270M823 Environmental Monitoring* is close to the previously mentioned themes. The rational solution could be grouping them into a comprehensive subject entitled *Methods of Environmental Instrumental analyses* that would cover all these issues.

Significant overlapping of the themes even sections are observed also in the subjects *T270M003 Environmental Management and Law*, and *T270M016 Environmental Policy, Law and Economics*.

Moreover, for the Master’s study more research oriented subjects such as “Process numerical modelling”, “Planning, organization, presentation of scientific research” should be included.

It is strongly recommended to screen the Master’s curriculum, eliminate repetitive subjects or themes and align better with the curriculum of the Bachelor’s programme.

The content and methods of the subjects are appropriate for the achievement of the intended learning outcomes.

In general the content of the programme reflects the latest achievements in science, art and technologies. But actual advances in nano and plasma technologies, even numerical models for processes analysis should be covered in the study subjects more widely. Although some progress

on investigating the plasma phenomena on an experimental wastewater treatment bench was witnessed during the experts' visit.

The SAR does not list specialised software used for process modelling. It is recommended to use more widely numerical modelling software in solving actual environmental engineering issues. Only a few Master's theses were identified to apply modelling tools during the experts' visit.

### ***3. Staff***

The high qualification of the teaching staff is adequate to ensure the intended learning outcomes. The legal requirements are fulfilled. The qualification of the teaching staff and their number are adequate to ensure learning outcomes.

The proper ratio of the number of the teachers working for the programme and the students is guaranteed referring to the Regulation of Pedagogical Load in force in the KTU.

The staff turnover during the assessment period was rather insignificant, a few teachers retired. Their teaching subjects were adopted by young doctors, who defended their doctor's dissertations and gained pedagogical experience in this department.

The KTU creates conditions for the professional development of the teaching staff necessary for the provision of the programme. Professional development of academic staff on a regular basis is possible via participation at seminars, conferences, courses and internships. The financing of conferences has to be covered from the staff themselves via projects. There is no direct money provided by the university administration.

The University structure and the programme staff are oriented towards fundamental and technological scientific research; Teachers and researchers at the Faculty of Chemical Technology, including the department responsible for running the programme, carry out an international level research.

### ***4. Facilities and learning resources***

In general the premises for studies are adequate both in their size and quality. However teachers during the interviews mentioned problems with rooms – some laboratories are crowded and it is difficult with placing all necessary works which was proved during the visit. Furthermore specialised Environmental Engineering or technology laboratories (Water and Wastewater; Solid Waste etc.) are lacking.

The teaching and learning equipment are good both in size and quality. Especially impressive are the chemical technology laboratories equipped with very sophisticated devices.

Actually a course management system (CMS) which provides a virtual learning environment like e.g. „Moodle“ is just at starting position, thus the distance learning system does not yet work properly. It is highly recommended to implement a CMS in due time as a mandatory platform for all staff members.

Many students and some stakeholders from companies explained desires regarding the quantity of the practice: the practice period should be longer to prepare students for real work in special fields.

According to the Self Assessment Report the students of the Programme use the resources of the University Library and departments libraries as well. The KTU library has access to the most significant foreign databases. Teaching materials are adequate and accessible for the students of the study programme.

### ***5. Study process and student assessment***

The admission requirements for the Master studies are well founded. The target amount of students in the Study Programme is considered between 12 and 14. A good thing to mention is that drop-out rate from the studies is almost non-existing. The organisation of the study process ensures provision of the programme and the achievement of the learning outcomes.

According to the SAR, the students are encouraged to participate in research activities (such as conferences, research programs etc.). The KTU organizes students' conferences, but the interviews revealed only satisfactory activity from the side of the students.

The KTU provides satisfactory arrangements for students' practice. According to students' request the practice period should be longer to prepare him/her for real work in a special field. On the other hand, as representatives of industry state, some students are not very much interested in their practice; they are accomplishing it very formally.

The SAR stipulates that within the programme of Environmental Engineering, 4 to 5 Erasmus agreements are continuously open with the universities in Denmark, Finland, Germany, Spain, Latvia etc. These exchange programmes are mostly oriented towards second-cycle students. However, no quantitative estimate – number of outgoing students - is provided there with regard to student mobility programme.

Social support is covered by several types of scholarships grants: social, nominal, one-off grants. It can be seen as satisfactory. A half of the Master students are working on a part time basis. The department is supporting them by offering to set up their own flexible study plan. But in this case, if they are many, than described group work/or seminars will not be possible and it is an extra work for the teachers.

The assessment system of students' performance is clear, adequate and publicly available. The order of the assessment of students' knowledge and skills is presented in the programmes of study subjects available on the KTU website. Requirements for the final degree projects of the second-cycle studies are determined by a decree publically available. Professional activities of graduates meet the programme providers' expectations.

### ***6. Programme management***

The responsibilities for decisions and the monitoring of the implementation of the programme are clearly formalised and allocated. Internal quality assurance measures are clearly formalised, but not effective and efficient. Assessment of the Programme quality is performed by referring to the structure of the Internal Study Quality Guarantee System enacted and approved by the University Senate.

During the site visit the feedback from staff members and from students did not show that the responsibilities and the paths of decisions are evident and clear for all stakeholders. Especially for students the decision making processes and the evaluation processes especially their possibilities to take part in decisions and potential changes are not quite apparent.

The evaluation of the programme management is based on regularly collected and analysed data. The results are discussed only internally in respective meetings of the faculty but they do not discuss the result with the class in order to learn more about potential wishes and changes.

There is scheduled a student's evaluation of the different lectures via on-line system. Outcomes of internal (mostly based on teachers' and students' evaluation) and external evaluations (employers) are likely to be used for the improvement of the programme.

Unfortunately there is no formalized process for external evaluation. Usually informal discussions are initiated on time to time invitations. The latest external evaluation of the programme was held on the bases of a round-table discussion with the topic "Environmental engineering education & science and industry cooperation" in December 2010. The main mentioned problems which were formulated are a too weak preparation in engineering graphics and computer aided design, lacking knowledge in environmental law, microbiology, hydrology, and construction, and the necessity to improve the organisation of the practice system. One of the recommendations given from the industry was to consider the possibility to shorten the study process on the bachelor's level and strengthen studies on the master's level.

The evaluation and improvement processes involve stakeholders in a satisfactory way. According to the SAR the evaluation of the learning outcomes are coordinated with the teachers, social partners, and students by discussing the improvement trends of the study programme at the beginning of each academic year. However the interviews show that stakeholders are involved only occasionally (there has been only one formal meeting, see above round-table discussion "Environmental engineering education & science and industry cooperation" in December 2010) and for students the evaluation process as well as their possibilities to be actively involved in adaption processes is not obvious.

### III. RECOMMENDATIONS

1. Revise the Master's curriculum, eliminate repetitive subjects or themes and align with the curriculum of the Bachelor's programme.
2. Consider to change the name of the program as its content is heavily oriented towards Chemistry. "Environmental Chemistry" could be more appropriate for the current content of the curriculum.
3. Encourage students to participate in mobility programmes and more actively participate in scientific research activity.
4. Some of core subjects can be given in foreign language.
5. Implement a course management system (e.g., e-learning software platform "Moodle") as a mandatory platform for all staff members.
6. Modelling tools (numerical models) should be more widely promoted in the Master's theses.
7. Outcomes of internal (especially students) and external (especially employers) evaluation of the program should be more effectively used for improvement of the programme.



#### IV. SUMMARY

The programme aims and learning outcomes are well defined, clear and publicly accessible. In general they are good; however there can be found similarities with the study programme of the bachelor level.

The interviewed senior administrators, teaching staff and stakeholders confirmed an existing niche in the labour market for the Master degree graduates.

Learning outcomes of the programme, its content and the qualifications offered are compatible with each other. However, the achieved knowledge of the students does not completely meet the self-defined aims of the study programme. The subjects of the programme do not cover full spectra of a really interdisciplinary Environmental Engineering field. As the content of the programme is heavily oriented towards Chemistry the name of as “Environmental Chemistry” could be more appropriate for this programme unless the faculty decides to adjust and rebalance the content of the curriculum.

The curriculum design meets legal requirements for MSc study programme Environmental Engineering. Study subjects are spread evenly; however there are still too many (8) chemically oriented subjects in the second level programme. The names of these subjects are slightly different but the content of them overlap in number of sections and themes. It is strongly recommended to screen the Master’s curriculum, eliminate repetitive subjects or themes and align with the curriculum of the Bachelor’s programme. Furthermore, numerical modelling software should be more widely used for the Master’s final theses.

The high qualification of the teaching staff is adequate to ensure the intended learning outcomes. The legal requirements are entirely fulfilled. The qualification of the teaching staff and their number are adequate to ensure learning outcomes.

In general the premises for studies are adequate both in their size and quality, however specialised Environmental Engineering or technology laboratories (Water and Wastewater; Solid Waste etc.) are lacking. The teaching and learning equipment are good both in size and quality.

The admission requirements for the Master studies are well founded. The organisation of the study process ensures provision of the programme and the achievement of the learning outcomes.

The KTU organizes students’ conferences, but the interviews revealed only satisfactory activity from the side of the students. Students’ mobility and involvement them into scientific research should be more encouraged.

The responsibilities for decisions and the monitoring of the implementation of the programme are clearly formalised and allocated. Stakeholders take part in the process of improvement of the study process, though not all their proposals are taken into account. Internal quality assurance measures are clearly formalised, but not effective and efficient.

## V. GENERAL ASSESSMENT

The study programme *Environmental Engineering* (state code - 621H17001) at Kaunas University of Technology is given **positive** evaluation.

*Study programme assessment in points by fields of assessment.*

No.	Evaluation Area	Evaluation Area in Points*
1.	Programme aims and learning outcomes	3
2.	Curriculum design	2
3.	Staff	3
4.	Material resources	2
5.	Study process and assessment (student admission, study process student support, achievement assessment)	3
6.	Programme management (programme administration, internal quality assurance)	2
	<b>Total:</b>	<b>15</b>

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

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

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

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

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