



STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

Vilniaus Gedimino technikos universiteto
STUDIJŲ PROGRAMOS *VANDENS ŪKIO INŽINERIJA*
(valstybinis kodas – 621H23001)
VERTINIMO IŠVADOS

EVALUATION REPORT of
WATER ENGINEERING
STUDY PROGRAMME (*state code – 621H23001*)
at Vilnius Gediminas technical university

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Išvados parengtos anglų kalba
Report language – English

DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	<i>Vandens ūkio inžinerija</i>
Valstybinis kodas	621H23001
Studijų sritis	Technologijos mokslai
Studijų kryptis	Statybos inžinerija
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Antroji
Studijų forma (trukmė metais)	Nuolatinė (2)
Studijų programos apimtis kreditais	120
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	<i>Vandens ūkio inžinerijos magistras</i>
Studijų programos įregistravimo data	2004/06/07

INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	<i>Water Engineering</i>
State code	621H23001
Study area	Technological Sciences
Study field	Civil Engineering
Type of the study programme	University studies
Study cycle	Second
Study mode (length in years)	Full-time (2)
Volume of the study programme in credits	120
Degree and (or) professional qualifications awarded	Master of Water Engineering
Date of registration of the study programme	07/06/2004

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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	Laboratory Health and Safety training log paper copy
2	Lecturers review schedule 2016
3	Lecturers reviews 2015-2016
4	Study Programme Committee records 2013-2016

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

This report is the outcome of the evaluation of the Master Degree studies in *Water Engineering* at the VGTU, which began in 2004, after being approved at the VGTU Senate on 24

September 2003, No. 23-2.1. The programme has previously been subject to an external evaluation in 2012. The previous evaluation resulted in a 3 year accreditation, which is being reviewed in this round. The programme being evaluated was last updated in 2013, slightly updated in 2014, and last renewal was made on 2016. The prepared self-evaluation report comprises of results from the 5-year period from 2011 to 2016. The site visit included the following meetings:

- discussions with senior faculty administration staff,
- discussions with staff responsible for preparation of Self-Evaluation Report (SER),
- discussions with teaching staff,
- discussions with students,
- discussions with alumni and employers of recent graduates of the programme,
- inspection of student coursework including final year projects,
- inspection of teaching premises and equipment including library, laboratories, auditoria, and computing.

The two-year full-time Water Management Engineering programme, leading to a Master of Water Engineering, is designed to develop specialists in water and wastewater engineering, building on their undergraduate education in environmental engineering or building engineering systems. The programme has been running since 2004 and the programme was updated in 2013. The average enrolment has stabilised at 14 through quota limitations on state-funded places.

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 December 2016*.

1. **Prof. dr. Haldor Jochim (team leader)**, *Professor of Railway and Transport Planning, FH Aachen University of Applied Sciences, Germany.*
2. **Prof dr. Miroslav Premrov**, *Dean of Faculty of Civil Engineering, Transportation Engineering and Architecture, University of Maribor, Slovenia.*
3. **Assoc. Prof. dr. Tone Merete Muthanna**, *Associate Professor of Hydraulic and Environmental Engineering Dep., Norwegian University of Science and Technology, Trondheim, Norway.*
4. **Assoc. Prof. dr. Jelke Dijkstra**, *Associate Professor of Civil and Environmental Engineering Dep., Chalmers University of Technology, Sweden.*
5. **Dr. Dalė Daunoravičiūtė**, *Quality Manager at the public institution "Technical supervision services", Independent Consultant, Lithuania.*
6. **Ignas Gaižiūnas**, *Bachelor student in Energy Physics, Vilnius University, Lithuania.*

II. PROGRAMME ANALYSIS

2.1. Programme aims and learning outcomes

The aims and learning outcomes of the *Water Engineering* study programme are well documented and publicly available at:

<https://medeine.vgtu.lt/programos/programa.jsp?fak=3&prog=82&sid=F&rus=U&klb=en>

The study programme is intended for holders of the Bachelor Degree or a degree in engineering who want to study the theory and practice of water sector engineering, quality and quantity parameters, and technological processes, of water and wastewater, to analyse water protection and water management systems, processes taking place in the environment, to acquire master-level education in the field of water engineering. The stated purpose of the *Water Engineering* study programme is to prepare highly qualified specialists educated as democratically-minded members of society who in the future will be able to contribute to the economic prosperity of the country, competitiveness of the economic activities, creation of social unity and welfare and high living standards both in Lithuania and in the global EU markets. The aim of the programme is well formulated and achievable. As water engineers the graduates contribute to economic prosperity, higher living standards and welfare in the country. However, the part of the statement referring to democratically-minded members might be more of a lofty general goal of education that is difficult to measure directly in the water engineering programme.

The programme focuses on delivering education with high academic standards as well as educating engineering with a strong understanding of the societal values and responsibilities of their profession, as listed under the social and personal skills. This is indeed a very worthy and desirable outcome, but it is not clear how these are measured or benchmarked.

Overall the aims and learning outcomes are appropriate for an academic MSc. degree, and consistent with the teaching material and literature being offered for the programme. As a recommendation the evaluation team proposes to consider implementation of a specialization in either urban water systems or water and waste water treatment. The former would be strongly focused on pipe hydraulics, drainage, flood protection and sustainable stormwater management, while the latter would have strong links to chemical/biological process engineering.

2.2. Curriculum design

In 2014, the learning outcomes of the study programme were updated, adapting them to the Description of study cycles approved by Order No. V-2212 of the Minister for Education and Science of the Republic of Lithuania of 21 November 2011. The Master's degree programme

water engineering is in compliance with level VII of the Lithuanian qualifications framework description, level VII of European qualifications framework and European higher education qualifications framework second-cycle studies. The learning outcomes are described according to the following structural elements: knowledge and its application, research skills, special skills, social skills and personal skills.

According to the list of branches within study fields approved by Order No. V-222 of the Minister for Education and Science of the Republic of Lithuania of 19 February 2010, the *Water Engineering* master study programme is assigned to the study field *Civil Engineering* within Technology Science study area (H200). In accordance with the Description of general requirements for the Master Degree study programmes (approved by Order No. V-826 of the Minister for Education and Science of the Republic of Lithuania of 3 June 2010), the curriculum design is in conformity with a the programme which graduation results in the award of Master Degree in Civil Engineering, branch of the study field – Water Engineering (H230).

Study plan

The programme comprises of 4 semesters over 2 years. There are 4-5 regular courses and one elective per semester. In total the programme has 120 credits, of which the Thesis makes up 39 ECTS, which is changed from 22 ECTS at the previous evaluation. The programme will be offered with a 30 ECTS Master thesis starting from fall 2017. This change is positive and aligns the programme with what is considered the norm in the EU/ECC. The master thesis makes up 32.5% of the total load in the current version of the programme, which will be increased to 25% in the new programme from fall 2017. The workload of the research projects that assists the final MSc project is evenly spaced over the programme. The downside of this approach is that the students have to choose their thesis topic already at the start of the first semester. That also means that the literature review stage of the master thesis is done with little to no prior knowledge of subject matter. This downside can be seen in the MSc Theses where key references in the field were often missing from students' work. The study time is divided into classwork (lectures, laboratory work, practical training), consultations and self-studies. Classwork accounts for 30%, consultations for 8%, and self-studies take 62% of the study time, which appears to be a well-balanced distribution.

The order of the courses offered appears in general well planned, however there are some exceptions. The course *Land hydrology* is a fundamental course for all water engineering, being it water supply or drainage design, hence it is recommended that this course should be a mandatory course in the first semester, and not an elective in the second semester as it is now. It should furthermore be mentioned that it seems somewhat odd to teach *urban water management* and

further *stormwater management* without prior knowledge from a mandatory hydrology class. It would be recommended to revisit this for the next planned revision of the study plan.

Repetition

There appears to be some overlap in the main courses. This, however, is not problematic from a pedagogical point of view as the overlap is small and some repetition is helpful. It is important to keep in mind that course content is continuous work that should be reviewed on a regular basis in collaboration with all teaching staff.

Course contents

Most of the core subject-specific courses appear to be thoughtfully designed at teaching an engineering skill, often supported with coursework. They aid in achieving the learning outcomes set for the programme. Several of the courses have course work projects to support the learning outcomes, which in general is positive, but could also lead to heavy work load, which will result in a focus on project report production rather than learning outcomes. During the interviews with the students and alumni it was not clear that all courses were taught with the content that the provided course description gave. Especially some of the software noted in the course description (e.g StormCAD) was known neither to the students nor the alumni.

As a general note, the first year has several mandatory courses which could be changed to electives; such as *Energy Supply systems* and *Environment Impact Assessment*. Especially considering that electives such as *Land hydrology* and *Urban stormwater management* should be compulsory courses for all students instead.

Scope

The scope of the programme fits the aims of the programme. However, a critical review of mandatory and elective courses should be made to further improve the programme.

State-of-art course contents

Overall the course contents appear relevant and well balanced. However, a slightly reduced focus on software learning and more focus on critical thinking and developing life-long learning skills could be beneficial for a Master Programme like this. State-of-the-art methods in treatment and systems design are important considerations in course design, which requires an active research based teaching staff.

2.3. Teaching staff

All teaching staff involved in the programme are reported to have the qualifications required by law.

Qualifications

The scientific and professional qualifications of all teaching staff are PhD or better. The formal pedagogic training appears somewhat more unclear as the faculty reported that a training programme was currently being rolled out in 2016, with some teachers having already received the training. Several of the teachers, however, reported having completed pedagogic training prior to this programme, though this was not reported in their CVs, which would appear natural. Unfortunately, being the only water engineering study programme in Lithuania the staff are all local recruits with a similar background. This is a challenge in a small country, making international connections and exchange opportunities even more important for the group as a whole. Staff with alternative academic backgrounds and skill sets (experimental or numerical modelling) would improve the diversity and ultimately the quality of the course contents on the missing aspects.

Number of teaching staff & turnover

The total number of staff over the past five years includes 22 teachers. The turnover rate is low and accountable and mainly due to maternity leave, which anyway is a temporary leave. The total number of academics appears high in comparison to the relatively low student numbers, however this also reflects growth opportunities. The age, gender, and experience of the teaching staff are well distributed, allowing for good knowledge transfer between the staff.

Professional development

Several of the staff have had international exchange opportunities, mostly for shorter durations (weeks or months), however none of the exchange opportunities have led to more long-term connections or exchanges. It would be very beneficial to investigate, for instance, Marie-Curie Fellowships that sponsor a Post-Doc elsewhere or other EU initiatives.

Research and work load

The research output was not evaluated specifically as this evaluation focused on the teaching. However, delivering a state-of-the-art teaching programme requires support from a good research programme. The current work load of the staff seems to hinder research time, as they deliver a large number of courses to a relative small number of students. Better course coordination and considering fewer classes could free up more time for research. An increased number of PhD students would also increase the research output. The publications list is mainly focused on conference publications. This could be related to the fact that the originality (in terms of advancing the state of art) does not always meet the international level.

Figures for the academic year 2015/2016 show that the annual academic workload of teachers working on a full-time basis amounts to 1,562 hours in total, of which about 850 hours are for teaching and about 400 hours are contact hours. Scientific and academic workloads take about 400 annual hours each. This leaves very little time for research by academic staff. Given the high

staff-to-student ratio it should be possible to organize the programme to free up considerable more research time for the academic staff.

2.4. Facilities and learning resources

Premises

VGTU offers adequate facilities for what is expected from an institute of higher education in terms of classrooms, computer rooms, library facilities and campus WIFI. At the faculty of Environmental Engineering there are sufficient numbers of licences for the software used in the courses and the library offers a large number of e-journals. The laboratories are generally well equipped. However, the hydraulic teaching laboratory could benefit from some upgrades in experimental setups. The total laboratory space is well utilized and the programme will be able to expand with additional laboratory space in 2017, which will be beneficial.

Teaching and learning equipment

Extensive literature for the course is available through hardcopy and e-resources. The use of e-resources is increasing, encouraged by a specific project (Information eBridge) running since 2008. Resources include 8 books and textbooks prepared by teachers of the programme. The programme does not involve laboratory work for coursework but use of laboratories is a typical feature of the final graduation works. Good laboratory equipment is available in the various contributing departments for research related to the final thesis. In addition, other equipment in the University, which was obtained through EU-funded grants, is available on a marginal cost basis.

2.5. Study process and students' performance assessment

The admission requirements to the University are clear and well founded. Admissions are being carried out by a VGTU Admission and Information Centre. Students are admitted based on competitive score. Information about the formula to calculate the competitive score is present on the VGTU website.

The programme draws a steady supply of good students and admits between 14-18 students each year in the past five years. The state funded positions declined from 13 to 8 in 2011 to 2013, but is back at 14 in 2016. The state funded spots are partly a result of research and teaching output from the programme, leading back to the work load of the staff and possibilities to restructure the programme by offering fewer courses in order to free up research time for the staff. This would result in a positive upward spiral of increased research output and graduates leading to increased funding, and mention in the Section 2.3 – teaching staff.

The programme has a very high retention of students and an overall high average graduation rate of 94%, which indicates that the programme succeeds in retaining the students recruited. The students study fulltime and work fulltime, as all the courses are taught in the evenings, adding a heavy work load to the students. Various study methods are used in the course of studies which in turn allow to develop different skills and to reach learning outcomes. There is a good proportion between independent and contact work. There seems to be a good electronic environment for studies implemented by VGTU and the majority of the teaching staff uses the advantages it provides.

The programme only partly succeeds in encouraging students to study abroad for part of their studies. Over the past five years 0-2 students have had an Erasmus exchange. This can mainly be explained by the situation of evening lectures combined with a fulltime job. This is a serious obstacle for the programme to encourage more exchange of their own students, but also, importantly, it hinders foreign students from seeing VGTU and the water programme as an attractive place for exchange, as the norm in Europe is that master students are full time day students. The evaluation committee acknowledges that in this societal structure it will be difficult for the programme to change on its own but encourages the faculty to work for a change towards day time lectures. This would be a tremendous benefit to the teaching staff as well as the students.

The topics of master thesis submitted for review shows that the students are given opportunities, and are encouraged to participate in on-going research projects. Several of the master thesis were research conducted as part of a larger research project. There were also several master thesis demonstrating applied research topics, where the students were involved in application of research to case studies and real life projects. The evaluation and grading of the students' final works appear to be inflated compared with similar work in other universities. A score of 9 and 10 was awarded in 66% of the cases, with 33% receiving a 10. A full score of 10 should be of a quality that could be presented at least as a very good conference paper, or preferably as a journal article with minor revisions. Some of the final work that had been awarded high grades had missing references, incomplete figure titles and poor language in the English summary. These are relatively small deviations but it pulls the overall impression down from the top grades. Generally, all the thesis works reviewed had relatively short discussion sections and very long introduction chapters with background description. However, the discussion is what really facilitates critical independent thinking, making this a very important part of the thesis work.

2.6. Programme management

Overall, the programme is well managed. It has a clear structure and measurable outcomes, and a clear division of responsibilities. The laboratory management is well structured and a system HES (health environment and safety) in laboratories is implemented and followed up.

The programme incorporates students in the Study Programme Committee (SPC), though it appears that the student representative is not always included in all the decisions. It is important that the work in the study committee is transparent. Though student feedback on teaching seems to be implemented, both in form of oral communications and end-of-term assessments, it would be beneficial to implement a formal system where previous years' feedback is also available to current students. The programme has very strong ties to industry and social partners. This is a positive feature that strengthens the programme, though care should be taken not to let the industry partners dictate teaching and learning. The evaluation committee met with a large group of social partners, and it appeared that some were very close with the programme, while others had little formal connection. Formalizing the communication and cooperation with the social partners would be beneficial for both sides.

There is a good system of financial support at VGTU. Students are, for example, eligible for scholarships for good academic results as well as good result in other areas such cultural, public or sports activities. Students with a problematic financial situation also get financial support from VGTU. It remains unclear what the size of financial support provided for students is and whether it is sufficient.

The management has adequately followed up on the recommendations from the previous evaluation from 2012. The programme title and structure recommendations have been implemented, and today the programme has a clear and well organized structure. The recommendation to change the thesis credits from 22 ECTS to 30 ECTS has been addressed by making the thesis 39 ECTS, which appeared strange; however, this will be revised to 30 ECTS from the fall of 2017.

The recommendation to relocate all the smaller laboratories to one large has not been implemented. However, the programme makes good use of the facilities they have, and although a larger facility could be desirable, it is not essential to this programme.

III. RECOMMENDATIONS

1. It is recommended that a formal communication channel be established with the social partners. This could be done in form a semi-annual or annual meeting with students, staff, alumni and social partners.
2. It is recommended to postpone students selecting their thesis topics until the second semester. This will enable students to make more informed decisions, and enhance the quality of the output, especially the literature review part.
3. The SPC should evaluate the total number of courses offered and seek to reduce the overall teaching load for the staff. This will free up more research time, which will benefit both the teaching quality and the programme output.
4. It is recommended that the system of offering the course work in the evening after 4pm be abolished and rather a normal daytime full-time programme be implemented. This will enhance the learning outcome, improve staff working conditions, and make the programme attractive to foreign nationals and Erasmus exchange.
5. It is recommended to allow specialization in either urban water systems or in water and waste water treatment. These two parts of the field have different requirements for emphasis, which are difficult to meet with the same curriculum plan.
6. It is recommended that the SPC review the current elective *Land hydrology* and consider making it a mandatory course, as it is an underlying knowledge base for all urban water systems.

IV. SUMMARY

The *Water Engineering* Master study programme meets the needs of the specialist marked and provides an education that is sought after from the social partners, indicated by the strong demand for its graduates in the market. Overall the aims and learning outcomes are appropriate for an academic MSc. degree and consistent with the teaching material and literature offered for the programme. As a recommendation, the evaluation team proposes to evaluate to implement a specialization in either urban water systems or water and waste water treatment. The former would be strongly focused on pipe hydraulics, drainage, flood protection and sustainable stormwater management, while the latter would have strong links to chemical/biological process engineering.

The curriculum had an easy-to-follow structure and most of the core subject specific courses appear to be thoughtfully designed at teaching an engineering skill, often supported with course work. They aid in achieving the learning outcomes set for the programme. As a general note the first year has several mandatory courses which could be changed to electives; such as *Energy Supply systems* and *Environment Impact Assessment*. Electives such as *Land hydrology* and *Urban stormwater management* should be compulsory courses for all students.

The scientific and professional qualifications of all teaching staff is PhD or better, which is a strength to the programme. A formal programme for pedagogic training of the staff is currently being implemented, which will further strengthen the programme. Unfortunately, being the only water engineering programme in Lithuania the staff are all local recruits with a similar background. This is a challenge in a small country, making international connections and exchange opportunities even more important for the group as a whole. Staff with alternative academic backgrounds and skill sets (experimental or numerical modelling) would improve the diversity and ultimately the quality of the course contents on the missing aspects.

VGTU offer facilities adequate facilities for what is to be expected from an institute of higher education in terms of class rooms, computer rooms, library facilities and campus WIFI. At the faculty of Environmental Engineering there are sufficient number of licences for the software being used in the courses and the library offers a large number of e-journals. The laboratories are generally well equipped. However, the hydraulic teaching laboratory could benefit from some upgrade in experimental setups. The total laboratory space is well utilized and the programme will be able to expand with additional laboratory space in 2017, which will be beneficial.

Extensive literature for the course is available through hardcopy and e-resources. The use of e-resources is increasing, encouraged by a specific project (Information eBridge) running since 2008. Resources include 8 books and textbooks prepared by teachers of the programme. The programme does not involve laboratory work for coursework but use of laboratories is a typical

feature of the final works. Good laboratory equipment is available in the various contributing departments.

The programme has a very high retention of students and an overall high average graduation rate of 94%, which indicate that the programme succeeds in retaining the students recruited. The students study fulltime and work fulltime, as all the courses are taught in the evenings, adding a heavy work load to the students. Various study methods are used in the course of studies which in turn allow to develop different skills and to reach learning outcomes. There is a good proportion between independent and contact work. There seems to be a good electronic environment for studies implemented by VGTU and the majority of the teaching staff uses the advantages it provides.

Overall, the programme is well managed. It has a clear structure and measurable outcomes, and a clear division of responsibilities. The laboratories' management is well structured and a system HES (health environment and safety) in laboratories is implemented and followed up.

V. GENERAL ASSESSMENT

The study programme *Water Engineering* (state code – 621H23001) at Vilnius Gediminas technical University is given **positive** evaluation.

Study programme assessment in points by evaluation areas.

No.	Evaluation Area	Evaluation of an area in points*
1.	Programme aims and learning outcomes	3
2.	Curriculum design	3
3.	Teaching staff	3
4.	Facilities and learning resources	3
5.	Study process and students' performance assessment	3
6.	Programme management	3
	Total:	18

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

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

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

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

Grupės vadovas:

Team leader:

Prof. dr. Haldor Jochim

Grupės nariai:

Team members:

Prof. dr. Miroslav Premrov

Assoc. Prof. dr. Tone Merete Muthanna

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**VILNIAUS GEDIMINO TECHNIKOS UNIVERSITETO ANTROSIOS PAKOPOS
STUDIJŲ PROGRAMOS *VANDENS ŪKIO INŽINERIJA* (VALSTYBINIS KODAS –
621H23001) 2017-02-22 EKSPERTINIO VERTINIMO IŠVADŲ NR. SV4-25 IŠRAŠAS**

<...>

V. APIBENDRINAMASIS ĮVERTINIMAS

Vilniaus Gedimino technikos universiteto studijų programa *Vandens ūkio inžinerija* (valstybinis kodas – 621H23001) vertinama **teigiamai**.

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

* 1 - Nepatenkinamai (yra esminių trūkumų, kuriuos būtina pašalinti)

2 - Patenkinamai (tenkina minimalius reikalavimus, reikia tobulinti)

3 - Gerai (sistemiškai plėtojama sritis, turi savitų bruožų)

4 - Labai gerai (sritis yra išskirtinė)

<...>

IV. SANTRAUKA

Magistrantūros studijų programa *Vandens ūkio inžinerija* tenkina specialistų rinkos poreikius ir teikia išsilavinimą, kuris paklausus tarp socialinių partnerių – tą rodo didelė absolventų paklausa rinkoje. Iš esmės tikslai ir studijų rezultatai yra tinkami akademiniam magistro laipsniui įgyti ir atitinka programoje nurodytą studijų medžiagą ir literatūrą. Ekspertų grupė siūlo teikti vieną specializaciją – arba miesto vandentvarkos sistemų, arba vandens ir nuotekų valymo sistemų. Pirmoji specializacija ypač akcentuotų vamzdžių hidraulikos, drenažo sistemos, apsaugos nuo potvynių ir tvaraus paviršinių nuotekų tvarkymo temas, o antroji būtų glaudžiai susijusi su cheminių / biologinių procesų inžinerija.

Programos sandaros struktūra paprasta, o dauguma studijų pagrindų dalykų apgalvotai parengti, siekiant ugdyti inžinerinius įgūdžius. Prie to prisideda ir kursiniai darbai, kurie padeda pasiekti studijų programos nustatytus studijų rezultatus. Ekspertai pastebėjo, kad pirmame kurse yra keli privalomieji dalykai, kuriuos būtų galima perkelti į pasirenkamųjų dalykų bloką, pvz., *Aprūpinimo energija sistemos* ir *Poveikio aplinkai vertinimas*. O tokie pasirenkamieji dalykai kaip *Sausumos hidrologija* ir *Paviršinių nuotekų tvarkymas* turėtų būti privalomi visiems studentams.

Visų dėstytojų mokslinė ir profesinė kvalifikacija aukšta – jie turi mokslų daktaro ar aukštesnį laipsnį, ir tai yra studijų programos stiprybė. Šiuo metu įgyvendinama formali darbuotojų pedagoginės kvalifikacijos kėlimo programa, kuri dar labiau sustiprins studijų programą. Deja, kadangi tai vienintelė vandens ūkio inžinerijos studijų programa Lietuvoje, visi dėstytojai yra vietiniai ir jų išsilavinimas panašus. Mažai šaliai tai iššūkis, todėl dar labiau išauga tarptautinių

ryšių ir mainų galimybių svarba. Darbuotojai, turintys kitokį akademinį išsilavinimą ir įgiję kitokių įgūdžių (eksperimentinio ar skaitinio modeliavimo), padidintą įvairovę ir galiausiai pagerintų trūkstumų programos aspektų turinio kokybę.

VGTU teikia tinkamą materialiąją bazę, kokios tikimasi iš aukštojo mokslo institucijos, – auditorijas, kompiuterių klases, biblioteką ir bevielį internetą universiteto teritorijoje. Aplinkos inžinerijos fakultetas turi pakankamą studijuojant naudojamos programinės įrangos licencijų skaičių, o biblioteka siūlo didelį el. žurnalų pasirinkimą. Laboratorijos apskritai gerai įrengtos. Vis dėlto reikėtų atnaujinti hidraulikos laboratorijos eksperimentinių tyrimų įrangą. Bendra laboratorijų erdvė gerai išnaudojama, o 2017 m. ji bus išplėsta ir tai bus naudinga studijų programai.

Išsami studijų programos literatūra prieinama tiek popieriniu, tiek skaitmeniniu formatu. Elektroniniai išteklių naudojami vis labiau; jų naudojimą skatina nuo 2008 m. vykdomas projektas „Informacijos e. tiltas“. Išteklių taip pat apima studijų programos dėstytojų parengtas 8 knygas ir vadovėlius. Studijų programoje nenumatytas laboratorinis darbas rengiant kursinius, tačiau laboratorijomis paprastai naudojamosi rašant baigiamuosius darbus. Įvairios programą kartu vykdančios katedros užtikrina gerą laboratorinę įrangą.

Studentų nubyrejimo rodiklis itin žemas. Studijų programa gali didžiuotis bendru aukštu studijas baigusių studentų rodikliu – 94 %, kuris rodo, kad programai pavyksta išlaikyti pritrauktus studentus. Studijų forma nuolatinė, o studentai dirba visu etatu, tad paskaitos dėstomos vakarais ir studentai patiria didžiulį darbo krūvį. Naudojami įvairūs studijų metodai, o tai savo ruožtu leidžia ugdyti skirtingus įgūdžius ir pasiekti studijų rezultatus. Savarankiško ir kontaktinio darbo valandų santykis geras. VGTU sukurta gera elektroninė studijų aplinka ir dauguma dėstytojų naudojami jos teikiamais privalumais.

Apskritai, programos vadyba gera. Jos struktūra aiški, rezultatai pamatuojami, o atsakomybė aiškiai paskirstyta. Laboratorijų valdymo sistema gerai parengta; jose įdiegta ir įgyvendinama sveikatos, aplinkos apsaugos ir saugumo sistema.

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III. REKOMENDACIJOS

1. Rekomenduojama sukurti oficialų komunikacijos su socialiniais partneriais kanalą. Tą galima įgyvendinti, kas pusmetį ar kas metus organizuojant susitikimą su studentais, darbuotojais, absolventais ir socialiniais partneriais.
2. Rekomenduojama leisti studentams rinktis baigiamojo darbo temą antrame semestre. Tai leis jiems priimti kompetentesnius sprendimus ir pagerins rezultatų, ypač literatūros apžvalgos dalies, kokybę.
3. Studijų programos komitetas turėtų įvertinti bendrą siūlomų dalykų skaičių ir siekti mažinti dėstytojų darbo krūvį. Taip atsiras daugiau laiko tyrimams, dėl to pagerės dėstytojų darbo krūvis ir studijų programos rezultatai.
4. Rekomenduojama atsisakyti dėstytojų vakarais, po 16 val., sistemos, o vykdyti įprastą nuolatinę dieninę studijų programos formą. Taip pagerės studijų rezultatai, dėstytojų darbo sąlygos, o programa taps patraukli užsienio ir „Erasmus“ mainų programos studentams.
5. Rekomenduojama nustatyti vieną specializaciją – arba miesto vandentvarkos sistemų, arba vandens ir nuotekų valymo sistemų. Šių dviejų sričių reikalavimai skiriasi, todėl sunku jų laikytis vykdančią patį studijų programos planą.
6. Studijų programos komitetui rekomenduojama peržiūrėti dabartinę pasirenkamąjį dalyką *Sausumos hidrologija* ir apsvaistyti galimybę jį padaryti privalomu, nes tai yra visų miesto vandentvarkos sistemų žinių pagrindas.

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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)