STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

Vilniaus Gedimino technikos universiteto
STUDIJŲ PROGRAMOS *GEOTECHNIKA*
(valstybinis kodas* – 621H25001*)
VERTINIMO IŠVADOS

EVALUATION REPORT of
***GEOTECHNICS* STUDY PROGRAMME**
(*state code* – 621H25001)
at Vilnius Gediminas technical university

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Išvados parengtos anglų kalba
Report language – English

DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	***Geotechnika***
Valstybinis kodas	621H25001
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	Statybos inžinerijos magistras
Studijų programos įregistravimo data	1997/05/19

INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	*Geotechnics*
State code	621H25001
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 Civil Engineering
Date of registration of the study programme	19/05/1997

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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	GEOTECHNICA PROGRAMME AND STUDY DESCRIPTIONS 2017-2018 teaching year
2	Minutes of the Study programme committee (2016-05-24 and 2016-09-05)

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

The second-cycle master's degree study programme *Geotechnics* in the field of Civil Engineering is implemented by the Department of Geotechnical Engineering at VGTU Faculty of Civil Engineering (FCE). The two-year full-time Master of Civil Engineering programme

Geotechnics is designed to deepen knowledge in the field of geotechnical engineering of civil engineering (90%) and engineering geology bachelor degree graduates (10%). The programme seems to be primarily designed to teach structural engineers geotechnical engineering, although some students from other programmes such as Road & Railway engineering are attracted as well. The programme has been running for almost 20 years and is in continuous development. It is the only programme of its kind in Lithuania which attracts the minimum number of students required. Furthermore, compared to similar research groups in geotechnics around the world the number of staff members is large which gives it the potential to generate sufficient critical mass. It was positively evaluated in 2012, hence the programme is certified until 2018. Since then the outstanding issues highlighted in the previous evaluation have been worked with. Potential links with other programmes such as infrastructure or hydraulics are not in the focus of the programme, as was confirmed during the site visit.

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 *29th November 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 *geotechnics* programme is well documented both in terms of aims and learning outcomes which are publicly available at https://medeine.vgtu.lt/programos/programa.jsp?sid=F&prog=273&klb=en&rus=U&fak=2&metai=2016 and for completeness are repeated below:

1. Deepening knowledge and abilities in geotechnical engineering.
2. Prepare specialists able to: solve geotechnical problems; identify necessary parameters for geotechnical design; apply various investigation methods for solving geotechnical problems; analyze and summarize results of research.
3. Learn to formulate research aims, plan and perform necessary experiments to achieve aims.
4. Learn to apply up-to-date analysis and design methods for geotechnical structures.

The clear aims and learning outcomes are designed to equip the future graduate with sufficient academic competences and engineering skills to directly participate in the labour market (which is further highlighted by the 95% employment rate in geotechnics afterwards).

As a small addition on the formulation of the competences SG3 and SG4, i.e. *"SG3. Ability to interpret data obtained from experimental investigations while monitoring and measuring the construction process."* and *"SG4. Ability to develop and apply original ideas while testing or designing both foundations and underground structures."* could be reformulated to reflect the potential ability of the graduate to generalize the findings from tests (and/or other forms of analysis) into new methods, numerical models or design guidelines.

What is noteworthy is that this is not at the expense of underlying societal values such as societal responsibility and professional integrity, as the latter are explicitly included in the expected outcomes, i.e.: *"CG2. Bearing responsibility for the quality of personal activity under the current techniques, standards and assessment in accordance with professional ethics and civic consciousness."* and *"AG3. Awareness of moral responsibility for personal activities and their results' impact on society and environment."*. It is unclear, however, how the latter outcome is developed or benchmarked as there is no ethics course included in the programme.

Finally, the aims and learning outcomes are consistent with the material offered, in terms of courses offered, and are appropriate for an academic MSc. degree. As opposed to the previous assessment the evaluation committee believe that the degree can carry the 'Master in Civil Engineering' name as the obvious links with Structural Engineering in the *Geotechnics* programme (both in terms of in-flux of students and optional course modules) sufficiently broaden the graduate to be called a Civil Engineer. Combining structures and geotechnics knowledge will also be a

valuable for the social partners. As engineers with substantial structural expertise in addition to geotechnical knowledge are in high demand. There is sufficient differentiation. Unfortunately, there is no specific certification of geotechnical engineers at the MSc. level (i.e. there is no difference to a BSc. graduate) in Lithuania. As a result, the programme is mainly attractive for engineers that want to deepen their knowledge.

As a minor change, it is recommended to formulate aim 3 into: "Learn to identify problems, formulate research aims and methodology, plan and perform necessary research activities, i.e. analyses and/or experiments, to achieve the aims." This will better highlight the academic process on an abstract level and does not limit the methodology to experimental testing alone. Also, this aligns aim 3 with the research skills outcomes GT2 and GT3.

2.2. Curriculum design

The structure of the curriculum conforms to the ECTS system, meets legal requirements and the programme fully complies with the General Requirements of Lithuanian regulations for Higher Education.

Scheduling of the modules

The programme comprises of 4 semesters over 2 years. On average 3-5 subjects are offered per semester. The scheduling of the modules seems rational with exception of teaching the Finite Element Method in *Computer Aided Design* before any (geotechnical) constitutive models or continuum mechanics principles are discussed. The research project that assists the final MSc project has to be chosen early, resulting in the literature review stage of the thesis work being performed with students' limited prior knowledge. This downside is reflected in the MSc theses where key references are often found to be missing.

The main design of the programme revolves around a large 'geotechnical' course with 9-12 ECTS that is complemented with some small courses. Also, a logical split between more theoretical courses in the beginning of the programme and more applied courses at the end is evident. There is one outlier to this structure which is the *Underground Structures, Retaining Walls and Anchors* course which appears too early in the programme (2^{nd} semester). In the new study programme for 2017-2018 this course has been even moved even earlier, to the first semester. This is not to be recommended as retaining walls and deep excavations are typically the most **advanced** topics offered in an applied geotechnics programme, i.e. it requires a thorough understanding of soil behaviour, structural elements soil-structure interaction and in most cases numerical modelling (including Finite Element Method) skills.

In addition to more traditional engineering subjects, more general courses for life-long learning are offered. Content wise, however, the scheduling could be improved. Teaching the *Mechanical Properties of Soils* course in the same period as the 'soil stress-strain' course potentially will give issues. By making those two courses sequential, i.e. by moving the *Mechanical Properties of Soils* course to the first semester and merging it with the *Analysis of geotechnical investigations and evaluation of base* course the quality would be improved.

Furthermore, the link between the *Soil Stress-Strain* course and the soil models lectures in the *Computer Aided Design in Geotechnical Engineering* course should be deepened. Finally, it is strongly recommended to make *Permeability and Consolidation* a compulsory course or alternatively improve similar content in one of the other courses. The level of independent work expected seems on par with the type of education offered.

Course contents

Most courses appear to be thoughtfully designed to teach engineering skill, often supported by course work and hence contributing to achieving the learning outcomes set for the programme. There seems to be a bias towards geotechnical design, often supported by local design practice or international standards. During the lectures the origin, rationale and limitations of the design methods are elaborated before teaching the application, often with course works. While the number of course credits may reflect the invested hours by the student it does not always reflect the level of topical knowledge such a course requires. Especially, the *Analysis of geotechnical investigations and evaluation of base* course seems too lightweight for a MSc programme (judging from the lecture topics) and could be merged with the *Mechanical properties of Soils* course to have an integrated *Advanced Soil Mechanics* course at the beginning of the programme. This course should reiterate and deepen some fundamental soil mechanics concepts and relate them to laboratory testing and data evaluation. This should integrate the most important concepts of groundwater flow and consolidation from the *Theory of Soil Permeability and Consolidation*.

The *Soil stress-strain state* course has an interesting mix of continuum mechanics topics. The evaluation committee sees this as an important course element that requires more ECTS and a stronger link to the constitutive models employed in Geotechnical Finite Element software the engineer will come across in their working life (e.g. Plaxis). Some of that material is already offered in *Computer Aided Design in Geotechnical Engineering* but those should be better integrated. The latter course somewhat glosses over the important aspects of FE analysis, constitutive model behaviour and the design of an experimental testing programme to obtain the model parameters and initial conditions in the field.

As already stated in the previous paragraph the *Underground Structures, Retaining Walls and Anchors* is an important advanced topic for a Geotechnical Engineer trained at MSc level. However, this course requires more credits and course work. Typically, such a course is the culmination of the build-up of knowledge on soil behaviour, interpretation of real world test data, numerical modelling and geotechnical design. The curriculum would also benefit if the underground structures part were to be split off into a separate course, ideally combined with tunnelling.

Repetition

There is 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. The bigger repetitions originate from one the elective courses (petrology), which should be revisited.

Scope

The scope of the programme fits the aims of the programme. However, as indicated above, some of the existing courses need to be condensed in order to make more room for the basic courses that form the basis for understanding, testing and modelling soil behaviour.

State-of-art course contents

The courses on shallow and deep foundations only offer a very limited amount of material for their respective amount of credits. Both courses would benefit from more contemporary approaches, beyond those offered in the code. Especially, the yield surface approach for the design of those foundations (combination of vertical, horizontal, moment loading), cyclic and dynamic loads and more detailed soil-structure interaction course elements would generalise what is offered now and bring it at a competing level to international programmes. The soil-structure interaction component is also something that employers want to see further developed in the programme.

The elective course *Durability and probability analysis of building structures* seems to lack probabilistic concepts in the course, which should be an important foundation for such a course. The other elective in that semester *Engineering Petrology and Hydrogeology* could benefit from a general update. The first half simply is basic undergraduate soil mechanics and useful geophysics, while petrophysics measurement techniques are missing altogether.

Missing courses

The programme could be further improved by adding some fundamentals on finite element methods, (advanced) geotechnical testing (and test design), constitutive modelling and soil-structure interaction. Engineering geology aspects appear to be under-represented generally. A course on rock mechanics, hydrogeology, or design of structures in rock would be recommended.

Furthermore, there are two different courses on Finite Element Analyses without a decent solid mechanics or numerical modelling course, this potentially leads to 'black box' FE users. The latter is indicated by the poor use of the Finite Element analysis as highlighted below in the section about the MSc theses. Finally, dealing with the underground involves uncertainties. Including probabilistic design techniques, or at the very least a basic risk assessment course (linking site investigation to potential risks further down the line), is a very useful addition to the knowledge of a modern geotechnical engineer. The same could also be said for re-introduction of ground improvement methods in one of the applied foundation courses.

2.3. Teaching staff

Legal

No less than 80% (or 60% where the study programme is oriented towards practical activities) of the teaching staff shall have advanced degrees of which no less than 60% shall engage in research in the same area as the subject they teach. No less than 20% of the subjects in the main field of studies shall be taught by full professors. Those requirements appear to be fulfilled.

Qualifications

The scientific and professional qualifications of all teaching staff is PhD or better. The teachers are participating in annual, centrally organised workshops to improve their pedagogical skills. Unfortunately, being the only *Geotechnics* programme in Lithuania leads to a situation with an over representation of teaching staff that has been locally educated with a similar expertise profile. Staff with alternative academic background and skill set (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 number of professors is somewhat low compared with the rather large group of academics. The total number of academics is also relatively high given the number of students.

The (academic/pedagogical) age differentiation of the teaching staff is adequate with a sufficient number of young and more experienced faculty members.

Professional development

A large number of academics were able to have an academic visit abroad or an industry internship within Lithuania. In principle those visits of 2-3 months are long enough to get a good impression of the receiving host institute, however, it is too short to fully master a new topic area. It is strongly recommended to investigate, e.g. Marie-Curie Fellowships that could sponsor a Post-Doc level international exchange.

Research

The research output is somewhat low for such a large group of experienced academics that formally has 30% of their time available for research (not including supervision of students). This could however be related to the rather high load of teaching duties, which seem particularly high given the relatively low number of PhD students. The ratio of journal/conference publications could be improved. Furthermore, somewhat surprisingly, most researchers don't publish in the leading geotechnical engineering journals. This could be related to the fact that the originality (in terms of advancing the state of art) is not always meeting the international level. The research fields of the senior scientists seem to be closer to structures rather than geotechnics and a specialist on advanced experimental or numerical techniques is missing. This may explain the absence of courses in the curriculum that cover those topics and the low standard of work on these points in the MSc theses reviewed.

2.4. Facilities and learning resources

VGTU offer facilities one comes to expect for an institute of higher education in terms of classrooms, computer rooms, library facilities and campus WIFI. At the faculty of Civil Engineering there are sufficient numbers of licences for the software being used in the courses and the library offers a large number of e-journals. Unfortunately, some of the journals required for the field are only available in hard copy (e.g. Géotechnique). On the other hand, the books available in the library of the Geotechnics department are of high quality. Given the low number of students the facilities available offer ample space both in the lecture theatre and in the teaching laboratories, which is modern and stocked with sufficient consumables.

The teaching laboratory is of high quality. In addition to dedicated teaching areas for Geology and Geotechnics the teaching lab has advanced stress path control triaxial equipment and mechanically actuated 1D oedometer equipment available for use by the students. Additionally, the research laboratory has a large scale 1-g test facility for tests on shallow foundations and piles. Unusually, equipment for site investigation was part of the inventory as well as that a new research laboratory with modern equipment is being realised. In addition to mechanical testing, also facilities for a material analysis is recently acquired (FEI Scanning Electron Microscope). At this stage it is too early to tell if the research laboratory will function properly, as initial issues with the climate control in the laboratory have recently been sorted out and most of the equipment is being build up.

The main improvement for the laboratory is not in equipment, as this is excellent, it rather would be to train the staff beyond basic use and instrument centred research towards science centred research.

2.5. Study process and students‘ performance assessment

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

There was a significant drop in applicants to this programme (from 12 first choice applicants in 2014 to 4 first choice applicants in 2015).

Overall applicant numbers dropped from 110 in 2011 to 35 in 2015. Yet the number of admitted students stayed almost the same. At the same time there is also a very high dropout rate, with only 45% of students finishing their studies. The evaluation committee recommends to investigate if there are links between the decline in number and the quality of applicants, which may furthermore influence the dropout rate. It is also recommended to analyse the situation carefully and implement necessary measures to turn the trend, as there is a clear market need for graduates of the programme. Two of the reasons for the dropout are the competitive environment with other MSc programmes that are perceived less difficult, and the fact that students work part time to fund their studies.

The part-time study programme, as recommended in the previous Review Assessment, did not gather sufficient critical mass to be approved as these studies are not supported by the state. The lectures, however, have been shifted to the evening to better accommodate the needs of the students and maintain state funding for the students. A review of the need for the part-time programme should be undertaken, as reducing the teaching load for some of the staff could improve the research output for the programme, which would improve teaching quality as a secondary effect.

During each semester students have an independent study week. The individual work week provides students with the possibility to catch up on their studies in case they fall behind. Time tables are well designed. Various study methods are used during the course of studies which in turn allow to develop different skills and to reach learning outcomes. There are good proportions 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.

Students only participate in one local conference organized by VGTU. It is recommended that students should be more encouraged to participate in other international or other national conferences. It is noted that this requires financial means, which perhaps could be provided by part-time employers. It is also recommended to facilitate more applied science activities for the students. There is also a variety of cultural activities through the VGTU and students are welcome to join.

However, students do not participate in any mobility programmes. This problem seems to have been known at the programme management for several years, but unfortunately, the situation has not improved. The students indicate that their day-job and evening studies leave little room for extra-curricular activities or an exchange abroad. The evening classes and organisation of the studies to fit with day time jobs also hinder an influx of exchange students from other countries. The evaluation committee recommend setting up a short-term exchange programme as a means to alleviate those deficits.

Finally, the grading of the MSc theses appears inflated compared to similar work in comparable universities. A full score (as awarded in 64% of the cases) should have led to a significant new insight that is publishable in a peer reviewed international journal. The problem here is not first and foremost the quality of the thesis itself, as many MSc theses are like that, but rather that they cannot be awarded full score as was frequently the case here for the ones the evaluation committee were presented for review.

2.6. Programme management

Organisation

The programme is well managed with clear structure and responsibilities. The incorporation of a student in the Study Programme Committee is helpful to maintain a student's perspective. Further student feedback is implemented through questionnaires; automation of this process improves efficiency. Here, surveys about the teaching staff at the end of each semester are carried out. The results seem to be later analysed and action taken. Students are also able communicate their problems directly to the deans' office. Industry involvement is somewhat unusual though it allows for alignment of the programme to the industry needs. Hence, all stakeholders are adequately represented. The structure and contents of the programme are monitored in a well-documented and rigorous manner. An example of this is the peers' monitoring systems for lectures, which shows a high level of dedication to educational quality.

There is a good system of financial support at VGTU. For example, students are 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 get financial support from VGTU. It remains unclear what the size of financial support provided for students is and whether it is sufficient.

Students who don‘t pass the exam in their first attempt are allowed to retake this exam twice. If a student fails after three attempts academic debts is received. Students have the chance to

settle their academic debts by retaking the entire study subject next year, though a fee has to be paid in that case.

In the SER there is a lack of information of the duration of visiting teachers, and teaching and topics/subjects planned by the visiting faculty. During the site visit it turned out that these are ERASMUS exchanges for no more than 5 days to the faculty. Students are not always aware of the existence or relevance of lectures held by foreign lecturers. Hence, student involvement can be improved.

In conclusion the organisation of the programme management is taken seriously with various measures to monitor and improve the programme in a transparent manner. Minutes of the Committee meetings (2016-05-24 and 2016-09-05) were provided.

The management has adequately followed up on the mainly organisational aspects of the programme from the previous evaluation. However, on three points some additional work remains: (1) The incorporation of soft soil geomechanics and seismics still would benefit from better visibility and critical mass, i.e. rather than the contents being spread over different courses perhaps a separate course could be created. (2) It is unclear to the evaluation committee whether the full potential of the laboratory is already employed, as for a lab that spans a considerable square metre area very few researchers were around during the visit, and little evidence of activity was seen. Furthermore, some of the equipment in the research lab was not fully mobilised even 9 months after the move, e.g. the Bishop-Wesley cell in the teaching lab. Finally, in addition to technicians, perhaps it is more important to have a highly trained academic to push the laboratory effort and bring the level to the required standard. (3) Although more collaborations with social stakeholders have been initiated since the previous evaluation assessment, the nature of the collaboration is perhaps too general. It would be helpful for the students and the programme if future collaborations were to be primarily aimed at reducing the financial risks for students taking the MSc programme – perhaps in the form of scholarships or improved prospect salary (growth).

The SER indicated some of the social partners where students are able to work. However, career paths typically undertaken by the students are not fully detailed, other than that 95% is employed by the geotechnical industry. A feedback system from graduates of the programme is not yet in place to its full extent. The faculty should take this into consideration as this would help to track the effectiveness of the studies and the problem-solving abilities of the graduates.

III. RECOMMENDATIONS

1. The programme's course contents need to be further developed to foster more advanced knowledge on understanding, testing and modelling of soil behaviour. These include more advanced continuum mechanics and numerical modelling concepts, but most importantly should include non-linear constitutive modelling.
2. High-quality research allows teachers to teach beyond the book and the local state-of-art. It is recommended to stimulate high quality research that can be published in the leading Geotechnical/Geomechanical Journals. It should be investigated how to send some of the young staff (this includes PhD students) to spend more than one year at institutes abroad. The knowledge on advanced experimental testing and numerical/constitutive modelling needs to be further developed among the staff members to further improve the teaching quality on these points.
3. It is recommended to merge *Analysis of geotechnical investigations and evaluation of base* and *Mechanical Properties of Soils* into an advanced soil mechanics course in the first semester. This may help free up some space to expand the *Soil Stress-Strain* course to include more constitutive modelling as later required in the *Computer Aided Design in Geotechnical Engineering* for the Finite Element modelling.
4. Move the *Underground Structures, Retaining Walls and Anchors* course from the second (or first as planned in 2017-2018) to the last semester. This course requires advanced knowledge of geotechnics & soil behaviour, modelling and engineering techniques to be developed first.
5. Consider formalising the shallow and deep foundation courses into a soil-structure interaction course with example cases such as shallow foundations, piles, walls, anchors. Here it would also be possible to include the seismics foundation response and failure envelope concepts.

IV. SUMMARY

The programme aims align well with the courses offered to arrive at the expected learning outcomes. Some minor rephrasing is suggested to reflect the desired learning outcome of a graduate to generalise the findings of a particular case, being it theoretical, numerical or experimental, for future use.

The curriculum should be improved with regard to course order and contents. With regard to course order it is highly recommend to move the *Underground Structures, Retaining Walls and Anchors* to the last term as this course should be the culmination of knowledge and modelling of soil behaviour and soil-structure interaction. More issues have been highlighted with regard to course contents. Especially, the *Analysis of geotechnical investigations and evaluation of base* course seems too lightweight for a MSc programme and could be merged with the *Mechanical properties of Soils* course to have an integrated *Advanced Soil Mechanics* course at the beginning of the programme. Furthermore, the *Soil stress-strain state* course has an interesting mix of continuum mechanics topics. The evaluation committee sees this as an important course element that requires more ECTS and a stronger link to the constitutive models employed in Geotechnical Finite Element software the engineer will come across in their working life. Some of that material is already offered in *Computer Aided Design in Geotechnical Engineering* but those should be better integrated. The latter course somewhat glosses over the important aspects of FE analysis. When executed well the latter would address the main weakness of the current curriculum where students are exposed to advanced numerical methods without covering the underlying fundamental concepts first.

The scientific and professional qualifications of all teaching staff is PhD or better. The teachers are participating in annual, centrally organised workshops to improve their pedagogical skills. Unfortunately, being the only *Geotechnics* programme in Lithuania leads to a situation with an over representation of teaching staff that has been locally educated with a similar expertise profile. Staff with alternative academic background and skill set (experimental or numerical modelling) would improve the diversity and ultimately the quality of the course contents on the missing aspects. One method to widen the expertise of the staff is to expose them to international research groups. This is already ongoing, however, 2-3 months is too short to fully master a new topic area. It is strongly recommended to investigate, e.g. Marie-Curie Fellowships that could sponsor a Post-Doc level international exchange.

VGTU offer facilities one comes to expect for an institute of higher education in terms of classrooms, computer rooms, library facilities and campus WIFI. At the faculty of Civil Engineering there are sufficient numbers of licences for the software being used in the courses and

the library offers a large number of e-journals. Unfortunately, some of the journals required for the field are only available in hard copy. On the other hand, the books available in the library of the Geotechnics department are of high quality. Given the low number of students the facilities available offer ample space both in the lecture theatre and in the teaching laboratories, which is modern, equipped with great equipment and stocked with sufficient consumables.

Overall applicant numbers reduced significantly in the last 5 years. Yet the number of admitted students remained constant. There is also a high dropout rate. The evaluation committee, therefore, recommends to investigate if there are links between the decline in number and the quality of applicants. It is also recommended to analyse the situation carefully and implement necessary measures to turn the trend, as there is a clear market need for graduates. One of the reasons could be the lack of a part-time study programme, as recommended in the previous Review Assessment. It, unfortunately, did not gather sufficient critical mass to be approved as these studies are not supported by the state. The lectures, however, have been shifted to the evening to better accommodate the needs of the students and maintain state funding for the students. A critical review of the need for the part-time programme should be undertaken, as reducing the teaching load for some of the staff could improve the research output for the programme, which would improve teaching quality as a secondary effect.

The programme is well managed with clear structure and responsibilities. The incorporation of a student in the Study Programme Committee is helpful to maintain a student's perspective. Further student feedback is implemented through questionnaires. And the management process is well documented through minutes.

The management has adequately followed up on the mainly organisational aspects of the programme from the previous evaluation. However, on three points some additional work remains. Those are: (1) the visibility and critical mass of soft soil geomechanics and seismics in the programme; (2) Improving the utilisation of the laboratory facilities; (3) Engaging social stakeholders to reduce the financial risk for students (e.g. by sponsoring/rewarding their employees to pursue a MSc degree).

V. GENERAL ASSESSMENT

The study programme *Geotechnics* (state code – 621H25001) 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	2
3.	Teaching staff	2
4.	Facilities and learning resources	3
5.	Study process and students' performance assessment	3
6.	Programme management	3
	Total:	**16**

*1 (unsatisfactory) - there are essential shortcomings that must be eliminated;
2 (satisfactory) - meets the established minimum requirements, needs improvement;
3 (good) - the field develops systematically, has distinctive features;
4 (very good) - the field is exceptionally good.

Grupės vadovas:
Team leader: **Prof. dr. Haldor Jochim**

Grupės nariai:
Team members: **Prof. dr. Miroslav Premrov**

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Vertimas iš anglų kalbos

VILNIAUS GEDIMINO TECHNIKOS UNIVERSITETO ANTROSIOS PAKOPOS STUDIJŲ PROGRAMOS *GEOTECHNIKA* (VALSTYBINIS KODAS – 621H25001) 2017-03-14 EKSPERTINIO VERTINIMO IŠVADŲ NR. SV4-50 IŠRAŠAS

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V. APIBENDRINAMASIS ĮVERTINIMAS

Vilniaus Gedimino technikos universiteto studijų programa *Geotechnika* (valstybinis kodas – 621H25001) vertinama **teigiamai**.

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

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

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IV. SANTRAUKA

Studijų programos tikslai suderinti su dėstomais dalykais ir leidžia pasiekti numatomus studijų rezultatus. Siūloma juos šiek tiek performuluoti, siekiant atspindėti pageidaujamą studijų rezultatą – absolventas gebės apibendrinti konkretaus atvejo – teorinio, skaitinio ar eksperimentinio – rezultatus ir taikyti juos ateityje.

Programos sandarą reikėtų tobulinti, atsižvelgiant į dalykų eiliškumą ir turinį. Kalbant apie dalykų eiliškumą, labai rekomenduojame perkelti dalyką *Slėgis į požemines konstrukcijas, atraminės sienos ir inkarai* į paskutinį semestrą, nes šiam dalykui reikalingos aukščiausio lygio grunto elgsenos ir grunto struktūros sąveikos žinios ir modeliavimas. Ekspertai taip pat turėjo pastabų apie dalykų turinį. Ypač dalykas *Geotechninių tyrimų analizė ir pagrindo vertinimas* atrodo pernelyg lengvas magistrantūros studijų programai, todėl jį būtų galima sujungti su *Mechaninių gruntų savybių* dalyku ir parengti bendrą dalyką *Pažangi gruntų mechanika*, dėstomą studijų programos pradžioje. Be to, dalyke *Pagrindo įtempių deformacijų būvis* įdomiai sujungtos ištisinių terpių mechanikos temos. Ekspertų grupės nuomone, tai yra svarbus programos elementas ir šiam dalykui turėtų būti skiriama daugiau ECTS kreditų, taip pat jis turėtų būti labiau susietas su fizikiniais modeliais, taikomais geotechnikos baigtinių elementų programinėje įrangoje, kurią inžinieriams teks naudoti profesinėje veikloje. Kai kurie minėti elementai jau įtraukti į dalyką *Automatizuoto projektavimo sistemos geotechnikoje*, tačiau juos reikėtų geriau integruoti. Šiame dalyke nutylėti kai kurie svarbūs baigtinių elementų analizės aspektai. Pašalinus šį trūkumą,

išsispręstų pagrindinė dabartinės studijų programos turinio problema, kai studentai turi taikyti pažangius skaitinius metodus neturėdami išankstinių svarbiausių pamatinių sąvokų žinių.

Visų dėstytojų mokslinė ir profesinė kvalifikacija aukšta – jie turi mokslų daktaro ar aukštesnį laipsnį. Dėstytojai dalyvauja kasmet centralizuotai organizuojamuose pedagoginės kvalifikacijos kėlimo seminaruose. Deja, tai yra vienintelė *Geotechnikos* studijų programa Lietuvoje, todėl pernelyg daug dėstytojų turi vietinį išsilavinimą ir yra sukaupę panašią patirtį. Darbuotojai, turintys kitokį akademinį išsilavinimą ir įgiję kitokių įgūdžių (eksperimentinio ar skaitinio modeliavimo), padidintų įvairovę ir galiausiai pagerintų trūkstamų programos aspektų turinio kokybę. Vienas būdas kelti profesinę darbuotojų kompetenciją – jiems dalyvauti tarptautinių tyrimų grupių veikloje. Tai jau vyksta, tačiau 2–3 mėnesiai yra pernelyg trumpas laikotarpis, norint visiškai įsisavinti naują sritį. Labai rekomenduojama panagrinėti tokias galimybes kaip Marijos Kiuri stipendija doktorantūros studijas baigusių asmenų tarptautiniams mainams finansuoti.

VGTU teikia tokią materialiąją bazę, kokios tikimasi iš aukštojo mokslo institucijos, – auditorijas, kompiuterių klases, biblioteką ir bevielį internetą universiteto teritorijoje. Statybos fakultetas turi pakankamą studijuojant naudojamos programinės įrangos licencijų skaičių, o biblioteka siūlo didelį el. žurnalų pasirinkimą. Deja, kai kurie šios srities žurnalai prieinami tik popieriniu formatu. Kita vertus, Geotechnikos katedros bibliotekoje esančios knygos yra kokybiškos. Atsižvelgiant į mažą studentų skaičių, esama materialioji bazė daugiau nei pakankama, visiškai užtenka vietos tiek auditorijose, tiek laboratorijose, kurios yra šiuolaikiškos, puikiai įrengtos ir aprūpintos pakankamomis priemonėmis.

Apskritai, per paskutinius penkerius metus stojančiųjų skaičius labai sumažėjo. Tačiau priimamų studentų skaičius nekito. Pastebimas didžiulis studentų nubyrėjimo rodiklis. Ekspertų grupė rekomenduoja paanalizuoti, ar yra sąsajų tarp studentų skaičiaus mažėjimo ir stojančiųjų pasiruošimo kokybės. Taip pat rekomenduojama atidžiai išnagrinėti situaciją ir įgyvendinti reikalingas priemones, siekiant pakeisti šią tendenciją, nes rinkoje pastebima akivaizdi šios programos absolventų paklausa. Viena iš priežasčių galėtų būti ištęstinės studijų programos nebuvimas, nors ji buvo rekomenduojama ankstesnio vertinimo metu. Deja, į šią studijų programą nesusirinko kritinė studentų masė, nes šios studijų formos valstybė nefinansuoja. Vis dėlto, paskaitos buvo perkeltos į vakarinį laiką, siekiant geriau patenkinti studentų poreikius ir išlaikyti valstybės finansuojamas vietas. Reikėtų kritiškai apsvarstyti ištęstinės studijų programos formos poreikį, nes sumažinus kai kurių darbuotojų darbo krūvį, pagerėtų programos mokslinių tyrimų rezultatai, o tai savo ruožtu pagerintų dėstymo kokybę.

Studijų programos vadyba gera, aiškios struktūros ir su aiškiai paskirstyta atsakomybe. Studentų atstovo dalyvavimas Studijų programos komitete padeda ginant studentų požiūrį. Studentų grįžtamasis ryšys taip pat renkamas naudojant klausimynus. Vadybos procesas dokumentuojamas protokolais.

Vadovybė ėmėsi tinkamų veiksmų, tobulindama daugiausia organizacinius studijų programos aspektus, nurodytus ankstesnio vertinimo metu. Vis dėlto, reikėtų patobulinti šiuos tris aspektus: (1) minkšto grunto geomechanikos ir seisminių temų atspindėjimas ir kritinė masė programoje; (2) naudojimosi laboratorijų materialiąja baze gerinimas; (3) socialinių dalininkų įtraukimas, siekiant mažinti studentų finansinę riziką (pvz., finansuojant studijas ar atsilyginant savo darbuotojams, siekiantiems magistro laipsnio).

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III. REKOMENDACIJOS

1. Studijų programos turinys turėtų būti toliau plėtojamas, siekiant aukštesnio lygio grunto elgsenos supratimo, tyrimų ir modeliavimo žinių. Tai apima sudėtingesnės ištisinių terpių

mechanikos ir skaitinio modeliavimo sąvokas, o svarbiausia – nelinijinį fizikinį modeliavimą.

2. Aukštos kokybės moksliniai tyrimai leidžia dėstytojams nesiremti vien tik knygomis ir vietos pasiekimais. Rekomenduojama skatinti aukštos kokybės tyrimus, kurių rezultatai gali būti skelbiami svarbiausiuose geotechnikos ar geomechanikos srities žurnaluose. Reikėtų ištirti galimybes, kaip išsiųsti keletą jaunų darbuotojų (įskaitant doktorantūros studentus) ilgesnėms nei metų trukmės stažuotėms į užsienio institucijas. Reikia toliau vystyti darbuotojų pažangių eksperimentinių tyrimų ir skaitinio / fizikinio modeliavimo žinias, siekiant gerinti dėstymo kokybę šiais aspektais.
3. Rekomenduojama sujungti *Geotechninių tyrimų analizę ir pagrindo vertinimą* su *Mechaninėmis gruntų savybėmis* į vieną pažangios gruntų mechanikos dalyką, dėstomą pirmame semestre. Taip būtų galima išplėsti *Pagrindo įtempių deformacijų būvio* dalyką ir įtraukti daugiau fizikinio modeliavimo, kurio vėliau reikės modeliavimui baigtinių elementų metodu studijuojant *Automatizuoto projektavimo sistemas geotechnikoje*.
4. Dalyką *Slėgis į požemines konstrukcijas, atraminės sienos ir inkarai* reikėtų perkelti iš antro (ar pirmo, kaip planuojama padaryti 2017/2018 akademiniais metais) į paskutinį semestrą. Šis dalykas reikalauja aukštesnio lygio geotechnikos ir grunto elgsenos žinių, taip pat modeliavimo ir inžinerijos metodų išmanymo.
5. Taip pat galima apsvarstyti, kaip sujungti sekliųjų ir giliųjų pamatų skaičiavimo metodų analizės dalykus į grunto struktūros sąveikos dalyką, pateikiant sekliųjų pamatų, polių, sienų, inkarų pavyzdžius. Į jį taip pat būtų galima įtraukti pamatų seisminio atsparumo ir tangentinių įtempių gaubtinės sąvokas.

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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)