



STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

VILNIAUS GEDIMINO TECHNIKOS UNIVERSITETO

STUDIJŲ PROGRAMOS

GEODEZIJA IR KARTOGRAFIJA

(valstybinis kodas – 621H14003)

VERTINIMO IŠVADOS

EVALUATION REPORT

OF GEODESY AND CARTOGRAPHY (state code – 621H14003)

STUDY PROGRAMME

At VILNIUS GEDIMINAS TECHNICAL UNIVERSITY

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Išvados parengtos anglų kalba
Report language - English

Vilnius
2016

DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	<i>Geodezija ir kartografija</i>
Valstybinis kodas	621H14003
Studijų sritis	Technologijos mokslai
Studijų kryptis	Bendroji 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	Matavimų inžinerijos magistras
Studijų programos įregistravimo data	2010 m. liepos 1 d.

INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	<i>Geodesy and Cartography</i>
State code	621H14003
Study area	Technological Sciences
Study field	General 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 Measurement Engineering
Date of registration of the study programme	1 July, 2010

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The Centre for Quality Assessment in Higher Education

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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 the 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 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	Relation Matrix of study subjects and program results
2	Plan of the full-time Master's degree studies
3	Compatibility of the study results, with type and cycle

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

Vilnius Gediminas Technical University (hereafter - VGTU) is a state higher education institution with a history tracing back to 1956, when the Vilnius Branch of Kaunas Polytechnic Institute was established in Vilnius. In 1969 it started functioning as an independent higher technical school and was reorganized into Vilnius Technical University in 1990.

VGTU consists of faculties, departments, scientific and study laboratories, scientific and academic institutes and centres. It is one of the biggest universities in Lithuania and strives to become the leader in technology and engineering studies in the Baltic States. VGTU is an active member in many international organisations and participates regularly in a variety of scientific research and educational international programmes.

The Department of Geodesy and Cadastre has been publishing a periodical scientific journal since 1963. Studies in Geodesy were delivered since 1969. The Institute of Geodesy has been functioning at VGTU since 1992.

The Geodesy and Cartography study program comprise full-time studies during 2 years, comparing to 120 ECTS and it is designed with a structure based on the European directives for Higher Education (Bologna Process). Graduates are awarded a Master's Degree in Measurement Engineering. VGTU aims to educate highly trained, creative and socially active professionals, who would be able to successfully enter the Lithuanian and foreign labour and research markets.

The last assessment of the programme was carried out by an external international expert team and took place in 2013. This is the second external evaluation of the programme.

1.4. The Review Team

The review team was assembled in accordance with the *Expert Selection Procedure*, approved by Order No 1-55 of 19 March 2007 of the Director of the Centre for Quality Assessment in Higher Education, as amended on 11 November 2011. The Review Visit to HEI was conducted by the team on 2nd May, 2016.

1. Prof. Dr. Bernd Teichert (team leader), former professor at the University of Applied Sciences, Dresden, Department of Surveying and Cartography; Research assistant (Physical Geodesy) at the Technical University of Berlin, Germany.
2. Assoc. Prof. Peregrina Eloina Coll Aliaga, associate Professor in the Cartographic Engineering, Geodesy and Photogrammetry Department, Politechnic University of Valencia, Spain.
3. Ms Vytautė Juodkienė, Lecturer at Department of Geodesy at Kaunas College, Lithuania.
4. Mr. Audrius Petkevičius, CEO of LLC „Urbanistika“, Lithuania.
5. Ms. Neringa Vaiciunaite, PhD student of Materials Engineering at Kaunas University of Technology, Lithuania.

II. PROGRAMME ANALYSIS

2.1. Programme aims and learning outcomes

The reasonably defined aim of the Geodesy and Cadastre study programme of the second cycle granting Master degree of measurement engineering is to train specialists, who upon completing their first cycle studies obtain more fundamental and much more special knowledge in geodesy. With regards to the present situation and development trends in Geodesy and Cartography, as well as to the demands of the Lithuanian science and economy, the study programme includes two specializations: Geodetic Networks and Geographical Information Systems. Graduates can work in the state and private enterprises involved in GIS creation, preparation and management of cadastral information, establish private companies or continue their education in the third cycle studies (unfortunately not in this Department). In order to be qualified for the above-mentioned positions the graduates must obtain knowledge and learning outcomes foreseen in the study programme. Both, students and social partners confirmed this during our visit.

The learning outcomes of the study program are well defined. According to the recommendation of previous external evaluation in 2013 the study programme learning outcomes were recently updated and following EUR-ACE framework standards with 6 learning outcome groups for the accreditation of engineering programme: Knowledge, Investigations, Engineering analysis, Engineering design, Engineering practice and Personal and social skills (according to documents, mentioned in 1.2. part).

One of the most important evidences for reaching the learning outcomes is the quality of final theses. The preparation of the final theses starts in the first semester and is completed in the last one with the public defence of the work at the commission for awarding the qualification degrees. This

rather very early beginning is in accordance with the students and the alumni's as well. The first chosen topic of the final thesis may also be changed during the study time without any problems. This is in accordance with the students and the alumni's as well. The topics of the masters' degree theses meet the expectations of the reviewing team, evaluation team agreed on theses assessment. All the presented final theses were written in Lithuanian with short English summary, foreign literature has been used.

The detailed description of the goals and study results of the Geodesy and Cartography study programme is presented on the VGTU website and also on the website for the applicants. Both of these two web pages are available in English. Furthermore, websites are frequently visited by high schools' pupils, students and social partners, thus the goals and the study results can be easily accessed (page 7 of SER).

The reviewing of the study results is annually supervised by the Committee of the Geodesy and Cartography study programme and the Study Committee of the Faculty of Environmental Engineering. Social partners and students are also involved in the reviewing process as members of both committees. Feedback comes from graduates, employers and geodetic associations; student surveys are carried out as well.

In Lithuania is no similar type of university studies in the field of general engineering granting graduates the Master degree in measurement engineering. The name of the programme, its learning outcomes, content and the qualifications offered are compatible with other Universities in Europe.

An agreement with Riga Technical University for the joint Master's degree study programme was signed in 2014. According to the agreement, both universities will establish a joint Master degree. The common study programme will be entitled "Innovative Solutions in Geomatics" and will be taught in English.

2.2. Curriculum design

According to the SER, the curriculum design complies with the national local legislation and the local regulations for the Master programmes. More specifically, the total volume of the academic and individual work hours of the study subjects and the respective volume of the individual study subjects conform to the legal acts of the University Academic Regulations as well as the valid legislation acts of the Republic of Lithuania (page 10 of SER). The duration of the studies is 2 years with two specializations; Geodetic Networks is more related to the origins of surveying and physical geodesy studies whereas Geographical Information Systems (GIS) contains the new topics

about computerized maps, database technologies etc. The information provided in table 3.1 shows: The field of study courses contain 89 credits and the general university courses 4 credits, Final thesis 30 credits and 4 credits for Elective courses. The detailed description of the study subjects are presented in Annex 8.1 and it shows, that the Geodesy study programme comprises courses distributed continuously and logically during semesters; they are not at all repetitive. The content of the subjects seems to be consistent with the type and level of the studies and they also show very detailed the content and methods of the subjects, which are appropriate for the achievement of the intended learning outcomes.

The content of the programme has been created on a sufficiently high level. Because of recommendations from the external experts, students and employers, the programme reflects the latest achievements in science and technologies.

After revision and improvement of the first cycle study programme “Geodesy” and the second cycle study programme “Geodesy and Cartography” in 2014, the determined overlapping between the topics of the programmes was eliminated. In consideration of the experts’ conclusions after the external evaluation, the specialization of Cadastre Information Systems in the second cycle Geodesy and Cartography study programme was cancelled in 2015, following the VGTU Rector’s order „On cancelling the specialization in the study programme“ No.257, on March 10, 2015.

Although the curriculum design seems to be good the alumni’s recommend teaching more software engineering, especially with the knowledge of modern programming languages.

2.3. Teaching staff

The staff providing the study programme meets the legal requirements The qualifications of the teaching staff are adequate to ensure learning outcomes; staff holds high academic degrees and the number of professors and doctors necessary for the provision of the programme far exceeds the minimum. There are 11 staff members, 3 are full- professors and 8 associated professors (academic year 2014/2015). In academic year of 2015/2016, 1 professor and 1 associate professor left the GKK and the study programme. One associate professor did not qualify for the position. They have been replaced by 3 lecturers with a PhD and there are also teachers from the Department of Water Management involved in the programme. It should be noted that programme management followed peer-review recommendations and there have been positive changes in the staff composition of the programme. Teaching staff fulfils the qualification requirements adequate to ensure the learning outcomes. This was proved during review panel visit and according to their qualifications which are illustrated by their wide research activities. According to the personal CVs (Annex 8.3.) and

Chapter 4 Annex 4.3, the scientific work experience is as follows: 0-5 years - 13% of teachers, 6-10 years - 19%, 11-15 years – 31%, 16-20 years - 13%, 21-25 years - 6%, 26-30 years - 6%, 31-35 years - 6%, 41-46 years - 6%. Teachers collaborate and make research at the VGTU Institute of Geodesy. Many teachers took part in the international science programmes that the VGTU Institute of Geodesy was involved in. Some teachers currently participate in the European project GEO VET Skills Plus (Leonardo da Vinci programme). They also participate in the project “NORDPLUS Framework Programme”, which is designed for the teaching institutions in the Baltic countries (Lithuania, Latvia, and Estonia), the Nordic countries (Denmark, Iceland, Norway, Sweden, Finland) and autonomic areas of the Nordic countries (Greenland, Faroe Islands and Aaland Islands).

The adequate number of the teaching staff to ensure learning outcomes is presented in Chapter 4 Annex 4.1, as well as in Fig. 4.1 of SER. During the 2013/2014 academic year, 12 professors were involved in teaching and in academic years of 2014/2015 and 2015/2016, 11 professors were involved in teaching of the study programme. The overall variation of teachers and students number in this study programme looks very positive for the students. Within the last three years the number of students went from 38 over 23 to 26, whereas the number of teachers remained almost the same. Also the ratio (0.42) of teachers and students in the Geodesy and Cartography study programme is really sufficient.

The workload of teachers could not exactly be evaluated because all professors and associate professors are involved in other programmes, thus, their teaching workload in the Geodesy and Cartography study programme constitutes only a small part of the general teaching workload (Chapter 4. Annex 4.4). It seems that the academic workload is very high and therefore the time for more research is rather not available.

Table 4.1 on page 14 of SER shows the structure of the academic staff by their age and occupied positions during the academic year 2014/2015. Teachers with academic experience up to 5 years constitute 19%. Teachers working 6-10 years constitute 13%, 11-15 years - 31%, 21-25 years - 6%, 31-35 years - 6%, 36-40 years - 19%, 41-45 years - 6%. Three young teachers with PhD have joined the Department in 2015. Thus the turnover of the teaching staff is ensured.

The department supports the professional development of the teaching staff by organising courses, seminars, and other similar events. From the information provided in the SER it comes out, within the last 3 years 9 teachers have participated under Erasmus and other exchange programmes, as well as to participate in the organizational meetings of the international research projects; 30 teachers

were involved in the traineeship programmes with an average duration of 2 months. Anyhow, the international mobility of the teachers is not very high; more international study trips should be carried out. The number of incoming teachers could also be improved.

Moreover, the teachers constantly improve their skills and enhance their qualifications by taking part in various national and international conferences and exhibitions, in various international projects, and collaborating with experts in the field of their interest (page 16 of SER). Therefore, in the course of preparing their lectures, the teachers constantly improve, update and complement the contents of their subjects; it was confirmed by students.

Each year, the University organizes courses for development of the andragogic competence for the teachers. During the analysed period, 5 teachers of the study programme improved their teaching skills by participating in these courses.

The level of the language skills of the teachers is improved by developing the international contacts and participating in the international projects, by publishing their research results in the international scientific journals. Within the 16 teachers there are 12 publications in 2015 in English but not necessarily in international magazines (see CVs).

The teachers of the Geodesy and Cartography study programme participate in the local and international research projects, funded by the Lithuanian State Science and Studies Foundation, the Research Council and various companies. They are also engaged in EU-funded research, studies and development projects. Over the last three years, 8 teachers from 16 of the Geodesy and Cartography study programme participated in 13 research projects. The list of international research projects is presented (Chapter 2. Annex 2.3.). These research activities of the teachers indicate high professional and teaching qualifications.

The university has lost the right to conduct the doctoral studies in the field of Measurement Engineering, there are no more PhD students and therefore the number of researchers will naturally decrease. This is a rather negative ascertainment of any University and the Department should really work intensively on a reestablishment of the doctoral studies. According to the Dean of the faculty this problem will be solved within the next year. Currently, graduates of Geodesy and Cartography study programme have the opportunity to choose other branch doctoral studies being carried out in VGTU, KTU and ASU. In the near future they plan to establish joint doctorates with Universities in Poland and Latvia.

2.4. Facilities and learning resources

According to the information provided by the SER and the on-site visit the auditoriums, laboratories and computer rooms (equipped with all the necessary licensed software) are adequate in number, size and quality and fully meet the study requirements.

The Department has the necessary modern equipment, which is actively used for academic and research purposes. Besides their own equipment they are using for teaching purposes the equipment belonging to the Institute of Geodesy and to the Civil Engineering Research Centre Laboratory of Geodesy. It could be mentioned that the Department has - besides the normal ones - some very specialised instruments which one cannot find on every university, e. g.: a set of magneto metric instruments ENVI PRO (2 pcs.), non-magnetic theodolite MinGeo 010A (2 pcs.), Gravimeter SCINTREX CG-5, GNSS Receiver Leica Viva GS15, Software for GNSS measurements processing Bernese 5.2. This kind of equipment is especially suitable for interesting research projects and PhD studies. On the roof of the main building they have a permanent GPS station within the Lithuanian and the European network.

The lack of financing limits the possibilities to update the instrumental basis. Business partners do support the Department with most modern equipment (e.g. Drones) in order to get well-prepared students for the labour market. Software from the Open Source Community is only available for GIS, namely QGIS; much more could be implemented and used, e.g. digital Photogrammetry and a GIS server for large data. According to the Head of the Department there will be new software for GIS, Photogrammetry and Remote Sensing in the next academic year.

The university makes availability for students to use the central VGTU library, which is among the most modern libraries in Lithuania, and subsidiary libraries in the Faculties. From the on-site visit it has been seen that the library provides a rich variety of books, textbooks, periodical publications and databases and the electronic catalogues that are also accessible from home. For example the library offers electronic access to some major scientific data bases like Springer Link. The number of printed books and periodicals is satisfactory. The virtual long-distance studying system Moodle is also used (moodle.vgtu.lt).

2.5. Study process and student's performance assessment

The admission requirements to the programme are clearly explained. The line of applicants is formed based on their competitive marks. All applicants need to have passed examinations in compulsory subjects and completed their course works. Applications for entering the second cycle studies are registered at the web-based applications' registering system. In case of the equal total of

competitive marks, the priority is given to a person with higher grade of final thesis or final examination grade, to the one who applied to the specialization listed higher in the application form.

During the last three years the recruitment of students was stable (according to SER page 22, table 6.3). The drop off rate of this programme is low. About 80% of the students admitted to the *Geodesy and Cartography* second cycle study programme complete it and graduate. The percentage of graduated students has decreased from 86% (2013) to 77% (2015).

Master students are satisfied with study process and their study programme in general. Also, they are happy about coordination of practical work and possibilities to work and study at the same time, and perform practice work in the private companies. The schedule of lectures are quiet flexible.

The equipment of laboratories, computer classes and online study resources are sufficient and easy access. They use electronic resources' such as Moodle. Students are satisfied with the master theses preparation and defence rules. At the start of the first semester they choose supervisor for their final theses and coordinate titles of their final theses. The training timetables are constructed under supervision of the vice-dean of AIF, in accordance with the occupancy rate of relevant teachers and requests from the students. The process of study during all semester is supervised by the head of the department.

Every year conferences of the young Lithuanian researchers "Science – the Future of Lithuania" are organized. GKK is supervising the section on geodesy of these conferences. Following each conference, the selected papers are published in periodical peer-reviewed collection of scientific papers "Geodesy and Cartography", which is referenced in the international database IndexCopernicus. Since 2014, all the papers of the conference are included into the Open Access database. According to the meeting with students it seems that they are participating in research projects actively.

Students have possibilities to participate in student mobility programmes, but their participation rate could be even bigger. Geodesy and Cadastre department has close contacts with the University of Bonn, Neubrandenburg University of Applied Sciences, Karlsruhe University of Applied Sciences, Stuttgart University of Applied Sciences in Germany and etc. During last three years, 1-2 students of the study programme travelled abroad under Erasmus programme every year.

The social support for students is well ensured. Individual study programmes can be organized for the disabled students, active sportsmen or foreign students if necessary. Student groups are appointed with teachers – tutors. Students mentioned that they can reach their teacher easily and be

consulted about study issues. Also, they were presented with opportunities by Career Office of VGTU. There are different kinds of scholarships – the social and personal types. Students engaged in part-time studies and /or practice under Erasmus or other university exchange programmes are granted motivation scholarship. However, according students' opinion the scholarship does not motivates them enough and only a very few of them gets a scholarship.

The assessment system of students' performance is clear and well explained. Students' knowledge is assessed according to the ten points assessment scale and the criteria proportionate assessment system. The teacher informs students about evaluation criteria and indicates how the level of knowledge will be determined. VGTU handles the issue of academic dishonesty very well by checking students' works by plagiarism system and obliging students to sign declaration of honesty. The site view confirmed that students' final theses and practical works are reasonably marked and recommendations of previous review evaluation team were taken into account.

Professional activities of the majority of graduates meet the programme providers' expectations. Graduates of Geodesy study programme are employed by the state owned and private companies. According SER the skills and capabilities provided by the programme are highly evaluated by employers. Qualification courses can be attended to get a certificate of surveyor or geodesist when it is needed. Almost 100% master students are working and studying at the same time.

2.6. Programme management

The responsibilities for the implementation of the study programme are clearly described and appropriately allocated. According to information provided by SER the Study Programme Committee (it was approved in 2015) is supervising and updating the Geodesy study programme in accordance to the VGTU Study Programmes Committee's regulations. The Committee is chaired by the head of the Department of Geodesy and Cadastre (hereafter - GKK). There are two student representatives and a social partner in the Committee.

It performs several functions; e. g., identifying drawbacks and initiating their removal; organizing surveys from students, faculty teachers, alumni and employers on issues of the quality of the study programme; analysing the results of the surveys and publicizing them at the University, its departments and faculties and finally it is organizing a proper presentation of the study programme on the University website (page 30 of SER). Overall, the monitoring programme seems to be good, whereas the employers wanted to be more involved in the whole system.

According to information provided by SER relevant issues of the studies are discussed at the GKK meetings. Proposals concerning the contents of the subjects and their implementation are submitted to the leaders of the study programme and to the study committee. Regular meetings with students are organized as well (page 39 of SER).

Student surveys regarding the subjects and teachers, their teaching methods and contents of the courses are carried out at least once per semester. Students are participating in improvement of their study programme and give a feedback to administration. They feel that changes are made according to their suggestions. Meetings with social partners are organized as well to discuss the quality of the studies, theoretical and practical qualifications of the students. Students confirmed it but employers did not really agree because a more active participation of the employers in the programme design and in the proposal of final projects would be more beneficial for the employability of the graduates.

The system of internal quality assurance is based on the Standards and guidelines for quality assurance in the European Higher Education Area (ESG). National and international requirements are integrated in the VGTU documents for the quality management system. The project entitled "Implementation of the Internal Study Quality Management System" for the whole University has been implemented but it will be further developed (page 31 of SER).

To improve the quality of the programme the student's feedback regarding the subjects taught, their teacher's performance and other information about the university are used. Similarly the opinions of the social partners are also taken in consideration. Information regarding plans of improvement of the study quality and learning outcomes is publicly available to the University academic society, social partners and employers. Part of such information is presented on the web, and part is shared during meetings with students, social partners and employers (see page 31 of SER).

The previous external evaluation of the Geodesy programme took place in May 2013. The Study Programme was given positive evaluation and accredited for 3 years. In summary, it was concluded that the Geodesy study programme is unique in Lithuania in its scientific aspect, and the personnel, employers providing jobs to the graduates and the students are well-aware of that and appreciate it. Collaboration with companies is intense, while employers are satisfied with the graduates. All the advices had been discussed, analysed and many changes of the study programme were implemented successfully (see page 31 of SER).

The review team advises the management of the programme to improve two important changes. Firstly, the number of outgoing Erasmus students is not sufficiently and the number of foreign incoming and outgoing teachers is very low. The department should look for international students and introduce teaching courses in English as well. Secondly, it is proposed by the reviewing team to improve and increase the overall marketing activities like distribution of printing information leaflets and the participation in international educational fairs. Visits to high-schools where the programme could be explained, might benefit the enrolment of new students in the future. To achieve all these requirements, a very good communication with students, teachers and social partners is necessary. Fortunately this was confirmed during the visit.

III. RECOMMENDATIONS

1. Establish the doctoral studies as soon as possible. Since the university has lost the right to conduct the doctoral studies in the field of Measurement Engineering, there are no more PhD students and therefore the number of researchers will naturally decrease.
2. Publishing in peer reviewed international journals by teachers is strongly encouraged.
3. Staff and student mobility should be increased (e. g. Erasmus).
4. Intensify advertising the study programme in order to increase the number of students (go to schools, open-door day, girls day, etc.).

IV. EXAMPLES OF EXCELLENCE (GOOD PRACTICE)*

The Geodesy department is a Member of the EUREF Permanent Network (EPN)¹ and the local Lithuanian network with a permanent GPS station on top of the building.

The European Terrestrial Reference System 89 (ETRS89) is used as the standard precise GPS coordinate system throughout Europe. Supported by EuroGeographics and endorsed by the EU, this reference system forms the backbone for all geographic and geodynamic projects on the European territory both on a national as on an international level.

The Department also organize an international geodesy conference every 4 years and publish a journal.

¹ EPN is a European Network of more than 200 continuously operating GNSS reference stations with precisely known coordinates referenced to the ETRS89. EPN is the key instrument in the maintenance of ETRS89 geodetic datum. The EPN stations collect continuously the observation data from high accuracy GPS/GLONASS receivers. [<http://www.epncb.oma.be/>]

V. SUMMARY

The programme aims and learning outcomes of the Geodesy and Cartography study programme of the second cycle granting Master degree of Measurement Engineering are in accordance with national and international regulations. They are consistent and they cover all important areas of the Geodesy field for a Master degree. A very detailed description of the goals and study results of the Geodesy study programme is presented on the VGTU website and on the website for the applicants. For the reviewing of the study results, feedback is coming from graduates, employers and geodetic associations. The name of the programme, its learning outcomes, content and the qualifications offered are compatible with other Universities in Europe.

The curriculum design is well balanced and covers the most important areas of the field and the credits and their respective distribution is fully in accordance with the regulations. The study subjects comprise courses distributed continuously and logically during semesters. The content of the subjects seems to be consistent with the type and level of the studies. There are some lectures missing or should be given more compliance: Remote sensing and GIS lectures about data modelling and modern programming languages.

The staff meets the legal and qualification requirements and the adequate number of the teachers ensure learning outcomes and the turnover of the teaching staff. The relatively good teachers/students ratio strengthens the special abilities and obtainable knowledge of the students but, it seems that teachers' academic workload is very high and therefor there is not much time for more research. Professional development of the teaching staff is organized by the Department. Teachers of the Geodesy and Cartography study programme participate in the local and international research projects. Although teachers participate in mobility programmes, their mobility should be increased. (e. g. Erasmus). The university has lost the right to conduct the doctoral studies in the field of Measurement Engineering, there are no more PhD students and therefore the number of researchers will naturally decrease. This is a rather negative ascertainment of any University and the Department should really work intensively on a reestablishment of the doctoral studies.

The facilities and learning resources are adequate in number, size and quality and fully meet the study requirements. All necessary modern equipment is mainly available. The Department has some specialised instruments which one cannot find at every University. This kind of equipment is especially suitable for interesting research projects and PhD studies. Unfortunately there is a lack of financing limits, so the possibilities to update the instrumental basis could be improved. However,

business partners do support the Department with most modern equipment (e.g. Drones) in order to get well-prepared students for the labour market. The university makes availability for students to use the central VGTU library and subsidiary libraries in the faculties. The library provides a rich variety of books, textbooks, periodical publications and databases and the electronic catalogues that are also accessible from home. The virtual long-distance studying system Moodle is also used.

The admission requirements to the programme are clearly explained. During the last three years the recruitment of students was stable. About 80% of the students admitted to the *Geodesy and Cartography* second cycle study programme complete it and graduate. Master students are satisfied with study process and their study programme in general. Students participate in student mobility programmes rather less actively. The assessment system of students' performance is clear and well explained. With the every year conferences of the young Lithuanian researchers "Science – the Future of Lithuania" and the permanent GPS station within the Lithuanian and the European network on the roof of the main building students really have two very good highlights. Professional activities of the majority of graduates meet the programme providers' expectations.

Responsibilities for the implementation of the study programme are clearly described and appropriately allocated. The Study Programme Committee is supervising and updating the Geodesy study programme in accordance to the VGTU Study Programmes Committee's regulations. Overall, the monitoring programme seems to be good, whereas the employers wanted to be more involved in the whole system. Information regarding plans of improvement of the study quality and learning outcomes is publicly available to the university academic society, social partners and employers. It is proposed by the reviewing team to improve and increase the overall marketing activities like distribution of printing information leaflets and the participation in international educational fairs. Visits to high-schools where the programme could be explained, might benefit the enrolment of new students in the future.

VI. GENERAL ASSESSMENT

The study programme *Geodesy and Cartography* (state code – 621H14003) 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	4
2.	Curriculum design	3
3.	Teaching staff	3
4.	Facilities and learning resources	4
5.	Study process and students' performance assessment	3
6.	Programme management	3
	Total:	20

*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. Bernd Teichert
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**VILNIAUS GEDIMINO TECHNIKOS UNIVERSITETO ANTROSIOS PAKOPOS
STUDIJŲ PROGRAMOS *GEODEZIJA IR KARTOGRAFIJA* (VALSTYBINIS KODAS –
621H14003) 2016-07-19 EKSPERTINIO VERTINIMO IŠVADŲ NR. SV4-174 IŠRAŠAS**

<...>

V. APIBENDRINAMASIS ĮVERTINIMAS

Vilniaus Gedimino technikos universiteto studijų programa *Geodezija ir kartografija* (valstybinis kodas – 621H14003) vertinama **teigiamai**.

Eil. Nr.	Vertinimo sritis	Srities įvertinimas, balais*
1.	Programos tikslai ir numatomi studijų rezultatai	4
2.	Programos sandara	3
3.	Personalas	3
4.	Materialieji ištekliai	4
5.	Studijų eiga ir jos vertinimas	3
6.	Programos vadyba	3
	Iš viso:	20

* 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

Antrosios pakopos studijų programos *Geodezija ir kartografija*, suteikiančios matavimų inžinerijos magistro laipsnį, tikslai ir numatomi studijų rezultatai atitinka nacionalinius bei tarptautinius reglamentus. Jie yra darnūs ir apima visas svarbias geodezijos sritis, būdingas magistro studijoms. Labai išsamus studijų programos *Geodezija ir kartografija* tikslų ir numatomų studijų rezultatų aprašas pateiktas VGTU interneto svetainėje ir stojantiesiems skirtoje svetainėje. Studijų rezultatų tikrinimo tikslais absolventai, darbdaviai ir geodezininkų asociacijos teikia grįžtamąjį ryšį. Programos pavadinimas, numatomi studijų rezultatai, programos turinys ir suteikiama kvalifikacija dera su kitų Europos universitetų studijų programomis.

Programos sandara subalansuota ir apima pačias svarbiausias šios krypties sritis; kreditai ir jų paskirstymas visiškai atitinka teisės aktus. Studijų dalykai yra nuosekliai paskirstyti per visus semestrus. Dalykų turinys, atrodo, atitinka studijų rūšį ir pakopą. Kai kurių studijų dalykų trūksta

arba į jų poreikį galėtų būti labiau atsižvelgta, pvz., *Nuotolinis matavimas ir Geografinės informacinės sistemos (GIS)*, o paskaitos apie duomenų modeliavimą bei modernaus programavimo kalbas turėtų būti išplėstos.

Dėstytojai atitinka teisės aktų ir kvalifikacijos reikalavimus, o pakankamas jų skaičius užtikrina numatomų studijų rezultatų įgyvendinimą ir dėstytojų kaitą. Palyginti geras dėstytojų ir studentų santykis padeda stiprinti studentų specialiuosius gebėjimus ir perduoti jiems žinias. Bet dėstytojų akademinis krūvis, atrodo, yra labai didelis, todėl nedaug laiko lieka moksliniams tyrimams. Dėstytojų profesinį tobulinimą organizuoja Geodezijos ir kadastro katedra. Studijų programos *Geodezija ir kartografija* dėstytojai dalyvauja vietos ir tarptautiniuose mokslinių tyrimų projektuose. Nors dėstytojai ir dalyvauja judumo programose, jų judumas turi būti didinamas (pvz., pagal *Erasmus*). Universitetas neteko teisės vykdyti matavimų inžinerijos srities doktorantūros studijas, nebeliko doktorantūros studentų, todėl, savaime suprantama, mažes tyrėjų skaičius. Tai gana neigiamas įvertinimas bet kuriam universitetui, ir katedra tikrai turėtų intensyviai dirbti, kad doktorantūros studijos būtų atgaivintos.

Materialieji ištekliai yra tinkami ir jų pakanka; jie atitinka visus teisės aktų reikalavimus. Iš esmės yra visa reikalinga šiuolaikinė įranga. Katedra turi kai kuriuos specialius instrumentus, kuriuos yra ne kiekviename universitete galima rasti. Šios rūšies instrumentai ypač tinka įdomiems mokslinių tyrimų projektams ir doktorantūros studijoms. Deja, dėl riboto finansavimo galimybės atnaujinti instrumentus yra nedidelės – jos galėtų būti gerinamos. Tačiau verslo partneriai remia Katedrą moderniausia įranga (pvz., dronais), kad gautų gerai darbo rinkai parengtus studentus. Universitetas suteikia studentams galimybę naudotis centrine VGTU biblioteka ir fakultetų bibliotekomis. Bibliotekoje gausu įvairių knygų, vadovėlių, periodinių leidinių, duomenų bazių ir elektroninių katalogų, kuriais galima naudotis būnant namuose. Be to, naudojama virtuali nuotolinio mokymosi sistema *Moodle*.

Priėmimo į šią studijų programą reikalavimai aiškiai apibrėžti. Per pastaruosius trejus metus studentų priėmimas buvo stabilus. Apie 80 proc. studentų, priimtų į magistrantūros studijų programą *Geodezija ir kartografija*, studijas baigė ir tapo absolventais. Magistrantūros studentai yra patenkinti studijų eiga ir šia studijų programa apskritai. Jie turi galimybių dalyvauti studentų judumo programose, bet dalyvavimo rodiklis galėtų būti aukštesnis. Studijų rezultatų vertinimo sistema skaidri ir gerai apibrėžta. Kiekvienais metais Lietuvos jaunųjų mokslininkų organizuojama konferencija „Mokslas – Lietuvos ateitis“ ir nuolat veikianti Lietuvos ir Europos tinklo stotis ant pagrindinio pastato stogo yra du svarbiausi šios programos išskirtinės kokybės pavyzdžiai, labai naudingi studentų patirčiai. Daugelio absolventų profesinė veikla atitinka programos teikėjų lūkesčius.

Studijų kokybės vertinimo centras

Atsakomybė už šios studijų programos įgyvendinimą aiškiai aprašyta ir tinkamai paskirstyta. Šios studijų programos komitetas prižiūri ir atnaujina studijų programą *Geodezija* laikydamasi VGTU studijų programų komiteto nuostatų. Apskritai, stebėsenos programa, atrodo, yra gera, o darbdaviai išreiškė norą daugiau dalyvauti visoje kokybės užtikrinimo sistemoje. Informacija apie planus tobulinti studijų programą ir jos studijų rezultatus yra viešai prieinami universiteto akademinėi visuomenei, socialiniams partneriams ir darbdaviams. Vertinimo grupė siūlo tobulinti ir plėsti bendrą rinkodaros veiklą (pavyzdžiui, spausdintų informacinių lapelių platinimas, dalyvavimas tarptautinėse edukacinėse parodose). Galėtų būti organizuojami vizitai į vidurines mokyklas, kur studijų programa būtų pristatoma; jie padėtų ateityje pritraukti naujų studentų.

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III. REKOMENDACIJOS

1. Kuo greičiau organizuoti doktorantūros studijas. Kadangi universitetas prarado teisę vykdyti doktorantūros studijas matavimų inžinerijos srityje, nebeliko studentų doktorantų, todėl savaime suprantama, kad mažės tyrėjų skaičius.
2. Primygtinai rekomenduojama skelbti publikacijas tarptautiniuose recenzuojamuose žurnaluose.
3. Reikėtų didinti dėstytojų ir studentų judumą (pvz., pagal *Erasmus* programą).
4. Aktyviau reklamuoti šią studijų programą reklamavimą siekiant pritraukti daugiau studentų (eiti į mokyklas, organizuoti atvirų durų dienas, merginų dienas ir t. t.).
5. Kai kurių studijų dalykų trūksta arba į jų poreikį galėtų būti labiau atsižvelgta, pvz., *Nuotolinis matavimas* ir Geografinės informacinės sistemos (*GIS*), o paskaitos apie duomenų modeliavimą bei modernaus programavimo kalbas turėtų būti išplėtos.

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