VILNIUS UNIVERSITY

STUDY FIELD PHYSICAL GEOGRAPHY

SECOND-CYCLE STUDY PROGRAMME CARTOGRAPHY
CODE: 6211CX013 (621F87001)
SELF-EVALUATION REPORT

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Vilnius

2017

Key data on the study programme

Title	Cartography
Code	6211CX013 (621F87001)
Study area	Physical Sciences
Study field	Physical Geography
Kind of study	University studies
Language of instruction	Lithuanian
Study cycle	2nd
Mode of study and length in years	Full time studies (2 years)
Scope in credits	120
Qualification awarded	Master in Cartography, starting with 2017 admission – Master of Physical Sciences.
Date of registration and Order No	2001-05-24 No. 877

Abbreviations used in the Self-Evaluation Report:
CfC – Centre for Cartography at the Faculty of Natural Sciences – reorganized into DCG
DCG – Department of Cartography and Geoinformatic at the Faculty of Chemistry and Geosciences at Vilnius University, former CfC
FCHG – Faculty of Chemistry and Geosciences at Vilnius University
FCHG IG – Institute of Geosciences at FCHG
GI – Geographic Information
GIS – Geographic Information System
SDI – Spatial Data Infrastructure
VU – Vilnius University

Composition of the self-evaluation group (SEG)* and their responsibilities

Name, surname, contact information	Position	Area and scope of responsibility in SEG
Prof. dr. habil. Algimantas Česnulevičius 869839351 algimantas.cesnulevicius@gf.vu.lt	Professor, Head of the DCG	Coordination and evaluation of the self-assessment process, Chapters "Purpose and learning outcomes of the study programme", "Academic staff", „Study process and assessment", "Study Programme management"
Prof. dr. Giedrė Beconytė 864016583 giedre.beconyte@gf.vu.lt	Professor	Analysis and evaluation of data and preparation of the entire report document. Chapters "Purpose and learning outcomes of the study programme", "Curriculum design"
Assoc. prof. dr. Artūras Bautrėnas 868637495 arturas.bautrenas@gf.vu.lt	Associate professor	Data collection and analysis, Chapters "Facilities and learning resources", "Study Programme management"
Evaldas Rožanskas	Deputy director, State enterprise „GIS-Centras", representative of the social partner	Providing opinions on graduates' qualifications and job market, requirements and recommendations for the study programme, legal information. Revision of the entire document.
Audrius Kalesnikas	Master degree student, delegate from the VU Students' Representation of FCHG	Collection of students' and graduates' opinions and placement information. Revision of the entire document.

*Approved by the Decision of the Faculty Council (No 8, 9 September 2016).

Schedule of task implementation

Task	Date of implementation
Collecting all relevant information for the self-evaluation	October 2016
First draft of the text of the Self-evaluation Report (SER)	December 2016
Discussing the first draft of SER focusing on three areas of evaluation: purpose and learning outcomes, curriculum design and academic staff	December 2016
Discussing the first draft of SER focusing on three areas of evaluation: facilities and teaching/learning resources, study process and assessment of academic progress, study programme (SP) management	January 2017
Presentation of the SER to the teaching staff, social partners of the SP, discussing their feedback	March 2017
Final draft of SER	May 2017

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INTRODUCTION

Vilnius University (hereinafter also University or VU), founded in 1579, is the oldest and largest institution of higher education in Lithuania. The University management structure is defined in the *Statute of Vilnius University* (approved 6 May 2014 by Law of the Republic of Lithuania No XII-862), which stipulates that the University community shall exercise its self-governance through the bodies of governance of the University: *the Senate*, *the Council* and *the Rector*. As of 1st of January 2017, the University had 3627 employees (including 1377 teaching staff and 450 research staff) and had 20236 students The University comprises 23 core academic units: twelve faculties, seven institutes (with two of them of faculty status), four research and study centres and seven core non-academic units.

The University implements study programmes of three study cycles in the areas of the humanities, social, physical, biomedical and technological sciences; the total number of undergraduate (bachelor) study programmes is over 85, the number of (graduate) master and integrated study programmes exceeds 123. Doctoral students may enrol in almost 30 and residents in more than 50 study programmes.

The FCHG (hereinafter also Faculty) was founded in November 14, 2016 after joining two former faculties: Faculty of Chemistry and Faculty of Geosciences. The Faculty operates in accordance with the Statute of Vilnius University. The Faculty is headed by the Faculty Council and the Dean. Presently, the Faculty comprises 2 institutes: Chemistry and Geosciences. Institute of Chemistry has 6 departments: Department of Analytical and Environmental Chemistry, Department of Physical Chemistry, Department of Inorganic Chemistry, Department of Organic Chemistry, Department of Polymer Chemistry, Department of Applied Chemistry. Institute of Geosciences has 4 departments: Department of Geography and Land management, Department of Hydrology and Climatology, Department of Geology and Mineralogy, Department of Hydrogeology and Engineering Geology and Department of Cartography and Geoinformatic. They are engaged in research and studies. The main research areas of the Faculty include "Ecosystems change, protection of natural resources" and "The new materials and functional derivatives". Members of the teaching staff of the study programme of Cartography contribute to the journals on a regular basis. The research results are disseminated in national and international conferences (http://www.chgf.vu.lt/struktura/geomokslu-institutas/publikacijos).

The Faculty implements 7 first cycle (Biochemistry, Chemistry, Nanomaterials chemistry, Geography, Geology, Cartography and GIS, Meteorology and Hydrology,) and 7 second cycle (Chemistry, Nanomaterials chemistry, Geography and Land management, Cartography, Geology, Hydrometeorology). The Faculty also implements doctoral studies in the field of Chemistry and two joint doctoral study programmes Physical Geography and Geology with NRC and Klaipėda University).

The Geosciences institute carries out two scientific programmes: *Geographical differentiation of Lithuania's territory in terms of state development and territorial planning* and *Ecosystems and climate changes, preservation of environment and use of natural resources*.

Presently, the Faculty has 205 staff members (teaching, research and administrative), including 44 professors and chief research fellows, 45 associate professors and senior research fellows, 35 lecturers with a PhD, 44 lecturers and assistant lecturers, 11 administrative staff. There are about 900 students in the Faculty.

The study programme of Cartography is implemented by the Department for Cartography and Geoinformatic (DCG). The programme has been implemented for 14 years since 2002.

In the recent years interest of society in maps and geographic information has grown beyond all expectations due to rapid development of GIS technology and Internet cartography. These technologies have created new challenges for scientific research in cartography. Cartography is the oldest and most traditional branch of geographic information science and the only one that combines so diverse aspects of geographic cognition. Modern cartography is much more than just science of map making. It is closely related with several fields of research and business such as *Physical sciences* (all geosciences, environmental sciences, informatics and newly emerging *GIS Science*); *Technological sciences* (geodesy, civil engineering, land management, graphic design etc.) and *Social sciences* (social geography and communication sciences). Professional cartographers may have to deal with all steps of geographic data management and with all thematic fields where maps are compiled, including medicine, criminology, history, archeology and linguistic sciences. They are able to participate in quality assurance, decision making and legislation that involves geographic information at all levels of government.

Possible profiles of specialisation for the graduate cartographers are:

- different levels of geographic data organisation (data – information systems – information infrastructures)
- use of cartographic information (analysis – synthesis – communication).

Cartography Master programme presented for external evaluation is the only programme in Lithuania orientated into broad cartographic competences including geographic information science and technology.

The Programme went through the external assessment in 2011. Overall assessment of the programme was very positive except some issues related with scientific performance of several staff members. Due to this weakness the programme was accredited for 3 years. The Assessment Report and the changes induced thereof are discussed in section 5 "Study Programme management". Particular strengths and weaknesses identified and improvements are also listed in the corresponding other sections of this document.

ANALYSIS OF THE STUDY PROGRAMME

1. Purpose and learning outcomes of the study programme

1.1. Purpose and learning outcomes of the study programme. Learning outcomes across course units (modules)

The purpose of the study programme is to prepare a broad profile geographic information professional with specific skills of cartographic visualisation and capacity to independently analyse a chosen field of geographic information application, identify problems and systematically advance the knowledge and (or) technology of the field by application of cartographic methods.
The competences and learning outcomes of the study programme (hereinafter also SP) are as follows:

Table 1. Generic and subject-specific competencies and learning outcomes of the SP

Generic competencies of the SP		Learning outcomes of the SP	
1.	Ability to search, process and analyse information from a variety of sources	**1.1**	Capability in searching scientific and technological information in primary and secondary sources, skills for selection of meaningful data in integral information flow.
		1.2	Ability to understand, assess and master diverse information technologies, ability to manage most types of data (documents, tables, databases, geographic data and maps).
2.	Ability to conduct scientific research	**2.1**	Ability to identify the research problem, to plan and to perform research on his own, creatively apply the familiar analysis methods individually and in a team.
		2.2	Knowledge of scientific method. Awareness of the method application limits. Ability to assess the research findings in the light of various theoretical paradigms; to be critical and self-critical applying theoretical and practical innovations.
3.	Ability to communicate	**3.1**	Capacity of clear, reasoned and correct communication of scientific and applied information in oral and written form for different audiences. Skills of presentation of projects and research outcomes, peer reviewing, assessment, discussion and compromise making.
		3.2	Ability to work in team sharing the responsibilities with colleagues, work with experts of GIS&T field and specialists from the other fields.
4.	Capacity to learn and adjust to changing environment	**4.1**	Capacity to generate new ideas (creative thinking) Ability to promote innovations in research and applied works
		4.2	Ability to learn, adapt and act in new situations. Ability to study in a manner that may be largely self-directed or autonomous
5.	Ability to carry out and present small to	**5.1**	Ability to plan, design and efficiently manage projects

	medium scale projects in the role of project coordinator or manager;	**5.2**	Ability to formulate goals, objectives and tasks for research and applied projects, to participate in decision making acting with social responsibility and civic awareness
Subject-specific competencies of the SP		**Learning outcomes of the SP**	
6.	**Conceptual foundations** (gnostic, historic, cognitive and social foundations, domains, elements and imperfections of geographic information and cartographic visualizations)	**6.1**	Understanding interaction of structures and functions and complexity of geo- and anthroposystems, principles of sustainable development.
		6.2	Understanding scalability and temporal development of geographic systems and its cartographic reflections. Recognition and definition of problems that require cartographic modelling and hypotheses in the interdisciplinary context. Ability to describe novelty, relevance, expedience of cartographic research.
		6.3	Ability to assess political, legal and business environment, disseminate geospatial information, participate in decision making where geographic information is concerned
7.	**Analytical methods of geographic and cartographic data** (academic and analytical origins, query operations and query languages basic analytical methods, spatial statistics, data mining, storage and retrieval structures, database management systems, metadata).	**7.1**	Ability to perform spatial data analysis using quantitative and qualitative methods; intuitive recognition of trends and relationships in geographic data.
		7.2	Understanding theoretical principles and skills of database management, and spatial data modeling; ability to understand, select and apply different technologies
8.	**Cartographic visualization** (history and trends, data considerations, methodology of mapping, graphic representation techniques, map production, use and evaluation).	**8.1**	Thorough knowledge on existing cartographic theories and methods, principles of map design, use and evaluation. Principal knowledge on GIS methods and technologies
		8.2	Skills of cartographic modeling of natural and social phenomena. Ability to create individually or in a group cartographic production of different types and complexity and communicate cartographic information using Web technologies.
		8.3	Ability to perform cartographic quality assessment
9.	**Geographic information system design** (the scope of geographic information system design, organizational structures and procedures, strategic planning, system analysis, design, implementation, risk management, change management, spatial data infrastructures)	**9.1**	Ability to perform strategic and system analysis and requirement specification taking risks and limitations into account.
		9.2	Ability to choose, evaluate and apply relevant (geodetic, GIS, DBMS, CAD, Web) technology for geographic information interchange;

Since 2011, learning outcomes have been several times revised and updated. Besides small revisions and additions due to changes in the scientific and technological environment over five years, some learning outcomes were enhanced as reaction to the conclusions of the previous assessment as the experts:

a) proposed „*stronger orientation towards acquaintance with the basic skills of scientific research and the development of a scientific mentality*“ – scientific research skills now are explicitly strengthened ;
b) „*more attention could be paid to a broad range of transferable skills*“ – the description of generic competencies is provided in more detail.

The form of presentation of learning outcomes was changed in order to better link the courses and the learning outcomes.

Objectives of the individual programme courses were also revised so that they better supplement each other and reflect newest changes in the field (grown importance of web mapping and spatial data infrastructures).

Upon completion of the SP of Cartography, a student may engage in further postgraduate studies in Lithuanian or foreign universities and institutes or work in diverse fields where geographic information is used.

The demand of the programme is determined by expanding national and international GI labour market. It has been estimated in various international studies that 80 to 95 percent of all information used

in public sector is geographic. More than this, intense technological (e.g., web and cloud mapping) and organisational (e.g., national, regional and global spatial data infrastructures) developments continue in this sector worldwide. As cartographic methods and technologies are used wherever geographic information is dealt with, it can be firmly assured that professional broad profile cartographers are and will be wanted for many years ahead. It applies both to Lithuania and international market as the language of cartography is universal.

The labour market for graduate cartographers consists of several major sectors:

a) research institutions, agencies and projects, where spatial data is concerned, e.g. European Space Agency, JRC Science Hub (https://ec.europa.eu/jrc/en), *Copernicus* support projects (http://www.copernicus.eu/project-database) and numerous others.
b) state institutions and enterprises (National Land Service, departments, divisions and regional agencies of the Ministry of Environment, "Centre for military mapping", "GIS-Centras", "Centre of Registers" and other institutions that manage geographic data). Estimated demand in this sector is at least 20 specialists per year;
c) municipality administrations, municipal institutions and enterprises. The most of 60 municipalities in Lithuania still lack GIS/cartographic capacity that is necessary for properly performing their functions determined by the Law of Self Government of Lithuania. Estimated demand in this sector is 15–20 specialists per year;
d) publishing houses that produce maps and atlases (estimated demand in Lithuania is 2–3 specialists per year);
e) data collecting and processing business, graphic design and other enterprises, such as "Institute of Aerial Geodesy", "HNIT-Baltic", publishers, surveying companies etc. Estimated demand is 10–20 specialists per year.

The graduates also have a good potential to start their own business.

A qualification obtained upon the completion of the second-cycle study programme is in conformity with qualification VII as specified in the Qualifications Framework of the Republic of Lithuania.

1.2. Availability of information about the purpose and learning outcomes of the SP

Information on the purpose, learning outcomes, content of the SP and admission requirements is accessible on the internet to all prospective students, academic community and the society at large. The information is freely accessible at:

- In the catalogue of study programmes of Vilnius University on its official website[1].
- On the official website of the Faculty at http://www.chgf.vu.lt//
- On the official website of the University intended to prospective students[2].
- On the official website of the Open System of Providing Information, Tutoring and Vocational Orientation, or AIKOS (a Lithuanian acronym)[3] at https://www.aikos.smm.lt/Registrai/_layouts/15/Asw.Aikos.RegisterSearch/ObjectFormResult.aspx?o=PROG&f=Prog&key=4360&pt=of&ctx_sr=za5dHDvp0IGJ2%2fD6Fkt7rIse6a8%3d).
- on the website of the DCG (www.kc.gf.vu.lt/Studijos).

Every year, the University issues a special publication intended for the dissemination of information about second cycle study programmes *Kviečia Vilniaus universitetas. Antroji pakopa*. (Vilnius University is calling. Second study cycle)[4]. The publication is available during a variety of promotional events, including meetings in secondary schools, where teachers offer advice on further studies, also on the internet, where all interested in studying in Vilnius University can easily access it, etc.

Every year the SP, its purpose/s and learning outcomes are introduced at the following promotional events:

[1] https://klevas.vu.lt/pls/pub/public_ni$www_progr_app.show
[2] http://www.vu.lt/kviecia/
[3] http://www.aikos.smm.lt
[4] http://www.vu.lt/kviecia/rinkis-studijas/studiju-programos/2-pakopos-studiju-programos/item/299#pri%C4%97mimo-s%C4%85lygos-ir-reikalavimai

- Vilnius University *Discovery Days*, when the administration, the teaching staff and the students of the FCHG deal with study-related issues on an individual basis.
- Study Fair *Mokymasis, studijos, karjera* (Learning, Studies and Career) held at LITEXPO, where all information related to the studies in the SP is given by the administration, the teaching staff and the students of the FCHG.
- During Vilnius University visits to secondary schools, where study programmes of all levels are introduced.
- Some course units (modules) are accessible to school students when they come to Vilnius University in autumn and spring during an event called *A student for a single day*. At that time, school students have an opportunity to attend lectures held at the FCHG together with the University students[5].
- Spring meeting with the students of the FCHG IG, organized by the DCG.
- In promotional materials – booklets, posters and souvenir bookmarks distributed during visits to other Universities and colleges (for example, on occasion of International GIS-Day) and during professional conferences in Lithuania.

1.3. Information about the revision of learning outcomes and participation of social partners in the SP implementation

Revisions of the programme objectives are performed by the programme committee every year, considering changes in political, legal and organisational environment, competition, changes in job market. Social partners actively participate in the process and provide valuable insights on strengths and weaknesses of the graduates.

Suggestions from stakeholders are mainly expressed during meetings in national conferences (e.g., ESRI user conferences, GIS for education / *GIS – švietimui*) and taken into account. Some organisations share the results of their surveys concerning competencies of the graduates. The staff of the programme is encouraged to review and update the learning outcomes of individual courses they teach. Essential updates must be firstly introduced to and approved by the programme committee.

1.4. Conformity of learning outcomes to the requirements specified in international and domestic documents focusing on academic and professional standards

The aim, goals and objectives (learning outcomes) of the programme are justified by the constant demand of the corresponding competences in this field in Lithuania. We continuously seek to adopt best practices from foreign study programmes. The objectives and outcomes are aligned with the general description of qualifications for Lithuania[6] (7th level).

The four groups of subject-specific competencies of the programme is aligned to the original *GIS&T Body of Knowledge of 20127 (*Fig. 1). Four members of the DCG staff actively participated in recent development of updated European *GIS&T Body of Knowledge*[8] in 2013–2016 and continue working with interactive environments9 that are designed for refinement of the BoK.

There are relevant national and European legal acts that influence the goals and the contents of the programme. Cartography Master programme was initially designed to meet the requirements for the competences of geodesist and cartographers regulated by the previous edition of the Law on Geodesy and Cartography of Lithuania. The new edition[10] came into force in May 2010 as result of transferring the EU INSPIRE Directive[11] of May 2007 into national legislation. These two documents are of crucial importance to development of all geographically oriented programmes. Implementing the INSPIRE Directive Lithuanian Spatial Information Infrastructure (LEII) has been implemented as an open, shared national spatial data infrastructure for accessing and distributing geographic information products and

[5] http://www.vu.lt/kviecia/naujienos/visos-naujienos/aplankyk/item/512-tapk-studentu-vienai-dienai
[6] https://www.e-tar.lt/portal/lt/legalAct/TAR.BC967702800C/TAIS_401210
[7] http://www.gi-n2k.eu/wp-content/uploads/2014/01/UCGIS_GISandT_BoK_DigReIssue2012.pdf
[8] http://www.gi-n2k.eu
[9] http://gin2k.bigknowledge.net/bokwiki/
[10] http://www3.lrs.lt/pls/inter3/dokpaieska.showAss. prof._l?p_id=371048&p_query=&p_tr2=
[11] http://eur-lex.europa.eu/JOHtml.do?uri=OJ:L:2007:108:SOM:EN:HTML

services online. It connects major public sector information sources through a single Internet portal (www.geoportal.lt). A package of legal acts related to the geoportal is still under preparation. All relevant legal acts are analysed by the programme committee and corresponding additions are continuously made to the contents of individual courses. A package of proposed changes in the programme related to new legal acts and required competencies was prepared and implemented in 2015.

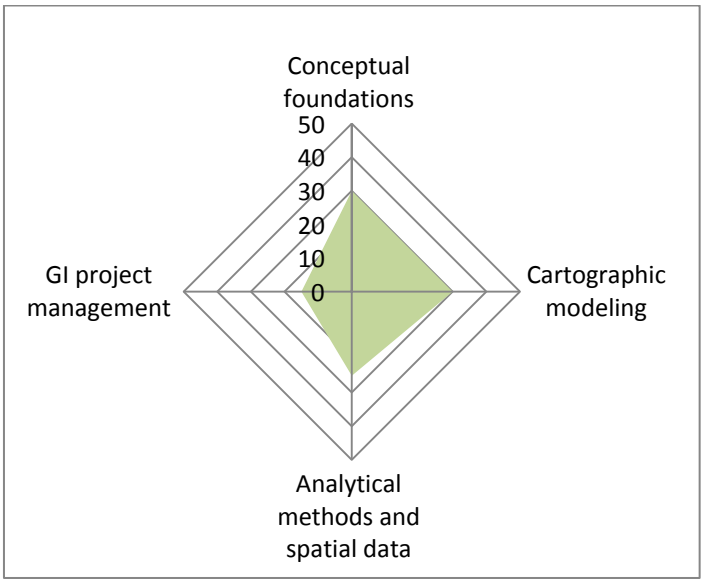

Fig. 1. Weights of the competencies of the programme within GIS&T Body of Knowledge

1.5. The SP in the context of other study programmes implemented by VU and other universities

The developers of the programme strive to comply with the programme for development of science, technology and innovations in aero- and space research[12].

Some competition with the other study programmes exists in the field of core and technological GIS competences. The main competing programme is "Geodesy and cartography" (62410T102) Master programme at Vilnius Gediminas Technical University. It is strongly orientated to cadastre and surveying technologies whereas "Cartography" programme aims at much broader synthetic competences. On the other hand, the relationship between the two universities is productive and perspectives of a joint study programme are often discussed. There is no significant competition with "Geography" programmes at Vilnius University, Lithuanian University of Educational Sciences and Klaipėda University as the former has no aim to develop scientific competences in Cartography and GI and the latter specializes in physical geography and mainly targets the region of Western Lithuania.

Competition in the above listed sectors of labour market is low. "Cartography" programme is the only one that prepares broad profile GI analysts also capable for all kinds of cartographic communication.

Sustainability of the Cartography Master study programme is also related with demand for continued education by bachelor level graduates from several colleges, mainly Kaunas College, "Geodesy", "Geoinformation Systems" and similar study programmes. The number of college graduates that potentially would choose "Cartography" programme to continue their studies estimates to 5-9 persons a year. Naturally, the graduates from all geoscience bachelor programmes and many programmes of other universities can also continue their studies in Cartography.

1.6. Strengths and weaknesses of the area under evaluation and improvement measures to be taken

Strengths:

[12] https://www.e-tar.lt/portal/lt/legalAct/3c669810fa3711e5a52397090a2fa158

1. Versatility – people with different background can find a research topic of interest in Cartography and (or) GI Science;
2. The programme offers good technological skills in balance with theoretical background that increases capability for innovations;
3. Integration in political, legal and business environment of Lithuania, extensive social and foreign partnerships;
4. Excellent career opportunities – acquired competencies are recognized in Lithuania and internationally
5. Intrinsic competences in project management and system analysis, ability to work in team, that are valuable in all kinds of further activities;

(as listed by the experts of previous external assessment of 2011):

6. The programme's aims and outcomes are directed towards satisfying national needs in the labour market; the need for specialist cartographers, especially in GIS-related employment, is expected to continue in coming years.
7. The formulations of learning outcomes are clear; the outcomes are achievable and well mapped into the subject courses that make up the programme.
8. The learning outcomes incorporate recent international trends of development in the field and continue to look to the future.

Weaknesses and threats:

1. Absence of the bachelor GI programme of corresponding level in Lithuania that results in diversity of backgrounds of the students and in many cases lack of primary skills in GIS, geography or cartography;
2. Rapidly changing technological and even methodological environment, ongoing paradigm shift in Geography.

(as listed by the experts of previous external assessment of 2011):

3. The programme aims are rather too focused on cartographic applications rather than on the development of cartography and GIS (where 'S' is alternatively 'System' or 'Science') as a science.

Improvement measures:

1. (in response to Weakness 1) New bachelor GI programme well aligned with the current Master programme was designed in 2013–2015. It was positively evaluated in the Faculty and by the experts of the VU Study Committee and accredited in May 2017. In 2012, CfC staff designed and successfully implemented complementary study programme „Geography" aimed at graduates of colleges, specifically of technical college programmes were Geodesy, GIS, mathematical and statistical methods and (or) Informatics are taught. In four years the programme brought us 8 additional Master students that all perform well. It is planned to further strenghten and advertise this program.
2. (in response to Threat 2) The newest trends of GI science, methods, cartographic technologies and applications are discussed every year. Necessary changes are introduced firstly into the contents of relevant courses, then, when they accummulate, into the programme. Following the trend of stronger integration of cartography with GI science that is observed worldwide, some revisions, e.g., introduction of more specific GI&T related learning outcomes are considered in the future (2018–2020). In the end of 2016, such trends are related mainly with 'big data', opportunities related with the *Copernicus*[13] programme and open source solutions (software and maps).
3. (in response to Weakness 3). After replacement of the Head of the CfC the staff made corrections to the CfC strategy and revised the aims and learning outcomes, adding the accents that were missing. The members of the Programme Committee periodically discuss the lingering risk of shifting too much to technological/engineering aspects and the measures to avoid it.

[13] http://www.copernicus.eu/

2. Curriculum design

2.1. Study plan, conformity of curriculum design with the provisions of legal acts

The curriculum design of the currently implemented study programme of Cartography is in conformity with the *General Requirements for Master Study Programmes* approved by Order No V-826 of the Minister of Education and Science 3 June 2010), the *Regulation of Study Programmes of Vilnius University* approved by Decree No SK-2012-12-4 of Vilnius University Senate Commission 21 June 2012 and a description of the study field of Natural and Society Geography approved by Order NoV-928 of the Minister of Education and Science of the Republic of Lithuania 27 August 2015[14] and the *General Requirements for Study Programmes* set by Order No V-1168 of the Minister of Education and Science 16 December 2016).

Table 2. The conformity of the SP of Cartography to the general requirements of the second cycle study programmes

Requirements	In the study programme
The scope of the second cycle study programme shall be between 90 and 120 credits.	120
The total number of course units per semester shall be no more than 5.	2–5
A student's individual work shall make no less than 30% of each course unit.	40 to 64%, average 48%
Course units within the study field shall make at least 60 credits; their content shall be of higher quality level than corresponding first-cycle course units within the same study field.	Conformant Course units within the study field: 92 credits
Optional course units offered by the university are intended for specialized studies and shall make no more than 30 credits.	Conformant, total 10 credits
The scope of the graduation thesis shall be at least 30 credits.	30

[14] (https://www.smm.lt/web/lt/teisesaktai/listing?date_from=2015-08-27&date_till=2015-08-27&text=&submit_lawacts_search=).

STUDY PLAN (full-time studies)
(COMPETENCES AND LEARNING OUTCOMES ACROSS COURSE UNITS (MODULES))

Code	Course units (modules) according to types	Volume in credits	Total student workload	Contact hours	Individual work	Competences of the study programme																		
						Generic competences								Subject-specific competences										
						1.		2.		3.		4.		5.		6.			7.		8.			9	
						Learning outcomes																		
						1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	6.3	7.1	7.2	8.1	8.2	8.3	9.1	9.2
YEAR 1		**60**	**1600**	***688***	***912***																			
SEMESTER I																								
Compulsory course units (modules)		**30**	**800**	**384**	**416**																			
	Database design	*8*	*212*	*96*	*116*	x					x	x							x					x	
	Application programming for spatial data systems	*8*	*212*	*96*	*116*		x				x									x					x
	Cartology	*6*	*160*	*80*	*80*					x						x	x				x				
	Methodology of scientific research	*4*	*108*	*48*	*60*	x		x	x	x			x			x									
	Topographic maps	*4*	*108*	*64*	*44*			x						x							x	x			
SEMESTER 2		**30**	**800**	**280**	**496**																			
Compulsory course units (modules)		**24**	**640**	**200**	**440**																			
	Cartographic information management	*6*	*160*	*80*	*80*			x		x	x	x	x	x	x	x		x			x		x		
	Cartographic communication	*5*	*133*	*64*	*69*	x				x		x			x			x			x		x		
	Scientific project	*9*	*239*	*8*	*231*	x		x	x	x		x	x	x	x										
	Remote mapping	*4*	*108*	*48*	*60*											x			x	x		x			
Optional course units (modules)		**6**	**160**	**80**	**80**																			
	GIS models	*6*	*160*	*80*	*80*		x						x	x					x	x					x
	Special purpose maps	*6*	*160*	*80*	*80*													x		x		x	x		
YEAR 2		**60**	**1600**	***474***	***1126***																			
SEMESTER 3		**30**	**800**	**400**	**400**																			
Compulsory course units (modules)		**26**	**692**	**336**	**356**																			
	GIS Methodology and Applications	*8*	*212*	*96*	*116*			x	x							x	x	x	x					x	x
	Mathematical cartography	*6*	*160*	*80*	*80*												x				x	x			
	Map publishing technologies	*6*	*160*	*80*	*80*			x						x							x	x			
	Methodology of mapping	*6*	*160*	*80*	*80*						x			x	x						x	x	x		
Optional course units (modules)		**4**	**108**	**64**	**44**																			
	Dissemination of cartographic information on the Internet	*4*	*108*	*64*	*44*													x			x	x	x		
	Map browsers and web-services	*4*	*108*	*64*	*44*	x	x			x											x	x	x	x	x

SEMESTER 4																									
Compulsory course units (modules)		**30**	**800**	**74**	**726**																				
	Master seminar	***5***	***133***	***48***	***85***	x		x	x	x		x	x	x	x										
	Master thesis	***25***	***667***	***26***	***641***	x		x	x	x		x	x	x	x	x		**x**	**x**		**x**	**x**		**x**	

2.2. Principles of curriculum design and rationale of the SP

The scope of the SP of Cartography is 120 credits; the length of the SP is two years. The SP consists of two thematic blocks: Cartography and GI Science. Seven courses (36 credits) are designed to develop both theoretical and applied skills.

Table 3. Types of courses in the SP of Cartography

Course	Study field	Cartography	GI Science	Development of applied skills
Database design	Yes		x	x
Application programming for spatial data systems	Yes		x	x
Cartology	Yes	x		
Methodology of scientific research	No	x	x	
Topographic maps	Yes			
Cartographic information management	Yes	x	secondary	x
Cartographic communication	Yes	x		
Remote mapping	Yes		x	x
GIS Methodology and Applications	Yes		x	
Mathematical cartography	Yes	x		
Map publishing technologies	Yes	x		
Methodology of mapping	Yes	primary	secondary	
Optional group 1	Yes			
GIS models	Yes		x	x
Special purpose maps	Yes	x		
Optional group 2	Yes			
Dissemination of cartographic information on the Internet	Yes	primary	secondary	x
Map browsers and web-services	Yes	secondary	primary	x

Some problems and unexploited possibilities of particular courses have been identified during the self-assessment and noted in the external evaluation report. The corresponding changes have been introduced into the programme in years 2012–2014. Some activities, such as update of course descriptions and textbooks have been partly financed by the EU funded project VP1-2.2.-ŠMM-09-V-01-004.

- The contents of the course "Cartographic information management" have been updated and expanded. More topics on theoretical problems in modern cartography and corresponding assignments were included in the course. Stronger links with the course "Dissemination of cartographic information on the Internet" have been planned in form of joint assignments.
- The contents of "Cartographic software" course have been extensively updated and expanded into: "Application programming for spatial data systems". Theoretical issues and broader overview of programming methods have been included into the course.
- The contents of the course "Internet cartography" have been massively updated and split into two courses "Dissemination of cartographic information in the Internet" and "Map browsers and web-services", including more theoretical issues and assignments that help to develop scientific and systematic thinking.
- The contents of the course "Topography" have been updated and expanded to form: "Topographic maps", including more theoretical, historical and usability issues.

During the period of 2015–2016, two groups of optional courses were formed, for deepening knowledge correspondingly in Cartography and GI science. In order to reflects latest achievements and

trends in Web cartography and data modelling, two new courses were included: *GIS models* and *Map browsers and web-services*.

Besides the above listed substantial changes, the programme has been significantly improved content-wise due to cumulative changes done every year.

The most of the courses of the Cartography Master programme are compulsory. There are two sets of optional courses – depending on the background and preferences of the students they can choose to deepen their knowledge either in special cartography or in special purpose geographic information models and choose more philosophical or more technological approach to Web maps. The schedule is designed in order to achieve **all programme objectives and maximal efficiency** in:

a) understanding newest theoretical and methodological developments in the field;
b) applying knowledge and skills from one course to the subsequent courses;
c) using benefits of dynamic skill transfer between parallel courses that stimulates development of cognitive and transferable skills.

The deepening and broadening courses taught in the **first semester** are all necessary to acquire professional knowledge and skills that are used in two project-oriented courses (*Cartographic information management* team project in the 2nd semester and *Methodology of mapping* individual project in the 3rd semester). *Database design* and *Application programming for spatial data systems* courses intertwine adding value to both courses. *Cartology* and *Methodology of scientific research* give strong theoretical background for independent research. *Topographic maps* course is useful to enhance knowledge on existing national, institutional and municipal databases, to renew basic mapping skills and to parallelly test practical skills acquired in *Application programming for spatial data systems* courses

In the **second semester** the most complex and difficult courses are taught. *Cartographic information management* and *Cartographic communication* courses also intertwine in terms of methods and transferable knowledge. They all include full scale practical projects that force students to develop ability to apply all professional knowledge and skills acquired before and during ongoing lectures and practices. The students learn to switch between different mapping technologies. *Cartographic information management* course gives good understanding of system analysis and project management that are the weak points of most undergraduate programmes. *Mathematical cartography* gives deeper knowledge and ability to understand the interaction of cartographic components and types their transformations. All these courses directly impact quality of the scientific research. Two optional courses *Special purpose maps/GIS models* are designed to deepen knowledge in applied cartography/GI engineering.

The **third semester** includes courses related to particular important aspects that could not be deeply understood without previous courses *Remote mapping*. *GIS Methodology and Applications* course is about application of GIS analysis and modelling in various fields of ecologic and social research, deepening the knowledge on corresponding geographic or other undergraduate level disciplines (e.g., hydrology, geology, geomorphology, archaeology, social geography etc.). *Map publishing technologies* applied course requires knowledge of almost all 1st and 2nd semester deepening courses and adds knowledge and skills of finalizing and communication of cartographic information. *Methodology of mapping* course connects and summarises everything in theoretic lectures and individual practical full-scale mapping projects (different from principal scientific research). Two alternatives *Dissemination of cartographic information on the Internet/ Map browsers and web-services* are related with different deepening aspects of Internet Cartography.

The **fourth semester** is exclusively for finalising Master theses, with one scientific seminar dedicated to improve the quality of the research jointly and individually for each student. 3 months ERASMUS study visits are highly recommended for this semester.

All courses contain theoretical part that comprises from approximately 30 percent for applied courses to up to 85 percent of the deepening courses. Newest theories of the field are introduced and assignments updated every year in order to train the students' scientific thinking.

Almost all courses contain parts oriented to the specifics of the two major segments of the labour market:

a) State and municipal institutions and enterprises segment – information on existing databases, legislation, policies and procedures;

b) Data collecting and processing business segment – methods and technology of specific data management.

Detailed **descriptions of the courses** are presented in the Appendix 1.

The **scientific research project** is performed continuously from the first semester according to requirements and recommendations published in the DCG website (in Lithuanian only)[14]. Scientific research projects are carried out following the individual plan made for a student together with his/her supervisor. It results in Master thesis and is presented in the end of the 2nd semester as Scientific project presentation. Master Seminar in the 4th semester is planned to support better preparation of Master thesis and its defence.

The Cartography Master programme produces **two types of specialists that are** acquainted with the latest theories, methods and technologies in Cartography and Geographic Information Science:

a) broad profile geographic information specialists that graduate from the University with the first and second stage degrees in Geography and Cartography studies. They have strong and consistent background for independent research both in applied and in theoretical cartography and in Geographic Information Science. They are fully prepared to continue their career in scientific research and (or) teaching in this field.
b) specialists of geographic information in a particular thematic field who have earned their first degree in that (non-geographic) field of studies, e.g., other physical sciences, biomedical or social sciences, and the second degree in Cartography only. They are able to perform research and assess the suitability of existing cartographic/GIS methods; to define and document the need for new methods and instruments of cartography and GIS and to critically evaluate and apply theoretical and practical innovations, specifically in the chosen thematic field.

The graduates of both types are expected to have good scientific mentality, broad teamwork skills and capability to make knowledge-based decisions in diverse situations.

2.3. Study methods, proportion between contact hours and students' individual work

According to the purpose of the SP, it aims at development of specific skills of cartographic visualisation (1), understanding possibilities and limitations of GI technologies (2), capacity to perform system analysis (3) , understanding of political, legal and business environment and decision making (4) and capacity for innovations (5).

The generic **goals** of the Cartography Master study programme are:

1. to **combine and extend** knowledge and competences received at the first study stage for the matriculates with different background;
2. to develop **scientific thinking** and **systematic approach** to the problems;
3. to convey the students strong **methodological knowledge** and ability to understand the most complex geographic relationships within a given context;
4. to teach the students perform **tasks** independently and sharing responsibilities in a team, planning and performing full scale cartographic project in any thematic field, including strategic planning, system analysis, modelling and implementation.

The following matrix shows what teaching strategies methods help to achieve these goals.

Table 4. Teaching initiatives matching the aims and goals of the programme

Aims	Goals			
	1	2	3	4
1	Encouragement of application of individual knowledge in	Transfer of knowledge and skills between different courses	Thematic cartography projects with explicit analysis stage	Project oriented approach to practical cartographic assignments

[15] http://kc.gf.vu.lt/?page_id=1197

	cartographic projects			
2	Encouragement of independent choice of diverse GIS technologies	Transfer of knowledge and skills between different courses	Use of GIS and DBMS technologies as the basic research instrument	Coordinated use of different technologies throughout practical projects
3	Encouragement of individual approach for projects	Project management elements in lecture courses	Complex full-scale projects as practical assignments	Team work in practical projects, brain storming during lectures
4	Individual essays on chosen political, legal and business aspects	Presentation elements in lecture courses	Discussions on political, legal and business environment	Taking political, legal and business aspects into account in practical projects
5	Encouragement of active participation in the lectures, sharing ideas	Innovation management elements in lecture courses	Assignments that require creative and innovative approach	Forced innovations and change management in a team project

Due to relatively small number of students, a highly individual approach and problem oriented training is still feasible and is efficiently realised in the programme.

The study content and the student workload are spread evenly within the timetable. Applied projects and independent studies are well embedded in the curriculum as subjects with aims and outcomes consistent with those of the whole programme. Individual work is in proportion to contact hours and contents of each course and varies from 40,7 to 63,94% for thematic courses. For *Scientific project* and *Master thesis*, the work is mostly individual (86,6 and 96,1% correspondingly).

Depending on particular course, individual work is allotted for these activities:

1. Reading scientific literature,
2. Analysis of cartographic products (maps, atlases, web maps, SDI portals, GI systems),
3. Preparation for discussions and presentations,
4. Homework assignments,
5. Performing individual research, and
6. Writing essays and theses.

Table 5. Proportion between contact hours and students' individual work

	Compulsory course units			**Optional course units**		
Semester	**Contact hours**	**Individual work, hrs**	**Total**	**Contact hours**	**Individual work, hrs**	**Total**
I	384	416	800	0	0	0
II	200	440	640	80	80	160
III	336	356	692	44	64	108
IV	74	726	800	0	0	0
Total	994	1938	2932	124	144	268

2.4. Requirements for graduation theses

Graduation theses are prepared in accordance with the *Procedure for the Preparation, Defence and Safekeeping of Graduation Theses* approved by Decree No R-446 of Vilnius University Pro-Rector on 17th of November, 2015. Cartography study committee approved "Requirements for preparation of scientific paper, scientific report and master thesis of Cartographic master studies program" (Extract from protocol No 1, 14 November 2013). It describes the basic requirements for preparing the scientific papers,

scientific reports and master thesis attitudes, preparation stages and evaluation criteria. Requires in particular emphasized for maps and other cartographic works preparation and its assessment.

Department of Cartography and Geoinformatics prepared requirements for student papers, research reports and master's thesis. In this requirement focus on papers, reports and master's thesis content, their form, reviewing procedure and the work evaluation criteria.

The documents and any other information related to graduation theses and students' other papers are accessible on the website of the FCHG IG (http://kc.gf.vu.lt/wp-content/uploads/2016/10/reikalavimai-magistro-darbui.pdf). The criteria for assessing graduation theses are also provided in the description of the course unit (module) *Graduation Thesis.*

The purpose of Master Final Thesis is to develop independent research skills, critical thinking and team working skills, to form a deeper knowledge in the fields of cartography and geographic information systems, to prepare for doctoral studies.

Recommended volume of master thesis is up to 60 pages.

The theses are supervised by the academic staff of the SP and researchers and teachers from other universities and social partner institutions. Topics for the theses are chosen by the students after having discussed them with potential supervisors and approved by the Department of Cartography and Geoinformatic. Topic themes provided in first study semester and finally confirmed in the beginning of third semester. Master's thesis preparing and writing process are discusses on the Master's seminar and with supervisor.

In third and fourth semester the students presented prepared parts of master's thesis in DCG workshops that are organized specifically for this purpose. In fourth semester held two presentations: in March and April. Master's thesis defence is public. Defences takes place in the presence of final thesis defence committee. The final evaluation of the work carried out after hearing the presentations of all master thesis.

The **requirements for Cartography Master thesis** are defined in "*The requirements for Master study programmes*". Master thesis is presented for public defence. The commission evaluates qualification of the student in accordance with the goals of the programme.

It consists of five members with scientific degrees; preferably mostly from other departments and organisations. The chair is always from other organisation.

The **Master thesis evaluation criteria** are (% of the evaluation mark):

1. Relevance and novelty of study problem (15).
2. Quality of previous research review (20).
3. Suitability of research methods (20).
4. Methodological correctness of conducted study (25).
5. Compliance of conclusions with the research results (5).
6. Relevance and informativeness of illustrations (5).
7. Originality, accuracy and aesthetics of created cartographic works (5).
8. Public presentation of scientific project (5).

The final mark is average of evaluations by the commission members and if necessary, approved by the chair after a discussion.

1.7. Strengths and weaknesses of the area under evaluation and improvement measures to be taken

Strengths:

1. The programme allows and encourages specialization in diverse aspects of cartography providing necessary knowledge and skills. That increases the scope of career opportunities.
   (as listed by the experts of previous external assessment of 2011):
2. The content of the programme generally reflects the latest achievements in science, art and technology that are represented in cartography. The curriculum design process takes cognisance of the needs and suggestions of employers and other social partners and practitioners.
3. Students, in acquiring the practical skills and knowledge to be able to act as cartographers after graduation, are kept up to date with trends of development in cartography.

Weaknesses:

1. Due to commonly insufficient knowledge of GIS technology and mathematical methods, lacks of basic programming skills and unawareness of logical methods of graduate bachelors, a part of study time has to be alloted to catching-up with the above listed aspects. No credits can be alloted for internships.
2. Majority of students find jobs during the first year of studies and sometimes become full-time employed. Significant part of study plan should be carried out on evenings and weekends, but that is not aways convenient to those who prefer daytime.

Improvement measures:

1. (in response to Weakness 1) See Improvement measure #1 in Chapter 1. In addition, both students and teachers usually agree to work more intensely. Volunteered summer internships with social partners are popular among the students and often result in job offers.
2. (in response to Weakness 2) Flexible schedule, additional meetings, well prepared course materials in Virtual Learning Environment of the VU[15] and online/email consulting anytime upon request.

Weaknesses listed by the experts of previous external assessment of 2011):

1. Although the curriculum ensures that students achieve all the intended learning outcomes to enable them to work on cartography applications, it does not sufficiently promote abilities to conduct scientific research.

Comment: not relevant in 2017. The teachers of the programme courses Methodology of scientific research, Scientific project, Master seminar and Master thesis were replaced by professors with much higher qualification and performance in scientific research in 2012–2014. The contents of the courses and teaching methods were correspondingly updated. Scientific project is now evaluated by all teaching staff and the problems are extensively analyzed. Young and dynamic researchers undertook the courses GIS Methodology and Applications, Cartographic communication and Dissemination of cartographic information on the Internet where they address more of research issues. We strongly believe that the above listed changes have strengthened the orientation towards scientific research, as it was requested in the External evaluation report of the programme of 2011. This belief is substantiated by several publications by our students and graduates in top-level research journals during 2012–2014.

[15] http://vma.esec.vu.lt/

3. Academic staff

3.1. Composition of academic staff and its conformity to requirements

The study programme of Cartography is implemented by 7 academic staff members, including 2 full professors, 1 associate professors, 4 lecturers (see Table 7 below). Three PhD students will assist with teaching from 2017 onwards.

The teaching experience of the academic staff, whose main employer is Vilnius University, is 15 years on average; their work experience is 8 years on average.

Table 6. Composition of academic staff according to academic titles and research degrees and scope of teaching in the SP of Cartography (see study plan of the academic year 2016-2017)

Academic title, research degree	No of people employed	Scope of teaching in the SP*	
		Credits[16]	Percentage
Professors (Dr Habil. or Prof. Dr)	**2**	**35**	**36,5**
Associate Professors (Dr)	**1**	**18**	**18,8**
Lecturers with a doctoral degree	**4**[17]	**43**	**44,8**
Assistant lecturers, doctoral students	**3**		
Total	**10**	**96**	**100**

The composition of the academic staff is in conformity to the requirements stipulated in legal acts of the Republic of Lithuania[18], which is reflected in the following table.

Table 7. Conformity of the qualifications of academic and other staff in the second-cycle SP of Cartography to the General Requirements and to the Regulation of Study Programmes of Vilnius University

Requirements	In the study programme
No less than 80% of the academic staff shall have a doctoral degree.	100%
All staff involved in lecturing (reading theoretical courses) shall have a doctoral degree (*Regulation of Study Programmes of Vilnius University*).	100%
No less than 60% (or 40%, when a study programme focuses on developing practical skills) of academic staff teaching course units in the study field shall do research in the same field.	84%
No less than 20% of the course units in the study field shall be taught by Vilnius University professors (*Regulation of Study Programmes of Vilnius University*).	36,5%
Graduation theses shall be defended in a meeting of a Viva Voce Defence Committee. The Chairperson of the Committee shall be from a Higher Education Institution other than the one where the second-cycle study programme has been implemented.	Conformant

Table 8. Composition of academic staff in the SP of Cartography according to position, academic year 2012-2016

Academic year / Position	2012		2013		2014		2015		2016	
	number	%	number	%	number	%	number	%	number	%
Professors	2	40	2	50	2	33,3	2	28,6	2	28,6
Associate professors	2	40	1	25	1	16,7	1	14,3	1	14,3
Lecturers\doctors	1	20	1	25	3	50	4	57,1	4	57,1
Lecturers										

[16] Master thesis not included as the credits are shared

[17] Out of them three work part time (1/4 each)

[18] *General Requirements for Master Study Programmes* approved by Order No V-826 of the Minister of Education and Science 3 June 2010.

Regulation of Study Programmes of Vilnius University approved by Decree No SK-2012-12-4 of Vilnius University Senate Commission 21 June 2012. Available in Lithuanian at: http://www.vu.lt/lt/studijos/studiju-procesas/studijas-reglamentuojantys-dokumentai#vu_nutarimai

Assistant lecturers										
Total	**5**	**100**	**4**	**100**	**6**	**100**	**7**	**100**	**7**	**100**

3.2. Recruitment of teaching staff, evaluation, turnover

On 17 December 2013 the Senate of Vilnius University (Decree No SK-2013-8-2) approved the *Regulations for Organising Open Competition for Teaching and Research Staff of Vilnius University*, which stipulate the procedure of evaluating the qualifications of the teaching and research staff of Vilnius University and the procedure of the competition as well as qualification requirements. At the University, teaching and research staff (except for invited professors and researchers) are recruited or promoted to higher positions on the basis of the results of open competition. The competition is started by the order of VU Rector. After the candidate wins the competition, he signs a contract for five years. If the person after five years of his/her work at the University, which is his/her main employer, wins the competition for the same position for the second time in succession, he/she signs a job contract for an unlimited period.

To determine if the qualifications of the teaching and research staff members are adequate for the position taken, every five years they are evaluated. During the evaluation, the following aspects are taken into consideration: the number of research papers, participation in conferences, supervising research projects, lecturing, preparing teaching materials, participation in the third-cycle (doctoral) studies, supervising students' papers, expert, managerial and other research-related activities. Moreover, the students' feedback on the lecturer's teaching is taken into account. During the last years, the system of students' feedback has been expanded paying more attention to student satisfaction and thus contributing to a more objective representation of the student's opinion.

DCG staff is encouraged to analyse students' feedback after every semester. The comments and ways to improve are discussed in staff meetings.

During the period of self-evaluation, the turnover of the academic staff has been natural, due to retirement of the Head of the DCG and hiring new staff members. Seeking for higher standards in teaching and integral orientation to the objectives of the programme, teaching staff from other departments was replaced by staff members of the DCG.

Table 9. Turnover of academic staff in the SP of Cartography

Academic year	Full professors		Associate professors		Lecturers/doctors		Lecturers		Assistant lecturers	
	First-time agreement with VU	Left VU	First-time agreement with VU	Left VU	First-time agreement with VU	Left VU	First-time agreement with VU	Left VU	First-time agreement with VU	Left VU
2012					1					
2013		1								
2014					2					
2015					1					
2016										
Total		1			3					

The age of the academic staff implementing the SP of Cartography is 45 years on average.

Table 10. Distribution of academic staff by age

Position	Age				
	25-34	35-44	45-54	55-64	65 and over
Professors			1	1	
Associate professors				1	
Lecturers\doctors	1	3			
Lecturers					
Assistant lecturers					

Total	**1**	**3**	**1**	**2**	

3.3. Teaching workload of academic staff

The annual teaching load of an academic working full-time is 395 hours on average (36 work hours per week).

Table 11. Teaching workload

Position	**Contact work with students (in class)**		**Other work (out of class)**		**Research and experimental development (RED)**		**Dissemination of information about academic and RED activities**		**Improving qualifications, managerial and organisational activities**	
	hours	**%**	**hours**	**%**	**hours**	**%**	**hours**	**%**	**hours**	**%**
Professors	201	22	223	30	763	34	769	97	133	50
Associate professors	303	34	506	64	1091	49	0	0	65	25
Lecturers/ doctors	391	44	70	6	376	17	23	3	67	25
Lecturers	-	-	-	-	-	-	-	-	-	-
Assistant lecturers	-	-	-	-	-	-	-	-	-	-
Total	**895**	**100**	**799**	**100**	**2230**	**100**	**792**	**100**	**265**	**100**

In 2012- 2013 year the annual teaching load of an academic working (all teachers) was 414 hours on average. The optimization of study subjects structure lets reduce teaching load average on 19 hours.

3.4. Competency and professional development of the academic staff

Didactic competences are improved by self-study and courses organized by VU. In 2013 - 2016, Associate professor Artūras Bautrėnas, professor Giedrė Beconytė, lecturer Linas Bevainis and professor Algimantas Česnulevičius attended virtual learning courses on virtual learning system and successfully passed the test. In 2016 year lecturers Andrius Balčiūnas and Kęstutis Papšys attended virtual learning system courses. Professor Algimantas Česnulevičius improved his pedagogical skills in Lithuanian University of Educological Sciences (2012 – 2016) and in Wroclaw University (Poland) in 2013 and 2015.

Research competencies are improved by publishing in scientific journals and monographs, by participation in scientific events, editorial boards of scientific journals, participation in organization committees of scientific events, reviewing research papers and monographs, performing research with doctoral students etc. International conference “From Cartography to Geographic Information Science” (2013) attracted over 100 participants including two leading cartography scientists of the world. National conference on newest trends of cartography was organized by the CfC in October 2015 in cooperation with Lithuanian Cartographic Society. In their secondary jobs, Kęstutis Papšys is engaged in remote sensing and spatial technology research and Giedrė Beconytė in spatial information infrastructure research. In 2015 year Algimantas Česnulevičius, Artūras Bautrėnas, Linas Bevainis and Donatas Ovodas created research methodology of eolian processes by unmanned aerial vehicles (UAV).

Different qualification courses for cartographers are offered by partner companies (JSC “HNIT-Baltic), software providers (ESRI, Hexagon, Adobe).

Professsional competencies are at very high level and continuously developed. Dr. Kęstutis Papšys is leading scientist and head of a department for Geographic Research and Technologies at SE “GIS-Centras” and has significant work experience in GIS theory and applications. Dr. Andrius Balčiūnas is an expert in Web mapping a head of Information Technology department at SE “GIS-Centras”. Dr. Giedrė Beconytė is a part time system analyst and head of a department for Spatial Information Infrastructure at SE “GIS-Centras”. Dr. Linas Bevainis is engaged in various educational projects for business. Their

industry and institutional experience is very important for training modern specialists according to the programme objectives and adds value to teaching at DCG. Dr. Donatas Ovodas has brought his unique experience from military career and is now working in the field of forest management. In 2015 year Algimantas Česnulevičius had a traineeship in Department of Cartography and Geoinformatics of Wroclaw University.

The scope of research undertaken by the SP academic staff is shown in Table 13.

Table 12. Research output of the academic staff of the study programme in 2012-2016

	1	2	3	3a	4	5	6	7	8	9	Total
2012	1	0	3	0	0	0	2	9	0	0	**15**
2013	0	0	5	1	0	0	2	4	0	0	**12**
2014	0	0	7	213	1	0	3	5	0	0	**229**
2015	2	0	5	207	0	0	0	4	0	0	**218**
2016	0	0	4	0	0	0	0	3	0	0	**7**
Total	**3**	**0**	**24**	**421**	**1**	**0**	**7**	**25**	**0**	**0**	**481**

01	**BOOKS:** (1) Monographs (monograph, study); (2) Literature intended for studies (textbook, teaching aid, other study-related literature); 3) reference publications (dictionary, guidebook, manual, encyclopaedia, atlases, maps, others); 4) other books (publications on the sources of research and scientific heritage, comments of legal acts, reports of projects, and other works, compiled and/or edited work, chapters in books)
02	**SUMMARIES** (summary of a doctoral dissertation, summary of a habilitation thesis, an overview of research papers submitted for the habilitation procedure)
03	**ARTICLES IN SERIAL PUBLICATIONS (JOURNALS) AND SINGLE VOLUMES** (article in ISI Web of Science, article in ISI Master Journal List, article refereed in the databases approved by the Lithuanian Research Council (LRC), article in other peer-reviewed publications, popular science article, article in a publication on research, arts or culture, other articles (overviews, information, introductory)
03a	**Original authored maps**
04	**PUBLICATIONS OF RESEARCH SOURCES AND PUBLICATION OF SCIENTIFIC HERITAGE**
05	**REVIEWS** (review in ISI Web of Science, review in ISI Master Journal List, review refereed in the databases approved by the LCR, review refereed in other databases, review in other peer-reviewed publications, review in a science popular publication, review in a publication on research, arts or culture)
06	**ARTICLES IN CONFERENCE PROCEEDINGS**: (1) Articles in peer-reviewed conference proceedings (article in ISI proceedings, article in conference proceedings refereed in the databases approved by the LCR, article in conference proceedings refereed in other databases, article in peer-reviewed international conference proceedings abroad, article in peer-reviewed international conference proceedings in Lithuania, article in peer-reviewed conference proceedings in Lithuania); (2) Articles in non-reviewed conference proceedings (article in non-reviewed international conference proceedings abroad, article in non-reviewed international conference proceedings in Lithuania, article in non-reviewed conference proceedings in Lithuania)
07	**CONFERENCE ABSTRACTS:** (1) Conference abstracts in peer-reviewed publications (abstracts in ISI Web of Science and ISI Proceedings, abstracts in ISI Master Journal List, abstracts in other databases, peer-reviewed extended abstracts, abstracts in other peer-reviewed publications); (2) Conference abstracts in non-reviewed publications
08	**PATENTS** (patents registered in the European Patent Office (EPO), patents registered in the US Patent and Trademark Office (USPTO), patents registered in the Japan Patent Office (JPO), patents registered in other countries, patents registered in Lithuania)
09	**TRANSLATION** (translated book, chapter in a book, article)

Table 13. Research projects implemented by the SP academic staff in 2012-2016

Title of project	Period	Source of funding/Partner(s)
International projects		
„Crowd Sourcing in National Mapping“ projektas “Collection and visualization of alternative tourism sites and objects in Lithuania”. (www.nemasinis.lt)	2012–2013	Student internship programme of AGILE and EuroSDR
Assessment of implementation of the INSPIRE directive in Lithuania for Inspire Initial Operating Capacity Task Force	2014	State budget

(Lithuanian part)		
Assessment of implementation of the INSPIRE directive in Lithuania for INSPIRE Maintenance and Implementation Framework. (Lithuanian part)	2015	State budget
Geographic Information – Need To Know on the GI S&T Body of Knowledge – Life Long Learning Programme,	2013–2016.	ERASMUS LLP
National projects		
Preaparation of National atlas of Lithuania (I part: Nature of Lithuania)	2013-2014	National Land Service
Preaparation of National atlas of Lithuania (II part: History of Lithuania)	2014 - 2015	National Land Service

1.8. Exchange of academic staff

International exchange is intense, fruitful and only physically limited due to small staff number and high work loads. The invited professors from abroad usually use their own resources. DCG teachers mainly use ERASMUS funding.

Table 14. Internships and study periods of the SP academic staff according to exchange agreements in 2012-2016

Academic title and/or degree	2012		2013		2014		2015		2016	
	LT	Abroad	LT	Abroad	LT	Abroad	LT	Abroad	LT	Abroad
Professors		1		1		1		1		3
Associate professors								2		
Lecturers\ doctors										
Lecturers										
Assistant lecturers										
Total		1		1		1		3		3

Table 15. Invited academic staff from abroad in the study programme in 2012-2016

Year	Name of lecturer	Institution (country)
2012	Dr., dr. h. c. Alexander Wolodtchenko Prof. Menno-Jan Kraak Prof. Michael Govorov	Dresden Technical University (Germany) Entschede University (The Netherlands) Vancouver Island University (Canada)
2013	Dr., dr. h. c. Alexander Wolodtchenko Prof. Georg Gartner Prof. Gennady Andrienko Prof. Menno-Jan Kraak	Dresden Technical University (Germany) Vienna Technical University (Austria) Fraunhofer Institute (Germany) Entschede University (The Netherlands)
2014	Dr., dr. h. c. Alexander Wolodtchenko Prof. Gennady Andrienko Prof. Michael Govorov	Dresden Technical University (Germany) Fraunhofer Institute (Germany) Vancouver Island University (Canada)
2015	Dr., dr. h. c. Alexander Wolodtchenko Prof. Abraham Solomonick	Dresden Technical University (Germany) Emeritus professor (Israel)
2016	Prof. dr. Jolanta Korycka-Skorupa Prof. dr. hab. Ewa Smolska Prof. dr. Piotr Szwarczewski	Warsaw University (Poland) Warsaw University (Poland) Warsaw University (Poland)

1.9. Proportion of academic staff to students in the study programme

The proportion of the staff to students is completely adequate to the level of study programme. In 2015–2016, the programme had 26 students and 7 staff members (four – full time, three – quarter-time; total 4,75 full positions).

Table 16. Proportion of academic staff to students admitted to the SP according to year of admission

Year of admission	Number of academic staff	Plan	Proportion number of academic staff / plan	Number of candidates	Proportion academic staff/ number of candidates	Admitted students	Proportion number of academic staff/number of admitted students
		Students (sf and nsf)*		Students (sf and nsf)		Students (sf and nsf)	
2012	5	8	0,625	9	0,56	6	0,833
2013	4	8	0,5	21	0,19	14	0,286
2014	4, 5	8	0,56	26	0,17	8	0,563
2015	4,75	13	0,365	21	0,23	13	0,365
2016	4,75	10	0,475	21	0,23	13	0,365
Average:			**0,505**	**Average:**	**0,28**	**Average:**	**0,482**

*sf—funded by the state; nsf—not funded by the state

1.10. Strengths and weaknesses of the area under evaluation and improvement measures to be taken

Strengths:

1. Experience and atmosphere that attracts young researchers. Five dissertations were defended after previous assessment in 2011 in the Centre for Cartography. All five new PhDs work in VU: one full-time, four part-time (one currently on maternity leave). Young people with this qualification are offered much greater salaries in job market, so we consider it a very big achievement that they have motivation to dedicate some of their time for teaching.

(as listed by the experts of previous external assessment of 2011):

2. The programme is in the hands of an enthusiastic and well-qualified staff, which supports the quality of the studies and enables the achievement of the intended learning outcomes.
3. The staff seems to be largely competent in the subjects they teach, actively participating in applied projects directly related to the study programme content.

Weaknesses and threats:

1. Low salaries in Vilnius University. In GIS and cartography business average salary for a person with associate professor qualification (i.e., system analyst or project manager in industry) may be two to five times higher than what university offers for professors in Lithuania. Therefore they have to work in business or government to compensate for that. There is always a risk that under inadequate pressure to publish or teach more they will give preference to better paid jobs. Salary also does not motivate to seek for higher academic positions.

(as listed by the experts of previous external assessment of 2011):

2. The workload of the programme leaders is much too high to provide adequate time for active participation in scientific research work.

Improvement measures:

1. (in response to Threat1) Close contacts with industry strengthening relevant research and co-operation in industry where the staff member work. It has resulted in joint high level research papers. Given necessary resources for salaries, we would be able to hire at least two more associate professors (part-time) who now work in related industry and government.
2. (in response to Weakness 2) We have very seriously considered the criticism expressed in the previous assessment report. Number of permanent teaching staff increased from three in 2011 to

six in 2014 and 7 in 2016. The work load was redistributed as much as the requirements set by VU allow.

Weaknesses listed by the experts of previous external assessment of 2011:

1. Although the curriculum ensures that students achieve all the intended learning outcomes to enable them to work on cartography applications, it does not sufficiently promote abilities to conduct scientific research.

Comment: not relevant in 2017. We believe that sharp criticism concerning the ‚lack of scientific mentality' was directed to not more than a couple of staff members that do not longer work in the DCG.

4. Facilities and learning resources

4.1. Rooms available for studies and the number of workplaces

DCG main premises are auditoriums 220 and 114 (since 2015) and laboratory No.116. The computer class 314 and other auditoriums of the FCHG IG are used for workshops, joint lectures, examinations and other activities. The facilities meet hygienic and safety requirements and are equipped with modern stationary and portable aids for multimedia demonstrations.

Most of practical assignments are performed using standard personal computers, Internet and special software.

All premises were renovated during the period of assessment, new furniture and equipment installed. The resources are completely sufficient for the study programme.

Institute library work time is 10 a.m – 19 p.m. There are 48 places in reading room (4 computer workstations with internet). All students also can use the central library services: 700 workplaces available 24/7.

Table 17. Rooms most frequently employed for studies

Room No	Address	Area, m^2	Number of workplaces	Equipment available in the room
220	M.K.Čiurlionio str. 21 / 27	61,29	16	wi-fi, computer, projector.
114	M.K.Čiurlionio str. 21 / 27	39,24	24	Internet cable for 6 workplaces, 7 computer, wi-fi, projector
116	M.K.Čiurlionio str. 21 / 27	37,70	12	Internet cable for 2 work place, 2 computer with Photo Mode software, projector, digitizer, scaner A3.
302	M.K.Čiurlionio str. 21 / 27	73,51	8	Internet cable for 8 work place, ploter scaner A3,
109	M.K.Čiurlionio str. 21 / 27	37,44	5	Internet cable for 6 work place.

Table 18. Teaching and learning laboratories used in the study process when implementing the SP of Cartopgraphy, including the number of workplaces and the area

No	Teaching and learning laboratories	Number of workplaces	Area, m^2	Area, m^2 per workplace
1.	116 (remote sensing)	4	73,51	73,51
2.	302 (cartography)	8	73,51	73,51

Table 19. Renovation of teaching and learning laboratories

No	Room for teaching and learning	The works completed and their cost, EUR
1.	116 (for remote sensing teaching and learning)	Adapted for lectures and seminars (mobil projector, 2 work place with Photo Mode software). Cost – 5714 EUR.
2.	302 (for learning)	Adapted for individual learning (8 work place, ploter

		scaner A3). Cost – 6382 EUR.

Premises (Room 116) were renovated and a new Remote Sensing laboratory was formed.

4.2. Equipment for studies

In 2012, photogrammetry workstations were installed and system software updated.
In 2015, two grants were received from the Agency for Science, Innovation and Technology as reward for the National Atlas project. 7953 € was received in March 2015 and 11584 € in September 2015. Major part of the grant was spent on two UAVs, tablet computers and update of hardware and software.

Hardware

The students have access to all hardware of the DCG and FCHG IG and to the optical cable and wireless Internet. (SVDPT) Safe state data transfer network connection for interchange of sensitive data is available. Students are also allowed to use their personal computers where the main software is installed for the study period.

Table 20. Hardware used for Cartography Master study programme

Room No.	Premises	Workplaces / PC WP[19]	Additional equipment
116	Laboratory	16/4	Stereoplotter *TopocartD* Stereocomparator Stereoscope Computer block *P III 800* Laser copier *EPS-1050* Multimedia projector *XD2000* GPS-III plus Printer *LaserJet SAMSUNG ML-1915* Software *PhotoMod* (2 places) Scanner *Color CIS Flatbad A3* Echo-sounder *echoMAP CHIRP 42 dv* Telemeter *Leica DIST D510* Quadracopter *X5C Explorers* (4 pieces) Tablet computer *GOCLEVER Quantum 960 mobile* (4 pieces)
302	Laboratory	5/5	Plotter *HP DesingJet 350c* Printer *HP DeskJet 9300* Printer *HP LaserJet 4v* Scanner *HP Scanjet 4c A4* Scanner *MUSTEK ScanExpress A3*
302	Laboratory	4/4	Tacheometer *Elta-50 R* Optical rangefinder *CT-5* Plotter *HP DesignJet 350c* Printer *HP LaserJet 4v*

[19] Computer workplace that includes a stationary PC and basic software: Operating system (Windows or Linux), Office programs (MS Office or OpenOffice), Other free open source software.

			Printer *SAMSUNG LaserJet 3000* Scanner *CanoScan 4400F A4* Scanner *Color CIS Flatbad A3* Scanner *Mustek ScanExpress A3 USB* Scanner *IPIScan Book 3*
109	Laboratory	4/4	Topographic-geodetic equipment (theodolites, levels, hubs etc.) Unmanned aerial vehicle *INSPIRE 1* Unmanned aerial vehicles *SUOPIS 2*

Hardware is updated upon possibility, 10-15%, every year, purchasing new equipment or upgrading the old one. A EU funded project in 2012 allowed completely replacing the obsolete equipment of the computer class and purchasing modern photogrammetric stations that are shared with other departments of the FCHG IG.

Software

The programme has extensive access to GIS software solutions.

ArcGIS by ESRI ® is the main GIS software used for teaching and projects. It is also the main commercial software used in Lithuanian state institutions and companies. Promoted by the DCG, academic site licence is purchased by VU and available throughout the University and administrated centrally (gis.vu.lt). The Education Site License provides the right to use an unlimited number of licenses of the software products for teaching, research, or administrative purposes. The software package includes:

- Desktop GIS
  - ArcInfo
  - ArcEditor
  - ArcView 9.1
  - ArcGIS extensions: ArcGIS Spatial Analyst, ArcGIS 3D Analyst, ArcGIS Geostatistical Analyst, ArcGIS Publisher, ArcGIS Schematics, ArcGIS Survey Analyst, ArcScan for ArcGIS, ArcGIS Military Analyst, Maplex for ArcGIS, and ArcGIS Network Analyst
- Server GIS
  - ArcSDE
  - ArcIMS
  - ArcGIS Server License with ArcGIS Server Spatial Analyst extension, ArcGIS Server 3D Analyst extension, and ArcGIS Server Network Analyst extension options
- Developer GIS
  - ArcGIS Engine Developer Kit
- Mobile GIS
  - ArcPad Application Builder including ArcPad
- Business GIS
  - BusinessMAP 4
  - ArcLogistics
- Other GIS Software
  - MapObjects—Windows Edition
  - MapObjects—Java Edition
  - NetEngine for Windows and UNIX
  - Production Line Tool Set (PLTS) for ArcGIS—Mapping Agency Solution

Additional benefits that come with the ArcGIS Education Site License are Virtual Campus — unlimited seat, Standard Subscription (These are primarily technology courses that teach Esri software and the Spatial Analysis of Geohazards course) and complimentary passes to the Esri National and International User Conferences.

Hexagon Geospatial is another commercial package, upon agreement between the vendor and the DCG provided free of charge for non-commercial use. Available throughout the University and administrated centrally (gis.vu.lt). Products:

- GeoMedia
- ERDAS IMAGINE
- IMAGINE Photogrammetry
- ImageStation
- ECW
- ERDAS APOLLO
- GeoMedia Smart Client
- GeoMedia WebMap
- Geospatial Portal
- Geospatial SDI
- Mobile

QGIS is open source GIS.

One year academic licence is also distributed on CDs and can be used by the students at home or portable computers.

Other commonly used **commercial cartographic software** at the DCG:

Graphic and Web design:

- Adobe Acrobat
- Adobe Illustrator
- Adobe InDesign
- Macromedia web tools

CAD, geodetic, photogrammetric software:

- AutoCAD
- CAD software "Spirit"
- Garmin "Trip & Waypoint Manager"
- GIS software:
- Mapinfo GIS
- "Easy Trace"
- "Raster Design".

Newest commercial, open source and trial cartographic software is recommended and newest products are widely used by the students ad the staff.

4.3. Internship centres

Our social partners SE "GIS-Centras" and National Land Service occasionally provide workplaces for the students who are interested in practical experience as addition to the study programme.

4.4. Teaching and learning resources

The students mainly use Vilnius University library and the Institute library resources. Scientific journals, textbooks, full text databases are ordered centrally, taking into account the needs of each SP.

Learning resources in Lithuanian language are prepared and maintained by department teachers. Most of the resources are published in electronic versions and freely available from the DCG website.

The shortage of learning resources is compensated by buying publications in other languages. The annual annual budget for new learning resources ((mostly in English: textbooks, handbooks, scientific books, etc.) was relatively stable during the last 5 years (**Table 21. Budget alotted for publications, EUR**

). It assures continuous improving of learning resources quantity and quality and mostly satisfies the requirements of the students.

Table 21. Budget alotted for publications, EUR

2012	2013	2014	2015	2016
500	500	450	500	600

The budget for publications is established for every department. The individual subject supervisor is responsible for revising and picking most useful and required item. Usually, quality, not quantity is prioritized. Electronic learning resources are becoming dominant between available sources (especially for independent work) for study process. They could be classified as: available from DCG internet database (http://www.kc.gf.vu.lt); reached via VU library access (https://biblioteka.vu.lt/istekliai); and freely available form internet sites & databases. Currently, the use of electronic resources exceeds 70% and rising. They are frequently used for seminars (90% of all resources) and practicals (~50%).

Teaching and learning resources include

a) textbooks and scientific literature available at the library of the FCHG IG and other libraries;
b) extensive access to scientific publications' databases (http://www.mb.vu.lt/istekliai/) from the VU computers or using VPN (especially Sage Publications: Sage Journals Online, Science Direct (SciVerse), Academic Search Complete (EBSCO).
c) professional monthly journals "Geoinformatics", "Geo: International", "Arc User", "ICA News", "Geodesy and cartography"; ESRI Map Books.
d) maps, atlases and other cartographic materials stored at the DCG;
e) other online materials and courses, that are practically unlimited. Virtual ESRI courses accessible to our students free of charge;
f) intense training courses occasionally offered free of charge by our social partners HNIT-Baltic (www.hnit-baltic.lt).

Over 50 new publications in Cartography, most of them theoretical studies were purchased or donated by social partners in 2012–2016.

ESRI **Virtual Campus online courses** for deeper specialization in GIS methods are available as a part of ESRI Educational Site Licence. Full list is provided at https://www.esri.com/training/catalog/ (total 518 courses in November 2016).

4.5. Strengths and weaknesses of the area under evaluation and improvement measures to be taken

Strengths:

1. Strong support of the programme by main commercial GIS vendors – possibility to use newest products for low price or free of charge, participate in training etc.
2. Available open source GIS software and digital resources.
3. Newly acquired UAVs and remote sensing software.
4. Possibility to get technological assistance from social partners.

(as listed by the experts of previous external assessment of 2011):

5. GIS and cartographic software provision that enables the achievement of intended learning outcomes, including good preparation for commercial employment in the field.

6. Secured EU funding (in 2012) that will enable investment in new computing and photogrammetric equipment.

Weakness: decentralized facilities are sometimes used inefficiently.

Improvement measures: ongoing optimization of resources after reorganization of the Faculty.

Weaknesses listed by the experts of previous external assessment of 2011):

1. „Laboratory equipment and facilities are very dated."
2. Technical support and current funding for maintenance and regular replacement of equipment are inadequate.
3. „Literature resources to support scientific research are poor."
4. The lack of practice placement (internship) opportunities.

Comment: not relevant in 2017. Improvement measures taken:

1. (in response to Weakness 1) Equipment and facilities completely updated in 2012.
2. (in response to Weakness 2) Use of VU and geoportal.lt GIS cloud PaaS, sharing hardware resources and thorough budget planning including commercial projects. Use of support from the European Structural funds and from Lithuanian Academy of Sciences.
3. (in response to Weakness 3) Printed and digital books, full access to the scientific databases subscribed by VU.

5. Study process and assessment

5.1. Admission requirements, statistics and major tendencies

Candidates to the SP of Cartography are admitted in accordance with the *Rules of Admission to the Second-cycle Study Programmes of Vilnius University*, approved by the VU Senate. The Rules are accessible on the VU website[20]. A prerequisite for admission is the completion of the first-cycle studies in Physical and Social Geography, Geology, Ecology, Archeology, Measurement Engineering, Environmentas Science, Environmental Engineering, Mathematics, Informatics, Information Engineering or Computer Science. The entrance score is calculated according to a formula, by adding up the mean value of the marks enumerated in the Diploma Supplement and a mark for the graduation thesis or marks for the final examinations. During the period of self-evaluation, the principles of calculating the entrance score has not been modified.

Table 22. Entrance scores of the candidates admitted to the SP of Cartography during the period of self-evaluation

Year of admission	No of students funded by the state (sf) / not funded by the state (nsf)		Entrance score of the students admitted to the study programme of Cartography			Mean value of the entrance score of all Faculty programmes
			Highest score	Lowest score	Mean value	
2012	sf	8	43,41	37,17	40,29	24,08
	nsf	0	-	-	-	-
2013	sf	12	47,43	40,40	43,92	26,59
	nsf	0	-	-	-	16,15
2014	sf	14	49,73	35,27	42,50	24,54
	nsf	0	-	-	-	21,81
2015	sf	13	29,85	19,93	24,89	24,81

[20] See http://www.vu.lt/kviecia/rinkis-studijas/kaip-istoti/2-pakopos-studijos

	nsf	0	-	-	-	15,07
2016	sf	13	30,21	20, 95	25,58	23,94
	nsf	0	-	-	-	23,78

Competitive analysis allowed discerned two periods; 2012-2014 and 2015-2016. These periods difference about 10 points of competitive value. This is due to several causes:

1. Reduces studying motivation of all bachelor students.
2. Most enrolled undergraduate students leave to pursue postgraduate studies in foreign universities.
3. No 1st cycle cartography study programme had not been implemented in Lithuania until 2017 . Other Bachelor's degree graduates choose to study cartography. Some of them were random and insufficiently motivated.

Table 23. Results of candidate admission to the SP of Cartography during the period of self-evaluation

Year of admission	Number of students funded by the state (sf) / not funded by the state (nsf)	Planned number of students	Number of applications		Regular competition*	Number of admitted students	Admitted students (% of planned number)
			1st priority	Total			
2012	sf	8	**7**	**9**	1,125	9	113
	nsf	2	-	-	-	-	-
	Total	10	**7**	**9**	0,9	9	90
2013	sf	8	15	20	2,5	12	150
	nsf	2	0	1	0,5	0	0
	Total	10	15	21	2,1	12	120
2014	sf	10	18	25	2,5	15	150
	nsf	2	0	1	0,5	0	0
	Total	12	18	26	2,16	15	125
2015	sf	14	12	20	1,42	13	93
	nsf	5	0	1	0,2	0	0
	Total	19	12	21	1,11	13	68
2016	sf	10	13	19	1,9	13	130
	nsf	5	0	2	0,4	0	0
	Total	15	13	21	1,4	13	87

* *Regular competition* defines the competition to the study programme in terms of the total number of applications (candidates) per place

Applicants prefer the state-funded studies and in these position the number of entrants increases all time. No state-funded studies annually choose only a few students, but because tuition fee is high they do not start to study.

It can be noted that 8–12 students group is optimal to cartography master studies, so latest admission results can be considered as highly satisfactory. For practicals the group is usually divided into two groups.

Cartography Master programme is quite popular among the applicants despite its relative complexity and technological orientation that sometimes is a challenge for the graduates of the geoscience bachelor programmes. However, the programme attracts bachelors from other universities with very different background among which informatics, archaeology, biology, and transportation engineering can

be mentioned. For those reasons motivation level is quite high. Analysis of the student enrolment to the programme of shows that average competition to the state-funded places and admission scores are among the highest in the FCHG IG (former Faculty of Natural Sciences). All state-funded places have been so far 100% filled. Whereas the number of newly admitted students in many programmes decreases, for Cartography programme it practically doubled compared with 2011.

5.3. Changes in the number of students: dropout rate and its causes

Students usually decide to leave university for several reasons:
1. Inability to combine full-time work and studies.
2. Health problems.
3. Personal reasons.

The exceptional situation when half of admitted students suspended their studies was in autumn 2014. They all realized that they would not manage to combine full-time work and studies and quit in the first semester.

Table 24. Dropout rate in the study programme of Cartography

Year of admission	**Number of admitted students**	**Number of dropouts**				**Dropout rate, %**
		1st year of study	**2nd year of study**	**Year of graduation**	**Total during the SP implementation period**	
2012	sf 8	0	1	2014	1	13
	nsf 0	0	0		0	0
Total	sf + nsf 8	0	1		1	13
2013	sf 12	0	0	2015	0	0
	snf 0	0	0		0	0
Total	sf + nsf 12	0	0		0	0
2014	sf 14	7	0	2016	7	50
	nsn 0	0	0		0	0
Total	sf + nsf 14	7	0		7	50
2015	sf 13	0	2	2017	2	15
	nsf 0	0	0		0	0
Total	sf + nsf 13	0	2		2	15
2016	sf 13	1	0	2018	0	0
	snf 0	0	0		0	0
Total	sf + nsf 13	1	0		0	0
Grand total during the period	**sf 60**	**8**	**3**		**11**	**18**
	nsf 0	**0**	**0**		**0**	**0**
	sf + nsf 60	**8**	**3**		**11**	**18**

Table 25. Causes of leaving the university in the period between 2012 and 2016

	Year of study	**Year of admission**					**Total**
		2012	**2013**	**2014**	**2015**	**2016**	
Failure to meet financial obligations	1st	-	-	-	-	-	-
	2nd	-	-	-	-	-	-
Unsatisfactory academic results	1st	-	-	-	-	-	-
	2nd	-	-	-	-	-	-

Academic dishonesty during the assessment of academic progress	1st	-	-	-	-	-	-
	2nd	-	-	-	-	-	-
Family reasons	1st	-	-	-	-	1	**1**
	2nd	1	-	-	-	-	**1**
Failure to renew studies after academic leave or suspension of studies	1st	-	-	-	-	-	-
	2nd	-	-	-	2	-	**2**
Inability to combine full-time work and studies	1st	-	-	7	-	-	**7**
	2nd	-	-	-	-	-	-

5.4. Organization of studies and academic support to the students

The aim of the study process is to ensure an effective implementation of the study programme so that the purpose is attained and learning outcomes of the SP are developed.

Information on the studies is provided by different institutions, from the Administration of Studies and the Dean's Office of the FCHG to the academic staff of the study programme of Cartography and tutors appointed by the Students' Representation. The website set up by the Administration of Studies (www.klausk.vu.lt) provides access to the ask-and-get-an-answer system, where answers to questions are provided by representatives of the Administration of Studies or the Faculties. This is a very fast and convenient system saving time and replacing more time-consuming face-to-face communication in the office. The staff members of the DCG also consult the students face-to-face and by electronic communication tools.

All information about the study process (study calendar, timetables of lectures and examinations, optional course and modules, the procedure of assessment and retaking the examinations), about partial studies abroad, tuition fees, grants, funding of studies is provided by the Faculty administrative staff responsible for studies, Vice-dean for Studies and Chair of the Study Programme Committee. The information is available at the website of FCHG IG. Another option is the Vilnius University information system of studies, or VUSIS. There the students can access personal data, copies of relevant orders, study plan, examination timetable and results, etc. The students can also actively participate in the process of study by enrolling in optional courses and modules or courses of general university education, etc.

All timetables of the upcoming semester become available online tree months after new semester. Upon the completion of the first semester, as provided by the *Regulations for Studies of Vilnius University*, all students have an opportunity to study according to their individual study plans. For that purpose, their applications, including sound motivation, shall be submitted to the Dean's office and approved by the Dean.

Questions related to the learning outcomes, the content of a course unit or module, career opportunities are within the responsibility of the Chair of the Study Programme Committee and the academic staff of the programme. They are all available for consultation at the time specified in advance or between/after the classes, or can be reached by electronic mail. Career opportunities are discussed during the classes, at the meetings with the Faculty alumni and potential employers. Meetings with alumni potential employers held every year in February - March. Potential employers present requirements for future employees and career opportunities. Every year in December held annual Lithuania Cartographic Society meeting were students have the opportunity to discuss trade prospects.

As provided in the *Regulations for Studies of Vilnius University*, students facing problems ensuing from unsatisfactory academic results are eligible for a second attempt. If they fail an examination, they may retake it once. If they fail the second time, they may repeat the whole course (module) by attending it together with other students who take it for the first time and resit the examination one year later. Those who have accumulated 15 credits of failed courses (modules) shall be expelled from the University and may renew their studies after having passed all relevant examinations.

Those who disagree with the examination procedure or the results, may launch an appeal to the Appeal Commission of the Faculty no later than five days after the results become available. A decision reached by the Appeal Commission on the results shall be final and not subject to further appeal. However, the examination procedure may be subject to further appeal at the VU Dispute Tribunal.

Students having health problems may take academic leave upon submitting a medical certificate; the leave shall be no longer than two years. Academic maternity leave may also be granted; it shall be no longer than three years. Upon the Dean's approval, the student, having a sound reason, may suspend his/her studies for one year.

The Students' Representation of Vilnius University deals with various problems of the students, defends their interests, takes care of their academic and social welfare, organizes events of culture, fosters University traditions of student life, helps first-year students in their integration into the University community. Usually the Student Representation appoints a tutor, a senior student, who is a contact person in matters of different nature for all first-year students.

5.5. Social support to the students: grants, loans, tuition fees, hostels

The main form of social support to the students is financial allocations. The students may be eligible for the following: special grants for academic excellence (in the year 2012-2016 the students of the study programme received 8 such grants).

Another form of social support is loans provided to the students by the state (administered by the State Studies Foundation) and allowances for students with disabilities. (This is administered by the Department for the Affairs of the Disabled under the Ministry of Social Security and Labour of the Republic of Lithuania). Information on the procedure of allocating and disbursing the above allowances is accessible on the VU website[21]. All the above forms of social support are introduced to the students admitted to the study programme of cartography during the introductory lectures of the first semester.

Accommodating students, residents of towns and villages outside Vilnius, in the hostels of Vilnius University might also be treated as social support. The demand for hostels is fully satisfied. Students in need of social support or with disabilities are eligible for a reduction when paying for the hostel.

Especially talented students manifesting academic excellence and taking part in research may be eligible for special VU grants according to study and research fields. More information is available on the VU website[22].

Moreover, Vilnius University offers professional psychological assistance to students and staff through the Psychological Training and Research Centre. Single consultations or cycles of consultations might be helpful to those facing problems of private or family life, social integration or studies.

5.6. Students' participation in research, sports and arts

The students enrolled in the study programme of Cartography, like any other VU students or staff, have multiple opportunities of self-expression outside their classes, usually in sports, arts and music[23].

The Health and Sport Centre of Vilnius University offers the programme of healthy lifestyle intended for the students and academic staff. The Centre has three gyms and/or stadiums in Vilnius (Saulėtekio al. 2, Saulėtekio al. 26, M. K. Čiurlionio g. 21/27). The students may make use of the facilities and equipment of the Centre, join general training classes or enrol in individual training programmes, choose a particular sport. In the Centre, people may, individually or in groups, engage in a number of sporting activities such as jogging, fitness, basketball, football, table tennis, volleyball, etc.

A number of choirs, drama troupes, orchestras and ensembles are available at the VU Centre of Culture. They can be frequently seen performing in many national and international festivals in Lithuania and abroad.

The students are offered multiple opportunities of participation in the activities of the Students' Representation of the FCHG and of Vilnius University (the latter is referred to as VUSA). The bodies representing the students aim at ensuring that such representation at all levels in VU is based on the students' needs and is high-quality, also at strengthening the self-governance of the students, etc. VUSA issues student-oriented newspaper *Studentų era*, which is the largest publication of its type in Lithuania.

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[21] See http://www.vu.lt/lt/studijos/studiju-procesas/finansine-parama.
[22] See http://www.vu.lt/lt/studijos/studiju-procesas/finansine-parama#vardines_stipendijos.
[23] http://www.ssc.vu.lt/cms/ and http://www.kultura.vu.lt/

5.7. Student exchange programmes

Studies abroad and processes of international cooperation in Vilnius University are administered by the International Programmes and Relations Office. At the FCHG, such responsibility is assigned to Dr. associate professor Rasa Šimanauskienė.

The students of the Faculty have multiple opportunities to enrol in partial studies of one semester or one academic year study within the exchange programmes Erasmus and Erasmus+ and bilateral agreements. The Faculty has Erasmus agreements with a number of European universities (see Table below).

Table 26. ERASMUS agreements concluded by the Faculty

No	Country	University/ other HEI	Number of Erasmus agreements
1.	Germany	Dresden Technical University	1
2.	Austria	Carinthian University of Applied Sciences	1
3.	Sweden	Technical University of Gavle	1
4.	Greece	Aristotle University of Thessaloniki	1

The DCG co-ordinates four ERASMUS agreements (Dresden Technical University, Carinthian University of Applied Sciences, Technical University of Gavle and Aristotle University of Thessaloniki). Three of them result in an intense exchange. DCG is becoming a popular place for the practical semester among the students of Dresden Technical University, Germany. Lithuanian students are more attracted by innovative GI management studies in Austria. Two textbooks in English for the exchange students were prepared and published in 2009 and in 2016.

There is a stable trend that our students who are not employed continue to participate in ERASMUS programme. They appreciate this possibility and confirm the benefits several years after graduation.

Table 27. Student mobility in the SP

Year of study	Number of outgoing students	Institution (country)
2012	1	Aristotle University of Thessaloniki (Greece)
2013	2	Carinthian University of Applied Sciences (Austria)
2014	0	
2015	1	Carinthian University of Applied Sciences (Austria)
2016	1	Carinthian University of Applied Sciences (Austria)
2017	2	Carinthian University of Applied Sciences (Austria)

Incoming students are mainly from Germany, often recommended by the colleagues German universities. They typically come for a practical semester (in some cases for two semester) during which they take part in the research and applied projects carried out in the DCG. Since 2005, DCG has had 11 exchange students, the last one in 2014–2015. Of them, 8 from the Dresden Technical University, one from the University of Graz (Austria), also from France and Finland. Some of their feedback is at http://kc.gf.vu.lt/?page_id=245.

5.8. Assessment of academic progress

The procedure of assessing academic progress, retaking the examinations and of appeals of students dissatisfied with their assessment results is stipulated in Vilnius University by the *Regulations for Studies*, the *Procedure of Assessing Academic Progress* and the *Regulations of the Appeal Commission for*

Assessing Academic Progress in a Core Academic Unit of Vilnius University[24]. All questions of academic assessing are introduced during the introductory lectures of the first semester.

All information on the assessment of academic progress, schedule of examinations, failed examinations and retaking them is available on the VU website[25].

During the first class, each SP academic staff member shall introduce the syllabus of the course (module) by focusing on its aim, learning outcomes, content, study and assessment methods as well as assessment strategy. The assessment criteria and the importance of meeting the deadlines are also discussed.

The system of assessment is specified in the course unit (module) description.

Academic progress may be assessed in different ways; several methods may be combined, such as continuous, mid-term and final assessment. The final assessment is mandatory[26]. The final mark for the course unit may be cumulative, calculated on the basis of the proportions specified in the course unit description. The form of the final assessment in Vilnius University is an examination. If the course unit extends over several semesters, all but final semester of the course unit end in a pass/fail assessment.

The examinations may be oral and/or written. Currently, Vilnius University employs a 10-point assessment scale[27]. The points on the scale are defined as "excellent, exceptional knowledge and skills", average knowledge and skills, some inessential mistakes", etc.

Table 28. Vilnius University scale of assessment and marks

Pass, fail	System of assessment	Description
PASS	10 (excellent)	Excellent, exceptional knowledge and skills
	9 (very good)	Very good knowledge and skills
	8 (good)	Knowledge and skills are above average
	7(average)	Average knowledge and skills, some inessential mistakes
	6 (satisfactory)	Knowledge and skills are below average, there are errors
	5 (weak)	Knowledge and skills meet the minimum requirements
FAIL	4, 3, 2, 1 (unsatisfactory)	Below minimum requirements

The final mark is usually calculated on the basis of the marks for the examination paper, participation in seminars, individual or group project, final (oral and/or written) examination. All general principles of the assessment and of ensuring feedback are specified in the documents of Vilnius University: the *Procedure of Assessing Academic Progress* and the *Procedure of Ensuring Feedback to all Involved in the Study Process*[28].

The bachelor graduation thesis is assessed by the Viva Voce Defence Committee of Graduation Theses in reference to the assessment criteria of graduation theses (http://kc.gf.vu.lt/wp-content/uploads/2016/10/reikalavimai-magistro-darbui.pdf. The members of the Committee take into consideration the graduation thesis, its presentation during the defence, responses of the author of the thesis to the questions of the reviewer and the members of the Committee, reviews and opinions of the reviewer and the supervisor of the thesis. If there is no unanimous agreement about the final mark, the final decision is taken by the chairperson of the Committee.

[24] *Regulations for Studies* approved by Decree No SK-2012-12-8 of Vilnius University Senate Commission 21 June 2012; available in Lithuanian at http://www.vu.lt/site_files/SD/Studentams/SP/SRD/VU_studiju_nuostatai_naujoji_redakcija.pdf; *Procedure of Assessing Academic Progress* approved by Decree No SK-2012-20-6 of Vilnius University Senate 13 December 2012, available in Lithuanian at http://www.vu.lt/site_files/SD/Studentams/Studiju_pasiekimu_vertinimo_Tvarka_12.21.pdf; *Regulations of the Appeal Commission for Assessing Academic Progress in a Core Academic Unit of Vilnius University* approved by Decree No SK-2012-20-3 of Vilnius University Senate Commission, available in Lithuanian at http://www.vu.lt/site_files/SD/Studentams/Padalinio_akademines_etikos_komisijos_nuostatai.pdf).

[25] See http://www.vu.lt/lt/studijos/studiju-procesas/egzaminu-sesija.

[26] In the modular system, mid-term assessment is also mandatory.

[27] http://www.vu.lt/lt/studijos/studiju-procesas/egzaminu-sesija/45-studijos/studijos/2591-vertinimo-sistema. Also see the *Procedure of Assessing Academic Progress*: http://www.vu.lt/lt/studijos/studiju-procesas/studijas-reglamentuojantys-dokumentai#vu_nutarimai [1 June 2012]

[28] See http://www.vu.lt/site_files/SD/SK/SP_dalyviu_GR_tvarka.pdf. Approved by VU Rector's Order No 115 2009 05 29.

To ensure academic honesty during the studies, Vilnius University has taken various measures. The academic staff and the students shall adhere to the principles of ethics laid down in the *Code of Academic Ethics of Vilnius University*[29], which defines general norms of academic, teaching, studies and research ethics. The Code also defines the notion of violation involving cheating, plagiarism, bribery, unsolicited dishonest assistance to the peers, etc.

As the studies are problem-oriented and based on individual approach, practically no space is left for cheating. During exams the students are usually allowed to use any literature for references, but instead of re-citing, they have to demonstrate essential and individual understanding of the problem. The feedback from students clearly shows that such approach is appreciated and considered objective, even though it makes exams more difficult and evaluations somewhat lower. Master theses are checked against plagiarism automatically by the system implemented in the VU.

In 2003–2016 12 out of 85 graduates of the Cartography Master programme (14%) have demonstrated distinctive results and are among the best of the FNS graduates, among them five *Magna cum Laude* and five *Cum Laude* diplomas. Three graduates already hold PhD degrees and three are PhD students.

5.9. Professional activities of SP graduates

Of the 85 graduates before Autumn 2016, we have information about professional activities of 83. Most of the graduates had found jobs in the field of study within one year after graduation (about 1/3 – before graduation). The statistics of the SP graduates is shown in Figure 2.

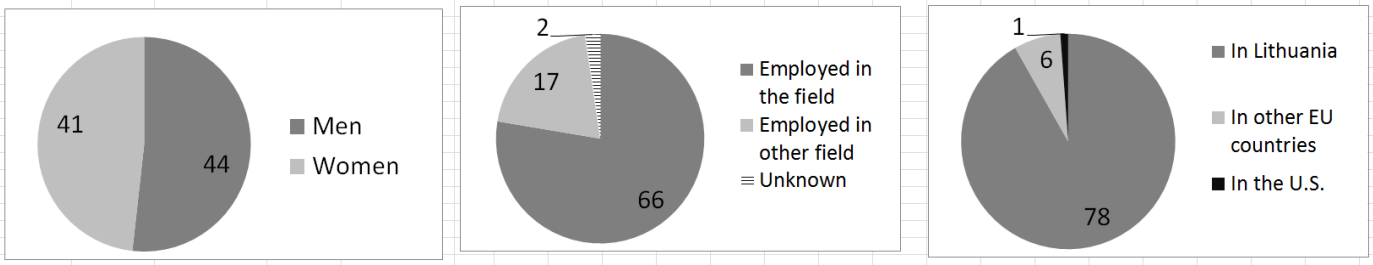

Fig. 2. Graduates from the study programme of Cartography

5.10. Strengths and weaknesses of the area under evaluation and improvement measures to be taken

Strengths:

1. Broad and diverse carreer opportunities in Lithuania and worldwide, resistant to possible changes in social, political, legal and economic environment

(as listed by the experts of previous external assessment of 2011):

2. The study process and student assessment are functioning well, ensuring the graduation of well-qualified specialists in the field.
3. Employment prospects for the graduates are good and would appear to be so for the foreseeable future.

Weaknesses:

1. Decreasing number of students in Lithuania

(as listed by the experts of previous external assessment of 2011):

[29] *Code of Academic Ethics of Vilnius University* approved by the Senate Commission of Vilnius University 13 June 2006, Minutes No S-2006-05, available in Lithuanian at http://www.vu.lt/lt/studijos/studiju-procesas/studijas-reglamentuojantys-dokumentai/45-studijos/studijos/2564-akademines-etikos-kodeksas.

2. Thesis topics reflect the work in cartographic applications that dominates the work of the academic staff and there is considerable room for improvement in the quality of thesis.

Improvement measures:

1. (in response to Weakness 1) Development and application of diverse advertisement strategies targeting different groups – schools, colleges, industry and government professionals.
2. (in response to Weakness 2) Strengthening control over students‘ research work. We encourage theoretical research topics although they are naturaly not so popular among students who are not oriented to academic career.

6. Study Programme management

6.1. Regulation of study quality assurance

Fostering quality culture is a strategic aim of Vilnius University. It is made feasible by adhering to the values specified in the VU mission and in the *Standards and Guidelines for Quality Assurance in the European Higher Education Area*[30]. In Vilnius University, all study programmes and their implementation are administered by the Administration of Studies, which is also responsible for ensuring the quality of functioning of the units of different levels in VU[31].

The main document concerned with the internal quality insurance of studies is: *Vilnius University. Quality Manual*[32]. The document was drafted during the implementation of the Project *Setting up the System of Internal Study Quality Management and its Implementation at Vilnius University* (2011-2013). The Centre was later reorganised with its main functions transferred to the Administration of Studies. The key aim of the Project was concerned with ensuring a systemic and continuous improvement of quality of University studies and of all study-quality related activities as well as with consolidating and coordinating the community's efforts. The results of the Project are available on the VU website[33].

When implementing and improving the processes and procedures of internal quality assurance, Vilnius University takes the responsibility for approving, monitoring and evaluating its study programmes and qualifications awarded, the evaluation criteria applicable to the new study programmes, the programme intended for newly recruited academic staff (see the publication *Manual of Vilnius University Lecturer*[34]). The University also organises courses intended for the professional development of the academic staff, etc.[35].

As stipulated by the *Regulation of Study Programmes of Vilnius University*[36], a study programme shall be updated and its quality monitored on a regular basis. The quality is assured and improved through its internal evaluation and external assessment, by making the results of such evaluation and assessment accessible to the community, by accumulating and analysing the data about the programme and the process of study, by monitoring the feedback, ensuring the availability of facilities and learning resources, improving the qualifications of the academic staff, promoting the application of innovative methods of teaching, learning and assessment, improving the management of the programme and disseminating good practice[37].

All modifications of the study programme shall be subject to discussion and approval by the Study Programme Committee and the Faculty Council. When modifications involve changes in the title, field (branch) of studies of the SP, qualification degree, awarded as a result of its completion, professional qualification or scope of the SP, they shall be approved by the SP Committee, the Faculty Council and finally, by the Senate. The process of SP updating is supervised by the Administration of Studies of Vilnius University.

In accordance with the *Regulation of Study Programmes of Vilnius University*, assuring and improving the SP quality is the responsibility of the SP Committee, which operates in accordance with the Regulations of the Study Programme Committee[38]. The Committee is in charge of the SP and the assurance

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[30] *Standards and Guidelines for Quality Assurance in the European Higher Education Area*. See http://www.enqa.eu/index.php/home/esg/

[31] See http://www.kvc.cr.vu.lt/site.

[32] *Vilnius University. Quality Manual*. Vilnius, 2013. available in Lithuanian at http://skvis.vu.lt/pub/book/qm/topic/10298430.

[33] See http://www.kvc.cr.vu.lt/site/?q=node/76.

[34] *Manual of Vilnius University Lecturer*. Vilnius, 2013. available in Lithuanian at http://www.kvc.cr.vu.lt/site/sites/default/files/VU_destytojo_vadovas_4_16.pdf.

[35] See http://www.kvc.cr.vu.lt/site/?q=node/90.

[36] Approved 21 June 2012. See http://www.vu.lt/site_files/SD/Studiju_programu_reglamentas_2014_01_27.pdf. The document also specifies requirements for new study programmes (their preparation and registration) and the accreditation, evaluation and improvement of the existing study programmes.

[37] For more information about the processes of study quality improvement see http://www.kvc.cr.vu.lt/site/

[38] Approved 6 March 2014. http://www.vu.lt/site_files/SD/Studentams/SP/SRD/SPK_nuostatai_03.06.pdf

of the quality of its implementation. It is accountable to the Faculty Council for the SP implementation and shall report to it at least once a year. The Committee is composed of academic staff, student and employer representatives; the composition is approved by the Senate upon the recommendation of the Faculty Council. The aims of the Committee are also enumerated in the *Regulations for Studies of Vilnius University*, the *Procedure of Approving Academic Results* and other documents.

6.2. Aims and responsibilities of the Study Programme Committee

The composition of the Study Programme Committee (hereinafter also SPC) is as follows:

1. Algimantas Česnulevičius – Dr. Habil., professor, chair of the study programme committee.
2. Giedrė Beconytė - PhD, professor.
3. Artūras Bautrėnas - PhD, associated professor.
4. Linas Bevainis – PhD, lecturer.
5. Regina Prapiestienė – PhD, associated professor.
6. Evaldas Rožanskas - Deputy director, State enterprise „GIS-Centras“, representative of the social partner.
7. Audrius Kalesnikas - Master degree student, delegate from the VU Students' Representation of FCHG.

The latest addition SPC was approved 9 September 2016 upon the Decision of the Faculty Council. One of the key goals of the SPC is to seek the high quality of the programme so that its purpose is attained, its learning competences are developed, its content is compatible with the teaching, learning and assessment methods and the programme is competitive and relevant to the society. The SPC analyses feedback about the programme and its implementation received from different units of the Faculty, students, graduates, academic staff and social partners. In addition to standardised questionnaires launched by the Administration of Studies, the SPC may, on its own initiative, launch its own questionnaire focusing on the improvement measures to be taken as well as any other issue relevant to the students. In search of viable solutions, the problems are usually discussed by the SPC members with the Faculty administration and the academic staff of the SP. The SPC shall ensure the update of the SP purpose and content; moreover, it shall participate in preparing and approving all documents related thereof (e.g. new course units descriptions prepared by the academic staff). All decisions of the SPC are taken by the simple majority of votes of its members. Another function of the SPC, usually performed by the chair, is concerned with evaluating the competences acquired by the students in other SPs and deciding about the approval or disapproval of the academic results attained by those students in those SPs.

6.3. SP management database: Vilnius University information system of studies

The Faculty administration and the academic staff make use of the Vilnius University information system of studies (VUSIS), which consists of several sub-systems. One of them is meant for managing study programmes, offering access to people responsible for studies (Vice-dean for Studies, administrative staff, etc.). The administrative sub-system is an instrument for making, reviewing and editing study plans. Another subsystem is meant for managing the students and thus helps deal with the students' personal data, their marks for course units (modules), registration for optional course units (modules), titles of graduation theses; it helps issue certificates, approve the course units (modules) attended and assessed in another higher education institution. The sub-system also gives access to the results of considering the students' applications, marks for the course units (modules), etc. All orders related to the student affairs issued by the Dean or Rector (e.g. on the titles of annual papers or graduation theses, on business trips when going for partial studies in foreign universities, etc.) are prepared by VUSIS. The system also assists in issuing diploma supplements. VUSIS also stores admission data (competition, the number of admitted candidates by priority), various statistics related to students and studies. The academic staff members have online workplaces, where they can enter examination results, descriptions of course units (modules); they have

access to the list of students enrolled in their course. VUSIS makes information management and the implementation of studies much easier.

6.4. Students' and graduates' feedback about the programme and its implementation

Ways of getting feedback and handling it in Vilnius University are defined in the *Procedure of Ensuring Feedback to all Involved in the Study Process*[39]. Twice a year, at the end of each semester, the University launches questionnaires to be filled in by first and second cycle students through an electronic database. The questionnaires focus on the following:

1) On specific course units (modules) attended during the semester.

For that purpose, the same standardised course questionnaire is used in all the faculties of the University. Upon registration in the VU information system, a special slot on questionnaires opens up. There

- the students may anonymously evaluate their studies, including specific course units (modules);
- the academic staff members have direct access to the students' evaluation and feedback about their course units (modules);
- chair of the SPC has direct access to the students' evaluation and feedback on all course units (modules) of the SP;
- The Faculty administration has direct access to the students' evaluation and feedback on all course units (modules) of the study programmes implemented by the Faculty.

2) On general satisfaction with the studies during the last semester.

Detailed results of the questionnaires according to units and study programmes are available in the slot "Feedback" of the section of the Administration of Studies on the VU intranet. Vilnius University makes use of the results of the standardised questionnaires for the following:

- to improve the SP and a particular course unit (module);
- to ensure the quality assurance and improvement by the SPC and the Faculty administration;
- to prepare for external assessment when drafting the self-evaluation report;
- to analyse new study programmes;
- to evaluate the qualifications of the academic staff;
- to improve other activities of the Faculty and the University.

Internal quality assurance is performed by the Programme Committee. A discussion on quality issues is included in agenda of all Programme Committee meetings and are correspondingly documented. Every Programme Committee member carries personal responsibility for quality improvement and is obliged to share the ideas and raise problems to the Committee.

Information on quality of the programme is collected every semester using the following methods:

- inquests performed by the VU including those organised by the Student's Union;
- informal students' feedback, ratings of academic staff members (continuously);
- interviews with social partners and other stakeholders;
- discussions with staff members and analysis of the studies' results that take place at the beginning of every new semester;
- opinion of graduates and student expressed in social networks and discussion forums (continuously).

Up to now analysis of all quality assessment allows asserting that Cartography Master programme has high ratings among the students, the involved staff and the foreign partners. The competences of graduates make them wanted by the employers and this fact is testified by an impressingly high employment rate. We have never ever received a generally negative evaluation of the programme or a particular course from the graduates (some brief reviews are published at http://kc.gf.vu.lt/?page_id=894). The satisfaction level and motivation of the students is also very high despites big work loads and high performance requirements.

[39] Approved 29 May 2009. See http://www.vu.lt/site_files/SD/SK/SP_dalyviu_GR_tvarka.pdf

6.5. Cooperation with social partners

The social partner (GIS-centre, Enterprice Hnit-Baltic, National land Survey) take part in annual meetings with programme students. They comment and present requirements for future employees, discuss about career opportunities, submit proposals to the program structure and content of the specific subjects. The social partner proposed students research topics, professional practice themes and carrying out places. Every semester in study committee meetings social partners submit their proposals for program improvement.

6.6. Strengths and weaknesses of the area under evaluation and improvement measures to be taken

Strengths:

1. Positive and motivated staff members with personal attitude towards students that is possible due to relatively small number of students
2. The involvement of stakeholders in the Centre's programme management.
3. The design and operation of the University's internal quality assurance system to align with international standards.
4. The willingness to apply the results of internal and external evaluations to improve the programme.
5. Programme management with respect to work with students functions well and supports a good quality of studies.

Weaknesses:

1. Challenges due to expectations of students who already work or reside in other towns.

Improvement measures:

1. (in response to Weakness 1) More attention to virtual communication and study materials

Weaknesses listed by the experts of previous external assessment of 2011):

1. Management of staff resources does not support a necessary improvement in the research activities of the lecturers.

Comment: not relevant in 2017. Improvement measures taken:

Management of staff resources replaced at DCG level; further improvement is expected in relation with re-organization of the Faculty and new strategy of the VU.

Appendices

1. Descriptions of course units
2. List of academic staff engaged in the study programme of Cartography
3. Curricula Vitae of academic staff
4. List of students' graduation theses
5. Summary of Previous Assessment Report