Study Programme Description

Title of the study programme	National code of the programme
Software Engineering	621I30001

Official name of the institution, faculty (s)	Language(s) of instruction of the programme
Vilnius University, Institute of Computer Science, Department of Software Engineering	Lithuanian, English

Kind of study	Cycle of studies	Level of qualification according to LQF (LKS)
University studies	Second cycle	VII

Mode of study and length of the programme in years)	Length of the degree programme in ECTS credits	Total student's workload	Contact hours	Self-study hours
Full-time, 2 years	120	3200	740	2460

Study area	Major study field (branch) of the programme	Minor study field (branch) of the programme (if applicable)
Physical sciences	Software Engineering	-

Qualification degree and (or) professional qualification (if applicable) awarded
Master in Computing Sciences

Head of the study programme	Contact information of the head of the programme
assoc. prof. dr. Karolis Petrauskas	Vilnius University, Institute of Computer Science, Department of Software Engineering, Didlaukio Str. 47, LT-0830,3Vilnius E-mail: karolis.petrauskas@mif.vu.lt; tel. (+370) 614 90606

Accreditation organization	The Programme accredited until
Center for Quality Assessment in Higher Education	01-07-2020

The purpose of the study programme
The purpose of the programme is to prepare high qualification software engineers that are able to carry out independently research; to lead software development, maintenance and process improvement projects; to apply their knowledge in different application areas; to make decisions under conditions of limited information, and logically, unambiguously and clearly argue them among specialists and non-specialists.

Study programme profile		
Content of the study programme: groups of modules	**Format of study programme**	**Distinctive features of the study programme**
Study programme is composed of three groups of modules: I. Theoretical and applied modules (for more in-depth knowledge) – 58.33 pct. I.1 Compulsory modules – 38.33 pct.	Study programme combines a practical orientation with a developing ability to conduct research work.	Graduates of the programme acquire knowledge in technologies and management, and abilities to lead projects of software development, maintenance and

I.2. Optional modules – 20 pct. II. Research work and the Master's thesis – 41.67 pct.		process improvement.

Admission requirements	Recognition of prior learning
Minimal education for admission – major university studies and the acquired Bachelor's diploma. Successfully maintained the entrance examination of the major Software Engineering Bachelor's study program sections, ensuring prerequisite general as well as specific knowledge and competence.	In accordance with procedures established at Vilnius University.

Access to further studies
Studies can be continued in informatics, informatics engineering or another related science at PhD cycle in Lithuania or abroad.

Employability
A graduate will be ready to work as a project manager in information technologies, as a manager of software process improvement; in addition, as an analyst, designer, programmer or researcher in private and public sectors in Lithuania or abroad.

Learning and teaching approaches	Assessment methods
Lectures, problem-oriented teaching, case analysis, projects, seminars, discussions, laboratory works, individual work, research, preparation of a final thesis.	Student's knowledge and general performance are evaluated using grading scale from 1 (very poor) to 10 (excellent). Usually accumulative grades are applied as well. Matters evaluated: project reports, their defense, presentation, home and laboratory work assignments, scientific investigational work and its defense. Final assessment of modules – examination (open-ended, semi-ended and close-ended type tasks and questions). Master thesis parts and the final master's thesis are defended in the meeting of the Commission.

General competences		Programme learning outcomes. Students have to be able to:	
1.	Teamwork and work in interdisciplinary environments.	**1.1**	work and communicate in a team, adapting to the ever-changing professional environment.
		1.2	communicate with representatives of other professional fields of business or science, while solving problems of other fields or interdisciplinary issues, and to act ethically.
2.	Planning and organization.	**2.1**	plan complex activities which consist of various interrelated tasks and organize their implementation.
		2.2	adjust a plan during its implementation process taking into account changes in the situation.
3.	Scientific investigations.	**3.1**	prepare specific investigation plans or projects, select methods and resources for the investigation.
		3.2	bring, develop, defend, and apply original ideas.
		3.3	estimate investigation results, determine their reliability, and appropriately document them.
Subject-specific competences		**Programme learning outcomes. Students have to be able to:**	
4.	Software requirements and design	**4.1**	practically use the most important methods of software requirements and design.
		4.2	conceptually and formally design objective field and evaluate the designed model.
		4.3	design the logical and technical architecture of software and to integrate design activities into software construction process.
5.	Software construction	**5.1**	construct software systems using heuristic and formal methods and tools of software engineering.
		5.2	evaluate methods and tools of software engineering and chose appropriate ones for construction of particular software.
6.	Software engineering process	**6.1**	easily and purposefully operate with the concepts of software engineering process.
		6.2	apply methods of development and process capability evaluation in developing results of the activity.

7.	Software engineering project management	**7.1**	plan, manage, and evaluate software engineering projects.
		7.2	manage software development, maintenance, and development projects.
8.	Software quality, security, acquisition, and maintenance	**8.1**	organize, perform, and evaluate software security, acquisition, and maintenance.
		8.2	apply models of software quality evaluation and methods of quality assessment and maintenance.

These competences and learning outcomes have been formulated on the basis of the long experience of Informatics (more than 30 years) and Software Engineering (12 years) studies in Vilnius University; bachelor study programmes of Software Engineering at universities in other countries; research on Software Engineering studies and projects on study programs definition [1,2]; demands of IT companies [3] and analysis of prerequisites for IT products and services export; recommendations of world leading professional organizations ACM/IEEE [4,5,6]; and criteria for accrediting Software Engineering study programmes in Europe [7] and USA [8,9].

1. A. Mitašiūnas and other. Informatics studies description, Vilnius, 2012. /in Lithuanian/ Internet access: <http://www.mii.lt/files/informatikos_ska_galutinis_2012_03_10.pdf> [Accessed: 30-05-2013].
2. L. Bukauskas and other. Methodology for competences development in Informatics studies. Vilnius University, Vilnius, 2011, ISBN 978-9955-526-78-0. /in Lithuanian/ Internet access: <http://www.ects.cr.vu.lt/Files/File/ECTS_informatika.pdf> [Accessed: 30-05-2013].
3. A. Poviliūnas and other. Results of Informatics professional field research: guidelines for study programmes updating. Vilnius, 2010. /in Lithuanian/ Internet access: <http://www.ects.cr.vu.lt/Files/File/Informatikos%20technine%20ataskaita.pdf> [Accessed: 30-05-2013].
4. Guide to the Software Engineering Body of Knowledge (Eds.: A. Abran, J.W. Moore), IEEE Computer Society, 2004. Internet access: <http://www.computer.org/portal/web/swebok/htmlformat> [Accessed: 30-05-2013].
5. Computing Curricula 2005. The Overview Report. The Joint Task Force for Computing Curricula 2005. A cooperative project of The Association for Computing Machinery (ACM), The Association for Information Systems (AIS), The Computer Society (IEEE-CS). ACM and IEEE. 2006. Internet access: <http://www.acm.org/education/education/curric_vols/CC2005-March06Final.pdf> [Accessed: 30-05-2013].
6. Graduate Software Engineering 2009 (GSwE2009). Internet access: http://www.gswe2009.org/.
7. Euro-Inf Framework Standards and Accreditation Criteria. EQANIE, 2011. Internet access: <http://www.eqanie.eu/media/Quality%20Label/Euro-Inf%20Framework%20Standards%20and%20Accreditation%20Criteria%20V2011-06-29.pdf > [Accessed: 30-05-2013].
8. Criteria for Accrediting Computing Programs 2013 - 2014 Accreditation Cycle. ABET Computing Accreditation Commission, 2012. Internet access: <http://www.abet.org/uploadedFiles/Accreditation/Accreditation_Step_by_Step/Accreditation_Documents/Current/2013_-_2014/cac-criteria-2013-2014.pdf> [Accessed: 30-05-2013].
9. Criteria for Accrediting Engineering Programs 2013 - 2014. ABET Engineering Accreditation Commission, 2012. Internet access: <http://www.abet.org/uploadedFiles/Accreditation/Accreditation_Step_by_Step/Accreditation_Documents/Current/2013_-_2014/eac-criteria-2013-2014.pdf> [Accessed: 30-05-2013].

The quality of the study programme is ensured by the programme Committee which estimates specific measures for observation of the study programme quality and development. At the end of every semester the study programme Committee arranges a students' opinion survey which is meant to estimate the quality of the study programme to foresee the means of the programme development. The study Committee includes at least one social partner which represents the business sector. The Committee of the study programme also includes a students' representative, with observer's rights, which is proposed by the Students' Representation. The study programme Committee regularly meets with the most important employers of the study programme graduates; possible ways of developing the study programme are discussed during the meetings, and the statistical data about the study programme graduates' placement is collected as well.

The Department of Software Engineering is responsible for implementation of the study programme. The activity of the study programme Committee is regularly (once a year) considered by the Council of the Faculty Mathematics and Informatics.

THE PLAN OF THE STUDY PROGRAMME (full-time studies)
(CORRELATION BETWEEN THE UNITS, COMPETENCES, AND THE LEARNING OUTCOMES)

Code	Study units according to groups	Credits	Student's workload in total	Contact work	Autonomous work	Study program competences																	
						General competences							Subject-specific competences										
						1.		2.		3.			4.			5.		6.		7.		8.	
						Main learning outcomes																	
						1.1	1.2	2.1	2.2	3.1	3.2	3.3	4.1	4.2	4.3	5.1	5.2	6.1	6.2	7.1	7.2	8.1	8.2
YEAR I		**60**	**1600**	**432**	**1168**																		
SEMESTER 1		**30**	**800**	**244**	**556**																		
Compulsory units		**30**	**800**	**244**	**556**																		
PMRI7124	*Requirements Engineering*	5	135	48	87	X							X	X		X							
PMPV7124	*Project Management*	5	135	54	81		X	X	X											X	X		
PMAP7124	*Software Systems Architecture and Design*	10	260	82	178	X							X	X	X	X							
PMLS7124	*Parallel and Distributed Computing*	5	135	48	87										X		X						
PMTD7124	*Master's Thesis – Research Plan*	5	135	12	123			X		X													
SEMESTER 2		**30**	**800**	**188**	**612**																		
Compulsory units		**20**	**530**	**92**	**438**																		
PMKM7124	*Software Engineering Models and Methods*	10	260	80	180						X			X		X	X					X	X
PMTD7224	*Master's Thesis – Literature Review*	10	270	12	258					X	X	X	X	X									
Optional units		**10**	**270**	**96**	**174**																		
PMZP7134	*User Experience Engineering*	5	135	48	87		X			X				X			X			X			
PAGP7134	*Enterprise Architecture Frameworks*	5	135	48	87		X	X	X	X			X	X		X		X		X			
PMSK7134	*Software Quality*	5	135	48	87			X								X							X
PMIS7134	*Information Security*	5	135	48	87			X							X							X	
PMRA7134	*Randomized Algorithms*	5	130	48	82					X	X	X		X		X							
PMDV7134	*Visualization of Multidimensional Data*	5	130	48	82			X		X		X				X							

YEAR II		**60**	**1600**	**308**	**1292**																	
SEMESTER 3		**30**	**800**	**172**	**628**																	
Compulsory units		**20**	**530**	**76**	**454**																	
xxxx	*Cyber security technologies*	5	138	64	74			X	X	X	X	X			X		X				X	X
PMTD7324	*Master's Thesis – Key Results*	15	392	12	380					X	X	X	X	X	X	X	X	X	X			X
Optional units		**10**	**270**	**96**	**174**																	
PSTV7134	*Software Testing and Configuration Management*	5	135	48	87										X	X	X					X
PSEP7134	*Electronic Signature Infrastructure and Electronic Documents*	5	135	48	87		X	X							X		X				X	
PMKM7134	*Methods of Cryptography*	5	130	48	82		X	X						X							X	
PMOB7134	*Object Databases*	5	130	48	82		X				X			X	X	X						
PMEU7134	*Heuristic Algorithms for NP-complete Problems*	5	130	48	82			X		X		X				X						
PMPA7134	*Programming in Cloud Computing*	5	130	48	82			X	X					X	X					X		X	
DIST7134	*Distributed Systems*	5	135	52	83						X	X	X	X	X	X	X					
xxxx	*Digital crime investigations*	5	135	48	87	X	X	X	X			X										X	
SEMESTER 4		**30**	**800**	**136**	**664**																	
Compulsory units		**30**	**800**	**136**	**664**																	
MD7124	*Master's Thesis*	20	530	22	508					X	X	X	X	X	X	X	X	X	X			X
PMKV7124	*Software Process Assessment and Improvement*	5	135	64	71			X	X									X	X			X
xxxx	*Leadership*	5	135	50	85	X	X	X	X											X	X	X	