COURSE UNIT DESCRIPTION

Course unit title	Course unit code
Statistical Analysis in Software Engineering	**PMSM7134**

Lecturer(s)	Department where the course unit is delivered
Coordinator: prof. dr. habil. Mindaugas Bloznelis **Other lecturers:** -	Department of Mathematical Computer Science Faculty of Mathematics and Informatics Vilnius University

Cycle	Level of course unit	Type of the course unit
Second	-	Optional

Mode of delivery	Semester or period when the course unit is delivered	Language of instruction
Face-to-face	Autumn semester, second year of study	Lithuanian, English

Prerequisites and corequisites	
Prerequisites: Knowledge of fundamentals of mathematical statistics and skills in applying methods of mathematical statistics to data analysis	**Corequisites (if any):** -

Number of ECTS credits allocated	Student's workload	Contact hours	Self-study hours
6	160	66	94

Purpose of the course unit: programme competences to be developed		
To increase knowledge of methods and tools of software testing, to develop skills in software testing, reliability, software development cost estimating, choosing and applying appropriate software reliability and testing methods and tools in practice, to improve abstract thinking.		
Learning outcomes of the course unit: students will be able to	**Teaching and learning methods**	**Assessment methods**
Solve problems of software reliability and testing, estimation of software development costs by applying statistical methods, models and tools.	Lectures, problem-oriented teaching, case studies, literary reading, individual work, tutorials, report preparation and presentation at the seminar, demonstration	Presentation material, the oral presentation, answers to oral questions, written exam (open, semi-open and close-ended questions and tasks).
Formalize a subject area, to choose and validate appropriate model as well as use it in software analysis.		
Clearly present the chosen topic, summarize and evaluate information, argue and defend his/her own opinion.	Information retrieval, literary readings, tutorials, report preparation and presentation at the seminar, demonstration	Presentation material, the oral presentation, answers to oral questions

Course content: breakdown of the topics	**Contact hours**							**Self-study work: time and assignments**	
	Lectures	Tutorials	Seminars	Practice	Laboratory work	Practical training	**Contact hours**	**Self-study hours**	**Assignments**
1. Fundamentals of statistics: descriptive statistics, statistical modelling of subject areas,	3	1					**4**	**6**	

choosing the model, its validation and parameters estimation.									Self-study of literature.
2. Statistical models of software reliability. Statistical analysis of software reliability.	4		2				**6**	**8**	
3. Software testing fundamentals.	3						**3**	**6**	
4. Statistical analysis of software failure data.	4	1	2				**7**	**9**	
5. Software productivity and process management.	2		2				**4**	**6**	
6. Statistical process control. Monitoring the software test process using statistical process control.	4	1	2				**7**	**10**	
7. Model-driven software testing. System usage model, its analysis and applying to software testing.	3		2				**5**	**7**	
8. Statistical estimation of software development costs.	3	1	2				**6**	**8**	
9. Practical statistical methods, models and tools for software reliability and testing. Examples of their successful applications	6	2	14				**22**	**26**	Preparation of a presentation on a modern software reliability or testing method, model or/and tool. Self-study of literature.
10. Preparing for the exam and taking the final exam (written)							**2**	**8**	Self-study of literature. (8 hours - preparation for exam, 2 hours – exam).
Total	**32**	**6**	**26**				**66**	**94**	

Assessment strategy	**Weight, %**	**Deadline**	**Assessment criteria**
Oral presentation	40	During the semester	The following aspects of the presentation are assessed: - The presentation structure, size and style: the structure is clear and logical, contains all necessary components (introduction, explanation, conclusions), the presentation is of a reasonable duration; the material was delivered for a preview – 1 point. - Completeness, recommendations and conclusions: The material presented in detail and in comparison to others methods/models/tools, recommendations and conclusions are grounded - 3 points.
Exam (written)	60	Exam session	The exam consists of open, semi-open and close-ended questions and tasks. The questions are formulated from topics set out in lectures. The exam is allowed only after reading the report of the seminar and the collection of at least 2 points before the exam. The assessment of the exam: - 6 points: excellent knowledge and skills, the assessment level, collected at least 5.5 points; - 5 points: good knowledge and skills, the synthesis level, collected at least 4.5 points; - 4 points: average knowledge and skills, the analysis level, collected at least 3.5 points; - 3 points: knowledge and skills are less than average, the application level, collected at least 2.5 points. - 2 point: knowledge and skills are minimal, the understanding level, collected at least 1.5 points; - 1 point: knowledge and skills are too low, collected less than 1.5 points.

Author	Year	Title	Number or volume	Publisher or URL
Required reading				
Nozer D. Singpurwalla, Simon P. Wilson	1999	Statistical Methods in Software Engineering: Reliability and Risk		Springer
Isaac Ramos Corro	2009	Statistical Procedures for Certification of Software Systems		Printservice TU, Eindhoven University of Technology, Netherland
Recommended reading				
National Research Council	1996	Statistical Software Engineering		National Academies Press
Donald J. Wheeler	2010	Understanding Statistical Process Control	3rd ed.	SPC PRESS
John C. Munson	2003	Software Engineering Measurement		Auerbach Publications
William A. Florac, Anita D. Carleton	1999	Measuring the Software Process: Statistical Process Control for Software Process Improvement		Addison-Wesley Professional