



RTU Course "Theory of Software Reliability"

12308 Programmatūras inženierijas katedra

General data

Code	DIP513
Course title	Theory of Software Reliability
Course status in the programme	Compulsory/Courses of Limited Choice
Course level	Post-graduate Studies
Course type	Academic
Field of study	Computer Science
Responsible instructor	Zaiceva Larisa
Volume of the course: parts and credits points	1 part, 4.0 Credit Points, 6.0 ECTS credits
Language of instruction	LV, EN, RU
Possibility of distance learning	Not planned
Abstract	Software reliability concepts. Faults, failures, errors. Hardware and software reliability. Factors that influence software reliability. Software reliability engineering. Reliability metrics. Classification of reliability models. Analytic, empirical and other reliability models. Software reliability evaluation and provision methods. CASE tools for reliability evaluation and analysis.
Goals and objectives of the course in terms of competences and skills	The aim of the study course is to prepare students for software system reliability evaluation and ensure the use of different reliability models and methods. Objectives: 1) to view parameters, metrics, models and evaluation methods of software reliability; 2) to prepare students to practically use the obtained knowledge in scientific work and for software system reliability evaluation and ensuring.
Structure and tasks of independent studies	Student should write a report on selected topics and should fulfil three laboratory works: 1) software reliability evaluation; 2) CASE-tool development for software reliability evaluation; 3) software reliability enhancing.
Recommended literature	<ol style="list-style-type: none"> 1.Musa J.D. Software Reliability Engineering: More Reliable Software Faster and Cheaper. – 2nd Edition. – AuthorHouse, 2004. – 232 p. 2.Musa J.D. Software Reliability Engineering. – China Machine Press, 2003. – 391 p. 3.Peled D.A., E.M. Clarke. Software Reliability Methods. – 1st Edition. – Springer, 2010. – 331 p. 4.Bauer E., Zhang X., Kimber D.A. Practical System Reliability. – Wiley-IEEE Press, 2009. – 287 p. 5.Kong W. Quantifying Software Reliability at Early Development Stages: A Formal and Scalable Approach. – VDM Verlag, 2009. – 264 p. 6.Bauer E. Design for Reliability: Information and Computer-Based Systems. – Wiley-IEEE Press, 2010. – 325 p. 7.Huang J.C. Software Error Detection through Testing and Analysis. – Wiley, 2009. – 259 p. 8.Reliability and Maintenance of Complex Systems / S.Ozekici. – 1st Edition. – Springer, 2010. – 591 p. 9.Humble J., Farley D. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation. – 1st Edition. – Addison-Wesley Professional, 2010. – 512 p. 10.Handbook of Software Reliability Engineering / Lyu M.R., editor. – IEEE Computer Society Press, McGraw-Hill, 1996. – 873 p. 11.Shooman M.L. Reliability of Computer Systems and Networks. Fault Tolerance, Analysis, and Design. – N.Y.: John Wiley & sons, Inc., 2002. – 546 p. 12.Полонников Р.И., Никандров А.В. Методы оценки показателей надежности программного обеспечения. – С.-Пб.: Политехника, 1992. – 77 с. 13.Благодатских В.А., Волнин В.А., Посакалов К.Ф. Стандартизация разработки программных средств. – М.: Финансы и статистика, 2005. – 288 с.
Course prerequisites	According to the 1st study year of Master programme

Course outline

Theme	Hours
Software reliability concepts. Faults, failures, errors. Hardware / software reliability. Causes of failure appearance.	4
Factors that influence software reliability.	2
Software reliability engineering (SRE) process and phases. Their connection with the software life-cycle.	6
Testing: phases, planning, development of test cases and procedures. SRE testing types. Execution of tests.	12
Software reliability metrics. Software reliability model and its characteristics.	6
Software reliability model classifications.	2
Software reliability models: static, dynamic, empirical and others.	20
Methods and CASE tools for ensuring, evaluation and enhancing of software reliability.	12

Learning outcomes and assessment

Learning outcomes	Assessment methods
Knows the process and basic activities of software reliability engineering, causes of failure appearance, software reliability metrics and models, methods for ensuring, evaluation and enhancing of software reliability.	Positive assessment of final examination.

Is able to detect, to analyze and to evaluate software faults, failures and errors using appropriate CASE tools.	Positive assessment of fulfilled 1st laboratory work.
Is able to implement different software reliability models and to evaluate the reliability of developed tool using different methods and tools.	Positive assessment of fulfilled 2nd laboratory work.
Is able to select an appropriate reliability model, to collect necessary data during testing, to perform an evaluation of software reliability and in case of necessity to enhance reliability.	Positive assessment of fulfilled 3rd laboratory work.

Study subject structure

Part	CP	ECTS	Hours per Week			Tests		
			Lectures	Practical	Lab.	Test	Exam	Work
1.	4.0	6.0	2.0	0.0	2.0		*	