

STUDY SUBJECT PROGRAMME

Subjectcode	Subjectgroup	Credits	Subjectcertified	Subjectcertificateonvaliduntil	Reg. No.
INF6003		6	2012-06-01	2014-06-01	

Course type (compulsory or optional)	Compulsory
Course level (study cycle)	Master
Semester the course is delivered	3
Study form (face-to-face or distant)	Face-to-Face

Title in Lithuanian

PASKIRSTYTŲ SISTEMŲ ANALIZĖ

Title

ANALYSIS OF DISTRIBUTED SYSTEMS

Subjectannotation

Two formalization methods are presented for analysis of distributed software systems. Piece-linear aggregate approach (PLA) is devoted for formal specification, verification and simulation protocols of distributed systems. Tools PRANAS and SPIN will be used for analysis of PLA specifications. Examples of PLA specifications of computer network protocols will be presented. Z specification approach will be presented for formalization and verification of systems. It includes: mathematical background of Z specification language, definitions of Z schemas, examples of formal specification of systems.

Necessary background knowledge for the study of the subject

Basics in mathematical analysis and mathematical logic, basics in software engineering.

Studyoutcomes

On successful completion of the course student will be able to:

- the behaviour and performance analysis tasks of distributed systems;
- how to formalize the systems using piece-linear aggregate;
- how to verify formal specifications using PLA method;
- how to create simulation models of systems composed from discrete and hybrid components;
- how to formalize the systems using Z specification language;
- how to verify formal specifications using Z method.

Subjectcontents

Provides understanding how formal methods are used for development of distributed software systems. After completion of the course students will be able to use Z and PLA formalization approaches to formally specify, verify and create simulation models of complex software systems.

The architecture of distributed systems and methods of analysis. Piece-linear aggregate (PLA) formalization method. PLA model. Method of controlling systems. Formalization of queuing network. Examples of formalization of telecommunication protocols. Safety and liveness properties of systems. Formalization and verification of real-time systems. SPIN verifications system for systems described by automata model. Reachable state verification approach. Verification of systems used in variant approach. Formalization of systems with changeable structures. Estelle/Ags specification language protocols analysis system PRANAS. Z specification language. Mathematical background of Z specification language. Z schemes and operations with Z schemes. Formal specification of abstract data types. Refinement of data and operations. Examples of systems specified by Z language.

Studyhours

Lectures – 45 hours,
Laboratory classes – 15 hours,
Homework – 30 hours,
Consultations - 4 hours,
Individual work – 66 hours.

Evaluationofstudyresults

Mid-term exam – 20%, Final exam – 50%, individual work – 30% of the final grade. Examination is performed in a written form. Use of a literature is allowed.

Literature

1. Nancy A. Lynch (1996) Distributed Algorithms. ISBN 1-55860-348-4. Morgan Kaufmann Publishers, Inc.

- 2. Pranavičius, H. (2008). Formalization and Analysis of Complex Systems. Vilnius: Mokslo aidai.
- 3. Pranavičius, H. Raudys, Š. (2008). Models of Agent Systems. ISBN 9789955591559. Vilnius: Mokslo aidai.
- 4. Pranavičius, H., Misevičienė, R. (2006) VerificationofPiece-Linear Aggregate Specifications. ISBN 9955-25-167-0. Technologija, Kaunas.
- 5. Zeigler, B., Kim, T. and Praehofer, H. (2000) TheoryofModelingandSimulation. Secondedition. AcademicPress, New York.
- 6. Piet Van Mieghem (2006) Performance Analysis of Communications Networks and Systems. Cambridge.
- 7. Woodcock, J. (2006) Using Z Specification, Refinement and Proof. <http://www.comlab.ox.ac.uk/igdp/usingz>.

Programme prepared by

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