

Technologies of component modeling

Masters

Russian Variant 2016-2017

No.	Study unit	Contact hours				Individual stud. work	Total hours	ECTS
		Lecture	Seminar	Tutorial and lab	Other			
1st Year - 1st Semester								
	Object-Oriented Modeling in Rand Model Designer	16		32		96	144	4
1st Year - 2nd Semester								
	Practical modeling	32	48				144	4
	Tools and Languages of modeling	32	48				144	4
	Simulation Modeling in Anylogic	32	32				144	4

Suggested Variant

N.	Study unit	Contact hours				Individual stud. work	Total hours	ECTS
		Lecture	Seminar	Tutorial and lab	Other			
4th Year – 7th Semester								
1	Technologies of component modeling	36		36		36	144	4.0

Lectures and labs_1

№	Lectures	Laboratory works
1	Component modeling Decomposition and aggregation	
2	Components with Inputs/Outputs	Control Theory
3	Examples from Control Theory	
4	Components with Contacts/Flows	
5	Examples from Electricity, Hydraulics	Hydraulics, Mechanics

Lectures and labs_2

№	Lectures	Laboratory works
6	Components with variable structure	
7	Examples from theory of queues	Queues
8	OMM - UML	
9	OMM – RMD, Modelica, Simulink	
10	Components with hybrid behavior Composition of hybrid automata Lazy hybrid automata	

Lectures and labs_3

No	Lectures	Laboratory works
11	Planning and carrying out computer experiments	Statistical experiments
12	Building Model Equations Structure analysis	
13	Numerical methods for modeling dynamical systems Non-linear algebraic equations (NAE)	Using Numerical Libraries
14	Sparse system	NAE
15	Numerical methods for modeling dynamical systems ODE, DAE	ODE-DAE
16	Tools for modeling and simulation	
17	Test	Credit
18	Credit	Credit

Textbook

Table of Contents

Introduction.

Chapter 1. Object-oriented modeling of dynamical systems. UML-based approach.

- Diagram of Classes.
- Diagram of Structure.
- Diagram of Behavior.
- Diagram of Packages.

Chapter 2. Component models.

- Isolated dynamical and hybrid systems
- Open systems: «causal» and «physical» components
- Agent-based systems

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Chapter 3. Do-Activities. From classical dynamical systems to dynamical activities of objects.

- Continuous and discrete dynamical systems
- Hybrid systems
- Behavior of objects (equation-based approach)

Chapter 4. Large-scale component systems: Aggregate structure and behavior.

- Composition of internal hybrid automata for aggregate system
- Final behavior of aggregate system

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Chapter 5. Environment Built-in Instruments for modeling and simulation

- Designing
- Reduction
- Debugging
- Testing
- Computer experiments
- Visualizing

Chapter 6. Numerical methods

Chapter 7. Designing of applied libraries