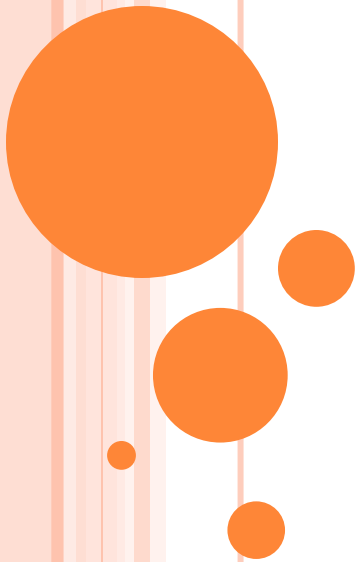


**THE BASIS OF MATHEMATICAL MODELING
(BACHELORS)
TECHNOLOGIES OF COMPUTER MODELING
(MASTERS)**

Yuri Senichenkov



THE BASIC BEARING COURSES



- Technologies of computer modeling
- The basis of mathematical modeling

- Technical courses
(applications)

- Numerical analysis

- Differential equations
- Linear algebra

- Mathematics

- Compilers theory
- Algorithms, automata, graphs

- Informatics

MATHEMATICAL MODELING

SINGLE-COMPONENT MODELS

(BACHELORS)

- Ordinary differential and difference equations (initial problem), algebraic equations
- Event-driven dynamical systems (hybrid systems)
- Statistic simulation (Markov chains, Kolmogorov equations)
- Computing experiments



BACHELORS

- **have to know**

1. theory of classical and event-driven dynamical systems

2. theory of random processes

- **be able to practice** deterministic and probabilistic models

- **have skills** of using tools for modeling and simulation



TECHNOLOGIES OF COMPUTER MODELING (FOR BACHELORS IT IS SECTION «THE BASIS OF MATHEMATICAL MODELING» COURSE)

Multicomponent models:

- A) Inputs/Outputs blocks (causal)
- B) Contacts/Flows blocks («physical»)
- C) Agents

Automatization of computing experiments:

- A) planning experiments
- B) analysis of observations
- C) Visualization



FOR THE BACHELORS

- **have to know** methods of decomposition and aggregation of large scale models
- **be able to use** standard tools for carrying out computing experiments
- **have skills of** designing multicomponent models using tools for modeling and simulation



TECHNOLOGIES OF COMPUTER MODELING (MASTERS)

Object-Oriented Modeling

Technologies of designing multicomponent
models

Automatization of computing experiments

Approximation of models by dynamical systems



MASTERS

o Have to know

1. theory of object-oriented modeling (classes, inheritance, polymorphism, packages)
2. Languages for state machines, I/O (oriented blocks) component systems, C/FL (non-oriented blocks) component systems, methods of building final systems of equations)
3. Numerical methods for solving NAE, ODE, DAE
4. Typical (standard) computing experiments



MASTERS

- **be able**

 - design multicomponent systems
and carry out computing experiments

- **have skills**

 - of using tools for modeling and simulation
complex dynamical systems



COURSE STRUCTURE
BASIS OF MATHEMATICAL MODELING
BACHELORS
AND
TECHNOLOGIES OF COMPUTER MODELING
MASTERS



RUSSIAN VARIANT

BACHELORS (4TH YEAR – AUTUMN)

MASTERS (1 YEAR –AUTUMN)

- Semester – 18 weeks
- 17 educational weeks + week for credits
- Educational week:

Lectures	2 hours
Labs	2 hours
independent work	4 hours
- Exam



SAKAI

- Lecture notes (chapters of textbook)
- Lecture Presentation (PowerPoint)
- Tasks (Practicum)
- instructional guidelines

