Siberian Federal University

Simulation Modeling

Course Syllabus

Krasnoyarsk, 2019

Basic Information

This is a course, which contributes to MSc award in Mathematics

Duration	216 hours (6 ECTS)
Starting date	September 1st
Study credits	6 ECTS credits
Language of instruction	English level B1 (European Framework of Reference od Communicative Skills)
Academic requirements	BSc degree in Mathematics, Physics, Computer Science, Engineering or equivalent

Course Description

Course Overview

The course deals with the fundamental concepts and tools of simultion modeling. A very important particular feature of the course is a wide using of special simulation software during the learning process. The topics will include agent-based model, system dynamics, and business processes modeling.

Special Features of the Course

Simulation modeling is an important tool which can be applied to solve real-world problems safely and efficiently. The concepts of simulation modeling have a wide area of applications. Institute of Space and information technologies of Siberian federal university has all necessary software needed to success learning the course.

Course Aim

The course is aimed to enable students to experience of real-world problems solving by means of concepts of simulation modeling.

Course Objectives

The objective of the course is to produce graduates with a rigorous foundation in the simulation modeling and with practical ability to using of simulation modeling methods.

Learning Outcomes

By the end of the course students should be able to:

- develop simulation models using special simulation software;
- carry out an adjusting of the developed simulation models;
- interpret obtained results.

Lecturer Contact information

Shmidt A.V., PhD in Mathematics,

Web-page: https://scholar.google.ru/citations?user=Ie3bOMAAAAAJ&hl=en

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Prerequisites

The students who take this course should have basic knowledge of mathematical modelling.

Preliminary Reading

Heinz S., Mathematical Modeling, Springer, 2011, e-ISBN: 978-3-642-20311-4.

Course Outline

Course Requirements

Required Texts:

Tayfur Altiok Benjamin Melamed, Simulation Modeling and Analysis with ARENA, 1st Edition, Hardcover ISBN: 9780123705235, eBook ISBN: 9780080548951, Imprint: Academic Press, Published Date: 22nd June 2007, Page Count: 456.

Bernard P. Zeigler Herbert Praehofer Tag Kim, Theory of Modeling and Simulation, 2nd Edition, Hardcover ISBN: 9780127784557, eBook ISBN: 9780080519098, Imprint: Academic Press, Published Date: 18th January 2000, Page Count: 510.

All the books are available on-line at SFU library.

Required Feedbacks:

You are encouraged to typeset the homework using LaTeX typeset system. The corresponding PDF files must be sent by Email to the Course Instructor for checking.

Course Structure

Learning Activities	**Hours**
Lectures	18
Practice sessions / Seminars	36
Self-study Assignments	126
Final Exam (including preparation)	36
Total study hours	**216**

Course Topics

Week	Lectures	Practice session / Assignments	Hours
1-4	Basics of simulation modeling	− Basic concepts simulation modeling − Stages of simulation modeling − Home assignment No 1	36
5-9	Descrete-event simulation	− Basic concepts of descrete-event simulation − Logistics and the models of production systems − Queueing theory − Home assignment No 2 − Home assignment No 3	54
10-14	System dynamics	− Basic concepts of system dynamics − Simulation of business processes − The dynamics of populations and models of epidemics − Home assignment No 4 − Home assignment No 5	54
15-18	Agent-based model	− Introduction to agent-based model − Monte Carlo methods − Cellular automata − Multi-agent systems − Home assignment No 6 − Home assignment No 7	36
19-20	Final exam		36

Assessment

Student's grades will be based on the following scheme: 40% Homework assignments, 20% Presentations, 40% Final Examination.

Grade policy for practical home assignments, presentations and the final exam is: A (excellent work) 91–100 points, B (above average work) 81–90 points, C (average work) 71–80 points, D (below average work) 50–70 points, F (failed work) < 50 points.

The exam is taken orally. Each exam ticket consists of 2 theoretical questions from the list of exam questions.

Attendance Policy

Students are expected to attend all classes. In the case you are unable to attend the class, it is under your responsibility to contact the course instructor for the purpose of getting individual instructions for the missed class(es). If you know you are going to miss the class, please contact the course instructor. Missed classes must not exceed a 15% of the total course time.

Required Course Participation

Students are encouraged to attend classes, use of special simulation software and participate in discussions.