COURSE DESCRIPTION CARD - SYLLABUS

Course name

Symulacja cyfrowa - Simulation techniques

Course

Field of study
Teleinformatics

Year/Semester
1/1

Area of study (specialization)

Profile of study
general academic

Level of study
second-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other (e.g. online)

Tutorials
0

Projects/seminars
30/0

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

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Institute of Radiocommunications
Faculty of Computing and Telecommunications

Responsible for the course/lecturer:

Prerequisites

A student has to be familiar with programming languages such as C, C++, or C# and must have a basic knowledge of probability, statistics and stochastic processes.

Course objective

The main purpose of the course is to offer a comprehensive and fairly balanced presentation of a wide repertoire of computer simulation techniques available to the modelers of discrete event systems. It teaches how to design, program and exploit computer simulation models by covering all basic and generic concepts used in computer simulation of discrete event systems in a self-contained manner.

Course-related learning outcomes

Knowledge

A student is familiar with basic computer simulation techniques of discrete event systems, knows how to run simulation experiments, and how to handle simulation results.

Skills

A student can select the most appropriate simulation methodology based on a type of a system being analyzed, the number of discrete events occurring, interactions between system objects and the complexity of a simulation model. He/she can also pick the most meaningful events, link them with objects comprising the model, choose the most adequate streams of pseudorandom variates, collect data for experiments, and plan the actual simulation runs in the most effective manner.

Social competences

A student is aware of advantages and constraints of computer simulation techniques. He/she can anticipate new areas of their applications in science, engineering, and social life. He/she can formulate his/her own opinions regarding feasibility of using computer simulation in the process of designing or analyzing complex systems.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

2h-long written (or oral) test comprising a few problems that cover the content of lectures. Project classes are evaluated based on progress reports regarding an individual project that a student keeps working on throughout a duration of the entire semester. The final score includes also a presentation of the project, the quality of the final report, and the quality of the associated software.

Programme content

Discrete-event systems, clock advance mechanisms, the concept of event, activity scanning, event scheduling, ABC approach, events vs. activities, implementation of event lists, run-time efficiency of event scheduling, process interaction, co-routines, distributed simulation, pseudorandom number generators, statistical tests of the pseudorandom number generators, non-uniform variate generation, design of simulation experiments, validation of simulation models, analysis of variance,

collection and analysis of simulation results, estimation of transient and steady-state phase characteristics, independent replications method, method of batch means, regenerative method, variance reduction, examples of simulation models, methodology of computer simulation.

Teaching methods

Lectures: a multimedia presentation. Project: students present progress reports regarding their own (individual) simulation models (project) of a given discrete event system.

Bibliography

Basic

1. J. J. Tyszer, Object-oriented computer simulation of discrete-event systems, Kluwer Academic Publishers, New York, 1999.
2. R. Wieczorkowski, R. Zieliński, Komputerowe generatory liczb losowych, WNT, Warszawa, 1997.
3. G.S. Fishman, Symulacja komputerowa, pojęcia i metody, Państwowe Wydawnictwo Ekonomiczne, 1981.
4. P. Perkowski, Technika symulacji cyfrowej, WNT, Warszawa, 1980.

Additional

1. J. Banks, J.C. Carson, B.L. Nelson, D.M. Nicol, Discrete-event system simulation, Pearson Prentice Hall, 2010.
2. K. Watkins, Discrete event simulation in C, McGraw Hill, 1993
3. I. Mitrani, Simulation techniques for discrete event systems, Cambridge University Press, 1986.
4. A.M. Law, W.D. Kelton, Simulation modeling and analysis, McGraw Hill, Boston, 2000.

Breakdown of average student's workload

	Hours	ECTS
Total workload	86	3.0
Classes requiring direct contact with the teacher	45	2.0
Student's own work (preparation for tests, project preparation, literature studies)	41	1.0