STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Computer Simulation		**1010821161010810077**

Field of study	Profile of study (general academic, practical)	Year /Semester
Electronics and Telecommunications	**general academic**	**3 / 6**

Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Computer Networks and Internet	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**full-time**

No. of hours					No. of credits
Lecture: **1**	Classes: **-**	Laboratory: **1**	Project/seminars: **-**		**3**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
other	**university-wide**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**3 100%**

Responsible for subject / lecturer:

prof. dr hab. inż. Jerzy Tyszer
email: tyszer@et.put.poznan.pl
tel. +48 61 665 3814
Electronics and Telecommunications
ul. Piotrowo 3A 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	A basic knowledge probability, stochastic process, statistics, and programming languages.
2	**Skills**	Can use programming languages such as C, C++, or C#.
3	**Social competencies**	A student is aware of his/her limitations and skills, he/she understands necessity of further and continuing education.

Assumptions and objectives of the course:

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 uniform and self-contained manner.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Students acquire a thorough understanding of generic algorithms developed for the purpose of computer simulation of discrete-event systems. They include the event scheduling approach, the activity scanning method, the process interaction scheme, and their hybrids. Furthermore, they learn how to implement the basic algorithms in an object-oriented fashion. - [K1_W16]

2. Students learn a variety of basic techniques used in computer simulation, such as time flow mechanisms, pseudorandom number generators, methods employed to mimic co-routines, and procedures used to monitor and record simulation results - [K1_W16]

3. A student gains a comprehensive knowledge regarding techniques used to prepare and schedule simulation experiments, including validation of simulation models, statistical analysis of simulation results, and variance reduction techniques. - [K1_W16]

Skills:

1. A student is able to choose adequate simulation algorithms based on the number of events, mutual interaction between components of a simulated system, and the resultant complexity of a computer simulation model. - [K1_U13]

2. a student can select appropriate events having a statistically significant impact on a system performance, prepare proper and representative input data streams, propose methods to mimic data provided by a user, and plan the simulation experiments, accordingly. - [K1_U13]

3. A student can select the most appropriate level of details a given simulation model should work with, develop the most efficient interaction between the simulator?s components, and carry out a validation process of the resultant simulator. - [K1_U13]

Social competencies:
1. Appreciate the practical significance of the computer simulation and its applications presented in the course. - [K1_K02]

Assessment methods of study outcomes
Based on projects aimed at developing computer simulation models of a given discrete-event system. The final project evaluation is followed by considerable discussion among the teaching staff to factor in diligence on the homework and labs, and participation in class and tutorials. This discussion can affect a final grade for the course.

Course description
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, random number generators, statistical tests of the random 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.

Basic bibliography:

1. J. Tyszer, Object-oriented computer simulation of discrete-event systems, Kluwer Academic Publishers, New York, 1999.
2. J. Banks, J.C. Carson, B.L. Nelson, Discrete-event system simulation, Prentice Hall 1996.
3. K. Watkins, Discrete event simulation in C, McGraw Hill 1993.
4. I. Mitrani, Simulation techniques for discrete event systems, Cambridge University Press 1986.

Additional bibliography:

1. A.M. Law, W.D. Kelton, Simulation modeling and analysis, McGraw Hill, Boston, 2000.

Result of average student's workload

Activity	**Time (working hours)**

Student's workload

Source of workload	**hours**	**ECTS**
Total workload	75	3
Contact hours	40	1
Practical activities	55	2