FACULTY OF PURE AND APPLIED MATHEMATICS
SUBJECT CARD

Name of subject in Polish: SYMULACJE KOMPUTEROWE PROCESÓW STOCHASTYCZNYCH

Name of subject in English: Computer simulations of stochastic processes

Main field of study (if applicable): APPLIED MATHEMATICS

Specialization (if applicable): COMPUTATIONAL MATHEMATICS, MODELLING, SIMULATION, OPTIMIZATION

Profile: **academic / practical***

Level and form of studies: **~~1st/~~ 2nd* level, full-time / ~~part-time~~***

Kind of subject: **~~obligatory~~ / optional / ~~university-wide~~***

Subject code

Group of courses **YES / ~~NO~~***

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		30		
Number of hours of total student workload (CNPS)	90		60		
Form of crediting	crediting with grade				
For group of courses mark (X) final course	X				
Number of ECTS points	3		2		
including number of ECTS points for practical classes (P)	2		2		
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1,5		1,5		

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Student knows and can apply basic concepts of the theory of stochastic processes.

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SUBJECT OBJECTIVES

C1 Mastering knowledge of computer simulations of stochastic processes with long memory property and heavy tails.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEU_W01 has in-depth knowledge of computer simulations of stochastic processes with long memory property and heavy tails.

PEU_W02 knows the basics of stochastic modeling in financial and actuarial mathematics or the natural sciences, especially physics, chemistry or biology

relating to skills:

PEU_U01 can construct algorithms with good numerical properties, used to solve common and unusual mathematical problems

relating to social competences:

PEU_K01 can, without assistance, search for necessary information in the literature, also in foreign languages

PROGRAMME CONTENT

Lecture		**Number of hours**
Lec 1	Generation of stable distributions and vectors	6
Lec 2	Simulation of stable processes by integral and series representations	6
Lec 3	Self-similar and stationary processes	6
Lec 4	Generating processes with long memory	6
Lec 5	Stable models with long memory in physics and economics	6
	Total hours	30

Laboratory		**Number of hours**
Lab 1	Solving problems illustrating methods given in the lecture.	30
	Total hours	**30**

TEACHING TOOLS USED

N1. Lecture-computer presentation and traditional method.
N2. Computer Laboratory with Matlab
N3. Consultations.
N4. Student's self work – preparation for the laboratory.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEU_W01 PEU_W02 PEU_K01	test
F2	PEU_U01	written reports

	PEU_K01	
P=0.5*F1+0.5*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] P. Doukhan, G. Oppenheim, M.S. Taqqu, Theory and Applications of Long-range Dependence, Birkhauser, Boston, 2004.

[2] A. Janicki, A Weron, Simulation and Chaotic Behavior of Stable Stochastic Processes, Marcel Dekker, New York, 1994.

[3] G. Samorodnitsky, M.S. Taqqu, Stable Non-Gaussian Random Processes, Chapman & Hall, New York, 1994.

SECONDARY LITERATURE:

[1] J. Beran, Statistics for Long-memory Processes, Chapman & Hall, New York, 1994.

[2] P. Cizek, W. Haerdle, R. Weron (red.), Statistical tools for finance and insurance, Springer, Berlin, 2011.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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