Zał. nr 4 do ZW

FACULTY OF PURE AND APPLIED MATHEMATICS
SUBJECT CARD

Name in Polish: SYMULACJE KOMPUTEROWE PROCESÓW STOCHASTYCZNYCH

Name in English: Computer simulations of stochastic processes

Main field of study (if applicable): APPLIED MATHEMATICS

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

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

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

Subject code MAT001580

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)	150				
Form of crediting	~~Examination~~ / crediting with grade*	Examination / crediting with grade*	Examination / crediting with grade*	Examination / crediting with grade*	Examination / crediting with grade*
For group of courses mark (X) final course	X				
Number of ECTS points	5				
including number of ECTS points for practical (P) classes	2		2		
including number of ECTS points for direct teacher-student contact (BK) classes	1,5		1,5		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

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

SUBJECT OBJECTIVES

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

*delete as applicable

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 has in-depth knowledge of computer simulations of stochastic processes with long memory property and heavy tails.

PEK_W02 knows the basics of stochastic modeling in financial and actuarial mathematics or the natural sciences, especially physics, chemistry or biology

relating to skills:

PEK_U01 can construct algorithms with good numerical properties, used to solve common and unusual mathematical problems

relating to social competences:

PEK_K01 can, without assistance, search for necessary information in the literature, also in foreign languages

PROGRAMME CONTENT		
Form of classes - 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**

Form of classes - 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 EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01 PEK_W02 PEK_K01	test

F2	PEK_U01 PEK_K01	written reports
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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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT

COMPUTER SIMULATIONS OF STOCHASTIC PROCESSES

MAT001580

AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **APPLIED MATHEMATICS** AND SPECIALIZATION **COMPUTATIONAL MATHEMATICS, MODELLING, SIMULATION, OPTIMIZATION**

Subject educational effect	**Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)****	**Subject objectives*****	**Programme content*****	**Teaching tool number*****
PEK_W01 **(wiedza)**	K2MST_W04 K2MST_W05 K2MST_cm_W01 K2MST_mso_W01 K2MST_mso_W02 K2MST_mso_W03	C1	Lec 1-Lec 5	1, 3
PEK_W02	K2MST_W09 K2MST_cm_W02 K2MST_cm_W03	C1	Lec 1-Lec 5	1, 3
PEK_U01 **(umiejętności)**	K2MST_U13 K2MST_U17 K2MST_U23 K2MST_U24 K2MST_U25 K2MST_U30 K2MST_cm_U01 K2MST_cm_U02 K2MST_cm_U03 K2MST_mso_U01 K2MST_mso_U02 K2MST_mso_U03	C1	Lab 1	2, 3, 4
PEK_K01 **(kompetencje)**	K2MST_K03 K2MST_K06 K2MST_cm_K01 K2MST_cm_K02 K2MST_mso_K01 K2MST_mso_K02	C1	Lec 1-Lec 5, Lab 1	1, 2, 3, 4

** - from table above