Zał. nr 4 do ZW 64/2012

FACULTY OF PURE AND APPLIED MATHEMATICS
SUBJECT CARD

Name in Polish: Finanse Obliczeniowe
Name in English: Computational Finance
Main field of study (if applicable): APPLIED MATHEMATICS
Specialization (if applicable): FINANCIAL AND ACTUARIAL MATHEMATICS, COMPUTATIONAL MATHEMATICS
Level and form of studies: ~~1st/~~ 2nd* level, full-time / ~~part-time~~*
Kind of subject: ~~obligatory~~ / optional / ~~university-wide~~*
Subject code MAT001566
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	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		

*delete as applicable

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Student knows and can apply basic notions of financial mathematics.
2. Student knows basics of computer programming.

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SUBJECT OBJECTIVES

C1 Study of concepts and acquisition of knowledge concerning algorithms and methods in computational finance
C2 Acquisition of abilities in implementing selected models and methods

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge the student:
PEK_W01 knows basic models and algorithms used in finance
PEK_W02 has in-depth knowledge regarding numerical implementation of selected derivatives pricing techniques

relating to skills the student:
PEK_U01 can implement and apply in practice computational techniques used in finance

relating to social competences the student:
PEK_K01 can, without assistance, search for necessary information in the scientific literature

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec1-2	Derivatives: forwards, futures, swaps and options. Portfolio construction and pricing. Sensitivity analysis.	4
Lec3-4	Binomial pricing: CRR, JR and „exact" trees. Hedging strategies. Trinomial trees.	4
Lec5-6	Binomial and trinomial pricing of path dependent derivatives.	4
Lec7-8	Monte Carlo (MC): Euler and Milstein schemes, variance reduction, correlated variates, quasi-random numbers.	4
Lec9-10	MC pricing of American options.	4
Lec11-12	Finite difference schemes: explicit, implicit, Crank-Nicolson, hopscotch.	4
Lec13-14	Partial differential equations technique.	4
Lec15	Test	2
	Total hours	**30**

Form of classes - Class		**Number of hours**
La1-15	Implementation (Matlab, R, Excel/VB, C++, Java and/or Python) of algorithms and methods discussed during lectures	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Lecture – traditional method N2. Laboratory – traditional method

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	Written test

F2	PEK_U01 PEK_K01	Discussions, tests, projects.
P=0.5*F1+0.5*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] J. Hull (2008) Options, Futures and Other Derivatives (7th Edition), Prentice Hall
[2] J. London (2005) Modeling Derivatives in C, Wiley
[3] A. Weron, R. Weron (1998, …, 2009) Inżynieria finansowa, WNT.

SECONDARY LITERATURE:

[4] Z. Bodie, A. Kane, A.J. Marcus (2007) Essentials of Investments (6th ed.), McGraw-Hill
[5] M. Capiński, T. Zastawniak (2003) Mathematics for Finance: An Introduction to Financial Engineering, Springer
[6] P.Cizek, W.Härdle, R.Weron, eds. (2011) Statistical Tools for Finance and Insurance, Springer
[7] J. Franke, W. Härdle, C Hafner (2005) Introduction to Statistics of Financial Markets, Springer
[8] P. Glasserman (2004) Monte Carlo Methods in Financial Engineering, Springer
[9] P. Wilmott (2000) Paul Wilmott on Quantitative Finance, Wiley

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

Prof. dr hab. Rafał Weron (rafal.weron@pwr.edu.pl)

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT **COMPUTATIONAL FINANCE MAT001566** AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **APPLIED MATHEMATICS** AND SPECIALIZATION **FINANCIAL AND ACTUARIAL MATHEMATICS, COMPUTATIONAL MATHEMATICS**

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 (knowledge)	K2MST_W04, K2MST_W09 K2MST_fam_W01 K2MST_cm_W01	C1, C2	Lec1-Lec15	1
PEK_W02	K2MST_W08, K2MST_W10 K2MST_fam_W02 K2MST_fam_W03 K2MST_cm _W02 K2MST_cm _W03	C1, C2	Lec1-Lec15	1
PEK_U01 (skills)	K2MST_U15, K2MST_U16, K2MST_U17, K2MST_U23 K2MST_U24 K2MST_U25 K2MST_fam_U01 K2MST_fam_U02 K2MST_fam_U03 K2MST_cm _U01 K2MST_cm_U02 K2MST_cm_U03	C2	Lec1-Lec15 La1-La15	1,2
PEK_K01 (competences)	K2MST_K02, K2MST_K06 K2MST_fam_K01 K2MST_fam_K02 K2MST_cm_K01 K2MST_cm_K02	C1, C2	La1-La15	2

** - enter symbols for main-field-of-study/specialization educational effects

*** - from table above