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
Profile: academic / practical*
Level and form of studies: 1st/ 2nd level, uniform magister studies*, 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	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	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 notions of financial mathematics.
2. Student knows basics of computer programming.

\

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

Lecture		Number of hours
Lec1	Derivatives: forwards, futures, swaps and options. Portfolio construction and pricing.	2
Lec2-3	Partial differential equations technique. Pricing in the Black-Scholes model.	4
Lec4-5	Sensitivity analysis. Delta-neutral and delta-gamma-neutral strategies.	4
Lec6	Volatility modeling	2
Lec7-8	Binomial pricing: CRR, JR and „exact" trees. Hedging strategies on trees. Trinomial trees.	4
Lec9-10	Binomial and trinomial pricing of path dependent derivatives.	4
Lec11-12	Finite difference schemes: explicit, implicit, Crank-Nicolson.	4
Lec13-14	Monte Carlo method in finance. Euler and Milstein schemes, variance reduction.	4
Lec15	MC pricing of American options.	2
	Total hours	30
Laboratory		Number of hours
Lab1-15	Implementation (Matlab, R, Excel/VB, C++, Java and/or Python) of algorithms and methods discussed during lectures	30
	Total hours	30
TEACHING TOOLS USED		
N1. Lecture – traditional method N2. Laboratory – traditional method		

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01 PEU_W02	Test
F2	PEU_U01	Exercises
F3	PEU_K01	Project
P=0.34F1+0.33F2+0.33F3		

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] P. Wilmott (2000) Paul Wilmott on Quantitative Finance, Wiley [2] J. Hull (2008) Options, Futures and Other Derivatives (7th Edition), Prentice Hall [3] J. London (2005) Modeling Derivatives in C, Wiley [4] A. Weron, R. Weron (1998, …, 2009) Inżynieria finansowa, WNT. **SECONDARY LITERATURE:** [5] Z. Bodie, A. Kane, A.J. Marcus (2007) Essentials of Investments (6th ed.), McGraw-Hill [6] M. Capiński, T. Zastawniak (2003) Mathematics for Finance: An Introduction to Financial Engineering, Springer [7] P.Cizek, W.Härdle, R.Weron, eds. (2011) Statistical Tools for Finance and Insurance, Springer [8] J. Franke, W. Härdle, C. Hafner (2005) Introduction to Statistics of Financial Markets, Springer [9] P. Glasserman (2004) Monte Carlo Methods in Financial Engineering, Springer
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)
dr inż. Joanna Janczura (joanna.janczura@pwr.edu.pl)