MASTER 'S PROGRAMME
APPLIED MATHEMATICS - IN ENGLISH
1ST YEAR OF STUDY, 2ND SEMESTER

COURSE TITLE	FINANCIAL MATHEMATICS
COURSE CODE	**MA2MFi**
COURSE TYPE	full attendance/ tutorial
COURSE LEVEL	2nd cycle (master's degree)
YEAR OF STUDY, SEMESTER	1st year of study, 2nd semester
NUMBER OF ECTS CREDITS	**6**
NUMBER OF HOURS PER WEEK	4 (2 lecture hours + 2 seminar/laboratory hours)
NAME OF LECTURE HOLDER	Dr. Stoleriu Iulian
NAME OF SEMINAR HOLDER	Dr. Stoleriu Iulian
PREREQUISITES	Curriculum: Probability Theory, Statistical Mathematics, Calculus Competencies: scientific computing with MATLAB Language: advanced level of English

A GENERAL AND COURSE-SPECIFIC COMPETENCES

General competences:

- ✓ Having a responsible attitude towards scientific research and teaching, being able to fully develop the personal potential in the professional career, respecting the principles of a rigorous and efficient work in order to fulfill complex tasks, respecting the ethical norms and principles in the professional activity
- ✓ Being able to work efficiently in a team and to coordinate and efficiently lead a team or an inter-disciplinary group
- ✓ Being able to make a selection of information resources and to use them efficiently in order to develop the professional activity and adapt it to the demands of a dynamical society

Course-specific competences:

- ✓ Manipulating notions, methods and mathematical models, specific techniques and technologies in scientific calculus and applications in economy and informatics
- ✓ Data processing, analysis and interpretation using mathematical, statistical and informatics tools
- ✓ Being able to develop, test and validate algorithms; implementation in high level programming languages
- ✓ Being able to construct and apply mathematical models for analysing and simulating some phenomena and processes
- ✓ Being able to develop, analyse and test computer systems and specific programming languages; being able to use them for solving problems in applied mathematics
- ✓ Being able to analyse and interpret some economic processes and phenomena

B LEARNING OUTCOMES

- ✓ Students will be familiarized with the financial terminology and will get an insight into the trading strategies
- ✓ Students will be familiarized with some mathematical models in Finance and be able to use them in specific problems
- ✓ Introduction to Stochastic Analysis and its applicability in Finance
- ✓ After successfully completing this course, the students will be able to:
  - ✧ Identify and understand basic notions from Financial Calculus
  - ✧ Evaluate a financial derivative in a binomial market
  - ✧ Evaluate a financial derivative using the Black-Scholes formula
  - ✧ Do calculus with interest rates
  - ✧ Use the expected utility principle
  - ✧ Build simple strategies for trading financial derivative

C LECTURE CONTENT

	1. Introduction to Financial Mathematics. Interest rates. Annuities 2. Financial derivatives (forwards and futures, options, swaps) 3. Forwards and Futures 4. Financial options. The put-call parity 5. Trading strategies with options 6. Discrete time models for financial markets. Arbitrage-free and complete markets 7. The binomial and trinomial models 8. The general discrete model for financial markets. Incomplete markets 9. Introduction to stochastic analysis (Brownian motion, martingales) 10. Itô calculus. Stochastic differential equations. Applications in Finance 11. The Black-Scholes model 12. The greek letters 13. Introduction to Utility Theory. Applications in insurance 14. Portfolio optimization (discrete and continuous models)
D	**RECOMMENDED READING FOR LECTURES**
	1. C. Hull, Options, Futures and Other Derivatives, 6th Edition, Prentice Hall (2006). 2. Higham, An Introduction to Financial Option Valuation: Mathematics, Stochastics and Computation, Cambridge University Press (2004). 3. M. Günther, A. Jüngel, Finanzderivate mit Matlab, Viewweg (2003). 4. B. Øksendal, Stochastic Differential Equations: An introduction with applications, Springer-Verlag (1999) 5. I. Stoleriu, Matematici financiare, note de curs (online), 2010. 6. Wilmot, S. Howison and J. Dewynne, The Mathematics of Financial Derivatives, A Student Introduction, Cambridge University Press (1995).
E	**SEMINAR CONTENT**
	1. Exercises with interest rates and annuities 2. Exercises with forwards and futures 3. Exercises with European financial options 4. Trading strategies with options 5. Exotic options 6. The binomial model for European options 7. Asset pricing in a arbitrage-free market 8. Stochastic processes simulations 9. Exercises on Itô calculus 10. Applications for the Black-Scholes formula 11. Calculus of the greek letters 12. The expected utility principle 13. Portfolio optimization with MATLAB
F	**RECOMMENDED READING FOR SEMINARS**
	1. C. Hull, Options, Futures and Other Derivatives, 6th Edition, Prentice Hall (2006). 2. Higham, An Introduction to Financial Option Valuation: Mathematics, Stochastics and Computation, Cambridge University Press (2004). 3. B. Øksendal, Stochastic Differential Equations: An introduction with applications, Springer-Verlag (1999) 4. I. Stoleriu, Matematici financiare, note de curs (online), 2010. 5. Wilmot, S. Howison and J. Dewynne, The Mathematics of Financial Derivatives, A Student Introduction, Cambridge University Press (1995).
G	**EDUCATION STYLE**
LEARNING AND TEACHING METHODS	Lectures: Blackboard presentation Seminars/laboratory: Exercises solved on the blackboard and PC simulations
ASSESSMENT METHODS	Course: weight in the final grade 90% (final examination) Seminary/laboratory: weight in the final grade 10% (class activity/homework) Minimal requirements: 1. Basic knowledge of various financial notions and the ability to apply them in solving simple problems 2. The ability to use MATLAB functions for pricing some basic financial derivatives 3. Interpretation of the results 4. Minimum grade 5
LANGUAGE OF INSTRUCTION	English