Course Syllabus

I.   General Information

Course name	Financial mathematics
Programme	mathematics
Level of studies (BA, BSc, MA, MSc, long-cycle MA)	BA
Form of studies (full-time, part-time)	full-time
Discipline	mathematics
Language of instruction	english

Course coordinator/person responsible	PhD Wiesław Główczyński

Type of class *(use only the types mentioned below)*	Number of teaching hours	Semester	ECTS Points
lecture	30	II	5
tutorial			
classes	30	II	
laboratory classes			
workshops			
seminar			
introductory seminar			
foreign language classes			
practical placement			
field work			
diploma laboratory			
translation classes			
study visit			

Course pre-requisites	

II.   Course Objectives

C-1 Getting students acquainted with basic concepts of financial mathematics with deterministic interest rate and information on stochastic financial mathematics.
C2 - Acquiring the ability to calculate the time value of money and the rate of return on investment.
C3 - Acquiring skills of valuation of selected types of forward, futures and options contracts.

III.   **Course learning outcomes with reference to programme learning outcomes**

Symbol	Description of course learning outcome	Reference to programme learning outcome
KNOWLEDGE		
W_01	The student understands the importance of financial mathematics and its applications, in particular its role in the context of contemporary civilization's dilemmas	K_W01
W_02	The student has advanced knowledge of the basic areas of financial mathematics and its applications.	K_W04
SKILLS		
U_01	The student is able to use his knowledge to formulate complex and unusual mathematical problems in a correct and understandable way, discuss them and methods of solving them and present mathematical results and contents, in particular using information and communication techniques.	K_U38
SOCIAL COMPETENCIES		
K_01	The student is prepared to appreciate the role and importance of knowledge in solving cognitive and practical problems, typical of occupations and workplaces appropriate for graduates in the field of mathematics and consulting experts in the case of difficulties in solving the problem.	K_K02
K_02	The student is ready to present selected achievements of financial mathematics in a popular way.	K_K05

IV.   **Course Content**

The measurement of interest: Simple interest, Simple discount, Compound interest and discount, Forces of interest and discount. Present value. Annuities - present and accumulation value. Practical applications of annuities. Discounted cash flow analysis. Yield rate (internal rate of return).
Bonds and other securities. Price of a bond. Zero coupon bonds. Term Structure of Interest Rates. Bootstrapping. Duration. Convexity. Immunization. Markets. Arbitrage. Stochastic interest rate. Derivative instruments. Forward and Futures contracts. Plain vanilla European Call and Put options. The Put-Call parity for European options. Binomial model C-R-R (Cox-Ross-Rubinstein). Lognormal distribution. Black-Scholes formula. On the optimality of early exercise for American options. Exotic options.

V.   **Didactic methods used and forms of assessment of learning outcomes**

Symbol	Didactic methods *(choose from the list)*	Forms of assessment *(choose from the list)*	Documentation type *(choose from the list)*
KNOWLEDGE			
W_01	Conventional lecture	Exam	Protocol
W_02	Conventional lecture	Exam	Protocol
SKILLS			
U_01	Practical classes.	Test	Protocol
U_02	Practical classes.	Test	Protocol
SOCIAL COMPETENCIES			

K_01	Conventional lecture **/** Practical classes.	Exam/Test	Protocol
K_02	Conventional lecture / Practical classes.	Exam/Test	Protocol

VI.   Grading criteria, weighting factors..…

Exam (for students who passed classes):
– in groups of less than 8 students – oral exam
– in groups of 8 or more students – written exam (and oral exam for students who didn't received 50% points at written exam).
Exam, passing level is 50% of the sum of points;
91% – 100% excellent (5.0)
81% – 90% very good (4.5)
71% – 80% good (4.0)
61% – 70% satisfactory (3.5)
50% – 60% sufficient (3.0)
less than 50% fail (2.0)

In groups of less than 8 students credits are given by active participation in classes.
Colloquium, passing level is 50% of the sum of points;
91% – 100% excellent (5.0)
81% – 90% very good (4.5)
71% – 80% good (4.0)
61% – 70% satisfactory (3.5)
50% – 60% sufficient (3.0)
less than 50% fail and lack of active participation in classes (2.0)

Hourly equivalent to ECTS credits:
Lecture - 30
Classes - 30
Consultations - 30
Preparation for classes including self-solving of tasks identified by the teacher - 30
Preparing for the tests and exam, including reading the literature - 30

VII.   Student workload

Form of activity	Number of hours
Number of contact hours (with the teacher)	**90** (including 30 hours of consultations)
Number of hours of individual student work	**60**

VIII.   Literature

Basic literature
Kellison S.G., The theory of interest – Irwin/McGraw -Hill
M.C. Finan A Basic Course in the Theory of Interest and Derivatives Markets: A Preparation for the Actuarial Exam FM/2, Arkansas Tech University   http://faculty.atu.edu/mfinan/actuarieshall/mainf.pdf

Additional literature
Stefanica D., A primer for the mathematics of financial engineering- Fe Press
Stefanica D., Solutions Manual - A Primer For The Mathematics Of Financial Engineering – Fe Press
R.W. Kolb, Understanding Options, John Wiley & Sons,
Hull J.C., Fundamentals of Futures and Options Markets - Prentice –Hall
Hull J.C., Options, Futures, and Other Derivative Securities- Prentice –Hall
Hull J.C., Solutions Manual - Options, Futures and Other Derivatives - Prentice –Hall