University of Gdańsk

Subject card

Subject name and code	Introduction to Financial Mathematics, PG_00172743						
Field of study	Mathematical Modeling and Data Analysis						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2025/2026			
Education level	Bachelor's studies		Subject group				
Mode of study	full-time studies		Mode of delivery	at the university			
Year of study	2		Language of instruction	Polish			
Semester of study	4		ECTS credits	6.0			
Learning profile	academic		Assessment form	credit			
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr Marta Frankowska				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	0.0	0.0	60
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	60		10.0		80.0	150
Subject objectives	Familiarize students with the structure of interest rates, issues related to the analysis and modeling of financial flows.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[MMiADL3_U07] can comprehensively, in speech and in writing, formulate definitions and theorems and present correct mathematical reasoning regarding the issues learned	Student: - can determine the value of capital in a given concept using the appropriate capital accumulation function, - is able to use the concept of capital updating over time and in uses it using for	[SU4] test/exam - oral or written
[MMiADL3_U08] is able to plan a way to solve a given problem and make a correct record of this solution, providing accurate and precise justifications for the correctness of their reasoning	Student -can, having one type of interest rate, determine another, - using classical annuities, calculates the present and accumulated values of cash flows, -predicts the amortization of a loan in fixed installments and fixed capital installments, -can evaluate the profitability and risk of an investment using classical methods like NPV	[SU4] test/exam - oral or written
[MMiADL3_W08] knows and understands well the role and importance of proof in mathematics, as well as the concept of the significance of assumptions	Student: - knows the characteristics of interest rates, the relationship between different types of rates interest rates, - has knowledge of annuities and their applications, - has knowledge of selected investment evaluation indicators, - knows the types of bonds and has knowledge of stock market indices.	[SW4] test/exam - oral or written
[MMiADL3_K02] is ready to precisely formulate questions to deepen his/her own understanding of a given topic or to find missing elements of reasoning	The student acts ethically, is able to work in a group, formulate his own conclusions, listen to the arguments of others and jointly build a strategy for solutions to the problems posed.	[SK8] observation of student's independent or team work

Subject contents

1. capital accumulation and discount functions: simple capitalization, continuous compound capitalization. Interest rates: effective, nominal, continuous.
2. The instantaneous structure of interest rates.
3. reference rates WIBOR and WIBID.
4. Fixed and variable installment annuities, payable in arrears and payable in advance, perpetual and deferred annuities, annuities whose payments do not coincide with the capitalization period, continuous annuities, present value and accumulated value of annuities.
5. Loans with fixed installments and fixed principal payments.
6. Selected ratios for evaluating financial investments including net present value (NPV) and internal rate of return (IRR).

Prerequisites and co-requisites

Knowledge of the basics of mathematical analysis.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
written exam	51.0%	60.0%
colloquium	51.0%	40.0%

Recommended reading

Basic literature

1. M. Podgórska, J. Klimkowska Financial mathematics, PWN, Warsaw, 20052.
2. Capital Markets. Financial Mathematics I, P. Jaworki, K. M. Jaworska, online version of the lecture: http://mst.mimuw.edu.pl/lecture.php?lecture=rka

	Supplementary literature	1. Financial Engineering, R. Weron, WNT, Warsaw 2. Mathematical Modeling in Finance and Insurance, P. Jaworski, J. Micał, Poltext, Warsaw 2005
	eResources addresses	Basic http://mst.mimuw.edu.pl/lecture.php?lecture=rka - Capital Markets. Financial Mathematics I, P. Jaworki, K. M. Jaworska
Example issues/ example questions/ tasks being completed	1. Capital accumulation processes (simple interest, compound interest, continuous capitalization, annual and subperiodic interest rate, nominal and effective rate, minimum and maximum interest). 2. Commercial discount, treasury bills, bills of exchange. 3. Inflation, real interest rate and real value of capital. 4. Time value of capital model, principle of equivalence of capitals. 5. Annuities payable in arrears and payable in advance, deferred annuities, perpetual annuities, annuities with fixed installments, annuities with variable installments: series of fixed, forming an arithmetic and geometric series, generalized annuity type I and II. 6. Loans, the principle of equivalence of debt and installments, different models of loan repayment, mortgages - WIBOR-dependent rate, loan repayment plan, real interest rate on loans. 7. Measures for evaluating financial investments - NPV (net present value of investment) and IRR (internal rate of return).	
Work placement	Not applicable	

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