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	2024/2025
Education level	Bachelor's studies	Subject group	Optional subject group
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	6.0
Learning profile	academic	Assessment form	exam
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	dr Marta Frankowska	
	Teachers	dr Marek Hałenda dr Marta Frankowska	

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_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_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	The student is able to - having one type of interest rate determine another, - using classical annuities determine the present and accumulated values of cash flows, - carry out the amortization of a loan in fixed installments and fixed capital installments, - can determine the profitability and risk of an investment using methods such as NPV and IRR	[SU4] test/exam - oral or written
[MMiADL3_U07] can comprehensively, in speech and in writing, formulate definitions and theorems and present correct mathematical reasoning regarding the issues learned	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	[SU8] observation of student's independent or team work
[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 is able to - determine the value of capital at a given point in time using capital accumulation functions, - is able to use the concept of updating capital over time and uses it by applying the principle of equivalence of capitals.	[SK4] test/exam - oral or written

Subject contents

1. Capital accumulation and discount functions: simple capitalization, compound capitalization. Interest rates: effective, nominal, continuous.
2. Momentum structure of interest rates.
3. Reference rates WIBOR and WIBID.
4. Annuities annuities with fixed and variable installments, payable in arrears and payable in advance, perpetual and deferred, 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).
7. Bonds.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
written exam	51.0%	60.0%
observation of the student's attitude	100.0%	0.0%
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Recommended reading

Basic literature	1. M. Podgórska, J. Klimkowska Financial Mathematics, PWN, Warsaw, 2005. 2. Capital Markets. Financial mathematics I, P. Jaworki, K. M. Jaworska.
Supplementary literature	1. Financial engineering, R. Weron, WNT, Warsaw, Poland. 2. Mathematical modeling in finance and insurance, P. Jaworski, J. Micał, Poltext, Warsaw 2005.
eResources addresses	

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. Trade 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, the real interest rate on a loan.
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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