

Subject card

Subject name and code	, PG_00155257						
Field of study	Mathematics						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2025/2026		
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	2		Language of instruction		Polish		
Semester of study	4		ECTS credits		6.0		
Learning profile	academic		Assessment form		exam		
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
	[MATL3_W09] knows and understands the role and importance of proof in mathematics, as well as the concept of the importance of assumptions	Student: - knows the characteristics of interest rates, the relationship between different types of 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
	[MATL3_U09] is able to plan how to solve a specific problem and prepare a correct record of this solution, providing strict and precise justification for the correctness of his 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
	[MATL3_U08] is able to formulate definitions and theorems in an understandable way, both orally and in writing, and present correct mathematical reasoning regarding the acquired issues	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.	[SU4] test/exam - oral or written
	[MATL3_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
	[MATL3_K01] is ready to accept the limitations of his/her own knowledge and understands the need for further education	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
	[MATL3_K06] is ready to formulate opinions on basic mathematical issues	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
	[MATL3_K04] is ready to understand and appreciate the importance of intellectual honesty in one's own and other people's actions; is willing to act ethically	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, 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	Knowledge of the basics of mathematical analysis.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	observation of the student's attitude	51.0%	0.0%
	colloquium	51.0%	40.0%
	written exam	51.0%	60.0%

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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