University of Gdańsk

Subject card

Subject name and code	Analysis of Financial Instruments, PG_00174480						
Field of study	Mathematics						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2025/2026			
Education level	Master'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	3		ECTS credits	6.0			
Learning profile	academic		Assessment form	exam			
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr Milena Matusik				
	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	To familiarize students with actual rates and instruments occurring in financial markets and issues related to risk measurement.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[MATMU2_U07] is able to define his/her interests and develop them; in particular, is able to establish contact with specialists in his/her field, e.g. understand their lectures intended for young mathematicians	The student is able to define and develop his/her interests in financial markets and the mechanisms operating within them.	[SU1] oral statement/conversation/ discussion [SU8] observation of student's independent or team work
[MATMU2_K01] is willing to acknowledge the limitations of his or her own knowledge and is willing to pursue further education	The student knows the limitations of his or her own knowledge and demonstrates readiness for further education.	[SK8] observation of student's independent or team work
[MATMU2_U06] is able to apply methods and examples from a selected field of mathematics in related fields	The student is able to apply selected financial instruments on the financial market using both standard methods of mathematical analysis, probability and the definitions, facts and theorems learned during the lecture.	[SU2] presentation/project/paper/ report
[MATMU2_W03] knows and understands in-depth a selected field of theoretical or applied mathematics and is able to understand the formulations of issues in this field that are still at the research stage and knows the connections of issues in this field with other areas of mathematics	The student has in-depth theoretical knowledge of the results and arguments in the field of selected financial instruments.	[SW2] presentation/project/paper/ report
[MATMU2_W02] knows and understands well the role and importance of the construction of mathematical reasoning	The student has knowledge and understands selected financial instruments and knows the role of risk measures in the financial decision-making process.	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report
[MATMU2_W01] knows and understands in-depth the theory of selected areas of mathematics	The student has in-depth knowledge of selected financial instruments available on the financial market.	[SW4] test/exam - oral or written [SW2] presentation/project/paper/ report
[MATMU2_U03] can understand mathematical texts of various types from selected fields of mathematics	The student acquires the ability to understand texts on financial mathematics at an advanced level.	[SU2] presentation/project/paper/ report [SU8] observation of student's independent or team work
[MATMU2_U01] can construct mathematical reasoning: prove theorems and refute hypotheses through construction and selection of counterexamples	The student has the ability to analyze and evaluate of financial instruments.	[SU2] presentation/project/paper/ report
[MATMU2_U04] is able, at an advanced level and including modern mathematics, to apply and present, orally and in writing, methods of at least one selected branch of mathematics	The student is able to apply and present methods related to financial instruments at an advanced level.	[SU2] presentation/project/paper/ report [SU3] text preparation/written work [SU4] test/exam - oral or written
[MATMU2_U05] can perform proofs in a selected field and, if necessary, also use tools from other areas of mathematics	The student is able to use selected financial instruments in argumentation, in which, if necessary, argumentation from mathematical analysis or probability theory is used.	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written [SU8] observation of student's independent or team work
[MATMU2_K06] is ready to formulate opinions on basic mathematical issues	The student is able to formulate opinions on selected financial instruments or risk measures.	[SK1] oral statement/conversation/ discussion
[MATMU2_K05] is ready to independently search for information in literature, also in foreign languages	The student is able to independently search for information in professional literature.	[SK2] presentation/project/paper/ report [SK8] observation of student's independent or team work
[MATMU2_K04] is ready to understand and appreciate the importance of intellectual honesty in one's own and other people's actions; ethical conduct	The student understands and appreciates the importance of intellectual honesty.	[SK8] observation of student's independent or team work
[MATMU2_K02] is ready to precisely formulate questions to deepen his/her understanding of a given topic or find missing elements of reasoning	The student is able to precisely formulate questions that serve to deepen understanding of a topic related to financial markets.	[SK1] oral statement/conversation/ discussion

<table>
<tr><td>Subject contents</td><td>1. Interest rate analysis based on the example of interbank reference rates WIBOR, LIBOR, EURLIBOR.
2. Loan rates with variable interest rates based on reference rates.
3. Selected term structures of interest rates.
4. Basic debt instruments including bonds clean price, dirty price of bonds, duration, modified duration, convexity based on examples from the market.
5. Construction of yield curves based on risk-free instruments and reference rates.
6. Review of futures contracts FRA, IRS contracts.
7. Options European, American, barrier, knock-in-and-up (CRR model and Black-Scholes model, Greek indicators).
8. Selected issues related to risk assessment including VaR.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Knowledge of the basics of mathematical analysis I and II, probability theory.</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>observation of the student's attitude</td><td>51.0%</td><td>0.0%</td></tr>
<tr><td>project</td><td>51.0%</td><td>20.0%</td></tr>
<tr><td>exam</td><td>51.0%</td><td>40.0%</td></tr>
<tr><td>tests</td><td>51.0%</td><td>40.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>1. Rynki kapitałowe. Matematyka finansowa I, P. Jaworki, K. M. Jaworska, wersja internetowa wykładu: http://mst.mimuw.edu.pl/lecture.php?lecture=rka
2. Modelowanie matematyczne w finansach i ubezpieczeniach, P. Jaworski, J. Micał, Poltext, Warszawa 2005
3. Inżynieria finansowa, R. Weron, WNT, Warszawa.
4. Options Futures and others Derivatives, J. C. Hull, Prentice Hall International, London</td></tr>
<tr><td>Supplementary literature</td><td>Modele matematyki finansowej, instrumenty podstawowe, K. Piasecki, PWN, 2007.</td></tr>
<tr><td>eResources addresses</td><td>Basic
https://mst.mimuw.edu.pl/lecture.php?lecture=rka - Lecture: "Rynki kapitałowe. Matematyka finansowa" I, P. Jaworki, K. M. Jaworska</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>None.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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