University of Gdańsk

Subject card

Subject name and code	Data Analysis in Life Insurance, PG_00208773		
Field of study	Mathematical Modeling and Data Analysis		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
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	3	Language of instruction	Polish
Semester of study	5	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	0.0	30.0	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 introduce students to basic concepts and facts in the mathematics of life insurance.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[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 precisely formulate questions that serve to deepen understanding of a given topic.	[SK1] oral statement/conversation/ discussion [SK8] observation of student's independent or team work
[MMiADL3_U11] knows how to arrange and analyse an algorithm in accordance with the specification and save it in the selected programming language	The student is able to implement selected algorithms and functions with a given specification in a selected programming language.	[SU2] presentation/project/paper/ report [SU5] implementation of a problem task
[MMiADL3_W09] knows and understands the basics of computational and programming techniques supporting mathematician's work and understands their limitations	The student has knowledge of the basic components and structures of a selected programming language and is able to apply them to speed up calculations or facilitate the analysis of a selected model.	[SW2] presentation/project/paper/ report [SW5] implementation of a problem task
[MMiADL3_U10] is able to recognise problems, including practical issues, that can be solved algorithmically; can make a specification of such a problem	The student is able to implement an appropriate algorithmic solution to a practical problem related to the mathematics of life insurance.	[SU2] presentation/project/paper/ report [SU5] implementation of a problem task

Subject contents

1. Elements of financial mathematics - interest rates, standard payment sequences.
2. Life expectancy - fractional life expectancy and its interpolation.
3. Life insurance - single net premium in continuous and discrete insurance.
4. Life annuities - actuarial present value of continuous and discrete annuities.
5. Standard insurance and net premiums.
6. Net mathematical reserves - loss sharing in annual policies, Hattendorff's theorem.
7. Multiple losses, group policies.
8. Commutation functions.
9. Gross mathematical reserve.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">Possess knowledge at the level of mathematical analysis I and II, probability theory and introduction to programming.</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>test</td><td>51.0%</td><td>40.0%</td></tr>
<tr><td>exam</td><td>51.0%</td><td>40.0%</td></tr>
<tr><td>project</td><td>51.0%</td><td>20.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. J. Czarnowska, K. Dziedziul, Ubezpieczenia na życie i komunikacyjne, Wyd. Politechniki Gdańskiej, 2010.
2. B. Błaszczyszyn, T. Rolski, Podstawy matematyki ubezpieczeń na życie, WNT, 2004.
3. N. Bowers, H. Gerber, J. C. Hickman, D. A. Jones, C. J. Nesbitt, Actuarial Mathematics, The Society of Actuaries, 1986.
4. H. Gerber, Life insurance mathematics, Springer, 1995.
5. A. Leung, Actuarial Principles. Lifetables and mortality models, Academic Press,2022.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1. M. Skałba, Ubezpieczenia na życie, WNT, 1999.
2. P. Jaworski, J. Micał, Modelowanie matematyczne w finansach i ubezpieczeniach, Poltext, 2005.</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">None.</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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