University of Gdańsk

Subject card

Subject name and code	Introduction to Biomathematics, PG_00174487						
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 Danuta Jaruszewska-Walczak				
	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	The aim is to knowing students with classical models and methods of biomathematics.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[MATMU2_W02] knows and understands well the role and importance of the construction of mathematical reasoning	The student knows and understands proofs of theorems and understands the role of reasoning construction in biomathematical problems.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[MATMU2_W01] knows and understands in-depth the theory of selected areas of mathematics	The student knows and thoroughly understands the theory related to the topics learned for recurrence and differential equations applicable to the modeling of biological phenomena.	[SW4] test/exam - oral or written
[MATMU2_U03] can understand mathematical texts of various types from selected fields of mathematics	The student is able to understand the proofs of selected mathematical theorems used in biomathematics and the construction and solution of a specific mathematical problem that is used to model biological phenomena.	[SU4] test/exam - oral or written
[MATMU2_K01] is willing to acknowledge the limitations of his or her own knowledge and is willing to pursue further education	The student understands the limitations of their own knowledge and the need for lifelong learning.	[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 ready to formulate questions aimed at deepening the understanding of a given topic.	[SK1] oral statement/conversation/ discussion [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 construct and solve mathematical models used in related natural sciences.	[SU4] test/exam - oral or written
[MATMU2_U01] can construct mathematical reasoning: prove theorems and refute hypotheses through construction and selection of counterexamples	The student is able to prove selected theorems in biomathematics and refute hypotheses by selecting counterexamples.	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written
[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 solve problems in biological models using various methods of modern advanced mathematics.	[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 construct and solve selected problems in biology modeling using tools from various areas of mathematics.	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written
[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 develop interests in order to construct and solve problems in biomathematics.	[SU1] oral statement/conversation/ discussion [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 basic problems in biological modeling.	[SK1] oral statement/conversation/ discussion [SK8] observation of student's independent or team work
[MATMU2_K05] is ready to independently search for information in literature, also in foreign languages	The student is ready to search for information in scientific studies.	[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 integrity and ethical conduct.	[SK8] observation of student's independent or team work
[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 knows and understands proofs of theorems and understands the role of reasoning construction in mathematical problems and their applications in modeling biology.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion

<table>
<tr><td>Subject contents</td><td>Recurrence equations and ordinary differential equations in historical and heuristic population models, including discrete and continuous ones.

Differential and discrete logistic equation and with delay - applications in population dynamics.

Theory of first-order partial equations, von Foerster equation in the population model with age structure.

Autonomous system of ordinary differential equations, approximation by a linear system - application in predator-prey models.

Optional: main epidemic models; crocodile survival environment; dynamics of marital interactions; model of enzymatic reactions.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Knowledge of the basics of differential and integral calculus.</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>test</td><td>51.0%</td><td>50.0%</td></tr>
<tr><td>exam</td><td>51.0%</td><td>50.0%</td></tr>
<tr><td>observation of student behavior</td><td>51.0%</td><td>0.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>J. D. Murray, Wprowadzenie do biomatematyki, Wydawnictwo Naukowe PWN, 2006.

U. Foryś, Matematyka w biologii, WNT, 2005.

R. Rudnicki, Modele i metody biologii matematycznej, cz. I: Modele deterministyczne, IMPAN, 2014.</td></tr>
<tr><td>Supplementary literature</td><td>Not required</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>Not required</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
</table>

Document generated electronically. Does not require a seal or signature.