GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mathematical Methods of Biophysics, PG_00047933		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
Education level	first-cycle studies	Subject group	Optional subject group Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	6	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Solid State Physics -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Jarosław Rybicki	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	15.0	0.0	0.0	0.0	30

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	30	2.0	18.0	50

Subject objectives

The goal is to familiarise the students with uncertainty calculus as well as basics of probabilistics and statistics. Furthermore the goal is to give the students necessary knowledge and abilities concerning differential equations.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U03] can design, according to required specifications, and make a simple device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	n.a. The course does not contain practical jobs	[SU2] Assessment of ability to analyse information
[K6_W01] knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study	Understands mathematics in minimal degree, necessary in order to formulate simple mathematical models	[SW1] Assessment of factual knowledge
[K6_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study and perform tasks, in an innovative way, in not entirely predictable conditions, by:n- appropriate selection of sources and information obtained from them, assessment, critical analysis and synthesis of this information,n- selection and application of appropriate methods and toolsn	1. Basic descriptive statistics, statistical inference, applications 2. Differental equations of the first and the second order and their application to simple models in epidemiology, immunology, population dynamics.	[SU4] Assessment of ability to use methods and tools

<table>
<tr><td>Subject contents</td><td>Measurement and its result. Measurement uncertainty and its origins. Measurement errors.

Basic principles of ordering and analysis of experimental data, and the visualization of experimental data.

Interval calculus and its applications.

Rudiments of descriptive statistics: stemplots, analytical means, moving averages, measures of dispersion, symmetry and shape.

The rudiments of probability theory: definitions of probability, random events, sample space, the rudiments of combinatorics and its application to calculations of the probability of events, conditional probability, independent events, law of total probability, Bayes theorem.

Discrete and continuous random variables. Bernoulli distribution, Poisson distribution, Gaussian distribution, chi-square distribution, Students t-distribution, the law of large numbers and its applications.

Statistical samples, the distribution of mean and of variance, estimating population parameters, point and interval estimation, statistical hypotheses and their types, parametric and nonparametric tests.

Continuous time series, Fourier analysis, wavelets.

The basics of mathematical modeling; discrete and continuous models; ordinary differential equations; first-order linear equations; first-order nonlinear equations; selected types of second-order linear equations; systems of first-order equations; autonomous system of two first-order nonlinear equations; phase space; steady states and their classification; limit-cycles; the PoincaréBendixson theorem.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basic 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>written test in theory</td><td>51.0%</td><td>50.0%</td></tr>
<tr><td>written test in problem solving</td><td>51.0%</td><td>50.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>Z. Pawłowski, Wstęp do statystyki matematycznej, PWN

U. Foryś, Modele matematyczne w biologii i medycynie

Krysicki, Zbiór zadań z analizy matematycznej, tom I</td></tr>
<tr><td>Supplementary literature</td><td>Murray, Introduction to biomathematics</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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