



## 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 2022		Academic year of realisation of subject		2024/2025		
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_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. Differential 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		
	[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_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		

Subject contents	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.		
Prerequisites and co-requisites	Basic calculus		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	written test in problem solving	51.0%	50.0%
	written test in theory	51.0%	50.0%
Recommended reading	Basic literature	Z. Pawłowski, Wstęp do statystyki matematycznej, PWN	
		U. Foryś, Modele matematyczne w biologii i medycynie	
		Krysicki, Zbiór zadań z analizy matematycznej, tom I	
	Supplementary literature	Murray, Introduction to biomathematics	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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