University of Gdańsk

Subject card

Subject name and code	, PG_00193387						
Field of study	Medical Physics						
Date of commencement of studies	October 2025		Academic year of realisation of subject	2025/2026			
Education level	Bachelor's studies		Subject group				
Mode of study	full-time studies		Mode of delivery	at the university			
Year of study	1		Language of instruction	Polish			
Semester of study	2		ECTS credits	3.0			
Learning profile	academic		Assessment form	credit			
Conducting unit	Division of Atomic and Molecular Physics -> Institute of Experimental Physics -> Faculty of Mathematics, Physics and Informatics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor	dr Łukasz Sobolewski					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	45.0	0.0	0.0	0.0	45
	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	45		0.0	30.0	75	
Subject objectives	The aim of the course is to introduce the fundamentals of differential and integral calculus and their applications in applied mathematics, statistics, and technical sciences.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[FIZMEDL3_U01] He can formulate, analyse, and solve complex problems in physics and medicine, using mathematical formalism, based on the physical phenomena, principles, and theories he has learned.	The student is able to formulate and solve computational problems in differential and integral calculus and differential equations, using mathematical formalism to analyze problems of physical, technical, or statistical nature.	[SU1] oral statement/conversation/ discussion [SU4] test/exam - oral or written [SU8] observation of student's independent or team work
[FIZMEDL3_W03] Knows and understands at an advanced level the most important topics of higher mathematics, including statistics, to the extent necessary for the quantitative description, understanding and modelling of physical and medical processes.	The student knows and understands methods of differential and integral calculus for functions of one and several variables and their applications in statistics and simple mathematical models.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[FIZMEDL3_K01] He is ready for a critical evaluation of his own knowledge and the information he receives, and understands the need for further education and for improving professional and personal competencies.	The student is able to independently verify the correctness of calculations and applied mathematical methods, critically evaluate obtained results, and recognizes the need for continuous improvement of their mathematical competencies.	[SK1] oral statement/conversation/ discussion [SK4] test/exam - oral or written [SK8] observation of student's independent or team work

Subject contents	**1.** Review, consolidation, and extension of mathematical calculus computing derivatives of functions of one variable, partial derivatives of multivariable functions, and applications of differential calculus in problem solving. **2.** Review, consolidation, and extension of mathematical calculus computing integrals of functions of one variable. **3.** Applications of differential and integral calculus in statistics: the concept of the probability function, probability density function, cumulative distribution function, transition from discrete to continuous random variables, problem solving using differential and integral calculus, hypothesis testing. **4.** Introductory topics in differential equations. **5.** Basic types of first-order ordinary differential equations. **6.** Vector differential equations. **7.** Scalar linear differential equations of order *n*.
Prerequisites and co-requisites	Students are expected to have prior knowledge of higher mathematics, in particular basic concepts of differential and integral calculus of single-variable functions, including limits, derivatives, and definite and indefinite integrals.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Obserwacja aktywności Studentów na zajęciach	0.0%	10.0%
Sprawdziany/ wejściówki/ prace domowe	0.0%	30.0%
Rozwiązywanie zadań	51.0%	60.0%

Recommended reading

Basic literature

1. Matematyka : kurs akademicki dla studentów nauk stosowanych. Cz. 1, Wybrane zagadnienia algebry liniowej / Grażyna Kwiecińska. Kwiecińska, Grażyna (matematyka). ; Wydawnictwo Uniwersytetu Gdańskiego

2. Matematyka : kurs akademicki dla studentów nauk stosowanych. Cz. 2, Analiza funkcji jednej zmiennej / Grażyna Kwiecińska.

Kwiecińska, Grażyna (matematyka). ; Wydawnictwo Uniwersytetu Gdańskiego

3 . Matematyka : kurs akademicki dla studentów nauk stosowanych. Cz. 3, Analiza funkcji wielu zmiennych / Grażyna Kwiecińska.

4. Podstawy metod opracowania pomiarów : wykład dla początkujących / Andrzej Bielski, Roman Ciuryło.

Bielski, Andrzej (1939-2013) | Ciuryło, Roman
2001 | Toruń : Uniwersytet Mikołaja Kopernika

5. Palczewski A. Równania różniczkowe zwyczajne, WNT, Warszawa, 1999.

6. Wojtowicz S. Zadania z matematyki dla wyższych uczelni technicznych, cz. II, PWN,

Warszawa, 1971.

7. Others as directed by the instructor.

	Supplementary literature	[1] Ombach J. Wykłady z równań różniczkowych, Wydawnictwo Uniwersytetu Warszawskiego, 1999. [2] Muszyński J., Myszkis A.D. Równania różniczkowe zwyczajne, PWN, Warszawa,1984. [3] Perko L. Differential equations and dynamical systems, Springer-Verlag, 1991. [4] Ogata K. Metody przestrzeni stanów w teorii sterowania, WNT, Warszawa, 1974. [5] Kołodziej W. Analiza matematyczna, PWN, Warszawa, 1986. [6] Krasnow M., Kisielew A., Makarenko G. Funkcje zmiennej zespolonej. Rachunek operatorowy. Teoria stabilności. , Nauka, Moskwa, 1971 (po rosyjsku).
	eResources addresses	
Example issues/ example questions/ tasks being completed	Review of the basics of differential calculus of single-variable functions: limits, continuity, derivatives, and their geometric and physical interpretation. Computation of derivatives of elementary and composite functions using differentiation rules. Applications of derivatives: analysis of monotonicity, determination of local and global extrema, concavity, inflection points, and sketching function graphs. Partial derivatives of multivariable functions; the gradient and its interpretation. Applications of partial derivatives in optimization problems. Indefinite and definite integrals of single-variable functions; basic integration techniques. Applications of definite integrals: calculation of areas, mean values, and simple physical and engineering problems. Introduction to applications of differential and integral calculus in statistics: discrete and continuous random variables, probability density function, cumulative distribution function. Probability calculations using derivatives and integrals; expected value and variance. Basic concepts of ordinary differential equations; solving simple first-order differential equations. Solving computational problems of increasing difficulty to consolidate the material covered during the classes.	
Work placement	Not applicable	

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