University of Gdańsk

Subject card

Subject name and code	, PG_00210436		
Field of study	Nuclear safety and radiological protection		
Date of commencement of studies	October 2026	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	1	Language of instruction	Polish not applicable
Semester of study	2	ECTS credits	3.0
Learning profile	academic	Assessment form	credit
Conducting unit			
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	30.0	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	0.0	45.0	75

Subject objectives

The aim of the course is to familiarize students with the basics of differential and integral calculus and their applications in applied mathematics, statistics, and technical sciences.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[BJORL3_W04] Has an advanced knowledge and understanding of selected techniques in advanced mathematics to the extent necessary to describe phenomena at the subatomic level and to solve problems in nuclear physics and chemistry.	Knows and understands selected advanced mathematical techniques used to describe subatomic phenomena and solve problems in nuclear physics and nuclear chemistry.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[BJORL3_W12] Has an advanced knowledge and understanding of the mathematical and statistical methods used in data analysis.	The student knows and understands the methods of differential and integral calculus of functions of one and more variables and their applications in statistics and simple mathematical models.	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion
[BJORL3_U10] Graduate applies mathematical and statistical methods to describe phenomena and analyze data.	The student is able to formulate and solve computational problems in the field of differential and integral calculus and differential equations, applying mathematical formalism to analyze problems of a 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

Subject contents	1. Review, consolidation, and expansion of mathematical calculus - calculating the derivative of functions of one variable, partial derivatives of functions of several variables, applications of differential calculus in problems. 2. Review, consolidation, and expansion of mathematical calculus - calculating integrals of functions of one variable. 3. Application of differential and integral calculus in statistics: Concepts of probability functions, probability density functions, cumulative distribution functions, transitions from discrete variables to continuous variables, calculations in problems using differential and integral calculus, hypothesis testing. 4. Introductory knowledge of differential equations 5. Basic types of first-order ordinary differential equations 6. Vector differential equations 7. Scalar linear equations of order n
Prerequisites and co-requisites	Students are expected to have knowledge of the basics of higher mathematics, in particular elementary differential and integral calculus of functions of one variable, including the concepts of limit, derivative, and definite and indefinite integrals.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Activity in classes	0.0%	10.0%
Test or tests	51.0%	30.0%
Colloquium	51.0%	60.0%

Recommended reading

Basic literature

1. **Mathematics: An Academic Course for Students of Applied Sciences. Part 1: Selected Topics in Linear Algebra** / Grażyna Kwiecińska.
Kwiecińska, Grażyna (Mathematics). Gdańsk University Press.

2. **Mathematics: An Academic Course for Students of Applied Sciences. Part 2: Analysis of Functions of One Variable** / Grażyna Kwiecińska.
Kwiecińska, Grażyna (Mathematics). Gdańsk University Press.

3. **Mathematics: An Academic Course for Students of Applied Sciences. Part 3: Analysis of Functions of Several Variables** / Grażyna Kwiecińska.
Gdańsk University Press.

4. **Fundamentals of Measurement Data Processing: An Introductory Lecture** / Andrzej Bielski, Roman Ciuryło.
Bielski, Andrzej (1939–2013); Ciuryło, Roman.
Toruń: Nicolaus Copernicus University, 2001.

5. Palczewski, A. **Ordinary Differential Equations**. WNT, Warsaw, 1999.

6. Wojtowicz, S. **Problems in Mathematics for Higher Technical Education Institutions**, Part II. PWN, Warsaw, 1971.

7. **Other references as recommended by the instructor.**

	Supplementary literature	1. Ombach, J. **Lectures on Differential Equations**. Warsaw University Press, 1999. 2. Muszyński, J., Myszkis, A.D. **Ordinary Differential Equations**. PWN, Warsaw, 1984. 3. Perko, L. **Differential Equations and Dynamical Systems**. Springer-Verlag, 1991. 4. Ogata, K. **State-Space Methods in Control Theory**. WNT, Warsaw, 1974. 5. Kołodziej, W. **Mathematical Analysis**. PWN, Warsaw, 1986. 6. Krasnov, M., Kisielev, A., Makarenko, G. **Functions of a Complex Variable. Operational Calculus. Stability Theory**. Nauka, Moscow, 1971 (in Russian).
	eResources addresses	
Example issues/ example questions/ tasks being completed	**Review of the fundamentals of differential calculus for functions of one variable:** limits, continuity, derivatives, and their geometric and physical interpretations. Calculation of derivatives of elementary and composite functions; application of differentiation rules. Applications of derivatives: analysis of function monotonicity, determination of local and global extrema, analysis of concavity and inflection points, and sketching graphs of functions. Partial derivatives of functions of several variables; gradient and its interpretation. Applications of partial derivatives in optimization problems. Indefinite and definite integrals of functions of one variable; basic integration techniques. Applications of definite integrals: calculation of areas, average values, and simple physical and engineering problems. Introduction to applications of differential and integral calculus in statistics: discrete and continuous random variables, probability density functions, and cumulative distribution functions. 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 complexity to reinforce the material covered during classes.	
Work placement	Not applicable	

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