



Subject card

Subject name and code	Calculations in Physics and Technology, PG_00047926								
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering								
Date of commencement of studies	October 2020	Academic year of realisation of subject		2022/2023					
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	5	ECTS credits		2.0					
Learning profile	general academic profile		Assessment form		assessment				
Conducting unit	Department of Atomic, Molecular and Optical Physics -> Faculty of Applied Physics and Mathematics								
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. Anna Perelomova						
	Teachers		prof. dr hab. Anna Perelomova						
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 aim of the course is to recall and to systematize some mathematical objects, definitions or methods as tools that can be used to describe physical quantities and relations they obey.								
Learning outcomes	Course outcome		Subject outcome			Method of verification			
	[K6_W01] Knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study		Student knows the following concepts: scalar product, vector product, derivative, partial derivative, gradient, divergence, curl, integral, differential equations and others. Student can use the concepts to describe some physical problems.			[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		Student solves analytically simple problems concerning selected branches of physics.			[SU1] Assessment of task fulfilment			
[K6_W02] Knows and understands, to an advanced extent, selected laws of physics and physical phenomena as well as methods and theories explaining the complex relationships between them, constituting the basic general knowledge in the field of technical sciences related to the field of study		Student lists and explains the basic physical phenomena, concepts and laws of mechanics, electromagnetism and heat transfer.			[SW1] Assessment of factual knowledge				

Subject contents	<p>1)The concept of the physical field. Physical fields classification (2h)</p> <p>2)The concept of tensor in physics. Scalars and vectors as tensors (1h)</p> <p>3)Operations on vectors: dot and vector products, oriented integral, application in physics (2h).</p> <p>4)Discussion of the properties of the derivative of a function of one variable with a geometric interpretation and reference to physical quantities defined as derivatives (1h)</p> <p>5)Presentation of the concept of the derivative of a function of several variables (1h)</p> <p>6)Operations on scalar and vector fields: divergence, rotation, gradient. Usage in physics (4h)</p> <p>7)Ordinary and partial differential equations in physics (1h)</p> <p>8)Methods of solving some ordinary and partial differential equations on the example of laws and problems of physics (3h)</p>						
Prerequisites and co-requisites							
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="446 833 794 871">Subject passing criteria</th><th data-bbox="794 833 1140 871">Passing threshold</th><th data-bbox="1140 833 1489 871">Percentage of the final grade</th></tr> </thead> <tbody> <tr> <td data-bbox="446 871 794 911">written test</td><td data-bbox="794 871 1140 911">50.0%</td><td data-bbox="1140 871 1489 911">100.0%</td></tr> </tbody> </table>	Subject passing criteria	Passing threshold	Percentage of the final grade	written test	50.0%	100.0%
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Example issues/example questions/tasks being completed	<ol style="list-style-type: none"> <li>Starting from the Maxwell's equations find the wave equations obeyed by the electric field <b>E</b> and the magnetic field <b>B</b>.</li> <li>Use the double integral to find the center of mass of the planar region with some density.</li> <li>Solve the differential equation describing the damped harmonic oscillator. The initial displacement and the initial velocity are given.</li> <li>The Coriolis force.</li> <li>The divergence of the heat flux density.</li> </ol>						
Work placement	Not applicable						