University of Gdańsk

Subject card

Subject name and code	Physical laboratory - electromagnetism and thermodynamics, PG_00168479		
Field of study	Pracownia fizyczna - elektromagnetyzm i termodynamika (Ćw. laboratoryjne)		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2026/2027
Education level	Bachelor's studies	Subject group	Obligatory subject group in the field of study 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	2	Language of instruction	Polish not applicable
Semester of study	3	ECTS credits	4.0
Learning profile	academic	Assessment form	credit
Conducting unit			
Name and surname of lecturer (lecturers)	Subject supervisor	dr Joanna Gondek	
	Teachers		

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	45.0	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	55.0	100

Subject objectives	deepening knowledge and understanding of the basic principles of physical phenomena through independent conduct and theoretical analysis of the results of selected physical experiments in electromagnetism and thermodynamics.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[BJORL3_K07] has a sense of responsibility for jointly implemented tasks; is able to interact and work in a group, taking on different roles in it	The student is aware of: – the need to cooperate with members of the research group in order to correctly conduct a physical experiment; – the need to constructively evaluate their own work and that of other members of the research group; The student is aware of: – the need to cooperate with members of the research group in order to correctly conduct a physical experiment; – the need to constructively evaluate their own work and that of other members of the research group; – the need to perform the tasks assigned to them reliably and on time; – the need to comply with the rules on intellectual property protection and the legal and ethical conditions related to research activities.	[SK1] wypowiedź ustna/rozmowa/ dyskusja [SK2] prezentacja/projekt/referat/ raport
	[BJORL3_U02] Has the ability to perform measurements of basic quantities used in physics and chemistry; can develop, describe and present the results of simple experiments and computer simulations; can perform quantitative analyses and formulate qualitative conclusions on this basis; can estimate measurement uncertainties	The student is able to: – present and use knowledge of electromagnetism and thermodynamics in experimental work, – perform a quantitative analysis of the studied physical phenomena in electromagnetism and thermodynamics, – apply mathematical apparatus to describe and analyze physical phenomena in electromagnetism and thermodynamics, – plan and conduct physical experiments in electromagnetism and thermodynamics, – use computer software to analyze and present measurement data, – determine the uncertainty of the measurement data obtained, – draw qualitative conclusions about the phenomenon under study from the experimental results obtained.	[SU1] wypowiedź ustna/rozmowa/ dyskusja [SU2] prezentacja/projekt/referat/ raport
	[BJORL3_W02] Understands the role of physical and chemical experimentation, mathematical theoretical models approximating reality, and computer simulations in scientific research methodology; is aware of technological, apparatus, and methodological limitations in scientific research	The student knows and understands: – basic concepts, physical quantities, and regularities of electromagnetic and thermodynamic phenomena, – the role of physical experiments in understanding the regularities of mechanical phenomena, – experimental limitations in the study of electromagnetic and thermodynamic phenomena, – the concept of measurement accuracy; – the construction and operating principles of basic measuring instruments used in experiments in electromagnetism and thermodynamics.	[SW1] wypowiedź ustna/rozmowa/ dyskusja [SW2] prezentacja/projekt/referat/ raport

Course outcome	Subject outcome	Method of verification
[BJORL3_W03] knows how to plan and perform a simple physical or chemical experiment and analyze the results obtained; knows the elements of the theory of measurement uncertainty as applied to experiments; knows the basic units of the SI system and its most important derived units; knows other systems of measurement units	The student knows and understands: – basic models, quantities, and physical laws of electromagnetism and thermodynamics, – principles of planning and conducting physical experiments with an emphasis on research in electromagnetism and thermodynamics, – principles of collecting and analyzing measurement data, – methods of calculating measurement data uncertainty, – units of physical quantities in electromagnetism and thermodynamics from various systems of measurement; – the construction and operating principles of basic measuring instruments used in experiments in electromagnetism and thermodynamics.	[SW1] wypowiedź ustna/rozmowa/ dyskusja [SW2] prezentacja/projekt/referat/ raport
[BJORL3_K08] can think and act in an entrepreneurial way	Student: – is able to precisely formulate problems and doubts related to the task at hand and present their own proposals for solving them.	[SK1] wypowiedź ustna/rozmowa/ dyskusja [SK2] prezentacja/projekt/referat/ raport
[BJORL3_U09] Can independently plan and implement his own learning	The student is able to: – search for reliable sources of knowledge and information; – complete assigned tasks on time.	[SU1] wypowiedź ustna/rozmowa/ dyskusja [SU2] prezentacja/projekt/referat/ raport

Subject contents	Methods of measuring electromagnetism using electronic techniques. Planning measurements, constructing measurement systems, performing measurements, assessing measurement uncertainty. Experimental investigation of the basic principles of electrical, magnetic, electromagnetic and thermodynamic phenomena: relaxation oscillations determination of the electrochemical equivalent of copper and Faraday's constant AC rectification. Greatz circuit RLC resonance circuit (series circuit) thermocouple calibration calculation of capacitor capacity using a discharge curve resistance determination using a Wheatstone bridge characteristics of a tungsten filament light bulb and a resistance wire heater study of the phase shift between the current and voltage of alternating current determining the magnetic field inside a solenoid using a Hall effect sensor study of the transformer determining the Cp/Cv ratio using the Clement-Desormes method determining the elasticity coefficient of gases using a gas thermometer determining the thermal expansion coefficient of solids determining the relationship between boiling point and pressure, and the heat of vaporization of water determining the heat of fusion of ice using a calorimeter determining the change in entropy of a system determining the thermal conductivity coefficient of air determining the specific heat of water determining the adiabatic exponent for air determining the work done on gas in adiabatic and isothermal thermodynamic processes
Prerequisites and co-requisites	
Assessment methods and criteria	
Recommended reading	

Subject passing criteria	Passing threshold	Percentage of the final grade
oral respoonses	51.0%	40.0%
reports	51.0%	60.0%

Basic literature	not applicable

	Supplementary literature	not applicable
	eResources addresses	
Example issues/ example questions/ tasks being completed	not applicable	
Work placement	Not applicable	

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