

Subject card

Subject name and code	Mechanics and Thermodynamics Laboratory, PG_00182294						
Field of study	Physics						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2025/2026		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study		
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	Faculty of Mathematics, Physics and Informatics -> Rector						
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		30.0	75
Subject objectives	Deepening knowledge and understanding of mechanical and thermodynamic phenomena by conducting laboratory experiments independently and analyzing and interpreting their results.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[FIZL3_K07] has a sense of responsibility for jointly performed tasks	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] oral statement/conversation/discussion [SK2] presentation/project/paper/report
	[FIZL3_U02] has the ability to perform measurements of basic physical quantities; is able to develop, describe and present the results of physics experiments and computer simulations; is able to perform quantitative analyses and formulate qualitative conclusions on this basis; can estimate measurement uncertainties	The student is able to: – plan and conduct a physical experiment independently in order to collect quantitative data on physical quantities characteristic of mechanical and thermodynamic phenomena; – perform a quantitative analysis of physical phenomena in mechanics and thermodynamics based on the measurement results obtained; – provide a qualitative description of the physical phenomenon under study based on the measurement results obtained; – calculate the uncertainty associated with the measurement results obtained in the experiment.	[SU1] oral statement/conversation/discussion [SU2] presentation/project/paper/report
	[FIZL3_W14] knows the principles of ergonomics and occupational health and safety	The student knows and understands: – occupational health and safety rules during experimental work.	[SW1] oral statement/conversation/discussion [SW2] presentation/project/paper/report
	[FIZL3_W03] knows how to plan and perform a physical experiment and analyze the results obtained; knows the elements of the theory of measurement uncertainty in application to advanced physics experiments, knows the basic units of the SI system and its most important derived units; knows other systems of units of measurement	The student knows and understands: – the principles of planning and conducting physical experiments with an emphasis on the study of mechanical and thermodynamic phenomena; – the principles of collecting and analyzing measurement data; – methods of calculating measurement data uncertainty; – units of physical quantities in mechanics and thermodynamics from various systems of measurement units;	[SW1] oral statement/conversation/discussion [SW2] presentation/project/paper/report
	[FIZL3_W02] understands the role of physical experiments, mathematical theoretical models that bring reality closer and computer simulations in the methodology of scientific research; is aware of technological, instrumental and methodological limitations in scientific research	The student knows and understands: – basic physical models, quantities, and regularities of mechanical and thermodynamic systems; – principles of conducting physical experiments, their limitations in studying mechanical and thermodynamic phenomena; – the structure and operating principles of basic measuring instruments used in experiments in mechanics and thermodynamics, and the resulting cognitive limitations; – the basics of numerical analysis and basic software packages for analyzing and presenting measurement data.	[SW1] oral statement/conversation/discussion [SW2] presentation/project/paper/report

	Course outcome	Subject outcome	Method of verification
	[FIZL3_U15] can work in a team, plan and organize his/her own work and in a team	The student is able to: – cooperate with members of the research group in order to correctly conduct a physical experiment; – constructively evaluate their own work and that of other members of the research group; – precisely formulate problems and doubts related to the research task being performed.	[SU1] oral statement/conversation/discussion [SU2] presentation/project/paper/report
	[FIZL3_W13] knows measuring instruments, their construction and principle of operation as well as the use of simple electronic systems	The student knows and understands: – the structure and operating principles of basic measuring instruments used in experiments in mechanics and thermodynamics.	[SW1] oral statement/conversation/discussion [SW2] presentation/project/paper/report
	[FIZL3_W09] knows and understands thermodynamic phenomena and processes and their description in phenomenological thermodynamics and statistical physics	The student knows and understands: – basic concepts, quantities, and physical laws in thermodynamics relating to the experimentally studied phenomenon; – units of physical quantities in thermodynamics.	[SW1] oral statement/conversation/discussion [SW2] presentation/project/paper/report
	[FIZL3_W06] knows and understands the principles of non-relativistic or relativistic mechanics	The student knows and understands: – basic concepts, quantities, and physical laws in non-relativistic mechanics relating to the experimentally studied phenomenon; – units of physical quantities in mechanics;	[SW1] oral statement/conversation/discussion [SW2] presentation/project/paper/report

Subject contents	Measurement methods in classical physics using electronic techniques. Planning measurements, constructing measurement systems, performing measurements, evaluating measurement uncertainty. Experimental study of the basic principles of phenomena and the properties of mechanical and thermodynamic systems: determining the moment of inertia of a rigid body (Oberbeck pendulum) determining the relative viscosity coefficient of a liquid using an Oswald viscometer determining the viscosity coefficient of a liquid (Stokes experiment) determining Young's modulus study of air flow velocity determining the value of Earth's gravitational acceleration using a reversible pendulum determining the value of the acceleration of a normal flat pendulum determining the stiffness modulus of a wire using the dynamic method determining the moment of inertia of a Maxwell pendulum study of Archimedes' principle study of accelerated rectilinear motion on an inclined plane study of projectile motion study of curvilinear motion study of the of the mechanical energy conservation principle study of the dependence of the viscosity coefficient on temperature acoustic resonance determining the hearing threshold and isophonic curves determining the C_p/C_v 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
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	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, isothermal thermodynamic processes		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	not applicable	51.0%	60.0%
	not applicable	51.0%	40.0%
Recommended reading	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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