University of Gdańsk

Subject card

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| Subject name and code | Mechanics and Thermodynamics Laboratory, PG_00182294 | | | | | | |
| Field of study | Physics | | | | | | |
| Date of commencement of studies | October 2026 | | Academic year of realisation of subject | 2026/2027 | | | |
| 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 | | | |
| 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 |
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| | [FIZL3_W06] knows and understands the principles of non-relativistic or relativistic mechanics | The student knows and understands:<br>– basic concepts, quantities, and physical laws in non-relativistic mechanics relating to the experimentally studied phenomenon;<br>– units of physical quantities in mechanics; | [SW1] oral statement/ conversation/discussion<br>[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:<br>– basic concepts, quantities, and physical laws in thermodynamics relating to the experimentally studied phenomenon;<br>– units of physical quantities in thermodynamics. | [SW1] oral statement/ conversation/discussion<br>[SW2] 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:<br>– the structure and operating principles of basic measuring instruments used in experiments in mechanics and thermodynamics. | [SW1] oral statement/ conversation/discussion<br>[SW2] presentation/project/paper/ report |
| | [FIZL3_U15] can work in a team, plan and organize his/her own work and in a team | The student is able to:<br>– cooperate with members of the research group in order to correctly conduct a physical experiment;<br>– constructively evaluate their own work and that of other members of the research group;<br>– precisely formulate problems and doubts related to the research task being performed. | [SU1] oral statement/conversation/ discussion<br>[SU2] 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:<br>– the principles of planning and conducting physical experiments with an emphasis on the study of mechanical and thermodynamic phenomena;<br>– the principles of collecting and analyzing measurement data;<br>– methods of calculating measurement data uncertainty;<br>– units of physical quantities in mechanics and thermodynamics from various systems of measurement units; | [SW1] oral statement/ conversation/discussion<br>[SW2] presentation/project/paper/ report |
| | [FIZL3_W14] knows the principles of ergonomics and occupational health and safety | The student knows and understands:<br>– occupational health and safety rules during experimental work. | [SW1] oral statement/ conversation/discussion<br>[SW2] 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:<br>– plan and conduct a physical experiment independently in order to collect quantitative data on physical quantities characteristic of mechanical and thermodynamic phenomena;<br>– perform a quantitative analysis of physical phenomena in mechanics and thermodynamics based on the measurement results obtained;<br>– provide a qualitative description of the physical phenomenon under study based on the measurement results obtained;<br>– calculate the uncertainty associated with the measurement results obtained in the experiment. | [SU1] oral statement/conversation/ discussion<br>[SU2] presentation/project/paper/ report |

| Course outcome | Subject outcome | Method of verification |
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| [FIZL3_K07] has a sense of responsibility for jointly performed tasks | The student is aware of:<br>– the need to cooperate with members of the research group in order to correctly conduct a physical experiment;<br>– the need to constructively evaluate their own work and that of other members of the research group;<br>– the need to perform the tasks assigned to them reliably and on time;<br>– 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<br>[SK2] 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:<br>– basic physical models, quantities, and regularities of mechanical and thermodynamic systems;<br>– principles of conducting physical experiments, their limitations in studying mechanical and thermodynamic phenomena;<br>– the structure and operating principles of basic measuring instruments used in experiments in mechanics and thermodynamics, and the resulting cognitive limitations;<br>– the basics of numerical analysis and basic software packages for analyzing and presenting measurement data. | [SW1] oral statement/ conversation/discussion<br>[SW2] presentation/project/paper/ report |

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| 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:<br><br>determining the moment of inertia of a rigid body (Oberbeck pendulum)<br><br>determining the relative viscosity coefficient of a liquid using an Oswald viscometer<br><br>determining the viscosity coefficient of a liquid (Stokes experiment)<br><br>determining Young's modulus<br><br>study of air flow velocity<br><br>determining the value of Earth's gravitational acceleration using a reversible pendulum<br><br>determining the value of the acceleration of a normal flat pendulum<br><br>determining the stiffness modulus of a wire using the dynamic method<br><br>determining the moment of inertia of a Maxwell pendulum<br><br>study of Archimedes' principle<br><br>study of accelerated rectilinear motion on an inclined plane<br><br>study of projectile motion<br><br>study of curvilinear motion<br><br>study of the of the mechanical energy conservation principle<br><br>study of the dependence of the viscosity coefficient on temperature<br><br>acoustic resonance<br><br>determining the hearing threshold and isophonic curves<br><br>determining the Cp/Cv ratio using the Clement-Desormes method<br><br>determining the elasticity coefficient of gases using a gas thermometer<br><br>determining the thermal expansion coefficient of solids<br><br>determining the relationship between boiling point and pressure, and the heat of vaporization of water<br><br>determining the heat of fusion of ice using a calorimeter<br><br>determining the change in entropy of a system |

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| | determining the thermal conductivity coefficient of air<br><br>determining the specific heat of water<br><br>determining the adiabatic exponent for air<br><br>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% | 40.0% |
| not applicable | 51.0% | 60.0% |

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| 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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