



Subject card

Subject name and code	Physics II, PG_00072597						
Field of study	Mechanical Engineering						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2026/2027		
Education level	first-cycle 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		5.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Division of Fluid-Flow Machinery -> Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Klaudia Wrzask				
	Teachers		dr inż. Joanna Sypniewska mgr inż. Balbina Makurat-Kasprolewicz dr inż. Klaudia Wrzask				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	15.0	0.0	0.0	60
	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	60		5.0		60.0	125
Subject objectives	Acquisition of knowledge in selected areas of modern physics, including wave phenomena, alternating current, the fundamentals of quantum mechanics, and elements of atomic and nuclear physics. Development of the ability to model selected physical processes using differential equations and to physically interpret the resulting solutions, enabling the solution of engineering computational problems. Development of skills in processing and analysing experimental measurement results, performing measurement uncertainty calculations, and correctly interpreting and presenting research results.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_U01] is able to acquire information from professional literature, databases, and other sources, integrate and interpret it, and formulate justified conclusions and opinions for solving engineering problems		The student is able to obtain and use information from scientific literature, teaching materials and other sources to analyse physical phenomena and formulate justified conclusions when solving engineering problems.		[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task		
	[K6_W01] possesses advanced knowledge of mathematics, physics, and mechanics, applied to the modeling, analysis, and description of phenomena and processes occurring in mechanical systems		The student has advanced knowledge of selected topics in modern physics and mathematical methods used to describe physical phenomena, enabling the modelling, analysis and interpretation of processes occurring in mechanical systems.		[SW1] Assessment of factual knowledge		

Subject contents	Course content – lecture 1. Alternating Current Sinusoidal waveforms, RMS values of voltage and current, RLC components, impedance, electrical resonance, power in AC circuits. 2. Wave Optics Interference and diffraction of light, Huygens' principle, Young's experiment, diffraction grating, polarization of light. 3. Quantum Mechanics and the Schrödinger Equation Wave-particle duality, Heisenberg uncertainty principle, Bohr model of the atom, atomic spectra, Franck–Hertz experiment, Schrödinger equation, potential step, quantum tunnelling, rectangular potential well, harmonic oscillator. 4. Atomic Structure and Electron Spin One-electron atoms, quantum numbers, Stern–Gerlach experiment, electron spin, Pauli exclusion principle, Zeeman effect, spin–orbit coupling, Einstein–de Haas experiment. 5. Nuclear Physics and Quantum Statistics Models of the atomic nucleus, binding energy, radioactive decay, nuclear reactions, Fermi–Dirac statistics, Bose–Einstein statistics, quantum distribution functions. 6. Modelling of Physical Phenomena Differential equations in physics, modelling of oscillations and waves, modelling of electrical circuits, physical interpretation of mathematical solutions.
	Course content – exercises 1. Alternating Current Calculation of RMS values of voltage and current, determination of impedance in RLC circuits, analysis of phase shifts, calculation of active, reactive and apparent power, modelling of electrical resonance, analysis of sinusoidal waveforms using harmonic functions. 2. Wave Optics Determination of interference and diffraction conditions, calculation of the wavelength of light, analysis of Young's experiment, determination of diffraction grating parameters, modelling of light intensity distributions, analysis of light polarization. 3. Modelling of Physical Phenomena Solving differential equations describing selected physical phenomena, modelling of damped and forced oscillations, modelling of RC, RL and RLC circuits, analytical solutions and numerical analysis of selected physical problems, physical interpretation of mathematical models, analysis of the relationship between mathematical solutions and the behaviour of physical phenomena.
	Course content – laboratory 1. Fundamentals of Physical Measurements

	Definition and classification of physical measurements, analysis of the sensitivity and accuracy of measuring instruments, determination of physical quantities based on measurement data. 2. Statistical Analysis and Measurement Uncertainty Calculation of measurement uncertainty using classical and statistical methods, analysis of systematic and random errors, application of the concepts of a random variable and standard deviation in the analysis of experimental data. 3. Processing and Modelling of Measurement Data Processing and analysis of experimental measurement results, modelling of selected physical relationships based on measurement data, interpretation of results with reference to physical models, preparation of measurement characteristics and relationships. 4. Presentation of Research Results Presentation of research results in the form of tables, graphs and laboratory reports, analysis and interpretation of experimental results.														
Prerequisites and co-requisites	Fundamentals of physics, differential and integral calculus														
Assessment methods and criteria	<table><tr><td>Subject passing criteria</td><td>Passing threshold</td><td>Percentage of the final grade</td></tr><tr><td>Lecture</td><td>60.0%</td><td>20.0%</td></tr><tr><td>Tutorial</td><td>60.0%</td><td>40.0%</td></tr><tr><td>Laboratory</td><td>60.0%</td><td>40.0%</td></tr></table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Lecture	60.0%	20.0%	Tutorial	60.0%	40.0%	Laboratory	60.0%	40.0%
Subject passing criteria	Passing threshold	Percentage of the final grade													
Lecture	60.0%	20.0%													
Tutorial	60.0%	40.0%													
Laboratory	60.0%	40.0%													
Recommended reading	<table><tr><td>Basic literature</td><td>Fizyka Tom 3 https://openstax.pl/szczegoly-ksiazki?book=Fizyka_dla_szk%C3%B3%C5%82_wy%C5%BCszych_tom_3</td></tr><tr><td>Supplementary literature</td><td>Halliday, David, et al. Podstawy fizyki: 3. Polska, Wydawnictwo Naukowe PWN SA, 2019.</td></tr><tr><td>eResources addresses</td><td>Basic https://openstax.pl/szczegoly-ksiazki?book=Fizyka_dla_szk%C3%B3%C5%82_wy%C5%BCszych_tom_3 -</td></tr></table>			Basic literature	Fizyka Tom 3 https://openstax.pl/szczegoly-ksiazki?book=Fizyka_dla_szk%C3%B3%C5%82_wy%C5%BCszych_tom_3	Supplementary literature	Halliday, David, et al. Podstawy fizyki: 3. Polska, Wydawnictwo Naukowe PWN SA, 2019.	eResources addresses	Basic https://openstax.pl/szczegoly-ksiazki?book=Fizyka_dla_szk%C3%B3%C5%82_wy%C5%BCszych_tom_3 -						
Basic literature	Fizyka Tom 3 https://openstax.pl/szczegoly-ksiazki?book=Fizyka_dla_szk%C3%B3%C5%82_wy%C5%BCszych_tom_3														
Supplementary literature	Halliday, David, et al. Podstawy fizyki: 3. Polska, Wydawnictwo Naukowe PWN SA, 2019.														
eResources addresses	Basic https://openstax.pl/szczegoly-ksiazki?book=Fizyka_dla_szk%C3%B3%C5%82_wy%C5%BCszych_tom_3 -														
Example issues/ example questions/ tasks being completed	In a series RLC circuit, the frequency of the supply voltage is equal to the resonance frequency. How do the circuit impedance and the phase shift between voltage and current behave? An electron encounters a potential barrier whose energy is higher than the electron's kinetic energy. Explain why, according to quantum mechanics, there is a non-zero probability that the electron can pass through the barrier.														
Practical activities within the subject	Not applicable														

Document generated electronically. Does not require a seal or signature.