GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Physics I, PG_00068156		
Field of study	Spatial Development		
Date of commencement of studies	October 2025	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	2	Language of instruction	Polish Classes are conducted in Polish, and in the case of foreign students, in Polish and English.
Semester of study	4	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of Molecular Photophysics -> Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Piotr Grygiel	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	30.0	0.0	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	6.0	49.0	100

Subject objectives

Mastering a specific body of knowledge in the field of general physics and developing the ability to reason in cause-effect categories based on the known laws of physics, in the context of engineering problems related to spatial management.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W03] has knowledge in the field of mathematics and physics relating to issues related to space management, including the basic mathematical methods used in urban design, as well as analytical and design methods using information technology used in planning processes of settlement structures	Has elementary knowledge of the basics of physics relating to issues related to spatial management, including basic mathematical methods used in urban design, as well as analytical and design methods using IT techniques used in the processes of planning settlement structures.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K6_U01] has the ability to abstractly understand technical problems; applies basic mathematical and simulation methods in urban planning and spatial planning	Has the ability to understand technical problems in an abstract way; applies basic mathematical and simulation methods in urban design and spatial planning, using the knowledge of the basics of physics.	[SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task

Subject contents	Course content – lecture 1. The scope and scale of physics: units and standards, unit conversion, dimensional analysis. 2. Vectors: scalars and vectors, coordinate systems and components of a vector, algebra of vectors, products of vectors. 3. Motion along a straight line: position, displacement and average velocity, instantaneous velocity and speed, average and instantaneous acceleration, motion with constant acceleration, free fall. 4. Motion in two and three dimensions: displacement and velocity vectors, acceleration vector, projectile motion, uniform circular motion. 5. Newton's laws of motion: forces, first, second and third laws of motion, mass and weight, common forces, drawing free-body diagrams. 6. Applications of Newton's laws: friction, centripetal force, drag force. 7. Work and kinetic energy, work-energy theorem, power. 8. Potential energy and conservation of energy, sources of energy. 9. Linear momentum, impulse and collisions. 10. Fixed-axis rotation: rotational variables, rotation with constant angular acceleration, moment of inertia and rotational kinetic energy, Newton's second law of rotation, work and power for rotational motion. 11. Static equilibrium and elasticity: conditions for static equilibrium, stress, strain and elastic modulus. 12. Fluid mechanics: fluids, density, and pressure, measuring pressure, Pascal's principle and hydraulics, Archimedes' principle and buoyancy, fluid dynamics, Bernoulli's equation, viscosity and turbulence. 13. Oscillations: simple harmonic motion, energy in simple harmonic motion, pendulums, damped oscillations, forced oscillations, resonance. 14. Waves: traveling waves, mathematics of waves, energy and power of a wave, interference of waves, standing waves and resonance, sound waves, speed of sound, normal modes of a sound standing wave. Course content – exercises 1. The scope and scale of physics: units and standards, unit conversion, dimensional analysis. 2. Vectors: scalars and vectors, coordinate systems and components of a vector, algebra of vectors, products of vectors. 3. Motion along a straight line: position, displacement and average velocity, instantaneous velocity and speed, average and instantaneous acceleration, motion with constant acceleration, free fall. 4. Motion in two and three dimensions: displacement and velocity vectors, acceleration vector, projectile motion, uniform circular motion. 5. Newton's laws of motion: forces, first, second and third laws of motion, mass and weight, common forces, drawing free-body diagrams. 6. Applications of Newton's laws: friction, centripetal force, drag force.

7. Work and kinetic energy, work-energy theorem, power.

8. Potential energy and conservation of energy, sources of energy.

9. Linear momentum, impulse and collisions.

10. Fixed-axis rotation: rotational variables, rotation with constant angular acceleration, moment of inertia and rotational kinetic energy, Newton's second law of rotation, work and power for rotational motion.

11. Static equilibrium and elasticity: conditions for static equilibrium, stress, strain and elastic modulus.

12. Fluid mechanics: fluids, density, and pressure, measuring pressure, Pascal's principle and hydraulics, Archimedes' principle and buoyancy, fluid dynamics, Bernoulli's equation, viscosity and turbulence.

13. Oscillations: simple harmonic motion, energy in simple harmonic motion, pendulums, damped oscillations, forced oscillations, resonance.

14. Waves: traveling waves, mathematics of waves, energy and power of a wave, interference of waves, standing waves and resonance, sound waves, speed of sound, normal modes of a sound standing wave.

Prerequisites and co-requisites

Basic knowledge of high school physics. Knowledge of the mathematical apparatus at the level of engineering studies.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Active participation in classes.	0.0%	25.0%
Assessment of a written work on a given topic	50.0%	75.0%

Recommended reading

Basic literature	1. University Physics by Open Stax
Supplementary literature	1. David Halliday, Robert Resnick, Jearl Walker, Fundamentals of Physics, John Villey & Sons, 2001
eResources addresses	

Example issues/ example questions/ tasks being completed

1. Determine the parameters for the movement of the passenger elevator as desired for a four-story and forty-story building.

2. Determine whether the slope of the roofs of the designed buildings is significant in areas with particularly heavy rainfall.

3. Determine whether the slope of the roofs of the designed buildings is significant in high winds.

4. Determine whether the distance between frontages on opposite sides of the street in the place of strong winds affects the comfort of building use. If so, when is the problem most significant?

Note: it is possible to suggest your own topics after prior consultation with the course instructor.

Practical activites within the subject

Not applicable

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