GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Basics of physics, PG_00045292		
Field of study	Data Engineering, Data 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	English
Semester of study	2	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Atomic Physics and Luminescence -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Sebastian Bielski	
	Teachers	mgr Aoussaj Sbai dr inż. Sebastian Bielski	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	15.0	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

The aim of the course is to provide the student with the specialist knowledge concerning the basic rules of physics relevant to the technical areas.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U06] acquires new knowledge, planning its own development in aiming at achieving defined goals	As a future engineer, the student deepens critical thinking skills, as well as quantitative reasoning and creativity.	[SU1] Assessment of task fulfilment
[K6_W02] demonstrates advanced preparation in methods and techniques for formulating and solving problems	The student names and explains the basic phenomena, concepts, dependencies and laws concerning classical mechanics, fluid mechanics, thermodynamics, oscillatory and wave motion, geometrical and wave optics, relativistic mechanics. and nuclear physics.	[SW1] Assessment of factual knowledge
[K6_U04] formulates logical solutions to complex or unstructured problems	The student solves simple problems of classical mechanics, thermodynamics, oscillatory and wave motion and wave nature of light.	[SU1] Assessment of task fulfilment

Subject contents

Course content – lecture
LECTURE

1. SI units, vectors

2. Kinematics and dynamics of a material point. Principle of conservation of energy. Principle of conservation of momentum and angular momentum. Basic properties of gravitational field. Elements of fluid mechanics.

3. Heat, work, internal energy, gas processes. Elements of the kinetic theory of gases. Entropy, reversible and non-reversible processes. Laws of thermodynamics.

4. Harmonic oscillator, superposition of oscillations. Mechanical waves. Transverse and longitudinal waves. Energy density.

5. Elements of geometrical optics. Wave optics: interference, diffraction, and polarization of waves.

6. Einstein's postulates. Lorentz's transformation and its consequences.

Course content – exercises
TUTORIALS

1. Problems on kinematics of translational motion, description of motion in the Cartesian system. Velocity, acceleration, normal and tangential acceleration. Problems on kinematics of rotational motion. Problems on dynamics of translational motion, applications of Newton's laws. Problems on conservation of energy and momentum.

2. Problems related to the first law of thermodynamics in the case of the ideal gas.

3. Examples of harmonic motion. Basics of wave motion.

4. Problems related to the interference of light. Diffraction from a single slit.

Prerequisites and co-requisites

No requirements

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Lecture: final test	50.0%	67.0%
Tutorials: two written tests	50.0%	33.0%

Recommended reading

Basic literature	University Physics, Openstax Halliday D., Resnick R., Walker J., Fundamentals of physics
Supplementary literature	Shankar R., Fundamentals of Physics: Mechanics, Relativity, and Thermodynamics Brown R. G., Introductory Physics I: Elementary Mechanics Orear J., Physics
eResources addresses	

Example issues/ example questions/ tasks being completed	LECTURE Conservation of energy, momentum, and angular momentum in a system of particles. Simple harmonic motion. Energy density of the longitudinal wave. A passenger of a rocket says the length of the rocket is 100 m. Some observer claims the rocket moves away from him at 0.8 of the speed of light. What is the length of the rocket in the frame of the observer? A) 100m B) 80m C) 60m D) 40m The intensity of light emitted by a candle or a bulb after passing through a polarizer A) does not change B) is reduced by a factor of 2 C) is reduced by a factor of 4 D) is reduced to 0 TUTORIALS A projectile is fired horizontally from a gun that is 45.0 m above flat ground, emerging from the gun with a speed of 250 m/s. (a) How long does the projectile remain in the air? (b) At what horizontal distance from the firing point does it strike the ground? (c) What is the magnitude of the vertical component of its velocity as it strikes the ground? A student is attempting to move a 30-kg mini-fridge into her dorm room. During a moment of inattention, the mini-fridge slides down a 35 degree incline at constant speed when she applies a force of 25 N acting up and parallel to the incline. What is the coefficient of kinetic friction between the fridge and the surface of the incline? When a dilute gas expands quasi-statically from 0.50 to 4.0 L, it does 250 J of work. Assuming that the gas temperature remains constant at 300 K, (a) what is the change in the internal energy of the gas? (b) How much heat is absorbed by the gas in this process?
Practical activites within the subject	Not applicable

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