COURSE DESCRIPTION CARD - SYLLABUS

Course name
Physics [S1IMe1E>FIZ1]

Course

Field of study
Mechanical Engineering

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
15

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

5,00

Coordinators

Lecturers

Prerequisites

Students should have basic knowledge of physics and mathematics at the high school level, be able to solve elementary physics problems, obtain information from specified sources, and be willing to cooperate within a team.

Course objective

Providing students with basic knowledge of physics and developing skills to solve simple physical problems, perform experiments, and analyze measurement results. The course also aims to develop students' self-education and teamwork skills.

Course-related learning outcomes

Knowledge:
The student is able to define and explain physical concepts within the scope of the course content and provide examples of their applications in technology.
The student has basic knowledge in the field of physical measurements and analysis of results.They know the typology of programming languages and understand their main applications. They are familiar with tools that support the work of a programmer and with information sources related to the creation, programming, and use of applications. The student can formulate algorithms and implement them using at least one popular programming tool.

Skills:
The student is able to work individually and in a team.
The student has the ability to self-study.
The student can perform simple experiments, interpret obtained results, and draw conclusions.

Social competences:
The student is able to cooperate within a team and demonstrate co-responsibility for the effects of the team's work.
The student understands the need for and knows the possibilities of continuous education and training.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
Acquired knowledge is verified during a 90-minute written exam conducted during the examination session. The exam consists of 8-9 open questions with various scores. Passing threshold: 50% of points.
Tutorials:
Acquired knowledge and skills are verified on the basis of two written tests and activity during classes. A total of 6-7 calculation tasks are included in the tests, with various scores. Passing threshold: 50% of points.
Laboratory:
Learning outcomes are verified based on oral or written answers related to the laboratory exercises (passing threshold: 50%) and written laboratory reports. To pass the course, the student must complete at least 85% of all planned laboratory exercises with a positive evaluation.

Programme content

Lecture:
1. Classical mechanics: classification of motion; kinematics and dynamics of translational and rotational motion; work, power, energy; conservation laws of energy, momentum, and angular momentum.
2. Harmonic motion: free, damped, and forced motion (resonance phenomenon).
3. Wave motion: mechanical waves; basics of acoustics; electromagnetic waves; wave coherence; diffraction, interference, and polarization phenomena.
4. Heat transfer mechanisms: thermal radiation, thermal conductivity, convection.
5. Gravitational field with elements of the general theory of relativity.
6. Electric and magnetic fields: electrostatics, electric current, electrodynamics, magnetostatics, electromagnetic induction, Maxwell's equations.
7. Light and geometric optics.
8. Basics of quantum physics: corpuscular properties of light, wave properties of matter, elementary issues of atomic structure.
9. Elements of solid-state physics.
Tutorials:
Selected issues related to lecture topics.
Laboratory classes:
During the semester, students perform 6-7 experiments selected from 24 available laboratory exercise sets, covering various branches of physics such as mechanics, oscillatory motion, wave motion, heat, electromagnetism, optics, and modern physics. Measurement data analysis includes linear regression, normal distribution, arithmetic mean, standard deviation, calculation of complex errors, rounding of results, and preparation of charts.

Course topics

The course covers fundamental issues of classical and modern physics and is delivered in the form of lectures, tutorials, and laboratory classes. Lectures introduce the basics of classical mechanics, including kinematics and dynamics of translational and rotational motion, conservation laws of energy, momentum and angular momentum, as well as harmonic motion and wave phenomena. The course also includes fundamentals of heat transfer, gravitational field, electromagnetism, geometric optics, quantum physics, and elements of solid-state physics.

Tutorial classes focus on solving calculation-based problems related to lecture topics, enabling students to apply physical laws and mathematical relationships in practice, analyze physical problems, and interpret obtained results.
Laboratory classes involve performing experiments in the areas of mechanics, oscillatory and wave motion, heat, electromagnetism, optics, and modern physics. A significant part of the laboratory work is devoted to the analysis of measurement results, including statistical methods such as linear regression, normal distribution, calculation of arithmetic mean, standard deviation, measurement errors, as well as graphical presentation of results and preparation of laboratory reports.-

Teaching methods

Lectures: multimedia presentations supplemented with demonstrations and examples on the board.
Tutorials: problem solving, discussion.
Laboratory classes: performing experiments, solving tasks, discussion, teamwork.

Bibliography

Basic:
Lecture materials made available to students by the lecturer.
D. Halliday, R. Resnick, J. Walker, Podstawy fizyki, tomy 1-5, PWN, Warszawa 2003.
S. Szuba, Ćwiczenia laboratoryjne z fizyki, Wydawnictwo Politechniki Poznańskiej, Poznań 2007.

Additional:
Fizyka dla szkół wyższych - darmowy podręcznik dostępny online (OpenStax).
C. Bobrowski, Fizyka, PWN, 2012.

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	62	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	63	2,50