COURSE DESCRIPTION CARD - SYLLABUS

Course name
Experimental Physics [S1ETI2>FD]

Course

Field of study
Education in Technology and Informatics

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
45

Laboratory classes
0

Other
0

Tutorials
45

Projects/seminars
0

Number of credit points

7,00

Coordinators

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Lecturers

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Prerequisites

Knowledge of physics and mathematics (core curriculum for secondary schools, basic level). Ability to solve elementary problems in physics based on knowledge, ability to obtain information from indicated sources. Understanding the need for education in order to obtain qualifications appropriate for future profession and social functions.

Course objective

Providing students with basic knowledge of physics, within the scope defined by the program content appropriate for the field of study Technical and IT education. Developing students' skills in solving simple problems in physics and analyzing results based on the knowledge obtained. The ability to interpret observed phenomena in the surrounding world based on the laws of physics learned and their practical use.

Course-related learning outcomes

Knowledge:

As a result of the conducted classes, the student:
has knowledge of selected issues from: classical mechanics, gravity, oscillatory and wave motion, acoustics, thermodynamics, electricity and magnetism, electromagnetic waves, optics and modern physics.
knows the applications of basic laws of physics in the scope of selected issues from: classical mechanics, gravity, oscillatory and wave motion, acoustics, thermodynamics, electricity and magnetism, electromagnetic waves, optics and modern physics to describe phenomena in the surrounding world.

Skills:
As a result of the conducted classes, the student should demonstrate skills in the scope of (the student will be able to):
is able to apply basic laws of physics and simplified models to solve simple problems in the scope of: classical mechanics, gravity, oscillatory and wave motion, acoustics, thermodynamics, electricity and magnetism, electromagnetic waves, optics and modern physics.
is able to perceive and explain physical phenomena in the surrounding world based on theoretical knowledge concerning selected issues of physics.
is able to plan and perform standard calculations concerning basic physical phenomena leading to the determination of specific physical quantities.
is able to formulate simple conclusions based on the analysis of the obtained results.
is able to use with understanding the indicated sources of knowledge (list of basic literature) and is active in acquiring knowledge from other sources.

Social competences:
As a result of the classes, the student will acquire the competences listed below. Passing the course means that the student:
is actively involved in solving the problems posed, independently develops and expands their competences.
understands the need to expand knowledge in the scope of selected issues in physics in order to apply them in innovative solutions to technological and engineering problems.
is responsible for the reliability of the results of their work, acts in accordance with the principles of ethics.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

written/oral exam 3 50.1%-70.0%
4 70.1%-90.0%
5 from 90.1%
colloquium 3 50.1%-70.0%
4 70.1%-90.0%
5 from 90.1%
oral/written answer; assessment of activity during exercises
grade 3 - the student shows moderate involvement in problem-solving, when encouraged, seeks a solution based on the knowledge obtained, is involved in the task to a limited extent,
grade 4 - the student shows involvement in problem-solving, seeks a solution based on the knowledge obtained, is actively involved in the task,
grade 5 - the student shows great involvement in problem-solving, independently seeks a solution based on the knowledge obtained, seeks additional sources of knowledge useful for solving the problem, is actively involved in the task, seeks solutions in non-standard situations.

Programme content

Selected topics in physics, including classical mechanics, thermodynamics, electricity, magnetism, electromagnetism, optics, and modern physics.

Course topics

1. Fundamentals of classical mechanics:
• kinematics and dynamics of translational motion (including the principles of dynamics, the principles of conservation of energy and momentum),

• kinematics and dynamics of rotational motion (including the principles of dynamics, the principle of conservation of angular momentum),
• free, damped and forced harmonic vibrations (including the phenomenon of resonance),
• mechanical waves,
• selected topics in acoustics.
2. Gravitational interactions.
3. Thermodynamics:
• principles of thermodynamics,
• kinetic-molecular theory of gases,
• mechanisms of energy and heat transport,
• thermal insulation. 4. Electricity and magnetism:
• electrostatics,
• magnetostatics,
• charge movement in electric and magnetic fields,
• electromagnetic induction,
• Maxwell's equations,
• electromagnetic waves,
• electrical and magnetic properties of matter,
• band model of solids (metals, semiconductors, insulators).
5. Optics:
• elements of geometric optics (basic optical devices),
• wave optics (dispersion, interference, diffraction and polarization of light),
• transmission of UV, VIS and IR waves - optical fibers,
• lasers - applications.
6. Elements of special relativity.
7. Elements of modern physics:
• structure of the hydrogen atom,
• quantum nature of light (photoelectric effect, Compton effect),
• matter waves (de Broglie waves),
• potential well, Schrödinger equation,
• tunnel effect - passage of a particle through a potential barrier (STM scanning tunneling microscope),
• properties of matter in the nano-scale, quantum effects,
• low-dimensional structures (graphene, quantum dots).

Teaching methods

1. Lecture: multimedia presentation, presentation illustrated with examples given on the board, scientific demonstrations
2. Exercises: tasks illustrating the material presented during the lecture solved on the board by students or demonstrated by the academic teacher, discussion of the concepts of solving the tasks proposed by students.

Bibliography

Basic:
1. D.Halliday, R.Resnick, J.Walker, Podstawy fizyki, t. 1-5, PWN, Warszawa 2003.
2. D.Halliday, R.Resnick, J.Walker, Podstawy Fizyki, Zbiór zadań, PWN, Warszawa 2005.
3. K. Jezierski, B.Kołodka, K.Sierański, Fizyka. Zadania z rozwiązaniami, t. 1-2, Oficyna Wydawnicza Scripta, Wrocław 2009.
4. K. Jezierski, K.Sierański, I. Szlufarska, Fizyka: Repetytorium, zadania z rozwiązaniami, Oficyna Wydawnicza Scripta, Wrocław 2003.

Additional:
1. Fizyka dla szkół wyższych w wersji online
Tom 1: https://openstax.org/details/books/fizyka-dla-szkół-wyższych-polska
Tom 2: https://openstax.org/details/books/fizyka-dla-szkół-wyższych-tom-2-polska
Tom 3. https://openstax.org/details/books/fizyka-dla-szkół-wyższych-tom-3-polska
2. J.Masalski, Fizyka dla inżynierow, t.1-2, WNT, Warszawa 1980.

Breakdown of average student's workload

	Hours	ECTS
Total workload	175	7,00
Classes requiring direct contact with the teacher	92	4,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	83	3,00