COURSE DESCRIPTION CARD - SYLLABUS

Course name
Experimental Physics [S1ETI1>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
40

Laboratory classes
0

Other (e.g. online)
0

Tutorials
45

Projects/seminars
0

Number of credit points

7,00

Coordinators

dr hab. Dobrosława Kasprowicz prof. PP
dobroslawa.kasprowicz@put.poznan.pl

Lecturers

dr hab. inż. Tomasz Buchwald
tomasz.buchwald@put.poznan.pl

dr hab. Dobrosława Kasprowicz prof. PP
dobroslawa.kasprowicz@put.poznan.pl

Prerequisites

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

Course objective

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

Course-related learning outcomes

Knowledge:
as a result of the conducted classes, the student:
w01 has knowledge of selected issues from: classical mechanics, gravity, oscillating and wave motion, acoustics, thermodynamics, electricity and magnetism, electromagnetic waves, optics and modern physics k1_w02
w02 knows the application of the basic laws of physics in the field of selected issues from: classical mechanics, gravity, oscillating and wave motion, acoustics, thermodynamics, electricity and magnetism, electromagnetic waves, optics and modern physics to describe phenomena in the surrounding world k1_w02
u03 is able to plan and carry out standard calculations regarding basic physical phenomena leading to the determination of specific physical quantities k1_u04
u04 is able to formulate simple conclusions based on the analysis of the obtained results k1_u04, k1-u08
u05 can use the understanding of the indicated sources of knowledge (list of basic literature) and is active in acquiring knowledge from other sources k1_u02

Skills:
as a result of the conducted classes, the student should demonstrate skills in the following areas (the student will be able to):
u01 is able to apply the basic laws of physics and simplified models to solve simple problems in the field of: classical mechanics, gravity, oscillating motion and wave, acoustics, thermodynamics, electricity and magnetism, electromagnetic waves, optics and modern physics k1_u01
u02 is able to see and explain physical phenomena in the surrounding world on the basis of theoretical

Social competences:
as a result of the conducted classes, the student will acquire the competences listed below. completing the course means that the student:
k01 is actively involved in solving the problems posed, independently develops and broadens its competences k1_k01, k1_03
k02 understands the need to expand knowledge in the field of selected issues in physics in order to apply them in innovative solutions to technological and engineering problems in the field of chemical engineering k1_k01, k1_k03
k03 is responsible for the reliability of the results of his work, follows the principles of ethics k1_k02

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
W01-W02 written / oral exam 3 50.1% -70.0%
4 70.1% -90.0%
5 from 90.1%
U01-U02 test 3 50.1% -70.0%
4 70.1% -90.0%
5 from 90.1%
U03-U05 discontinued / written answer; solving physical tasks and problems on exercises
3 50.1% -70.0%
4 70.1% -90.0%
5 from 90.1%
K01-K03 assessment of exercise activity
3 the student shows moderate commitment to problem solving, when encouraged, he / she looks for a solution based on the acquired knowledge, engages in the task to a limited extent,
4 the student is committed to solving problems, looks for a solution based on the acquired knowledge, is actively involved in the implementation of the task,
5 the student shows great commitment to solving problems, independently seeks a solution based on the acquired knowledge, looks for additional sources of knowledge useful for solving the problem, is actively involved in the implementation of the task, looks for solutions in non-standard situations.

Programme content

none

Course topics

1. Basics of classical mechanics:
• kinematics and dynamics of progressive 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 issues in acoustics.
2. Gravitational interactions.
3. Thermodynamics:
• laws of thermodynamics,
• kinetic-molecular theory of gases,
• mechanisms of energy and heat transport,
• thermal insulation.
4. Electricity and magnetism:
• electrostatics,
• magnetostatics,
• movement of the charge in an electric and magnetic field,
• electromagnetic induction,
• Maxwell equations,
• electromagnetic waves,
• electrical and magnetic properties of matter,
• band model of solids (metals, semiconductors, insulators).
5. Optics:
• elements of geometric optics (basic optical instruments),
• wave optics (dispersion, interference, diffraction and polarization of light),
• transmission of waves in the UV, VIS and IR range - 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 (scanning tunneling microscope STM),
• properties of matter on the nano-scale, quantum effects,
• low-dimensional structures (graphene, quantum dots).

Teaching methods

1 Lecture: multimedia presentation, presentation illustrated with examples given on the blackboard, scientific demonstrations
2 Exercises: tasks illustrating the material presented during the lecture, solving on the blackboard by students or demonstrated by an academic teacher, discussion of the concepts of solving problems proposed by the 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.
Additional
1. J.Masalski, Fizyka dla inżynierow, t.1-2, WNT, Warszawa 1980.
2. J. Orear, Fizyka, t. 1-2, WNT, Warszawa1998.

Breakdown of average student's workload

	Hours	ECTS
Total workload	160	7,00
Classes requiring direct contact with the teacher	95	4,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	65	3,00