# COURSE DESCRIPTION CARD - SYLLABUS

Course name
Physics [S1EiT1E>FIZ]

## Course

Field of study
Electronics and Telecommunications

Year/Semester
1/2

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 (e.g. online)
0

Tutorials
15

Projects/seminars
0

## Number of credit points

6,00

## Coordinators

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## Lecturers

## Prerequisites

Knowledge of physics and mathematics (core curriculum for high schools, basic level); skill to solve elementary problems in physics based on knowledge, skill to use available information sources to obtain information from indicated sources; understanding the necessity of education in order to obtain qualifications suitable for future profession and social roles.

## Course objective

1. Providing students with basic knowledge of physics, to the extent specified by the curriculum content appropriate to the field of study. 2. Developing students" skills in solving simple physics problems and analyzing results based on the knowledge obtained. 3. Skill to interpret the observed phenomena in the surrounding world based on the known laws of physics and their practical use in the field of study.

## Course-related learning outcomes

Knowledge:
Student has knowledge of selected issues of: classical mechanics, gravity, vibrating and wave motion, acoustics, electricity and magnetism, electromagnetic waves, optics and modern physics.
Student knows the applications of basic laws of physics in the field of selected issues of: classical

mechanics, gravity, vibrating and wave motion, acoustics,electricity and magnetism, electromagnetic waves, optics and modern physics to describe phenomena in the surrounding world.

Skills:
Student is able to apply the basic laws of physics and simplified models to solve simple problems in the field of: classical mechanics, gravity, vibrating and wave motion, acoustics, electricity and magnetism, electromagnetic waves, optics and modern physics.
Student is able to see and translate physical phenomena in the surrounding world based on theoretical knowledge of selected physics issues.
Student is able to use with understanding the specified sources of knowledge (e.g. references, databases) and is active in extraction of knowledge from other sources.

Social competences:
Student is able to actively engage in solving of posed problems, raising his/her professional, personal and social competences.
Student follows the rules of professional ethics, is responsible for the reliability of results obtained in his/her work and their interpretation, and the assessment of work done by others/understands the need to expand knowledge in selected issues of physics in order to apply them in innovative solutions to technological and engineering problems.

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Lecture: written exam (6 open questions for individual answer/to pass the exam student must receive 50%).
Tutorials: test (3 tasks for individual solving/to receive a credit student must receive 50%).
Laboratory classes: reports with experimental results prepared according to program of physical laboratory.

## Programme content

1. Gravitation: gravitational field and force, orbits and energy of satellites, effect of gravity on space-time, curvature of space.
2. Oscillations: mechanical oscillations (simple harmonic motion (SHM), kinematics and energy of SHM, forced oscillations, damping, resonance).
3. Mechanical waves: transverse and longitudinal waves, the speed of a traveling wave, energy and power of a traveling wave, the principle of superposition for waves, interference of waves, standing waves, sound waves, ultrasounds, infrasounds, Doppler effect.
4. Electromagnetism: electric field (the electric field due to a point charge and an electric dipole, Coulomb's Law, the Gauss' Law: cylindrical, plannar and spherical symmetry, electric potential), magnetic field (magnetic field due to a current, electrodynamic force, Ampere's Law, Gauss' Law for magnetic, Faraday's Law of induction, Lenz's Law), charge particle in electric and magnetic field; cyclotrons and synchrotrons, conductivity/ the electrical properties of solids, energy levels in solids (metals, insulators, semiconductors, superconductors).
5. Electromagnetic waves: Maxwell's equations, the electromagnetic spectrum, the travelling electromagnetic waves (channels of communication).
6. Optics: reflection and refraction of light, total internal reflection of light, critical angle, white light, dispersion, diffraction, interference and polarization of light, diffraction gratings, Brewster's Law, classical and photonic optical fibres, lasers – work and applications.
7. Special theory of relativity: relativity, the speed of light postulate, mass and energy, time dilatation, length contraction, the twin paradox, Doppler effect of light, the NAVSTAR Navigation System, GPS Global Positioning System.
8. Selected problems of modern physics: quantum nature of light (photons, the photoelectric effect), matter waves (de Broglie waves), Schrödinger's equation, barrier tunneling effect, low-dimensional structures (nanocrystallites, quantum dots).

## Course topics

1. Gravitation: gravitational field and force, orbits and energy of satellites, effect of gravity on space-

time, curvature of space.
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## Teaching methods

Lecture: multimedia presentation, demonstrations of physical effects.
Tutorials: solving physical problems/calculation of tasks given by the teacher using the board, demonestration of simple physical problems.
Laboratory classes: laboratory exercises according to program of physical laboratory.

## Bibliography

Basic
1.D.Halliday, R.Resnick, J.Walker, Fundamentals of Physics, John Wiley&Sons, Inc., New York 1997.
2. D.Kasprowicz, Physics/learning materials for the lecture/ the basic academic physics course intended for the students of the Faculty of Electronics and Telecommunications of the Poznan University of Technology.
3. T.Runka, Physics/learning materials for the tutorials intended for the students of the Faculty of Electronics and Telecommunications of the Poznan University of Technology.
Additional
1. D.Halliday, R.Resnick, J.Walker, Podstawy fizyki tom: 1-5, PWN Warszawa 2003.
2. S.J. Ling, J. Sanny,W. Moebs, at all., University Physics volume: 1-3, OpenStax textbooks, 2016: https://openstax.org/details/books/university-physics-volume-1, https://openstax.org/details/books/university-physics-volume-2, https://openstax.org/details/books/university-physics-volume-3.

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 150 | 6,00 |
| Classes requiring direct contact with the teacher | 75 | 3,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 75 | 3,00 |