COURSE DESCRIPTION CARD- SYLLABUS

Course name
Physics

Course

Field of study
Mathematics in Technology
Area of study (specialization)
—
Level of study
first-cycle studies
Form of study
full-time

Year/Semester
1/2
Profile of study
general academic
Course offered in
Polish
Requirements
compulsory

Number of hours

Lectures
30
Tutorials
30
Laboratory classes
15
Projects/seminars
—
Other (e.g. online)
—

Number of credit points

5

Lecturers

Responsible for the course/lecturer::

dr hab. Tomasz Runka

Responsible for the course/lecturer::

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Prerequisites

- Knowledge of physics (core cirriculum for secondary schools, basic level) and mathematics core cirriculum for secondary schools, advanced level).
- Skill of solving elementary problems in physics base on knowledge, skill in obtaining information from indicated sources.
- Understanding the need for education in order to obtain the relevant qualifications to perform in the future of the profession and social roles.

Course objective

- Providing to students basic knowledge of physics in the field specified by the content of the curriculum relevant to the field of study: Mathematics in technology.

- Developing of skills of mathematical description and interpretation of the observed phenomena in the surrounding world based on the known laws of physics.

- Developing of the ability to solve simple problems in the field of physics on the basis of the obtained knowledge.

Course-related learning outcomes

Knowledge

- she/he has knowledge in the field of selected issues including classical mechanics, gravitation, vibrational and wave motion, thermodynamics, electricity and magnetism, electromagnetic waves, optics, theory of relativity and modern physics;

- she/he knows applications basic laws of physics in the field of selected issues including classical mechanics, gravitation, vibrational and wave motion, thermodynamics, electricity and magnetism, electromagnetic waves, optics, theory of relativity and modern physics to description of phenomena in the surrounding world.

Skills

- she/he is able to apply basic laws of physics and simplified mathematical models to solving simple problems in the field including classical mechanics, gravitation, vibrational and wave motion, thermodynamics, electricity and magnetism, electromagnetic waves, optics, theory of relativity and modern physics;

- she/he is able to recognize, explain and describe mathematically physical phenomena in the surrounding world on the basis theoretical knowledge related to selected issues of physics;

- she/he is able to use with understanding from specified sources of knowledge (e.g. references, databases) and is active in extraction of knowledge from other sources.

Social competences

- she/he is able to actively engage in solving of posed problems, raising his or her professional, personal and social competences;

- she/he follows the rules of professional ethics, is responsible for the reliability of results obtained in his or her work and their interpretation, and the assessment of work done by others.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures: written exam/oral (during exam session)

3 50.1%-70.0%,

4 70.1%-90.0%,

5 90.1%-100%.

Tutorials: tests (7th and 14th week of the semester)

3 50.1%-70.0%,

4 70.1%-90.0%,

5 90.1%-100%.

Laboratory classes: evaluation of activity on classes

3 50.1%-70.0%,

4 70.1%-90.0%,

5 90.1%-100%.

Programme content

Update: 31.01.2020r.

1. The basics of classical mechanics:
    - kinematics and dynamics of translational motion (Newton's laws, conservation of energy and momentum including);
    - kinematics and dynamics of rotational motion (Newton's laws for rotational motion, conservation of angular momentum);
    - simple harmonic motion, damped and forced oscillations (resonance including);
    - mechanical waves;
    - elements of acoustics.
2. Grawitation.
3. Thermodynamics:
    - laws of thermodynamics;
    - the kinetic theory of gases;
    - energy transfer mechanisms in thermal processes;
    - thermal expansion;
    - thermal insulation.
4. Elecricity and magnetism:
    - electrostatics;

- magnetostatics;
- motion of charged particle in electric and magnetic uniform field;
- Faraday's law of induction;
- Maxwell's equations;
- electromagnetic waves;
- electric and magnetic properties of matter;
- band theory of solids (metals, insulators and semiconductors).

5. Optics:
   - basics of geometrical optics (optical instruments);
   - wave optics (dispersion, interference, diffraction and polarization of light);
   - transmission of waves from the range UV, VIS and IR, optical fibers technology;
   - lasers and their applications.
6. Special theory of relativity.
7. Modern physics:
   - Bohr's model of hydrogen atom;
   - quantum nature of light (the photoelectric effect, the Compton effect);
   - the wave properties of particles (de Broglie wavelength);
   - Schrodinger equation;
   - potential well;
   - tunneling through a potential energy barrier (scanning electron microscope STM);
   - properties of matter in nanoscale, quantum effects.

Teaching methods

Lectures: multimedia presentation, demonstrations of physical effects;

Tutorials: calculation of tasks using whiteboard, demonestration of simple physical problems;

Laboratory classes: laboratory exercises according to program of physical laboratory.

Bibliography

Basic

- Fizyka dla szkół wyższych, Katalyst Education 2018, openstax Polska.
- D. Halliday, R.Resnick, J.Walker, Podstawy fizyki, t. 1-5, PWN, Warszawa 2003.
- K. Jezierski, B.Kołodka, K.Sierański, Fizyka. Zadania z rozwiązaniami, t. 1-2, Oficyna Wydawnicza Scripta, Wrocław 2009.
- A. N. Kucenki, J. W. Rublewa, Zbiór zadań z fizyki dla wyższych uczelni technicznych, PWN, Warszawa 1997.

Additional

- Masalski, Fizyka dla inżynierów, t.1-2, WNT, Warszawa 1980.

Breakdown of average student's workload

	Hours	ECTS
Total workload	131	5,0
Classes requiring direct contact with the teacher	81	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam)	50	2,0