COURSE DESCRIPTION CARD - SYLLABUS

Course name
Physics [S1TOZ1>FIZ1]

Course

Field of study
Circular System Technologies

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
30

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

4,00

Coordinators

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

Lecturers

dr inż. Anna Dychalska
anna.dychalska@put.poznan.pl

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

Prerequisites

1. Student has knowledge of mathematics necessary to understand and describe the basic issues related to physics (core curriculum for secondary schools, advanced level). 2. Student has basic knowledge in the field of physics (core curriculum for secondary schools, basic level). 3. Student is able to obtain information from the indicated sources of literature, the internet and other sources. Student can use formulas, tables and technical calculations. 4. Student understands the need to expand his competences and is ready to cooperate in a team.

Course objective

1. To acquaint students with the basic concepts and laws of classical physics, within the scope defined by the curriculum content appropriate for the field of study, including their applications in technical sciences. 2. Developing students" ability to solve problems in the field of physics, to see its potential applications in the studied field. 3. Developing students" skills in solving tasks in the field of physics on the basis of the acquired knowledge. 4. Shaping students" ability to independently acquire knowledge, use literature and other sources.

Course-related learning outcomes

Knowledge:
1. has an extensive knowledge of classical physics including issues of mechanics, electromagnetism and optics necessary to understand the phenomena and changes occurring in technological and environmental processes [k_w02],
2. has knowledge of physics necessary to describe the concepts and principles of closed-loop technology as well as the characteristics of connections and relationships between its components [k_w03],
3. has basic knowledge covering key issues in the field of technical thermodynamics [k_w17],
4. has a basic knowledge of the heat, mass and momentum exchange processes [k_w23].

Skills:
1. can obtain information from literature and other sources in the field of classical physics; interpret them and draw conclusions, formulate and justify opinions [k_u01],
2. has the ability to independently acquire knowledge and learn in the field of classical physics, can read with understanding, conduct analyzes, syntheses, summaries [k_u04],
3. correctly uses in discussions and properly uses nomenclature and terminology in the field of classical physics [k_u05],
4. can plan and organize individual work [k_u08].

Social competences:
1. behaves professionally in every situation, acts in accordance with the moral principles and principles of professional ethics [k_k01],
2. shows self-reliance and inventiveness in individual work; objectively assesses the effects of own work [k_k02],
3. objectively evaluates the level of his knowledge and skills, understands the importance of improving professional and personal competences adequately to the changing social conditions and the progress of science [k_k05].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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1. Under the LECTURE: Assessment of knowledge and skills is verified on a 90-minute written exam carried out stationary or remotely on the basis of explanation of selected problems in physics presented during the lecture. In a situation where the grade from the written examination cannot be clearly defined, then an oral examination is conducted. Additionally, activity during lectures is assessed. Passing threshold: 50% of points.
2. Under the EXERCISES: Assessment of knowledge and skills (application of physical principles and laws, transforming formulas, correctness of numerical accounts and ability to prepare a unit account) is verified on the basis of a 90-minute test carried out in the last stationary or remotely class on the basis of calculating tasks from the issues presented in the classes. Additionally, exercise activity is assessed. Passing threshold: 50% of points.

Programme content

Lecture:
1. Elements of vector calculus.
2. Kinematics of a material point.
3. Dynamics of a material point.
4. Dynamics of a rigid body.
5. Principles of conservation in mechanics, collisions of bodies, statics of a rigid body.
6. Gravitational field.
7. Statics and dynamics of fluids.
8. Elastic properties of bodies.
9. Elements of thermodynamics.
10. Harmonic motion.
11. Mechanical waves.
12. Electric field.
13. Electric current.
14. Magnetic field.

15. Electromagnetic induction.
16. Electromagnetic waves.
17. Geometrical and physical optics.
18. Elements of special relativity theory.

Course topics

Lecture:
1. Scalar and vector quantities, operations on vector quantities; geometric interpretation.
2. Rectilinear and curvilinear motion, uniform and variable circular motion, motion in a gravitational field.
3. Newton's laws of dynamics, friction, momentum, work, power, energy, conservative and non-conservative forces.
4. Torque, moment of inertia, Steiner's theorem, principles of rotational dynamics, angular momentum, kinetic energy of rotational motion.
5. Conservation principles: momentum, angular momentum, energy, collisions of bodies (perfectly elastic and inelastic), statics of a rigid body (simple machines).
6. Law of universal gravitation, Kepler's laws of planetary motion, weight, field intensity, work in the field, field energy, field potential.
7. Archimedes' principle, Pascal's law, Bernoulli's equation, viscosity of fluids.
8. Elastic properties of bodies, Hooke's law.
9. Elements of thermodynamics, temperature, pressure, laws of thermodynamics, heat, heat transfer mechanisms, gas transformations, heat engines.
10. Simple harmonic motion, damped, forced - resonance, mechanical waves.
11. Refraction and reflection of waves, diffraction and interference phenomena, Doppler effect, fundamentals of acoustics.
12. Coulomb's law, electric field intensity and potential, work of electric field forces, Gauss's law.
13. Direct current, Ohm's law, Kirchhoff's laws, electrical conductivity.
14. Lorentz force, electrodynamic force, Gauss's law, Ampère's law, Biot-Savart law.
15. Magnetic flux, Faraday's law of induction, Lenz's rule.
16. Maxwell's equations.
17. Geometrical and physical optics.
18. Galilean transformation, Lorentz transformation, time dilation, length contraction.

Exercises:
1. Vector calculus.
2. Gradient, divergence, curl.
3. Kinematics of a material point.
4. Dynamics of a material point.
5. Principle of conservation of momentum.
6. Principle of conservation of mechanical energy and total energy.

Teaching methods

1. Lecture: presentation of program content in the form of a multimedia presentation, presentation of physical experiences in the form of multimedia films, simulation of physical phenomena with the use of computer programs.
2. Exercises: presenting the way of solving problems on the blackboard, solving the problems given by the teacher during classes on the blackboard and outside the class.

Bibliography

Basic
1. D. Halliday, R. Resnick, J. Walker, Podstawy Fizyki, t. 1-4, PWN 2014,
2. J. Massalski, M. Massalska, Fizyka dla inżynierów, t. 1-2, WNT, Wydanie V,
3. W. Moebs, S. J. Ling, J. Sanny, Fizyka dla szkół wyższych, t. 1-3, OpenStax, https://openstax.pl/pl,
4. J. Kalisz, M. Massalska, J. Massalski, Zbiór zadań z fizyki z rozwiązaniami, PWN, Warszawa 1971.
Additional
1. D. Halliday, R. Resnick, J. Walker, Podstawy Fizyki, t. 5, PWN 2014,
2. I.W. Sawieliew, Wykłady z fizyki, t. 1-3, PWN 2013,
3. K. Jezierski, B. Kołodka, K. Sierański, Fizyka. Zadania z rozwiązaniami. Cz. 1 i 2, Oficyna Wyd. Scripta, Wrocław 1999,

4. K. Jezierski, B. Kołodka, K. Sierański, Fizyka. Repetytorium, zadania z rozwiązaniami, Oficyna Wyd. Scripta, Wrocław 2003.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	50	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	50	2,00