1. Course number and name

RB-S1-19-I0A-F, **Physics**

2. Credits and contact hours*

6 ECTS, lectures: 30 hours**, classes: 15 hours**, laboratory: 15 hours**

3. Instructor's or course coordinator's name

Bogusława Adamowicz PhD, DSc/University Professor

4. Text book, title, author, and year

- Fundamentals of Physics, D. Halliday, R. Resnick, J. Walker, 2014 University Physics, W. Moebs, S. J. Ling, J. Sanny, 2016: https://openstax.org/details/books/university-physics-volume-1 https://openstax.org/details/books/university-physics-volume-2

a. other supplemental materials

- Understanding Physics, M. Mansfield, C. O'Sullivan, 1998 Physics, J. Orear, 1961,
- Physics for Scientists and Engineer, P. A. Tipler, G. Mosca, 2007.
- "Guide to the expression of uncertainty":
- https://www.bipm.org/utils/common/documents/jcgm/JCGM_100_2008_E.pdf

5. Specific course information

a. brief description of the content of the course (catalog description)

Lectures:

(1) Kinematics and dynamics of a material point and a rigid body, (2) Dynamics of an oscillatory motion and waves, (3) Basics of thermodynamics, (4) Fundamentals of electric and magnetic fields, their interaction and application in technology, (5) Elements of optics and quantum mechanics.

Classes:

Solving tasks related to the lecture content and discussion on student reports (team work).

Laboratory:

6 experiments (correlated with the lecture) performed by two-student teams preceded by a discussion with the teacher on the experiment goal and scope.

b. prerequisites or co-requisites

Students should have knowledge of the secondary school physics and mathematics courses as well as English language skills. Students are able to make an initial analysis of physical tasks and use known mathematical methods for solving them. Students are able to use modern tools (computers, multimedia) and information sources (manuals, encyclopedias, network resources).

c. indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program

Required.

6. Specific goals for the course

a. specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic

The student can:

- analyze and solve standard physical problems of dynamics of a material point and a rigid body, oscillatory and wave motion, thermodynamics, electric and magnetic fields and elements of quantum mechanics;

- explain how the fundamental laws of nature are applied in technology and everyday life;
- plan and perform a physical experiment and analyse data.

b. explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

K1A_W01, K1A_U05

7. Brief list of topics to be covered

Lecture

1. Physics as a natural science and the basis of technology.
2. Dynamics of a material point. Newton's laws of dynamics.
3. The law of universal gravitation. Motion of a body in a gravitational field.
4. Inertial and non-inertial reference frames, inertial forces.
5. Motion of a particle system. Center of mass. Elastic and inelastic collisions.
6. Harmonic oscillations: simple, damped and forced. Resonance.
7. Acoustic waves. Wave equation. Diffraction and interference of waves. Doppler effect.
8. Dynamics of a rigid body.
9. Ideal gas model.
10. Heat, work and internal energy.
11. Heat transfer. Heat conduction, convection and radiation. Global warming.
12. Electrostatic field in a vacuum, Coulomb's law and the principle of superposition.
13. Magnetic field.
14. Electromagnetic radiation.
15. Elements of solid state physics. Solar cells.
16. Wind action.

Calculation classes

1. Organizational classes.
2. Dynamics of a material point - solving tasks.
3. Work, power, principles of energy and momentum conservation - solving tasks.
4. Harmonic oscillatory motion and wave motion - solving tasks.
5. Dynamics of a rigid body. Torque, angular momentum - solving tasks.
6. Ideal gas state equation. Heat, work and internal energy change in the thermodynamic processes - solving tasks.
7. Electrostatic field; force, strenght, potential - solving tasks.
8. Magnetic field; electrodynamic force, Faraday's law of induction, Lorentz force - solving tasks.

Laboratory classes

9. Determination of the Earth’s gravitational acceleration using a simple pendulum.
10. Determination of the sound velocity in air using a Quincke tube.
11. Determination of the viscosity coefficient in air using a capillary.
12. Determination of the density of materials using regular solids.
13. Determination of the liquid density using the Westphal balance.
14. Determination of the diffraction grating constant.

*- Consultations were not included in the contact hours
**-per semester