

Fundamentals of physics I - Mechanics - opis przedmiotu

Informacje ogólne	
Nazwa przedmiotu	Fundamentals of physics I - Mechanics
Kod przedmiotu	13.2-WF-FizP-FP-I-M-S17
Wydział	Wydział Fizyki i Astronomii
Kierunek	WFiA - oferta ERASMUS
Profil	-
Rodzaj studiów	Program Erasmus
Semestr rozpoczęcia	semestr zimowy 2023/2024

Informacje o przedmiocie	
Semestr	1
Liczba punktów ECTS do zdobycia	7
Występuje w specjalnościach	Fizyka
Typ przedmiotu	obowiązkowy
Język nauczania	angielski
Sylabus opracował	prof. dr hab. Andrzej Drzewiński

Formy zajęć					
Forma zajęć	Liczba godzin w semestrze (stacjonarne)	Liczba godzin w tygodniu (stacjonarne)	Liczba godzin w semestrze (niestacjonarne)	Liczba godzin w tygodniu (niestacjonarne)	Forma zaliczenia
Ćwiczenia	45	3	-	-	Zaliczenie na ocenę
Wykład	45	3	-	-	Egzamin

Cel przedmiotu

The first objective of this course is to acquaint students with the development of concepts and methods of physics. Executed in parallel, and most important goal is to get the student's ability for understanding and rigorous description of physical phenomena in the field of mechanics. Thanks to demonstrations accompanying lectures, verbal communication is illustrated by numerous examples.

Wymagania wstępne

Knowledge of mathematics and physics at the high school level

Zakres tematyczny

LECTURE:

- *History and methodology of science*: basic physical quantities and their measurement, the international SI system of units, coordinate systems, vectors and vector quantities in physics
- *Kinematics*: kinematics of uniform motion, linear motion, motion in two and three dimensions, velocity and acceleration
- *The dynamics of linear motion*: the dynamics of material point, force and motion, mass and weight, the principles of Newtonian dynamics, friction
- *Frames of reference*: inertial and non-inertial, Galileo and Lorentz transformations
- *Circular motion dynamics*: *uniform circular motion*, the forces of inertia, the Coriolis force
- *Energy*: kinetic and potential energy, work and power, principle of the conservation of energy
- *Collisions*: momentum and the principle of conservation of momentum, elastic inelastic collisions
- *Gravitational interaction*: Kepler's laws, Newton's law of universal gravitation, the work force in a gravitational field, the first and second cosmic velocity
- *Rotary rigid body motion*: rigid body, center of mass, the principle of Steiner's, progressive and rotary motion, the principle of conservation of angular momentum
- *Statics*: a state of equilibrium, inclined plane, equilibrium of rigid bodies
- *Oscillatory motion and waves*: deformation of the bodies, harmonic vibrations, the elastic wave motion and the principle of superposition, interference and diffraction, standing waves, Doppler effect
- *Statics and dynamics of fluids*: Archimedes' principle, Pascal's law, the principle of continuity, Bernoulli's law

CLASS:

- *Vectors*. Adding vectors. Multiplication of vectors.

- *Motion in one dimension*. Average and instantaneous velocity. Accelerated motion. Freely falling bodies.
- *Motion in two and three dimensions*. Position, velocity, acceleration. Projectile motion. Relative motion. *Newton's laws*. Force, mass. Applications of Newton's laws. Frictional forces.
- *Work and energy*. Work done by a constant force and by a variable force. Kinetic energy and the work. Power.
- *Conservation of energy*. Conservative forces. Potential energy. One-dimensional conservative systems.
- *System of particles*. Two- and many-particle systems. Center of mass. Linear momentum of a particle and system of particles. Conservation of linear momentum.
- *Collisions*. Conservation of momentum during collisions. One- and two-dimensional collisions. *Rotational kinematics*. Rotational motion. The rotational variables. Rotation with constant angular acceleration. Relationship between linear and angular variables.

Metody kształcenia

Classes are in the form of lectures illustrated with demonstrations. During the lecture the student is encouraged to ask questions, while during the demonstration the students are also encouraged to actively participate. On the exercises, students analyze and solve problems with a teacher.

Efekty uczenia się i metody weryfikacji osiągnięcia efektów uczenia się

Opis efektu	Symbole efektów	Metody weryfikacji	Forma zajęć
Student understands the relationship between energy and work and can give various examples of potential energy . Student knows the conservation laws in mechanics and can use them to solve problems of mechanics. Student knows the law of universal gravitation and can apply to motion of the planets.		- egzamin - ustny, opisowy, testowy i inne - obserwacja i ocena aktywności na zajęciach	- Wykład - Ćwiczenia
Student knows the principle of superposition of forces and the principle of superposition of motions. Student knows and is able to apply Newton's principles, in the inertial and non-inertial reference frame. Student can describe wave motion and the superposition principle. Student understands the general method in physics: breaking problems down into idealized models, as the perfectly elastic collision.		- egzamin - ustny, opisowy, testowy i inne - obserwacja i ocena aktywności na zajęciach	- Wykład - Ćwiczenia
Based on the concept of work and energy can explain Bernoulli's Principle and apply them to simple problems of fluid dynamics.		- egzamin - ustny, opisowy, testowy i inne - obserwacja i ocena aktywności na zajęciach	- Wykład - Ćwiczenia
Student understands the role of inertial mass and its distribution in the analysis of rigid body motion and is able to calculate the moment of inertia for the basic bodies, like a ring, rod or ball.		- egzamin - ustny, opisowy, testowy i inne - obserwacja i ocena aktywności na zajęciach	- Wykład - Ćwiczenia

Warunki zaliczenia

The exam is conducted in writing. Student receives four issues to consider requiring the knowledge of the issues and ability to combine different phenomena. For each task, one can get from 0 to 5 points. Received a positive rating requires at least 8 points (a sufficient for 8-10.5 points, a plus sufficient for 11-13.5 points, a good 14-16, a plus good 16.5-18.5 points, a very good 19-20 points).

The basis of assessment exercises is attendance and passing written tests.

The exercises must be completed before the exam begins.

The final grade is the weighted grade from two parts: exercises (40%) and final exam (60%).

Literatura podstawowa

- [1] D. Halliday, R. Resnick, J. Walker, Podstawy fizyki, tom 1 i 2, Wydawnictwo Naukowe PWN, Warszawa 2005.
- [2] W. Moebs, S. J. Ling, J. Sanny, Fizyka dla szkół wyższych. Tom 1, [https://openstax.org/details/books/fizyka-dla-szkół-wyższych-tom-1]
- [3] B. Jaworski, A. Dietłaf, L. Miłkowska, G. Siergiejew, Kurs fizyki, tom 1, PWN, Warszawa 1976.
- [4] I. W. Sawieliew, Kurs fizyki, tom 1, Wydawnictwo Naukowe PWN, Warszawa 2002.
- [5] L. D. Landau, J. M. Lifszyc, Mechanika, Wydawnictwo Naukowe PWN, Warszawa 2007.

Literatura uzupełniająca

- [1] A. K. Wróblewski, Historia fizyki, Wydawnictwo Naukowe PWN, Warszawa 2007.

Uwagi

