



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Physics [N1Mech2>FIZ]

### Course

Field of study  
Mechatronics

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  
part-time

Requirements  
compulsory

### Number of hours

Lecture  
16

Laboratory classes  
8

Other  
0

Tutorials  
8

Projects/seminars  
0

### Number of credit points

5,00

### Coordinators

### Lecturers

### Prerequisites

Knowledge: Basic knowledge of physics and mathematics (core curriculum for secondary schools, basic level). Skills: Ability to solve elementary problems in physics based on acquired knowledge, ability to obtain information from indicated sources (can obtain information from the Internet, library and reading room and from other resources). Can determine the quality and usefulness of the information and data found. Can also integrate information obtained from various resources, interpret it, as well as draw conclusions and formulate and justify opinions. Social competences: Understanding the need to expand one's competences, readiness to cooperate within a team.

### Course objective

Students acquire basic knowledge of physics, within the scope defined by the program content. Students acquire the ability to solve simple problems and perform simple experiments, as well as analyze results based on the knowledge obtained. Students develop teamwork skills..

### Course-related learning outcomes

Knowledge:

The student knows the basic physical concepts within the scope of the curriculum content appropriate to the field of study and provides simple examples of their application in the surrounding world. The student is able to formulate and explain the basic physical laws within the scope of the curriculum

content appropriate to the field of study and determine the basic limitations and scope of their applicability. The student is able to provide examples of the application of basic physical laws to describe phenomena in the surrounding world. The student is able to explain the purpose and significance of simplified models in the description of physical phenomena

#### Skills:

The student is able to apply basic physical laws and simplified models in solving simple problems within the scope of the program content. The student is able to use their knowledge of physics, supplemented with information obtained from literature and other sources, to explain the principles of operation of technical devices.

The student is able to perform qualitative and quantitative analysis of the results of simple physical experiments, formulate simple conclusions based on the obtained results of calculations and measurements. The student is able to use with understanding the indicated sources of knowledge (list of basic literature) and acquire knowledge from other sources.

The student is able to plan and carry out standard measurements of basic physical phenomena, identify and assess the importance of basic factors interfering with the measurement.

#### Social competences:

The student is able to actively engage in solving problems, independently develop and expand their competences. Cooperate within a team, fulfill the duties assigned within the division of labor in the team, demonstrate responsibility for their own work and joint responsibility for the effects of the team's work. The student is able to act in accordance with basic ethical principles..

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Knowledge acquired during the lecture is verified in a written exam. The exam in the form of a test consists of 20 questions and calculation tasks, equally scored. Passing threshold: 50.1%.

Tutorials: Knowledge and skills acquired during the tutorials will be verified on the basis of a final colloquium during the last classes in the semester. The colloquium consists of 8 calculation tasks, of which the student has to solve 5 of his/her choice. Passing threshold 50.1%. Activity during classes is also scored.

Laboratory: test and rewarding knowledge necessary to solve the problems posed in a given area of laboratory tasks, assessment of knowledge and skills related to the implementation of the exercise task, assessment of the report on the completed exercise..

### Programme content

A course presenting selected issues of classical physics with references to the use of phenomena and laws of physics in various fields of science and technology. Presentation of curiosities and facts from the area of contemporary physics of the 20th and 21st centuries..

### Course topics

Lecture and tutorials:

Kinematics of a material point. Principles of point dynamics, examples of force models. Apparent forces in non-inertial systems. Momentum and the principle of conservation of momentum. Center of mass of a system of points. Work and energy. Examples of potential energy. Relationship of potential energy and force. Principle of conservation of energy. Momentum of a point and a system of material points.

Principle of conservation of angular momentum. Basic problem of mechanics. Numerous examples of rigid body motion. Harmonic motion. Resonance phenomenon. Wave motion, superposition principle, Huygens' principle, Fermat's principle. Thermodynamics. Vector and scalar description of the electric field. Gauss's law. Laws describing electric current. Vector description of the magnetic field of Maxwell's laws and their connection with special relativity. Geometrical and wave optics. This lecture covers the kinematic structures of manipulators and the construction of their end effectors, used in machines and devices performing specific functions in the production process, with references to concrete examples. Laboratory exercises will be performed within three main sections: mechanics, electromagnetism and optics. Students working in 2-person teams will have to perform at least 2 exercises from each section. The exercise sets are presented in detail on the physics lab website (<https://www.phys.put.poznan.pl/>).

### Teaching methods

#### Lectures:

lecture with multimedia presentation (including: drawings, photos, animations, video materials) supplemented with examples provided on the board, taking into account various aspects of the issues presented, including: economic, ecological, legal and social, presenting a new topic preceded by a reminder of related content known to students from other subjects.

#### Tutorials:

solving tasks from indicated textbooks, content of tasks selected to address practical issues occurring in technology and everyday life, discussion.

#### Laboratory:

detailed review of reports by the laboratory instructor and discussions on comments, demonstrations, team work.

### Bibliography

#### Basic:

1. D. Halliday, R. Resnick, J. Walker, Podstawy fizyki, t. 1-5, PWN Warszawa 2007
2. St. Szuba, Ćwiczenia laboratoryjne z fizyki, Wydawnictwo Politechniki Poznańskiej, Poznań 2007
3. K. Łapsa, Ćwiczenia laboratoryjne z fizyki, Wydawnictwo Politechniki Poznańskiej, Poznań 2008
4. K. Jezierski, B. Kołodka, K. Sierański, Fizyka. Zadania z rozwiązaniami t 1-2, Oficyna Wydawnicza Scripta, Wrocław
5. K. Sieranski, P. Sitarek, K. Jezierski, Repetytorium wzory i prawa z objaśnieniami, Oficyna Wydawnicza Scripta, Wrocław 2002

#### Additional:

1. R. P. Feynman, R. B. Leighton, M. Sands, Feynmana wykłady z fizyki tomy 1-2, PWN, Warszawa 2014
2. S. J. Ling, J. Sanny, W. Moebs, Fizyka - dla szkół wyższych, tomy 1-2, www.openstax.org, Polska 2018
3. J. Masalski, Fizyka dla inżynierów t.1-2, WNT Warszawa 1980
4. K. Jezierski, B. Kołodka, K. Sieranski, Wzory i prawa z objaśnieniami, czesc II, Oficyna Wydawnicza Scripta, Wrocław 1995
5. K. Sieranski, J. Szatkowski Wzory i prawa z objaśnieniami, czesc III, Oficyna Wydawnicza Scripta, Wrocław 1996

### Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	34	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	91	3,50