COURSE DESCRIPTION CARD - SYLLABUS

Course name
Physics [S1MiTPM1>FIZ]

Course

Field of study
Materials and technologies for automotive industry

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
15

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

6,00

Coordinators

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Lecturers

Prerequisites

1. Basic knowledge of physics and mathematics (core curriculum for secondary schools, basic level). 2. Logic thinking ability, using mathematical tools, and implementing them to solve problems in physics at the secondary school level. 3. Ability to learn with comprehension. 4. Ability to obtain information from indicated sources. 5. Understanding the need to expand one's competencies. 6. Willingness to teamwork.

Course objective

1. Mastering basic knowledge of physics with an emphasis on its applications in technical sciences. 2. Developing the ability to solve problems in physics, finding its potential applications in the field of study, performing experimental tasks and analyzing their results based on the knowledge obtained during the course. 3. Shaping the ability of self-education and teamwork.

Course-related learning outcomes

Knowledge:
1. Student can define basic physical concepts and their units.
2. Student understands and can describe basic physical phenomena.
3. Student can explain the purpose and significance of simplified models in describing physical

phenomena.
4. Student has basic knowledge for understanding more complex problems in electrical engineering and electronics.
5. Student knows and can apply in practice the basic metrology knowledge.
6. Student has detailed knowledge of thermodynamics.

Skills:
1. Student is able to obtain information from literature and other appropriately selected sources in the field of engineering.
2. Student is able to verify the obtained information, interpret it, draw conclusions and formulate and justify opinions.
3. Student is able to formulate conclusions based on the results of conducted experiments and calculations performed, using theoretical knowledge acquired during classes.
4. Student is able to prepare a protocol from the conducted experiment containing a description and analysis of results and conclusions.
5. Student has the ability to self-educate.
6. Student is able to plan and conduct measurements and perform quantitative and qualitative analysis of the results of physical experiments.
7. Student is able to use simplified models and physical laws in solving simple physical problems.

Social competences:
1. Student understands the need for lifelong learning and is able to inspire and organize the learning process of others.
2. Student can actively engage in solving problems, as well as independently develop and expand the competencies.
3. Student can cooperate, think and act in an entrepreneurial manner and team work, assuming different roles in it.
4. Student can appropriately determine priorities for the implementation of a task defined by themselves or others.
5. Student learns the rules of conduct following the ethical principles.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
- assessment of knowledge and skills in the form of a written and/or oral exam based on the explanation of selected topics
Assessment criteria:
3.0 (50.1%-60.0%),
3.5 (60.1%-70.0%),
4.0 (70.1%-80.0%),
4.5 (80.1%-90.0%),
5.0 (> 90.1%)
Tutorials:
- substantive assessment of the tasks solving method: correct application of physical laws, the logical course of considerations, mathematical operability in transforming formulas on general data, the correctness of numerical calculations, and the ability to prepare a unit calculation,
- assessment of the ability to propose other ways of solving a given problem,
- assessment of the clarity and aesthetics of the task development
- assessment of student engagement and activity during classes
- assessment in the form of written colloquia verifying knowledge and ability to solve tasks
Assessment criteria:
3.0 (50.1%-60.0%),
3.5 (60.1%-70.0%),
4.0 (70.1%-80.0%),
4.5 (80.1%-90.0%),
5.0 (> 90.1%)
Laboratory:
- assessment of preparation and knowledge of theoretical issues required to perform the experiment
- skills verification in performing the experiment

- evaluation of the report on the experiment performed

Programme content

1. Classical mechanics: kinematics and dynamics of progressive and rotational motion, mechanical energy, classification of forces.
2. Fundamentals of thermodynamics.
3. Description of source fields (gravitational and electrostatic fields).
4. Direct current circuits.
5. Description of magnetic field.
6. Fundamentals of optics.

Course topics

1. Classical mechanics: kinematics and dynamics of progressive and rotational motion, mechanical energy, classification of forces.
- SI system of units, physical quantities
- vector description of motion
- classification of motions
- work, power, energy: kinetic energy, potential energy
- conservative and non-conservative forces
- kinematics and dynamics of progressive motion (principles of dynamics, conservation principles)
- kinematics and dynamics of rotational motion (principles of dynamics, conservation principles)
- harmonic movement: free, forced (resonance phenomenon) and damped
2. Fundamentals of thermodynamics.
- ideal gas, real gas
- ideal gas transformations
- general gas equation
- zeroth law of thermodynamics
- heat, specific heat, heat balance equations
- first law of thermodynamics
- linear expansion of solids
- selected thermodynamic cycles
3. Description of source fields (gravitational and electrostatic fields).
- Newton's law of universal gravitation
- Coulomb's law
- concept of source field's strength
- concept of source field's potential
- gravitational and electromagnetic potential energy
- equipotential surfaces
- electric charges and charge conservation
- electric field flux
- Gauss's law
- electric capacity
4. Direct current circuits.
- electric current strength
- Ohm's law
- conductor resistance (specific electrical resistance)
- sources of electromotive force
- Joule's first law
- Kirchhoff's circuit laws
- series and parallel circuits
- electrical measurements
5. Description of magnetic field.
- Lorentz force
- electrodynamic force
- magnetic field
- cyclotron motion
- Ampère's circuital law
- Gauss's law for the magnetic field

- Faraday's law of induction and Lenz's law
- Maxwell's equations
6. Fundamentals of optics.
- reflection and refraction of light
- diffraction and interference, Young's experiment
- diffraction grating
- polarization of electromagnetic waves
- mirrors and lenses

Teaching methods

Lecture: multimedia presentation, conversation with students, Oxford debate
Tutorials: solving tasks and excercises, analyzing and discussing the results
Laboratory: performing laboratory experiments and preparing reports

Bibliography

Basic:
Lecture:
1. D. Halliday, R. Resnick, J. Walker, Podstawy fizyki t 1-5, PWN, Warszawa 2003 (wyd. 1), 2015 (wyd. 2)
2. OpenStax, Fizyka, t. 1-3 (praca zbiorowa) https://openstax.pl/pl/
3. J. Massalski, M. Massalska, Fizyka dla inżynierów cz.1, WNT Warszawa, różne wydania - ostatnie 2018
Tutorials:
1. K. Jezierski, B. Kołodka, K. Sierański, Fizyka. Zadania z rozwiązaniami t 1-2, Oficyna Wydawnicza Scripta, Wrocław 2007
2. J. Kalisz, M. Massalska, J. Massalska, Zbiór zadań z fizyki z rozwiązaniami, PWN Warszawa, różne wydania - ostatnie 1980
3. W. Zillinger, J. Kosiuczenko, Zbiór zadań z fizyki z rozwiązaniami dla szkół średnich, Agmen Warszawa, różne wydania - ostatnie 2002
Laboratory:
1. S. Szuba, Ćwiczenia laboratoryjne z fizyki, Wydawnictwo Politechniki Poznańskiej, Poznań 2007

Additional:
1. R. P. Feynman, R. B. Leighton, M. Sands, Feynmana wykłady z fizyki Tom 1-3, Wydawnictwo Naukowe PWN, Warszawa, różne wydania - ostatnie 2014

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,00
Classes requiring direct contact with the teacher	62	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	88	3,00