COURSE DESCRIPTION CARD - SYLLABUS

Course name
Aspects of 21st century physics [S2MiBP1>AFXXIw]

Course

Field of study
Mechanical and Automotive Engineering

Year/Semester
1/1

Area of study (specialization)
Hybrid Powertrain Systems

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

1,00

Coordinators

dr inż. Łukasz Majchrzycki
lukasz.majchrzycki@put.poznan.pl

Lecturers

Prerequisites

Knowledge: Basics of mathematics, chemistry and physics. Skills: Using literature (textbooks, internet), the ability to perceive lecture content Social competences: Awareness of the need to deepen engineering knowledge and its place in everyday life.

Course objective

Providing students with basic knowledge of the physical aspects of the functioning of the world around us in the scope defined by the curriculum content appropriate for the field of study.

Course-related learning outcomes

Knowledge:
1.The student ought to acquire field specific vocabulary related to manufacturing techniques as well as repairs and maintenance and to be able to define and explain associated terms, phenomena and processes.
2. The student ought to acquire field specific vocabulary related to disc brakes and to be able to define and explain associated terms, phenomena and processes.
3. The student ought to acquire field specific vocabulary related to central heating and to be able to

define and explain associated terms, phenomena and processes.
4. The student ought to acquire field specific vocabulary related to recycling and to be able to define and explain associated terms, phenomena and processes.

Skills:
1. The student is able to give a talk on field specific or popular science topic (in English), and discuss general and field specific issues using an appropriate linguistic and grammatical repertoire.
2. The student is able to formulate a text in English where he/she explains/describes a selected field specific topic.
3. The student is able to understand and analyze international, field specific literature.
4. The student has already acquired language skills compatible with level B2 (CEFR).

Social competences:
1. The student is able to communicate effectively in a field specific/professional area, and to give a successful presentation in English.
2. The student is able to recognize and understand cultural differences in a professional and private conversation, and in a different cultural environment.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Written credit based on orally asked questions. In case of doubts related to the assessment, an oral exam is allowed.

Programme content

Development of research on the structure of matter,
Properties of the atom and the atomic nucleus,
Obtaining energy in the process of breaking the atomic nucleus,
Construction of nuclear reactors,
The use of various elements in the production of nuclear fuel,
Manhattan Project,
The use of radioactive sources for peaceful civilian purposes, other uses of alpha, betha, gamma radiation

Course topics

Developments in research on the structure of matter,
Properties of the atom and atomic nucleus,
The most important physical experiments in the field of the structure of matter,
Electromagnetic radiation - ranges and applications,
Alpha, beta, and gamma radiation,
Nuclear binding energy, stability of atomic nuclei,
Obtaining energy in the process of nuclear fission,
Construction of nuclear reactors,
Application of radioactive sources in technology and medicine,
Optical and confocal microscopy in technical applications,
Research methods of electron microscopy (SEM, TEM),
Methods of scanning probe microscopy (STM, AFM).

Teaching methods

Lecture with multimedia presentation

Bibliography

Basic
1. Paul. A. Tipler - Fizyka współczesna
2. Jerzy Ginter - Wstęp do fizyki atomu, cząsteczki i ciała stałego
3. Mikroskopia elektronowa, red. A. Barbacki, Wydawnictwo Politechniki Poznańskiej, Poznań 2003.

4. STM/AFM mikroskopy ze skanującą sondą (org. A practical guide to scanning probe microscopy, R. Howland, L. Benatar, Park Scientific Instruments, wydanie polskie, Warszawa 2002)

Additional

Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1,00
Classes requiring direct contact with the teacher	15	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	10	0,50