COURSE DESCRIPTION CARD - SYLLABUS

Course name
Ionizing radiation in materials testing and industrial applications [S1MiTPM1>PJwBMiZP]

Course

Field of study
Materials and technologies for automotive industry

Year/Semester
3/5

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
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of physics, chemistry, materials science. Reasoning skills, use of information obtained from libraries and the Internet. Understanding the need for learning and acquiring new knowledge.

Course objective

Learning the theoretical basis and practical implementation of materials testing methods using X-ray radiation.

Course-related learning outcomes

Knowledge:
1. A student who has passed the course has systematic knowledge of physics, chemistry and the structure of matter, necessary to understand the basic physical and chemical phenomena occurring in testing of materials used in the automotive industry using ionizing radiation.
2. Student also has detailed knowledge of testing the properties of materials and vehicle parts, and knows the measurement methods used in the automotive industry.

Skills:

1. A student who has passed the course is able to plan and carry out measurements and experiments, interpret the obtained results and draw conclusions. Is able to apply material testing methods and operate specialized measuring equipment.
2. Is able to analyze, evaluate and solve technical problems of the automotive industry using knowledge from the field of materials science and material technologies.

Social competences:
1. A student who has passed the course understands the need for lifelong learning and is able to inspire and organize the learning process of other people.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
Written examination, the condition for receiving a positive grade is obtaining at least 50% of the possible points.
Lab:
Report on laboratory exercises, oral and written answers (the condition for receiving a positive grade is to provide the correct answer to at least 50% of the questions). Credit based on an oral or written answer regarding the content of each laboratory exercise performed, a report on each laboratory exercise according to the instructions of the laboratory instructor. To pass the laboratories, all exercises must be completed (positive grade for answers and reports).

Programme content

Issues related to the nature and properties of X-rays will be discussed, as well as methods of examining various materials used in the automotive industry with methods using X-ray radiation.

Course topics

Issues related to the nature and properties of X-rays will be discussed, as well as: X-ray diffraction; X-ray scattering; crystal structure testing methods: Laue method, rotated and rocked crystal, goniometric methods, Debye-Scherrer-Hull, Seemann-Bohlin, Preston, Bragg-Brentano, Guinier method, X-ray diffractometer (registration techniques, selection of working conditions). Qualitative and quantitative phase analysis. Indexing of diffractogram. Precise measurement of crystal lattice parameters. Macro- and micro-stress measurements. Texture studies. Testing various materials used in the automotive industry (metals, alloys, ceramics, composites, polymers, plastics, amorphous materials) using X-ray diffraction methods. The principle of operation of industrial computed tomography and its application in the automotive industry.

Teaching methods

1. Lecture: presentation illustrated with examples given on the board, problem solving.
2. Laboratory exercises: conducting experiments, solving tasks, discussion

Bibliography

Basic:
1. D. Senczyk, Rentgenowskie metody i techniki badania struktury materiałów, Wydawnictwo Politechniki Poznańskiej, Poznań, 1984.
2. D. Senczyk, Laboratorium z rentgenografii strukturalnej, Wydawnictwo Politechniki Poznańskiej, Poznań, 1982
3. D. Senczyk, Dyfraktometria rentgenowska w badaniach stanów naprężenia i własności sprężystych materiałów polikrystalicznych, Wydawnictwo Politechniki Poznańskiej, Poznań, 1995.
4. C. Kittel, Wstęp do fizyki ciała stałego, Wydawnictwo Naukowe PWN, Warszawa, 1999
5. N.W. Ashcroft, N.D. Mermin, Fizyka ciała stałego, Państwowe Wydawnictwo Naukowe, Warszawa, 1986

Additional:
1. M. Jurczyk, Nanomateriały, Wydawnictwo Politechniki Poznańskiej, Poznań 2001
2. L. A. Dobrzański, Wprowadzenie do nauki o materiałach, Wydawnictwo Politechniki Śląskiej, Gliwice

2007

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00