



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Optimization of properties and applications of metallic materials [S1ETI2>OWiZMM]

Course

Field of study	Year/Semester
Education in Technology and Informatics	2/3
Area of study (specialization)	Profile of study
–	general academic
Level of study	Course offered in
first-cycle	Polish
Form of study	Requirements
full-time	elective

Number of hours

Lecture	Laboratory classes	Other
15	15	0
Tutorials	Projects/seminars	
0	0	

Number of credit points

2,00

Coordinators

dr hab. inż. Aneta Bartkowska prof. PP
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Lecturers

Prerequisites

Basic knowledge of materials science and metal science.

Course objective

Learning about the theoretical and practical problems associated with the processes of optimizing the properties of metallic materials for use in various conditions.

Course-related learning outcomes

Knowledge:

The student has basic knowledge of the technology of formation of properties of metallic materials to selected exploitation conditions.

The student has basic knowledge of the basic methods of optimizing the selection of metallic materials to selected exploitation conditions.

The student has basic knowledge of the mechanics of destruction of metallic materials depending on their exploitation conditions.

Skills:

The student is able to apply basic property modification technologies to specific groups of metallic materials.

The student is able to perform multi-criteria optimization of selected metallic materials depending on exploitation conditions.

Social competences:

The student can independently expand knowledge and skills in metallic materials engineering.

The student is able to work in a team and take different roles in it.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Written test at the end of the semester consisting of: open questions and/or test questions.

Grading scale: <51% 2.0; 51% -64% 3.0; 65% -74% 3.5; 75% -84% 4.0; 85% -94% 4.5; > 95% 5.0

Laboratory: pass on the basis of an oral and/or written test and/or on an e-learning platform in the field of the content of each laboratory exercise, report of each laboratory exercise as instructed by laboratory instructors. In order to pass the exercises, all of oral or/and written tests and all reports must be counted as positive.

Programme content

Basic concepts and definitions related to optimization.

Classification of properties of metallic materials.

Mechanisms of destruction of metallic materials.

Course topics

Lecture:

1. Basic concepts and definitions applicable to single-criteria and multi-criteria optimization.
2. Classification of properties of metallic materials.
3. Classification of metallic materials and examples of applications.
4. Friction and wear.
5. Corrosion and corrosion resistance of metallic materials.
6. Creep and heat resistance.
7. Fracture toughness.

Laboratory:

1. The role of material microstructure in friction wear processes.
2. Corrosion resistance of selected groups of steels.
3. Methods of testing resistance to fracture toughness.
4. The role of chromium in materials for applications at elevated temperatures.
5. Creep.

Teaching methods

Lecture: multimedia presentation.

Laboratory: practical exercises, discussion, problem solving.

Bibliography

Basic:

1. L.A. Dobrzański, Materiały inżynierskie z podstawami technologii procesów materiałowych, Wydawnictwo Naukowe PWN, 2024
2. M.F. Ashby - Dobór materiałów w projektowaniu inżynierskim, WNT 1998
3. M.F. Ashby, D.R.H. Jones - Materiały inżynierskie t. 1 i 2, WNT 1995 i 1996
4. L.A. Dobrzański, Podstawy kształtowania struktury i własności materiałów metalowych, Wydawnictwo Politechniki Śląskiej, Gliwice, 2007

Additional:

1. L. A. Dobrzański, Zasady doboru materiałów inżynierskich, Wyd. Politechniki Śląskiej, 2000
2. M. Blicharski, Inżynieria materiałowa. Stal, WNT , 2013

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	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)	25	1,00