COURSE DESCRIPTION CARD - SYLLABUS

Course name

Diffusion processes

Course

Field of study

Materials Engineering

Year/Semester

3/6

Area of study (specialization)

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

polish

Form of study

full-time

Requirements

elective

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
15	15	
Tutorials	Projects/seminars	

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

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Faculty of Materials Engineering and Technical Physics

Piotrowo 3 Street, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge: basic knowledge of chemistry, physics and materials science. Skills: logical thinking, use of the information obtained from the library and the Internet. Social competencies: understanding the need for learning and acquiring new knowledge.

Course objective

Understanding the phenomenon of diffusion in metals and alloys and its application in surface layer manufacturing processes.

Course-related learning outcomes

Knowledge

1. Student should know and apply the laws and characterize the types and mechanisms of diffusion - [K_W03, K_W16]

2. Student should characterize the basic technologies of the manufacture of diffusion layers - [K_W08, K_W11, K_W14]

Skills

1. Student can choose diffusion layer for working conditions - [K_U03, K_U05, K_U13]

2. Student can model and calculate diffusion process conditions - [K_U01, K_U05]

3. Student can conduct diffusion process studies - [K_U05, K_U08]

Social competences

1. Student can collaborate in a group - [K_K03]

2. Student is aware of the role of diffusion processes in the technique and their impact on the formation, protection and degradation of metals and metal alloys. - [K_K02]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Ranking based on written test consisting of general and test questions (ranking in case of getting at least 51% of points: <51% 2 - ndst, 51%-62% 3 - dst, 63%-72% 3,5 - dst+, 73%-83% 4 - db, 84%-94% 4,5 - db+, > 94% 5 – bdb).

Classes: Ranking based on the evaluation of the multimedia presentation, answers to the lecturer's questions and participation in the discussion.

Programme content

Lecture:

1.Crystal lattice and defects of crystal structure.

2.Diffusion mechanisms.

3.Fundamental diffusion rights.

4.Self-diffusion.

5.Diffusion of atoms of impurities in metals.

6.Reaction diffusion.

7.Surface diffusion along grain boundaries and dislocation diffusion.

8.The role of diffusion in the phase transformation of metal alloys.

9.Manufacture and properties of diffusion surface layers

10.Methods of testing diffusion processes.

Classes:

1. Chromizing

2. Carburizing

3. Titanazing

4. Boriding

5. Nitriding

6. Aluminizing

7. Vanadising

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples on the board.

2. Classes: presentations, discussion, case study.

Bibliography

Basic

1. Jastrzębski J.: Dyfuzja w metalach i stopach, Wydawnictwo Śląsk, 1988

2. Mrowec S.: Defekty struktury i dyfuzja atomów w kryształach jonowych?, PWN , 1990

3. Mrowec S.: Teoria dyfuzji w stanie stałym, PWN , 1989

Additional

1. Młynarczak A., Jakubowski J.: Obróbka powierzchniowa i powłoki Ochronne, Skrypt PP, Poznań, 1998

2. Kula P.: Inżynieria warstwy wierzchniej, Politechnika Łódzka, 2000

3. Burakowski T. Wierzchoń T., Inżynieria powierzchni metali, PWN , Warszawa , 1998

4. Kulka M., Current Trends in Boriding: Techniques, Springer International Publishing, 2019

Breakdown of average student's workload

	Hours	ECTS
Total workload	62	2,0
Classes requiring direct contact with the teacher	32	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	30	1,0

[1] delete or add other activities as appropriate