COURSE DESCRIPTION CARD - SYLLABUS

Course name
Diffusion processes [S1IMat1>ProcDyf]

Course

Field of study
Materials Engineering

Year/Semester
4/7

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
15

Number of credit points

3,00

Coordinators

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Lecturers

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:

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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	65	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)	35	1,00