COURSE DESCRIPTION CARD - SYLLABUS

Course name

Modelling of the structure and properties of diffusion layer

Course

Field of study

Materials Engineering

Year/Semester

2/3

Area of study (specialization)

Nanomaterials

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

prof. dr hab.inż.Michał Kulka

email: michal.kulka@put.poznan.pl

tel. 61 665 35 75

Faculty of Materials Engineering and Technical Physics

Piotrowo 3 Street, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge: basic knowledge of materials engineering and surface treatment. Skills: logical thinking, use of the information obtained from the library and the Internet, operation of the basic computer software. Social competencies: understanding the need for learning and acquiring new knowledge.

Course objective

Acquainting with theoretical and practical problems of planning the thermochemical treatment in order to provide required functional properties for the surface layer.

Course-related learning outcomes

Knowledge

1. Student has an underpinned theoretically and detailed knowledge of selected issues from the materials engineering, and can describe the surface phenomena and thermochemical treatment. [T2A_W04] [K_W06]

Skills

1. Student is able to use the simulation and experimental analytical methods for formulating both solving engineering problems and simple research problems. [T2A_U09] [K_U09]

2. Student is able to assess the usability of the methods and tools being used to solve the task engineering, characteristic of the materials engineering. [T2A_U18] [K_U19]

Social competences

1. Student is aware of importance and understanding the differents aspects and effects of engineering activity, including its impact on the environment and the associated responsibility for decisions. [T2A_K02] [K_K02]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Ranking based on written examination 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) written for the end of the semester.

Laboratory: Ranking based on an oral answer from the scope of contents of the performed laboratory excersise and report on every laboratory exercise according to indications of the leading the laboratory exercises.The average score of all the laboratory exercises is calculated. All the exercises have to be accepted in respect of oral answer and report.

Programme content

Lecture:

1. Essence of applying diffusion layers in the materials engineering.

2. Classification of methods of producing diffusion layers.

3. Basic technological processes of formation of diffusion layers: carburizing, nitriding, boriding, carbide layers.

4. Heat treatment of diffusion layers: volume and laser.

5. Devices for producing diffusion layers.

6. Microstructures of diffusion layers.

7. Basic functional properties of diffusion layers: hardness, wear resistance, fatigue strength, cohesion, fracture toughness, corrosion resistance.

8. Modelling of the structure and functional properties of diffusion layers.

Laboratory:

1. Microstructure of diffusion layers produced with various methods

2. Microhardness of diffusion layers produced with various methods

3. Fracture toughness of diffusion layers produced with various methods

4. Cohesion of diffusion layers produced with various methods

5. Wear resistance tests of diffusion layers produced with various methods

Teaching methods

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

2. Laboratory: practical exercises, performing experiments, discussing, working in a team.

Bibliography

Basic

1. Praca zb. pod. red. Burakowskiego T., Obróbka cieplna metali, SIMP-IMP,W-wa 1987, tom 1÷7.

2. Kula P., Inżynieria warstwy wierzchniej, Wyd. Politechniki Łódzkiej, 2000.

3. Burakowski T., Wierzchoń T., Inżynieria powierzchni metali, WNT, Warszawa, 1995

Additional

1. Pertek A., Kształtowanie struktury i właściwości warstw borków żelaza otrzymywanych w procesie borowania gazowego, Wyd. PP 2001.

2. Młynarczak A., Modyfikowanie budowy i właściwości jedno- i wieloskładnikowych dyfuzyjnych warstw węglików chromu, wanadu i tytanu wytwarzanych na stalach metodą proszkową, Wyd. PP, 2005.

3. Małdziński L., Termodynamiczne, kinetyczne i technologiczne aspekty wytwarzania warstwy azotowanej na żelazie i stalach w procesach azotowania gazowego, Wyd. PP, 2002.

4. Kulka M., The gradient boride layers formed by borocarburizing and laser surface modification, Wyd. PP, 2009.

Breakdown of average student's workload

	Hours	ECTS
Total workload	70	2,0
Classes requiring direct contact with the teacher	35	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	35	1,0

[1] delete or add other activities as appropriate