



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Manufacturing of surface layers by welding methods

### Course

Field of study

Material Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3/6

Profile of study

general academic

Course offered in

Polish

Requirements

elective

### 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:

Artur Wypych Ph.D.

Responsible for the course/lecturer:

### Prerequisites

Basic knowledge in the field of physics, materials science. Ability to think logically, use information from the library and the Internet. understanding of the need to learn and acquire new knowledge.

### Course objective

Learn about methods and ways of producing top layers by welding methods. Understanding the properties and applications of such layers.

### Course-related learning outcomes

Knowledge

1. The student should characterize the types of top layers produced by different welding methods. -

[K\_W02, K\_W03, K\_W07, K\_W08]

2. The student should select the parameters of the process of making top layers by welding methods. -

[K\_W07, K\_W10, K\_W16]

3. The student should define the elements of the construction of the top layers produced by welding

methods. - [K\_W10, K\_W12]



### Skills

1. The student can operate welding equipment. - [K\_U01, K\_U05, K\_U12]
2. The student can choose the initial conditions of the processes of making top layers. - [K\_U08, K\_U21]
3. The student is able to plan the processes of making top layers. - [K\_U07, K\_U09, K\_U21]

### Social competences

1. The student can cooperate in a group - [K\_K01, K\_K03, K\_K04]
2. The student is aware of the role of top layer manufacturing processes by welding methods in the modern economy and society. - [K\_K06, K\_K07]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: pass on the basis of a colloquium consisting of 5 general questions (pass in case of correct answer to min. 3 questions: <3 = ndst, 3 = dst, 3,5 = dst+, 4 = db, 4,5 = db+, 5 = bdb) carried out at the end of the semester.

Laboratory: Based on an oral or written response to the content of each laboratory exercise performed, a report of each laboratory exercise according to the indications of the laboratory exercise operator. In order to be counted in laboratories, all exercises must be completed (positive assessment from the response and report).

### Programme content

Lectures:

1. Construction and operation of welding equipment.
2. Welding methods of surface layering by gas burner, MMA, TIG, MIG/MAG, microplasm and heat spraying by flame, arc, supersonic, plasma, cold gas spraying).
3. Properties of connections of different materials.
4. Characteristics and classification of additional materials for welding.
5. Properties of top layers produced by different welding methods.
6. The role of parameters for the manufacture of top layers by incinerator methods in shaping the properties of layers.

Laboratories:

1. Top layering by gas burner, MMA, GTA, GMA, SAW, plasma and microplasm layers and by flame spraying.
2. Study of the effect of the amount of heat introduced on the geometry of the welds and the contribution of the substrate material to the welds.



3. Testing of the properties of flame sprayed top layers without melting and melting.
4. Comparison of the performance of welded and thermally sprayed layers by different methods.

### Teaching methods

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1. Lecture: multimedia presentation, presentation illustrated with examples given on the board,
2. Laboratory exercises: practical exercises, performing experiments, discussion, teamwork, case study.

### Bibliography

Basic

1. Napawanie i natryskiwanie cieplne, Klimpel A., WNT, Warszawa, 2000,
2. Maszyny i urządzenia spawalnicze, Dobaj E., WNT Warszawa, 1998.

Additional

1. Poradnik Inżyniera Spawalnictwo cz.1, Pilarczyk J., WNT, Warszawa, 2001,
2. Spawalnictwo, Ferenc K., WNT, Warszawa, 2007.

### Breakdown of average student's workload

	Hours	ECTS
Total workload	30	2,0
Classes requiring direct contact with the teacher	15	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	15	1,0

<sup>1</sup> delete or add other activities as appropriate