



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Technology of melting metals and alloys

### Course

Field of study

Year/Semester

Material Engineering

4/7

Area of study (specialization)

Profile of study

Metal and Polymeric Materials

general academic

Level of study

Course offered in

First-cycle studies

Polish

Form of study

Requirements

full-time

elective

### Number of hours

Lecture

Laboratory classes

Other (e.g. online)

15

15

Tutorials

Projects/seminars

### Number of credit points

3

### Lecturers

Responsible for the course/lecturer:

Responsible for the course/lecturer:

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Faculty of Mechanical Engineering

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### Prerequisites

Basic knowledge of materials science, phase changes, physical phenomena and chemical reactions at phase interfaces.

### Course objective

Acquainting with the principles of melting, refining and modification of metals, especially technical alloys of iron, aluminum, copper and highly reactive alloys.

### Course-related learning outcomes

Knowledge

1. The student can describe the course of the metal melting process - [K\_W12];



2. The student is able to identify the factors influencing the quality of the metal melting process - [K\_W12];

3. The student is able to describe the methods of metal refining - [K\_W12]

#### Skills

1. Student is able to safely (health and safety rules) carry out the process of metal melting for a selected alloy (aluminum, copper, cast iron) - [K\_U12];

2. The student is able to use the specialized research and control equipment to evaluate the melting process and the quality of the metal - [K\_U09];

3. The student is able to operate typical electric furnaces - [K\_U12].

#### Social competences

1. The student is aware of the importance of his knowledge in professional life - [K\_K02];

2. The student has the ability to work and cooperate in a group (team) - [K\_K03].

#### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Colloquium at the end of the semester. Passing in case of obtaining min. 50.1% correct answers. Up to 50.0% - 2,0; from 50.1% to 60.0% - 3,0; from 60.1% to 70.0% - 3,5; from 70.1% to 80% 4,0; from 80.1% to 90.0% - 4,5; from 90.1% - 5,0.

Laboratory: Passing credit is conditioned by a positive assessment of each of the laboratories on the basis of the presence, written or oral response to the topics indicated by the laboratory teacher.

#### Programme content

Lecture:

Technical alloys. Foundry alloys. Charge materials: metal and non-metal. Refractory materials. Preparation of the metal charge (accounting, metal dross). Melting conditions (temperature, pressure, atmosphere). Impurities in liquid alloys: origin, form. Impact on the quality of the product (casting). Methods of refining liquid metals and alloys. Modifying alloys intended for castings. Control and correction of the chemical composition of alloys. Melting process control. Assessment of the quality of the metal intended for castings. Technological trials. Equipment used in the processes of melting, refining and modification of metals and technical alloys.

Laboratory in blocks:

1. Preparation of the metal charge

2. Melting (remelting) aluminum alloys from ingots in a crucible furnace.

3. Copper alloy melting in an induction furnace.



4. Cast iron melting in an induction furnace.
5. Smelting small metal charge (aluminum alloy scrap),
6. Evaluation of the quality of metal intended for castings

### Teaching methods

Lecture: A multimedia presentation illustrated with examples.

Laboratory: Practical classes in the laboratory of Division of Foundry and Plastic Working and field classes in the Foundry Enterprise

### Bibliography

Basic

1. A. Modrzyński, Technologia odlewnictwa, Wyd. P.P. Poznań 2015
2. Łybacki W., Modrzyński A., Szweyker M., Technologia topienia metali, Wyd. P.P. Poznań 1986
3. Górny Z., Odlewnicze stopy metali nieżelaznych. Przygotowanie ciekłego metalu, struktura i właściwości, WNT Warszawa 1992
4. Szweyker M., Nagolska D., Metalurgia i odlewnictwo, Wyd. Politechniki Poznańskiej Poznań 2002

Additional

1. Tabor A., Odlewnictwo, Wyd. Politechniki Krakowskiej, Kraków 2007
2. Perzyk M., Odlewnictwo. WNT, 2013

### Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	40	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	35	1,0

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