# COURSE DESCRIPTION CARD - SYLLABUS

Course name
Automotive parts casting [S1MiTPM1>OCM]

## Course

Field of study
Materials and technologies for automotive industry

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

## Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

## Number of credit points

2,00

## Coordinators

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## Lecturers

## Prerequisites

Basic knowledge of physics and chemistry. Logical thinking, analyzing occurring phenomena, and using knowledge obtained from scientific, technical, and popular science literature. Understanding the need for learning and acquiring new knowledge.

## Course objective

Learning the basic phenomena and processes related to the production of castings. Presenting the importance of casting technology in the automotive industry.

## Course-related learning outcomes

Knowledge:
1. The student is able to present the course of the metallurgical process of producing metals and metal alloys - especially in the scope of metal refining processes.
2. The student is able to describe the process of physical phenomena characteristic of foundry.
3. The student is able to characterize casting methods.
4. The student knows the equipment used in foundry processes.
5. The student is able to indicate the relationships between individual foundry technologies and the

characteristic features of castings.

Skills:
1. The student is able to make a casting.
2. The student is able to select the appropriate technology to shape a casting with the required properties.
3. The student is able to conduct the casting production process in a safe manner.

Social competences:
1. The student is able to convey information about foundry technology in a generally understandable way.
2. The student is able to determine the technical and non-technical conditions related to foundry.
3. The student is able to think and act in an entrepreneurial manner.
4. The student understands the need for continuous education.
5. The student is able to cooperate and work in a group, assuming different roles in it.

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
Written assessment. A positive assessment if at least 50.1% of correct answers are obtained. 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 80.0 - 4,0, from 80.1% to 90.0% - 4,5, from 90.1% - 5,0.
Laboratory:
Assessment based on an oral or written answer from the content of each laboratory exercise performed, a report from each laboratory exercise according to the instructions of the laboratory instructor. To obtain a credit for the laboratories, all exercises must be passed (a positive assessment of the answers and reports passed).

## Programme content

Familiarizing students with the process of manufacturing metals and metal alloys - technology of melting metal alloys. Familiarizing them with the processes of manufacturing castings. Application of castings in the automotive industry.

## Course topics

Lecture:
Stages of metal and alloy production. Primary and secondary metals. Metal scrap. Contaminants in metals and alloys: origin, form, and properties. Refining processes: purpose, methods, course, and effect. Refined metal (characteristics, properties, uses). Metallurgy of iron alloys. Blast furnace. Blast furnace charge, process course, and products. Pig iron. Steelmaking process. Stages of the process, course, and effect. Aluminum production, raw materials, and processing. Copper production, ores, and their processing. Stages of pure copper and its alloys production. Technology of melting scrap of selected non-ferrous metals. Basic concepts related to casting. Casting materials (basic characteristics and applications). Molds. Formation of castings in the mold. Gating system - elements, purpose, and operation. Metal flow through the gating system and mold filling. Formation of the casting's surface layer. Solidification and cooling of the metal. Course of solidification. Shrinkage phenomena before and after casting solidification. Feeding shrinkage. Feeding of castings - principles. Control of the solidification process. Risers and chills. Casting shrinkage. Free and restricted shrinkage. Removal of castings from the mold. Final treatment of castings. Overview of casting manufacturing methods. Applications of castings in the automotive industry. Features of castings and their production methods.
Laboratory:
1. Preparation and testing of basic properties of molding sands.
2. Hand molding method of sand casting.
3. Die casting.
4. Special casting methods (investment casting and casting in shell molds).
5. Application of computer technology in foundry.
6. Comparison of characteristics of castings obtained by different methods.

## Teaching methods

Lecture: multimedia presentation, films presenting selected technologies.
Laboratory: performing experiments, solving tasks, discussion, teamwork.

## Bibliography

Basic:
1. Jackowski J. Podstawy odlewnictwa. Ćwiczenia laboratoryjne. Wydawnictwo PP, Poznań, 1993
2. Szweycer M. Metalurgia. Wyd. Politechniki Poznańskiej. Poznań 1993

Additional:
1. Nagolska D., Szweycer M.: Technologia materiałów. Metalurgia i Odlewnictwo, Wydawnictwo Politechniki Poznańskiej, Poznań 2002
2. Perzyk M. i inni, Odlewnictwo. WNT, Warszawa 2004

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 55 | 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) | 25 | 1,00 |