COURSE DESCRIPTION CARD - SYLLABUS

Course name
Additive techniques in automotive manufacturing [S1MiTPM1>TPwPM]

Course

Field of study
Materials and technologies for automotive industry

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
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

dr hab. inż. Natalia Makuch-Dziarska prof. PP

Lecturers

Prerequisites

Basic knowledge of materials science and manufacturing techniques.

Course objective

Learn about additive manufacturing techniques and their application in the automotive industry.

Course-related learning outcomes

Knowledge:
1. Has basic knowledge of technological and material design of components made for the automotive industry by additive techniques.
2. Has detailed knowledge of the technology of additive manufacturing of automotive materials.
3. Has basic knowledge of development trends from additive manufacturing technologies of materials, especially used for materials in the automotive industry.

Skills:
1. Can analyze, evaluate and solve technical problems of the automotive industry related to additive manufacturing processes of materials.
2. Can select engineering materials for additive manufacturing and can compare their basic mechanical,

technological and performance properties.

Social competences:
1. Understands the need to develop knowledge of materials manufacturing technology, including additive techniques.
2. Is able to cooperate in a group to solve problems arising during additive manufacturing of automotive materials.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: written credit at the end of the semester (credit if at least 51% of the points are obtained).
Laboratory: Credit on the basis of a written test/ oral answer and written studies from the realized program content during exercises. In order to receive credit, the written test/ oral answer and all reports must be passed with a positive mark.

Programme content

Learn about the history and development of incremental manufacturing techniques and their application in the automotive industry.

Course topics

Lectures:
1. Additive technologies - introduction: definitions, history, classification.
2. Fused Deposition Modelling (FDM) technologies.
3. Stereolithography (SLA) and related processes.
4. Selective Laser Sintering (SLS) and related processes.
5. Powder printing: MultiJet Printing / ColorJet Printing (MJP/CJP) and related processes.
6. Laminating object manufacturing (LOM).
7. Types of materials used in incremental manufacturing and their properties.
Laboratory:
1. Surface topography of materials made by additive techniques.
2. Study of porosity of materials made by additive techniques.
3. Comparison of microstructure and basic mechanical properties of AISI 316 steel produced by conventional and SLM techniques.
4. Comparison of microstructure and basic mechanical properties of Inconel 625 alloy produced by conventional and LDT techniques.
5. Comparison of the microstructure and basic mechanical properties of Ti6Al4V alloy produced by conventional and SLM techniques.

Teaching methods

1. Lecture: multimedia presentation
2. Laboratory exercises: practical exercises, discussion and teamwork.

Bibliography

Basic:
1. Siemiński P., Budzik G.: Techniki Przyrostowe - Druk Drukarki 3D; Oficyna Wydawnicza Politechniki Warszawskiej, 2015.
2. Dodziuk H., Druk 3D/AM. Zastosowania oraz skutki społeczne i gospodarcze, PWN, 2019.
3. Mikulska A., Kotliński J.: Badanie drukowanych części maszyn, UTH, 2019.

Additional:
1. Chlebus E.: Innowacyjne technologie: rapid prototyping--rapid tooling w rozwoju produktu, Oficyna Wydawnicza Politechniki Wrocławskiej, 2003.
2. Dobrzański L.A.: Materiały inżynierskie z podstawami technologii procesów materiałowych. T. 1 i T.2, PWN, 2024.
3. Kaziunas France A.: Świat druku 3D. Przewodnik, Wydawnictwo Helion, 2014.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	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)	20	1,00