COURSE DESCRIPTION CARD - SYLLABUS

Course name
Additive manufacturing [S1Mech2>WyP]

Course

Field of study
Mechatronics

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

dr inż. Wiesław Kuczko
wieslaw.kuczko@put.poznan.pl

Lecturers

Prerequisites

1. The student is capable of utilizing acquired knowledge to analyze new manufacturing techniques and is proficient in using information obtained from libraries and the Internet. 2. The student demonstrates independence in problem-solving, acquiring, and enhancing acquired knowledge and skills, and understands the necessity of continuous learning. 3. The student possesses fundamental knowledge in the field of information technology as well as in engineering graphics, CAD systems, and manufacturing techniques. 4. The student is able to collaborate effectively within a project team.

Course objective

The aim of the course is to familiarize the student with various additive manufacturing methods and the trends in the development of additive manufacturing techniques, using specific mechatronic solutions as examples

Course-related learning outcomes

Knowledge:
1. The student possesses an advanced knowledge of the construction and control of additive manufacturing devices.

2. The student describes the role of prototyping in the contemporary design and engineering process.
3. The student outlines the technological foundations of Additive Manufacturing, identifies the individual characteristics of the employed technologies, and discusses their applications in the development of machines and devices.

Skills:
1. The student is able to identify design limitations in additive manufacturing devices and to counteract them.
2. The student creates 3D models and prepares STL files, selecting the resolution suitable for the additive manufacturing process.
3. The student produces prototypes using FDM, DLP, and PolyJet techniques. They prepare batch files and select the appropriate adjustable parameters, as well as perform post-processing on the models.

Social competences:
1. The student correctly identifies and resolves dilemmas associated with the practice of the profession.
2. The student is open to implementing additive manufacturing technologies in engineering activities.
3. The student understands the opportunities and threats associated with additive manufacturing.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Written test (for responses to: 50 to 60% of questions - satisfactory (dst), above 60 to 70% - satisfactory plus (dst+), above 70 to 80% - good (db), above 80 to 90% - good plus (db+), above 90 to 100% - very good (bdb)).Laboratory: Assessment of the tasks performed by students during laboratory sessions. Continuous evaluation during each class (oral responses).

Programme content

1. Additive Technologies (3D Printing) in Rapid Prototyping, Rapid Manufacturing, and Rapid Tooling.
2. Preparation of Data for Additive Manufacturing Processes: Formats such as STL and 3MF (polygon mesh) for graphic data storage.
3. Materials and Devices Used in Additive Manufacturing Processes.
4. Layered Manufacturing Methods: FDM, SLA, DLP, and Related Techniques.

Course topics

Lectures:
Additive Manufacturing: Introduction, sources of knowledge, and fundamental concepts. Detailed discussion of FDM/FFF methods. General overview of SLA/DLP and powder methods. Examples of projects realized using additive manufacturing.
Laboratory:
Familiarization with selected additive manufacturing methods. Preparation of the additive manufacturing process, considering the selection of process parameters. Discussion of the design solutions of selected 3D printers, identification of weaknesses, and proposal of improvements. Comparison of products manufactured using FDM, SLA, and PolyJet methods. Discussion of examples of prototypes made with layer-based additive technologies.

Teaching methods

Lecture: Multimedia presentation, discussion.
Laboratory: Multimedia presentation, practical problem-solving, source research, teamwork, discussion, and work at computer stations

Bibliography

Basic:
1. E. Chlebus, Innowacyjne technologie Rapid Prototyping - Rapid Tooling w rozwoju produktu, Oficyna Wydawnicza Politechniki Wrocławskiej , Wrocław, 2003
2. L. Wallach-Kloski, N. Kloski, Druk 3D : praktyczny przewodnik po sprzęcie, oprogramowaniu i usługach, Gliwice 2022, ISBN: 978-83-283-8708-9, 9788328387089, Wydawnictwo Helion
3. Chua C. K., Leong K. F., and Lim C. S., 2010, “Rapid Prototyping: Principles and Applications”, World

Scientific Publishing Co. Pte. Ltd., Singapore
4. Ian Gibson, David W. Rosen, Brent Stucker , 2010, Additive Manufacturing Technologies, Rapid Prototyping to Direct Digital Manufacturing, Springer, Boston, MA

Additional:
1. Pająk E., Dudziak A., Górski F., Wichniarek R., Techniki przyrostowe i wirtualna rzeczywistość w procesach przygotowania produkcji, Poznań 2011, ISBN 978 83 86912 56 8, Wydawnictwo Promocja 21
2. H. Dudziuk, Druk 3D/AM zastosowania oraz skutki społęczne i gospodarcze, 2022, Wydawnictwo PWN, ISBN 978-83-01-20465-5

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	55	2,00