COURSE DESCRIPTION CARD - SYLLABUS

Course name
TECHNOLOGIES OF RAPID AND VIRTUAL PROTOTYPING [S5IMECH>TSWP]

Course

Proposed by Discipline
–

Year/Semester
2/4

Level of study
Doctoral School

Course offered in
English

Form of study
full-time

Requirements
elective

Number of hours

Lecture
4

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

1,00

Coordinators

dr hab. inż. Filip Górski prof. PP
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Lecturers

Prerequisites

1. Knowledge: Has knowledge of information technology and engineering graphics and CAD/CAM systems. Knows the basic groups of manufacturing techniques. 2. Social Competencies: Can collaborate in a project team, is aware of responsibility for the tasks performed, and understands the need to acquire new knowledge.

Course objective

Understanding the techniques and methods of rapid prototyping using additive techniques, as well as the hardware and software used in virtual design techniques using XR (VR/AR/MR). Applications of these techniques in a modern manufacturing enterprise.

Course-related learning outcomes

Knowledge
1. Knows the possibilities of applying virtual reality and additive manufacturing techniques in modern product development processes in a manufacturing enterprise. (P8S_WG/SzD_W01)
2. Knows the structure and components of VR/AR systems, both hardware and software, as well as the process of building and implementing the system in an enterprise. (P8S_WK/SzD_W07)
3. Possesses knowledge of rapid and virtual prototyping processes and their application in a manufacturing enterprise, and knows the advantages and disadvantages of these processes. (P8S_WK/SzD_W07)

4. Possesses knowledge of basic additive manufacturing processes in accordance with ISO standards. (P8S_WG/SzD_W01)

Skills
1. Is able to assess the feasibility and plan the prototyping process for a selected product and select the appropriate rapid prototyping method or XR technology (P8S_UW/SzD_U01).

Social Competencies
1. Is open to implementing additive manufacturing and virtual reality techniques in engineering (P8S_KK/SzD_K03).
2. Is able to independently assess the potential of additive manufacturing and XR technologies in rapid prototyping processes (P8S_KK/SzD_K01).

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Assessment based on the final pass - a study in the form of an essay and/or a final test - after obtaining at least 51% of points.

Programme content

Rapid prototyping, additive techniques. Virtual prototyping, VR systems, application development and implementation. Applications throughout the product lifecycle.

Course topics

1. Application of RP and VR in the product lifecycle, prototypes, virtual design, and prototyping.
2. Building a VR system: hardware and software.
3. Planning and building VR applications, implementing VR systems.
4. Rapid prototyping - basics: definitions, processes, applications, current trends, additive manufacturing processes.

Teaching methods

- informative lecture
- multimedia presentation
- case study

Bibliography

Basic:
1. Górski F., Methodology for Building Open Virtual Reality Systems. Applications in Mechanical Engineering. Poznań University of Technology Publishing House, 2019.
2. Górski, F. (2025). Computer-Aided Design of 3D Printable Anatomically Shaped Medical Devices: Methodologies and Applications. CRC Press.

Additional:
1. Chua C. K., Leong K. F., and Lim C. S., 2010, Rapid Prototyping: Principles and Applications, World Scientific Publishing Co. Pte. Ltd., Singapore.
2. S. K. Ong, A. Y. C. Nee, Virtual and Augmented Reality Applications in Manufacturing, Springer, London, 2004.

Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1,00
Classes requiring direct contact with the teacher	4	0,00
Doctoral student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation)	21	1,00