



COURSE DESCRIPTION CARD - SYLLABUS

Course name

VIRTUAL AND MIXED REALITY IN MODERN INDUSTRY

Course

Proposed by Discipline

Mechanical engineering

Type of studies

Doctoral School

Form of study

full-time

Year/Semester

II/4, III/6

Course offered in

English

Requirements

elective

Number of hours

Lecture

4

Tutorials

Projects/seminars

Number of credit points

1

Lecturers

Responsible for the course/lecturer:

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Poland

Responsible for the course/lecturer:



Prerequisites

Knowledge: The doctoral student has basic knowledge of information technology and the functioning of industrial enterprises. Student is familiar with lifecycle of industrially manufactured products.

Skills: The doctoral student is able to work with CAx systems and manipulate 3D models.

Social competencies: The student is open to the implementation of modern information technologies in science and technology. Is able to independently develop knowledge and skills in the subject.

Course objective

Learning about the possibilities associated with the industrial use of XR techniques, i.e. virtual reality, mixed reality (Mixed Reality) and augmented reality (Augmented Reality) and latest developments in the area. Learning about the main classes of currently available hardware and software and selected use cases.

Course-related learning outcomes

Knowledge

A PhD student who graduated from doctoral school:

- 1) Defines, distinguishes and classifies concepts in the field of virtual reality, augmented reality and mixed reality, and is able to indicate common features and differences between technologies from the XR spectrum, [P8S_WG/SzD_W01].
- 2) Indicates the place of XR techniques and types of their applications in modern industry, is able to provide examples of applications, [P8S_WK/SzD_W07].
- 3) Knows the basics of the state of the art in the field of virtual, augmented and mixed reality - recognizes various classes of XR systems, is able to indicate currently available technical solutions and characterize their basic features, [P8S_WG/SzD_W02].

Skills

A PhD student who graduated from doctoral school can:

- 1) In general terms, select technology from the XR spectrum, to solve a given industrial research problem or meet a specific requirement, [P8S_UW/SzD_U01]
- 2) Find information and source of skills related to own development of XR applications in mechanical engineering and industry, [P8S_UK/SzD_U10]
- 3) Inspire and organize the learning process of team members, especially in the field of modern digital technologies such as XR, [P8S_UK/SzD_U10]

Social competencies

A PhD student who graduated from doctoral school:

- 1) Understands the need to make changes in industrial processes, including digitization of processes using techniques such as VR or AR, [P8S_KK/SzD_K03]
- 2) Is able to present in an appropriate and creative way the advantages and disadvantages of using XR systems in the modern production industry, [P8S_KK/SzD_K01]



Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

PQF code	Methods for verification of learning outcomes	Assessment criteria
W01, W02, W07	assessment based on a test consisting of closed questions	The test is passed after obtaining at least 51% of the points.
U01, U10	assessment based on a test consisting of open and closed questions	The test is passed after obtaining at least 51% of the points.
K01, K03	assessment based on a test consisting of open questions	The test is passed after obtaining at least 51% of the points.

Programme content

Lecture:

1. Basic concepts related to virtual reality (VR), augmented reality (AR) and mixed reality (MR) and the concept of "XR technology" – current state of the art and directions of development.
2. The place of various technologies in the XR spectrum and among other technologies from the Industry 4.0 group. Types of interactive applications.
3. Applications of VR and AR in modern industry, latest achievements.
4. XR systems - MR, AR, VR hardware and software classes, state of the art.

Course topics

1. Extended Reality technologies (XR)
2. XR applications throughout the product lifecycle
3. latest achievements in industrial XR
4. XR hardware and software systems

Teaching methods

- informative lecture
- multimedia presentation
- case study

Bibliography

Basic

1. F. Górski, Metodyka budowy otwartych systemów rzeczywistości wirtualnej: zastosowanie w inżynierii mechanicznej, Wyd. Politechniki Poznańskiej, 2019



2. G. Ćwikła, F. Górski, J. Patalas-Maliszewska, Wspomaganie informacyjne menedżerów produkcji, Polskie Wydawnictwo Ekonomiczne, 2021
3. B. Arnaldi, P. Guitton, G. Moreau, Virtual Reality and Augmented Reality: Myths and Realities, Wiley, 2018

Additional

1. 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	1,0
Classes requiring direct contact with the teacher	4	0
Doctoral student's own work (literature studies, preparation for tutorials, project preparation) ¹	21	1,0

¹delete or add other activities as appropriate