POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Fundamentals of Engineering in the Industry of the Future [S1DSwB1>PIwPP]

Course

Field of study	**Year/Semester**
Data Science in Business	1/1
Area of study (specialization)	**Profile of study**
–	general academic
Level of study	**Course offered in**
first-cycle	Polish
Form of study	**Requirements**
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other
15	0	0

Tutorials	Projects/seminars	
15	0	

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of mathematics and physics.

Course objective

The aim of the course is to introduce students to the fundamentals of engineering, its history, and its role in shaping the industry of the future. Students will gain knowledge about successive industrial revolutions, key manufacturing technologies, and the challenges associated with their implementation. The course will cover automation and robotics in production, as well as the consequences of digital transformation in engineering and manufacturing. Students will learn about the characteristics of modern production systems, methods of their modeling and simulation, and the application of artificial intelligence and data analysis in process optimization.

Course-related learning outcomes

Knowledge:

Defines fundamental concepts related to engineering and describes its role and significance in the context of the industry of the future [DSB1_W01].
Explains the principles of automation and robotics systems in production processes and their impact on operational efficiency [DSB1_W05].
Identifies key aspects of digital transformation in engineering and manufacturing, describing its technological, organizational, and social consequences [DSB1_W06].

Skills:
Analyzes historical changes in industry and compares successive industrial revolutions in terms of manufacturing technologies and their impact on the economy [DSB1_U05].
Evaluates the impact of digital transformation on the efficiency of engineering systems, considering both technical and organizational aspects [DSB1_U07].
Prepares concise reports and presentations on the impact of Industry 4.0 and 5.0 technologies on the economy and society, using specialized terminology [DSB1_U11].

Social competences:
Is prepared to critically assess the impact of technological transformation on society and to make responsible engineering decisions in the context of sustainable development [DSB1_K01].
Engages in interdisciplinary project teams, integrating knowledge from engineering, data analysis, and management to optimize production processes [DSB1_K02].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Formative Assessment:
Tutorials: Ongoing verification of knowledge and skills during classes.
Lectures: Assessment based on discussions about material covered in previous lectures.
Summative Assessment:
Tutorials: Based on the average results of formative assessments.
Lectures: Knowledge test.

Programme content

The program includes an introduction to engineering, its historical background, and its role in the industry of the future. It analyzes successive industrial revolutions, their characteristics, key manufacturing technologies, and associated challenges. Topics include automation and robotics in production processes, digital transformation in engineering and manufacturing, and its consequences. The course covers the characteristics of modern production systems, aspects of their modeling and simulation, and the role of artificial intelligence and data analysis in optimizing production processes. It also addresses sustainable development and ethical issues in the context of the future industry.

Course topics

ntroduction to engineering - its history and role in the industry of the future.
Industry and successive (r)evolutions - characteristics, key manufacturing technologies, and challenges.
Automation and robotics in production processes.
Digital transformation in engineering and manufacturing and its consequences.
Characteristics of modern production systems - modeling and simulation.
The role of artificial intelligence and data analysis in optimizing production processes.
Sustainable development and ethical aspects in the industry of the future.

Teaching methods

Lectures with multimedia presentations.
Problem-solving exercises related to lecture topics.

Bibliography

Basic:
Tytyk, E., & Butlewski, M. (2008). Introduction to Engineering. Poznan University of Technology Publishing.

Moczydłowska, J. (2023). Industry 4.0: People and Technologies. Difin.

Additional:
Gajšek, B., Đukić, G., Butlewski, M., Opetuk, T., Cajner, H., & Kač, S. M. (2020). The impact of applied technology on health and productivity in manual "picker-to-part" systems. Work, 65(3), 525-536.
Muraszkiewicza, M. (2022). Artificial Intelligence for Engineers: General Methods.
Lewandowski, J., Skołud, B., & Plinta, D. (2013). Organization of Production Systems. PWE Publishing.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	32	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	43	2,00