SYLLABUS

Course description

Course code	Course	**MODELOWANIE CYFROWE W PRZEMYŚLE**	
ME/O/1/ST/C7b		**DIGITAL MODELS IN INDUSTRY**	
Language of instruction	English		
Academic year	2025/2026		
field of study:	Mechanical engineering		
field of specialisation:	All		
Educational level	first-cycle studies		
Education profile	General academic		
Mode of study	Full-time studies		
Semester(s)	6		
Affiliation with a group of classes	C . Group of courses to choose from		
Course status	Electable		
Types of classes, instruction hours, ECTS credits	Types of classes	Number of instruction hours	Number of ECTS credits
	Lecture	15[h]	5 ECTS
	Classes	45[h]	
Linkage of the course – with the education profile	related to the conducted scientific activity in the discipline to which the field of study is assigned		5 ECTS
Linkage of the course – with qualifications	it serves the student's acquisition of engineering competences		5 ECTS
Linkage of the course – with science discipline	Mechanical engineering		5 ECTS
Form of teaching	Traditional – classes organized at the University /classes conducted using online learning methods and techniques		
Prerequisites	Electrical engineering and electronics, Mechatronics and Automatics, Industrial Controllers PLC		
Department	Faculty of Mechanical Engineering, UTH Rad		
Coordinator	Dr hab. inż. Iwona Komorska, prof. UTH		
The website of the basic organizational unit	http://wm.uniwersytetradom.pl		
E-mail address, phone number of the coordinator	iwona.komorska@urad.edu.pl		

LEARNING OUTCOMES, CURRICULUM CONTENT, TEACHING CLASSES, VERIFICATION OF LEARNING OUTCOMES

Learning Objective:	The objective of the course is to familiarize students with the principles of creating virtual digital models that replicate real objects or systems. An additional goal is to demonstrate how simulation results and data analysis from digital twins can be used to refine actual systems and enhance their efficiency and reliability..
Curriculum Content:	LECTURE Introduction to Digital Modeling in Industry: Overview of digital modeling and its role in modern industry. Key concepts: virtual models, digital twins, and cyber-physical systems. Examples of digital modeling applications in industrial production. Principles of Creating Virtual Models. Techniques for capturing physical system parameters and translating them into a virtual environment. Simulation and Data Analysis. Enhancing Real Systems Using Digital Twins. Future Trends and Applications. LAB Introduction to the programming environments (Festo CIROS and/or IO Factory). Building Virtual Models of Industrial Systems: Creating digital representations of physical production components. Defining parameters for digital twins to mimic real-life objects or processes. Practical exercise: modeling a modular production line (MLP) and adjusting system variables. Simulation and Analysis. Hands-on activities: testing the effects of different control strategies and process modifications. Integration of Advanced Technologies. Practical demonstration: linking simulation results with real-time data from sensors. Final project: students work in teams to simulate a complete production process using Festo CIROS/IO Factory, identify potential improvements, and present recommendations for optimizing system efficiency and reliability.
Didactic (educational) methods:	• problem methods (problem lecture, conversational lecture), • simulation methods, • practical methods (demonstration, laboratory exercises, project method, simulation
Course assessment type, the criteria for assessing the achieved learning outcomes, and the method of calculating the final grade:	The condition for passing the course is to achieve all the required learning outcomes specified for the subject. Lectures are passed on the basis of a written test. Completion of the laboratory requires the performance of exercises and obtaining positive grades from entrance cards and reports. The method of calculating the final grade for the course is specified in the regulations.

Learning outcomes for the course in relation to the field of study learning outcomes and the type of classes				Methods of verifying learning outcomes	
Learning outcome number	Description of the learning outcomes for the course (PEU) A student who has passed the course (**W**) knows and understands / (**U**) can / (**K**) is ready to:	Field of study learning outcome (KEU)	Types of classes	Form of verification (credits)	Methods of testing and assessment
W1	Knows and understands the digital modeling in industry. Knows the theoretical principles behind creating accurate virtual models that replicate real-world systems and processes, and understands how to analyze simulation results and data from digital twins.	K_WG18 K_WG19	Lecture	Test	Pass a subject
U1	Can design and build digital models using appropriate tools. Can conduct	K_UW05 K_UW12	Lecture/lab	Test	Pass a subject

	simulations to evaluate system performance and predict potential issues. Can integrate cyber-physical systems to improve overall production processes				
K1	Is ready to supplement and critically evaluate specialist knowledge and is able to select appropriate sources of knowledge and learning methods.	K_KK01 K_KK02	Lab	Test	Pass a subject

Literature and teaching aids
1. New Paradigm of Industry 4.0, Patanik S., Springer AG 2020 2. Industry 4.0 and Engineering for Sustainable Future, Dastbaz M., Cochrane P., Springer AG 2019 3. CIROS Studio Produktinformation 4. Internal lectures and tutorial materials, Komorska I.www.mechatronika.uniwersytetradom.pl

Student workload required to achieve the assumed learning outcomes – the balance of ECTS credits		
Attendance, participation	Student workload [h].	
	Student's self-study hours Classes without a teacher (ZBN)	Classes
Participation in lectures/classes/lab	X	15 [h] / 45 [h]
Preparation for lectures/classes/lab , Preparation for ... credit / exam	10 [h] / 20 [h] 15 [h] / 20 [h]	X
Total student workload Preparation for ... credit / exam	65 [h]/ 2,6 ECTS	60 [h]/ 2,4 ECTS
ECTS points per subject	5 ECTS	

Additional information, comments
In the case of students with special needs, including disabilities, and chronic illnesses, the methods and forms of verification of learning outcomes specified above (in the syllabus) are adapted to the individual needs of these students, as appropriate. Detailed rules and forms of support for students with special needs, including those with disabilities and chronically ill, during classes, credits, and exams are specified in: University Regulations (Regulamin Studiów Uniwersytetu Technologiczno-Humanistycznego w Radomiu), Study Regulations (Zasady Studiowania), and Procedure for Ensuring Accessibility of the Educational Process to Students with Special Needs, Including Those with Disabilities and Chronically ill (Procedura dotycząca zapewnienia dostępności procesu kształcenia studentom ze szczególnymi potrzebami, w tym: z niepełnosprawnością, przewlekle chorych).