

# SYLLABUS

## Course description

Course code		Course	MODELOWANIE CYFROWE W PRZEMYŚLE		
ME/O/1/NST/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		Part-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	8[h]	5 ECTS	
		Classes	24[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
	with qualifications	it serves the student's acquisition of engineering competences			5 ECTS
	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		<a href="mailto:iwona.komorska@urad.edu.pl">iwona.komorska@urad.edu.pl</a>			

## 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:	<p><b>LECTURE</b>  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.</p> <p><b>LAB</b>  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.</p>
Didactic (educational) methods:	<ul style="list-style-type: none"> <li>• problem methods (problem lecture, conversational lecture),</li> <li>• simulation methods,</li> <li>• practical methods (demonstration, laboratory exercises, project method, simulation)</li> </ul>
Course assessment type, the criteria for assessing the achieved learning outcomes, and the method of calculating the final grade:	<p>The condition for passing the course is to achieve all the required learning outcomes specified for the subject.</p> <p>Lectures are passed on the basis of a written test.</p> <p>Completion of the laboratory requires the performance of exercises and obtaining positive grades from entrance cards and reports.</p> <p>The method of calculating the final grade for the course is specified in the regulations.</p>

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. <a href="#">CIROS Studio Produktinformation</a> 4. Internal lectures and tutorial materials, Komorska I. <a href="http://www.mechatronika.uniwersytetradom.pl">www.mechatronika.uniwersytetradom.pl</a>	

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	8 [h] / 24 [h]
Preparation for lectures/classes/lab , Preparation for ... credit / exam	10 [h] / 48 [h] 15 [h] / 20 [h]	X
Total student workload Preparation for ... credit / exam	93 [h]/ 3,72 ECTS	32 [h]/ 1,28 ECTS
ECTS points per subject	5 ECTS	

Additional information, comments
<p>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.</p> <p>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, przewlekłe chorych).</p>

