SYLLABUS

Course description

Course code	Course	Inżynieria odwrotna	
ME/O/I/ST/C1b		Reverse Engineering	
Language of instruction	English		
Academic year	2025/2026		
field of study:	Mechanical Engineering		
field of specialization:	All		
Educational level	First-cycle studies		
Education profile	General academic		
Mode of study	Full-time studies		
Semester(s)	5		
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]	3 ECTS
	Classes	[h]	
	Lab	30[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		ECTS
Linkage of the course – with qualifications	It is used to acquire engineering competences by the student		3 ECTS
Linkage of the course – with science discipline	Mechanical engineering		3 ECTS
Form of teaching	Traditional – classes organized at the University /classes conducted using distance learning methods and techniques		
Prerequisites	None		
Department	Faculty of Mechanical Engineering		
Coordinator	Marcin Migus, Ph.D. Eng.		
The website of the basic organizational unit	http://wm.uniwersytetradom.pl		
E-mail address, phone number of the coordinator	m.migus@urad.edu.pl		

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

Learning Objective:	The goal of the course is to equip students with the skills needed to analyze, reconstruct, and optimize mechanical components using modern engineering tools. Students will learn to apply 3D scanning, CAD modeling, and material analysis techniques to reverse-engineer mechanical parts with high accuracy. Additionally, the course will cover quality control, failure analysis, and integration with advanced manufacturing methods such as 3D printing.
Curriculum Content:	**Lecture topics:** Fundamentals of Reverse Engineering in Precision Mechanics 3D Scanning and Digitization of Mechanical Components Materials and Manufacturing Analysis in Reverse Engineering CAD Modeling and Reconstruction of Mechanical Parts Failure Analysis and Wear Assessment through Reverse Engineering **Laboratory Topics:** Introduction to Reverse Engineering Tools in Precision Mechanics 3D Scanning and Point Cloud Processing Surface Reconstruction and Mesh Optimization Reverse Engineering of Small Mechanical Components Material Identification and Structural Analysis Feature Extraction and CAD Modeling from Scan Data Tolerance Analysis and Quality Control Functional Testing and Simulation of Reverse-Engineered Components Restoration and Reproduction of Worn Components Integration of Reverse Engineering with Additive Manufacturing
Didactic (educational) methods:	Lecture - Conventional lecture using audiovisual aids, verbal problem-solving method. Laboratory exercises – implementation of a practical task..
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 course of Reverse Engineering

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 principles of design of machine parts and mechanical structures regarding reverse engineering	K_WG09	Lecture	graded pass	Test
W2	Has knowledge of reverse engineering, knows and understands the methods of analyzing and reconstructing mechanical components, understands measurement techniques used in digitizing physical objects, and is familiar with computational methods and software tools necessary for processing and analyzing scanned data and experimental results.	K_WG12	Lecture	graded pass	Test
U1	Is able to assess the suitability of standard reverse engineering methods and tools for analyzing and reconstructing mechanical components, as well as select and apply the appropriate techniques for digitization, modeling, and	K_UW09	Laboratory	graded pass	Laboratory report

	manufacturing of reverse-engineered parts.				
K1	Is ready to expand and critically evaluate specialized knowledge in reverse engineering and is able to identify relevant sources of information and learning methods suitable for both personal and professional development in the field.	K-KK01	Lecture Laboratory	-	Class participation
K2	Is willing to comprehensively analyze and effectively perform reverse engineering tasks, and in case of difficulties, seek expert opinions to ensure accurate reconstruction and analysis of mechanical components.	K-KK02	Lecture Laboratory	-	Class participation

Literature and teaching aids
Primary literature: **Dang B., Gazet A., Bachaalany E., Josse S.** *Inżynieria odwrotna w praktyce. Narzędzia i techniki.* Helion, Gliwice, 2015, ISBN: 978-83-283-0849-0. **Kosmol J. (red.).** *Laboratorium z inżynierii odwrotnej.* Wydawnictwo Politechniki Śląskiej, Gliwice, 2016, ISBN: 978-83-7880-378-2. Additional literature: **Kathryn A. Ingle, "Reverse Engineering"** Wydawnictwo McGraw-Hill, 1994, ISBN: 978-0070316930. **Jemielniak K.** *Obrabiarki CNC – Podstawy funkcjonowania i programowania.* Wydawnictwo Naukowe PWN, Warszawa, 2013, ISBN: 978-83-01-17108-3. Study aids: **"What is reverse engineering?" na stronie Hexagon** Artykuł dostępny online na stronie Hexagon: https://hexagon.com/resources/resource-library/reverse-engineering. **Szelewski M., Wieczorowski M.** *Inżynieria odwrotna i metody dyskretyzacji obiektów fizycznych.* Artykuł w czasopiśmie "Mechanik", nr 6/2015, s. 183–188.

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	45 [h]
Preparation for lectures/classes/lab , Preparation for credit / exam	30 [h]	X
Total student workload Preparation for credit / exam	30 [h]/ 1,2 ECTS	45 [h]/ 1,8 ECTS
ECTS points per subject	3 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).