

# SYLLABUS

## Course description

Course code	Course	<b>DRUK 3D</b>		
MB/O/I/NST/C1A.09		<b>3D PRINTING</b>		
Language of instruction	English			
Academic year	2023/2024			
<b>field of study:</b>	Mechanical engineering			
<b>field of specialisation:</b>	CAE Computer Aided Engineering			
Educational level	first-cycle studies			
Education profile	General academic			
Mode of study	Part-time studies			
Semester(s)	6			
Affiliation with a group of classes	Specialization module			
Course status	obligatory			
Types of classes, instruction hours, ECTS credits	Types of classes	Number of instruction hours	Number of ECTS credits	
	Lecture	8 [h]	3 ECTS	
	Laboratory classes	12 [h]		
	Project	12 [h]		
Linkage of the course	with the education profile	The course is related to the conducted research in the scope of analysis and design of supporting structures of machines and transport devices		3 ECTS
	with qualifications	The aim of the course is to gain the engineering skills by students		3 ECTS
	with science discipline	Mechanical engineering		3 ECTS
Form of teaching	Traditional – classes organized at the University /classes conducted using online learning methods and techniques			
Prerequisites	-			
Department	Faculty of Mechanical Engineering			
Coordinator	dr inż. Jarosław Kotliński			
The website of the basic organizational unit	www.wm.uniwersytetradom.pl			
E-mail address, phone number of the coordinator	jaroslaw.kotlinski@uthrad.pl, tel.: 48-3617620			

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

Learning Objective:	The aim of the studies is to gain by the participant the basic knowledge and skills necessary to understand the issues of construction and manufacturing of machine parts using modern incremental technologies such as 3D printing technologies.
Curriculum Content:	Lecture 3D printing methods. Construction and types of 3D printers. Control the 3D printer, the most popular programs. Types of materials used in 3D printing. 3D printing application. Prototyping and functional prototypes. Lab Health and safety rules. Control the 3D printer, the most popular programs. Impact of parameters on the print quality. Properties of printed parts. Machining after printing. Design Development of a solid model of a functional machine element and tool using a 3D graphic editor. Selection of material and printing technology depending on the load, taking into account the anisotropy of the material properties. Generating STL files.
Didactic (educational) methods:	Lecture: Conventional lecture using audiovisual means, verbal problem method. Lab: Research of technological processes in the laboratory. Design: individual work.
Course assessment type, the criteria for assessing the achieved learning outcomes, and the method of calculating the final grade:	Credit with the grade - the answer to three questions on a scale is assessed 2 ÷ 5.

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	Has knowledge in the field of mathematics, including algebra, mathematical analysis, probability and selected numerical methods, including knowledge necessary for: - modeling and analysis of mechanical systems; - performing calculations in the design of technological processes; - description and prediction of the operational properties of equipment, facilities and technical systems.	K_WG01	Lecture	Test	Test
W2	Has knowledge in the field of engineering materials, their research and shaping technology.	K_WG13	Lecture	Test	Test
W3	Has basic knowledge of development trends in the field of design, manufacture, construction and operation of machines.	K_WG14	Lecture	Test	Test
W4	Knows and understands the basic techniques and tools required for solving simple engineering tasks in the field of construction, manufacturing technology and machine operation.	K_WG16	Lecture	Test	Test
U1	Can use analytical, simulation and experimental methods to formulate and solve engineering tasks.	K_UK02	Lab	Report	Report
U2	A student is able to use computer methods of mechanics to solve engineering tasks in	K_UK13	Lab Design	Report Individual work	Report Individual work

	the field of machine design, manufacture and operation				
U3	Is able to plan and carry out experiments, including computer measurements and simulations, interpret the results obtained and draw conclusion.	K_UO17	Design	Individual work	Individual work
U4	Can use the appropriate databases in the process of designing, manufacturing and operating machines.	K_UO19	Design	Individual work	Individual work
K1	Is ready to analyze the tasks assigned to the implementation, in terms of determining the priorities, serving the maximum effectiveness of the task, and the comprehensive effects of its implementation.	K_KK01	Lab Design Lecture	verbal evaluation	verbal evaluation

Literature and teaching aids	
1.	Chlebus E.: Innowacyjne technologie Rapid Prototyping – Rapid Tooling w rozwoju produktu. Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2003.
2.	Chua C. K., Leong K. F., Lim C. S.: Rapid Prototyping Principles and Applications. Jon Wiley and Sons, Inc., New York 2003.
3.	Miecielica M.: Analiza wybranych metod szybkiego prototypowania. PW IIPiB, Warszawa 2007.
4.	Kęsy A.: Metody komputerowe w budowie kół łopatkowych podzespołów hydrokinetycznych. Wydawnictwo Politechniki Radomskiej, Radom 2010.
5.	Miecielica M.: Rapid prototyping – metody i możliwości zastosowania w inżynierii biomedycznej. AGH, Krakow 2009.
6.	Osiński Z., Wróbel J.: Wybrane metody komputerowego konstruowania maszyn. PWN, Warszawa 1988.
7.	Winkler T.: Komputerowy zapis konstrukcji. WNT, Warszawa 1989.
8.	Gebhardt A.: Rapid prototyping. Carl Hanser Verlag, Munich 2003.
9.	Wohlers Report 2017.

Student workload required to achieve the assumed learning outcomes – the balance of ECTS credits			
Attendance, participation	Student workload [h].		
	Other contact hours (IGK)	Student's self-study hours Classes without a teacher (ZBN)	Classes
Participation in ... lectures	X	X	8 [h]
Participation in .... classes/laboratory classes	X	X	24 [h]
Meeting with teachers during their duty hours	2 [h]	X	X
Preparation for lectures/classes/.... , Preparation for ... credit / exam	X	41 [h]	X
Total student workload	2[h]/ 0,1 ECTS	41 [h]/1,1ECTS	32[h]/ 1,3 ECTS
ECTS credits for the course	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).

