

SYLLABUS

Course description

Course code		Course	Optymalizacja konstrukcji		
ME/O/I/ST/C8a			Optimization of construction		
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)		7			
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]	4 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			4 ECTS
	with qualifications	It is used to acquire engineering competences by the student			4 ECTS
	with science discipline	Mechanical engineering			4 ECTS
Form of teaching		Traditional – classes organized at the University /classes conducted using distance learning methods and techniques			
Prerequisites		knowledge of mechanics (statics) and mathematics			
Department		Faculty of Mechanical Engineering			
Coordinator		dr inż. Marcin Wikło, prof. URad			
The website of the basic organizational unit		http://wm.uniwersytetradom.pl			
E-mail address, phone number of the coordinator		m.wiklo@urad.edu.pl			

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

Learning Objective:	C1 – To acquaint students with issues related to optimization and types of optimization
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	<p>C2 – Mastering the skills associated with defining the optimization task</p> <p>C3 – The use of software designed to optimize the structure</p>
Curriculum Content:	<p>Content of lectures</p> <p>Introduction to optimal design. Specifying the types of optimization. Presentation of mathematical foundations in structural optimization. Examples of the use of optimization in issues not related to the optimization of the structure. Presentation of the method of optimal construction design using strength criteria. Definition of optimization task: objective function, limitations. Solving optimization tasks in numerical calculation software..</p> <p>The content of laboratory exercises</p> <p>The use of software for numerical calculations in optimization. A stand-alone solution for a single and multidimensional project.</p> <p>Designing a structure/frame that meets the limitations imposed during the classes, manual optimization of the designed structure, optimization with using the software to find the optimal geometry, a summary of results.</p> <p>Topological optimization, a definition of optimization areas and areas separated from optimization. Definition of new geometry after topological optimization. With use of the dedicated software. Manufacturability on an example of the geometry from the topological optimization.</p>
Didactic (educational) methods:	Informative lecture and calculation exercises
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 out comes specified for the course.</p> <p>The average obtained by the student's grades from the in class test - lecture and from the projects - exercise</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	A student has knowledge including the ability to model machine construction, conduct numerical simulations and use numerical simulation software	K_WG01, K_WG06, K_WG09, K_WG11, K_WG17	Lectures	in class tests	Tests grades
U1	Student can independently define the optimization task, build a mathematical model of the objective function and constraints. He can run optimization using software dedicated to it as well as use software for numerical calculations. He can interpret the results of optimization.	K_UW02, K_UW03, K_UW04, K_UW10, K_UK16, K_U18	Project	Projects	Project grades
K1	A student is able to cooperate and work in a group and understands the non-technical aspects of the engineer-mechanic activity, including the impact on the environment and safety	K_K04, K_K02	Lectures / Project	Verbal evaluation	Verbal evaluation

Literature and teaching aids
<p>Primary literature:</p> <p>1. Jacek Stadnicki, Teoria i praktyka rozwiązywania zadań optymalizacji z przykładami zastosowań technicznych, Wydawnictwo WNT</p>

2. Ansys manual, Ansys Innovation Space 3. Fusion manual 4. Matlab manual Additional literature: 1. Daniel Inman, Engineering Vibrations, Pearson Education, Inc.; (2008) English 2. Rakowski G., Kacprzyk Z., Metoda elementów skończonych w mechanice konstrukcji, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 1993. Study aids: Materials provided during classes

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	55 [h]	X
Total student workload Preparation for ... credit / exam	55 [h]/ 2.2 ECTS	45 [h]/ 1.8ECTS
ECTS points per subject	4 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, przewlekle chorych).</p>