

# SYLLABUS

## Course description

Course code		Course	TECHNOLOGIA WYROBÓW KOMPOZYTOWYCH		
MB/O/I/ST/C2B.1			COMPOSITE PRODUCTS TECHNOLOGY		
Language of instruction		English			
Academic year		2023/2024			
field of study:		Mechanical engineering			
field of specialisation:		Designing and manufacturing of machines			
Educational level		first-cycle studies			
Education profile		General academic			
Mode of study		Full-time studies			
Semester(s)		7			
Affiliation with a group of classes		Specialization module			
Course status		Eligible			
Types of classes, instruction hours, ECTS credits		Types of classes	Number of instruction hours	Number of ECTS credits	
		Lecture	15 [h]	3 ECTS	
		Classes	15 [h]		
		Laboratory	15 [h]		
Linkage of the course	with the education profile	Associated with the conducted scientific activity in the discipline to which the field of study is assigned			0 ECTS
	with qualifications	It serves the student's acquisition of engineering competencies			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. Wojciech Kucharczyk			
The website of the basic organizational unit		<a href="http://www.wm.uniwersytetradom.pl/">http://www.wm.uniwersytetradom.pl/</a>			
E-mail address, phone number of the coordinator		wojciech.kucharczyk@uthrad.pl, tel. 48 361 7680			

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

Learning Objective:	The aim of the course is for students to gain knowledge in the field of production of composite products used in mechanical engineering; their technical and processing properties and utility; principles of quality control of materials and composite products.
Curriculum Content:	<p><b>Lecture.</b> Characteristics of structural composites and functional, their classification and components. Characteristics of basic matrix materials (organic, ceramic, metal) and basic filling and reinforcement materials (nanoparticles, dispersion particles, powder fillers, reinforcing fibers) of composites. Basics of physicochemical production of composites. Unit methods of composites production. Characteristics of serial and industrial methods for manufacturing composite products: pressure and vacuum, RIM infusion, pultrusion, continuous winding, SMC and A-SMC, BMC, RTM, Fiberforge technology. Shaping the structure of polymer composites in manufacturing and processing processes. Usage properties and guidelines for the use of polymer composites and their use in machine construction.</p> <p><b>Classes.</b> Selection of geometrical parameters of reinforcing fibers. Calculations of the degree of reinforcement and filling of composites and calculations of volumetric and mass phase compositions. Calculations of the shape factor and specific surface area of the filler. Strength calculations of composites based on the rule of mixtures. Calculation of the value of the critical length of the chopped (dispersed) fibre. Calculations of the modulus of elasticity of fiber composites along and across the fiber arrangement. Calculations of the modulus of elasticity of porous composites (foams).</p> <p><b>Laboratory.</b> Polymer composites - selection of components (matrix material, powder fillers, fiber reinforcement). Production of polymer nanocomposites. Production of polymer composites: fibrous, powder, hybrid. Tests of strength and specific stiffness of the produced composites. Shaping the properties of functional composites used in thermal protection. Structural studies of composites.</p>
Didactic (educational) methods:	<p><b>Lecture</b> - giving method (informative lecture).</p> <p><b>Classes</b> - practical methods (calculation, project method, simulation).</p> <p><b>Laboratory</b> - practical method (laboratory classes).</p>
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><b>Lecture:</b> written colloquium - grade point average for partial questions.</p> <p><b>Classes:</b> final test - arithmetic average of grades from partial questions.</p> <p><b>Laboratory classes:</b> the arithmetic mean of the grades obtained by the student for each laboratory exercise (the grade from the exercise is the average of the grades from the preliminary colloquium and individually prepared report).</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	He has knowledge in the field of composite engineering materials, their research and shaping technologies.	K_WG13	Lecture, Classes	Written test	Arithmetic mean of sub-question scores
W2	He knows the basic techniques and tools required to solve simple engineering tasks in the field of construction, manufacturing technology and operation of machines, with particular emphasis on composite products.	K_WG16	Lecture, Classes	Written test	Arithmetic mean of sub-question scores
U1	He can plan and carry out experiments, including measurements and computer simulations, interpret the results and draw conclusions.	K_UW13	Laboratory classes	Passing individual practical exercises	Arithmetic average of grades from practical exercises
U2	Is able to select the appropriate engineering materials to ensure the correct operation of the machine.	K_UW11	Laboratory classes	Passing individual practical exercises	Arithmetic average of grades from practical exercises
K1	He is ready to analyze the tasks assigned for implementation in terms of defining priorities, serving the maximum effectiveness of the task and the comprehensive effects of its implementation.	K_KK02	Lecture	Written test	Arithmetic mean of sub-question scores

Literature and teaching aids
<p>[1] Ever J. Barbero (Editor): Multifunctional Composites. ISBN: 978-1-51-680452-8, 2016.</p> <p>[2] Rucki M., Kucharczyk W., Żurowski W., Hevorkian E.: New Engineering Materials: A Handbook (w druku). Wyd. UTH Radom, Radom 2023.</p> <p>[3] Królikowski W.: Polimerowe kompozyty konstrukcyjne. Wyd. PWN. Warszawa 2012.</p> <p>[4] Kucharczyk W., Mazurkiewicz A., Żurowski W.: Nowoczesne materiały konstrukcyjne. Wybrane zagadnienia. Wyd. Politechniki Radomskiej, Radom, 2008 / 2010/ 2011.</p> <p>[5] Boczkowska A., Kapuściński J., Lindemann Z., Witenberg-Perzyk, Wojciechowski S.: Kompozyty. Politechnika Warszawska. Warszawa 2003.</p> <p>[6] Tordoff B., Bale H. (Editors): Engineering Materials: Metals and Alloys. Wiley-VCH GmbH. Weinheim. Germany 2022.</p>

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	15 [h]
Participation in classes	X	X	15 [h]
Participation in laboratory classes	X	X	15 [h]
Meeting with teachers during their duty hours	2 [h]	X	X
Preparation for lectures / laboratory classes Preparation for credit (written test)	X	18 [h] 10 [h]	X
Total student workload	2 [h] / 0,1 ECTS	28 [h] / 1,1 ECTS	45[h] / 1,8 ECTS
ECTS credits for the course	75[h] / 3 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>