SYLLABUS

Course description

<table>
<tr><td colspan="2">Course code</td><td rowspan="2">Course</td><td colspan="4">INŻYNIERIA POWIERZCHNI</td></tr>
<tr><td colspan="2">MB/O/I/NST/C2A.18</td><td colspan="4">SURFACE ENGINEERING</td></tr>
<tr><td colspan="3">Language of instruction</td><td colspan="4">English</td></tr>
<tr><td colspan="3">Academic year</td><td colspan="4">2023/2024</td></tr>
<tr><td colspan="3">field of study:</td><td colspan="4">Mechanical engineering</td></tr>
<tr><td colspan="3">field of specialisation:</td><td colspan="4">Designing and Manufacturing of Machines</td></tr>
<tr><td colspan="3">Educational level</td><td colspan="4">first-cycle studies</td></tr>
<tr><td colspan="3">Education profile</td><td colspan="4">General academic</td></tr>
<tr><td colspan="3">Mode of study</td><td colspan="4">Part-time studies</td></tr>
<tr><td colspan="3">Semester(s)</td><td colspan="4">7</td></tr>
<tr><td colspan="3">Affiliation with a group of classes</td><td colspan="4">Specialization module</td></tr>
<tr><td colspan="3">Course status</td><td colspan="4">obligatory</td></tr>
<tr><td colspan="3" rowspan="4">Types of classes, instruction hours, ECTS credits</td><td>Types of classes</td><td>Number of instruction hours</td><td colspan="2">Number of ECTS credits</td></tr>
<tr><td>Lecture</td><td>8 [h]</td><td colspan="2" rowspan="3">2 ECTS</td></tr>
<tr><td>Classes</td><td>0 [h]</td></tr>
<tr><td>Lab</td><td>12 [h]</td></tr>
<tr><td rowspan="3">Linkage of the course</td><td>with the education profile</td><td colspan="3">Associated with the conducted scientific activity in the discipline to which the field of study is assigned</td><td>1 ECTS</td></tr>
<tr><td>with qualifications</td><td colspan="3">It serves the student's acquisition of engineering competencies</td><td>1 ECTS</td></tr>
<tr><td>with science discipline</td><td colspan="3">Mechanical engineering</td><td>2 ECTS</td></tr>
<tr><td colspan="3">Form of teaching</td><td colspan="4">Traditional – classes organized at the University /classes conducted using online learning methods and techniques</td></tr>
<tr><td colspan="3">Prerequisites</td><td colspan="4"></td></tr>
<tr><td colspan="3">Department</td><td colspan="4">Faculty of Mechanical Engineering</td></tr>
<tr><td colspan="3">Coordinator</td><td colspan="4">dr inż. Sylwester Stawarz</td></tr>
<tr><td colspan="3">The website of the basic organizational unit</td><td colspan="4">www.uniwersytetradom.pl</td></tr>
<tr><td colspan="3">E-mail address, phone number of the coordinator</td><td colspan="4">stawarz@uthrad.pl, tel. 48 361 76 98</td></tr>
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LEARNING OUTCOMES, CURRICULUM CONTENT, TEACHING CLASSES, VERIFICATION OF LEARNING OUTCOMES

Learning Objective:	The aim of the course is to acquire the ability to constitute, produce, testing and application of surface layers with other, better than the core (substrate) properties, with particular attention to the correlation between the microstructure, phase and chemical composition, and their functional and mechanical properties, e.g. abrasion resistance, chemical resistance, impact resistance, thermal protection.
Curriculum Content:	Lecture. Chronological development and etymology of surface engineering. The concept of areology. The subject and area of operation of surface engineering. Role, tasks and importance of surface engineering. The sciences that make up surface engineering. The surface of a solid. surface layers. Top layers and coatings. Coating technologies. The concept of areological system. Potential and functional properties of surface layers. Technological and exploitation surface layers. Manufacturing methods and types of surface layers. Unconventional strengthening and surface refinement. General discussion of methods of producing surface layers. Directions of development of surface engineering. Laboratory exercises (BN). Production of selected surface layers using surface engineering technologies. Exploitation layers research. Study of the influence of process parameters on the quality of the surface layers produced. Testing the properties of the surface layers produced: chemical resistance, impact resistance, adhesion, cohesion, heat resistance, hardness, wear resistance by friction.
Didactic (educational) methods:	Lecture - giving method (informative lecture) Laboratory - practical method (laboratory exercises)
Course assessment type, the criteria for assessing the achieved learning outcomes, and the method of calculating the final grade:	The condition for passing a subject is to achieve all the required learning outcomes specified for a given subject. 1. Lecture. Final test - the average of grades from partial questions. 2. Laboratory. 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 test and the individually prepared report).

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	Defines the top layer.	K_WG13 K_WG14	Lecture	Final test	Arithmetic mean of sub-question scores
W2	It proposes a method of producing a surface layer with the assumed parameters (including an anti-corrosion layer, anti-abrasion layer, chemically resistant layer, decorative layer).	K_WG13 K_WG14	Lecture	Final test	Arithmetic mean of sub-question scores
W3	Can propose methods of producing surface layers with properties adequate to the technical requirements of given machine elements.	K_WG13 K_WG14	Lecture	Final test	Arithmetic mean of sub-question scores
U1	Examines the properties of the obtained surface layer.	K_UW13 K_UW06	Laboratory exercises	Passing individual practical exercises	Arithmetic mean of sub-question scores

U2	He knows how to use measuring equipment and methods of estimating measurement errors.	K_UW06 K_UO13	Laboratory exercises	Passing individual practical exercises	Arithmetic mean of sub-question scores
K1	He is ready to analyze the tasks assigned for implementation in terms of determining priorities, serving the maximum efficiency of task performance, and the comprehensive effects of its implementation.	K_KK01 K_KO03	Lecture	Final test	Arithmetic mean of sub-question scores

Literature and teaching aids
1. Ziewiec W. et al.: Technology. Vol. II. Lab. T. 2. Chap. 4. Plastic coatings. ed. Polit. Radomska. Radom 1999. 2. Standards: PN-EN ISO 2812-1 - Paints and varnishes. Determination of resistance to liquids; PN-88 C-81522 – Varnish products. Testing of resistance of coatings to aggressive media. PN-78 C-89067 – Plastics. Determination of resistance to chemical substances. 3. Kotnarowska D.: Protective coatings. ed. Polit. Radomska. Radom 2004. 4. Hryniewicz T.: Physicochemical and technological basis of steel electropolishing process. Higher School of Engineering. Koszalin 1989. 5. Kucharczyk W., Mazurkiewicz A., Żurowski W.: Modern construction materials - selected issues. ed. Polit. Radomska. Radom. 2008, 2010, 2011. 6. Instructions for use of the YAG:Nd Genesis neodymium laser. 2011. 7. Marczak J.: Analysis and removal of foreign layers from various materials by laser ablation. WATT. Warsaw 2004. 8. Koss A., Marczak J.: The use of lasers in the conservation of monuments and works of art. Scientific works of the Inter-University Institute for the Conservation and Restoration of Works of Art. Issue 1. Warsaw 2005.

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	12 [h]
Meeting with teachers during their duty hours	2 [h]	X	X
Preparation for lectures/classes/.... , Preparation for credit / exam	X	18 [h] / 20[h]	X
Total student workload	2 [h]/ 0,1 ECTS	28 [h]/ 1,1 ECTS	20 [h]/ 0,8 ECTS
ECTS credits for the course	50 [h] / 2 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).