

Course code																																	
Type and description	EC																																
ECTS credit	1																																
Course name	Surface Engineering of Polymer Materials																																
Course name in Polish	Inżynieria powierzchni materiałów polimerowych																																
Language of instruction	English																																
Course level	8 PRK																																
Course coordinator	prof. hab. inż. Dariusz M. Bieliński																																
Course instructors	prof. dr hab. inż. Dariusz M. Bieliński, dr inż. Mariusz Siciński, dr inż. Tomasz Gozdek																																
Delivery methods and course duration	<table border="1"> <thead> <tr> <th></th> <th>Lecture</th> <th>Tutorials</th> <th>Laboratory</th> <th>Project</th> <th>Seminar</th> <th>Other</th> <th>Total of teaching hours during semester</th> </tr> </thead> <tbody> <tr> <td>Contact hours</td> <td></td> <td>0</td> <td>0</td> <td>15</td> <td></td> <td>0</td> <td>15</td> </tr> <tr> <td>E-learning</td> <td>No</td> <td>No</td> <td>No</td> <td>No</td> <td>No</td> <td>No</td> <td></td> </tr> <tr> <td>Assessment criteria (weightage)</td> <td>0</td> <td>0,00</td> <td>0,00</td> <td>100%</td> <td>0,00</td> <td>0,00</td> <td>100%</td> </tr> </tbody> </table>		Lecture	Tutorials	Laboratory	Project	Seminar	Other	Total of teaching hours during semester	Contact hours		0	0	15		0	15	E-learning	No	No	No	No	No	No		Assessment criteria (weightage)	0	0,00	0,00	100%	0,00	0,00	100%
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Course objective	Making student familiar with the information on composition and structure of the surface layer of polymer materials, possibilities for shaping of its properties on the stage of material processing and treatment of final products as well as during their exploitation.																																
Learning outcomes	<p>After the course a PhD student is able to:</p> <ol style="list-style-type: none"> describe methods used for surface modification of polymer materials as well as surface phenomena accompanying their processing and exploitation. He/she knows and can describe analytical methods used for studying the surface layer of polymer materials. He/she knows and can describe components of paints, coatings, adhesives, and promoters of adhesion – effects W4, U4, apply the gained knowledge in order to select suitable method of surface treatment for a polymer, based on its characteristic, morphology and required properties. He/she can select promoters of adhesion and auxiliary chemicals used as components of paints, coatings and adhesives. He/she can critically analyze literature data and draw logical conclusions – effect W4, U4, K1 present the results of her/his work in front of the audience – effects W4, U4, K1 																																
Assessment methods	<p>Effects W4, U4, K1 – oral examination and presentation</p> <p>The final evaluation is based on: Exam - 40% Presentation - 60%</p>																																
Prerequisites	fundamental knowledge on physics, organic and physical chemistry and polymer science																																
Course content with delivery methods	<ol style="list-style-type: none"> Short course (including a flipped education form): Composition and structure of the surface layer of polymer materials and its consequences. Surface energy, wettability and adhesion. Influence of processing on the composition and structure of the surface layer. Gradient polymers. Technologies of chemical and physical methods used for the surface modification of polymer materials. Modification of the surface layer of polymer materials resulting from their exploitation: ageing, degradation, scorch and swelling. Methods used for prediction and determination of modification progress. Problems from the theory of adhesion. Principles of formation of adhesive joints. Chemicals used as promoters of adhesion, components of paints, coatings and adhesives. Polymer coatings, including abrasion resistant and regenerative coatings. Determination of their properties. Presentations on the surface engineering and testing used in PhD works of students. Discussion 																																

	with other participants.
Basic reference materials	<ol style="list-style-type: none"> 1. Żenkiewicz M.: Adhezja i modyfikowanie warstwy wierzchniej tworzyw wielocząsteczkowych, WNT 2000. 2. Garbassi F., Morra M., Occhiello: Polymer Surfaces. From Physics to Technology, Wiley 1998. 3. Rosen M.J.: Surfactants and Interfacial Phenomena, Wiley-VCH, 2004. 4. Clay surfaces. Fundamentals and Applications, Wypych F., Satyanarayana K.G. eds, Elsevier Acad. Press, 2004. 5. Bieliński D.M.: Tribologia elastomerów i gumy z perspektywy inżynierii materiałowej, ITeE Radom, 2009.
Other reference materials	current scientific articles, given by the lecturer
Average student workload outside classroom	15 h
Comments	---
Last update	March 2023