



## Subject card

Subject name and code	Advanced engineering materials, PG_00057376						
Field of study	Mechanical Engineering, Space and Satellite Technologies						
Date of commencement of studies	February 2024	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group			Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			English		
Semester of study	1	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Zakład Materiałoznawstwa I Technologii Materiałowych -> Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Krzysztof Krzysztofowicz					
	Teachers	dr inż. Artur Sitko dr inż. Krzysztof Krzysztofowicz					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	0.0	45
E-learning hours included: 0.0							
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours		Self-study		SUM
	Number of study hours	45	8.0		47.0		100
Subject objectives	Obtaining the basic knowledge on the advanced construction materials and its behavior in various environments						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_U08] is able to design a procedural equipment or device compliant with the specifications using a design aid system in the form of a design documentation, selecting the appropriate model, performing critical analysis with the proper selection of tools and technologies	able to do critical analysis			[SU3] Assessment of ability to use knowledge gained from the subject		
	[K7_W04] possesses specialized knowledge on design, construction, properties and testing methods of construction materials	has specialist knowledge			[SW3] Assessment of knowledge contained in written work and projects		
	[K7_U06] when solving engineering problems on design, technology and operation of machines is able to assess and classify typical methods and tools, define systemic and ex-technical aspects using modern calculating methods and design tools or modifying the current ones	able to evaluate and classify			[SU2] Assessment of ability to analyse information		

Subject contents	<p>LECTUE: Rules and criteria for metallic materials selection. Weldable increased and high strength steels. Maraging steels. Steels for automotive body sheets. Corrosion resistant and acid resistant steels: austenitic and duplex type ferritic-austenitic, corrosion resistant superalloys. Steels for elevated temperatures application. Heat resistant and high-temperature creep resistant steels. High-temperature creep resistant iron, nickel and cobalt superalloys for power generation turbines, aviation turbines, petrochemical and chemical industry. Refractory metals and alloys: molybdenum, niobium, rhenium, tantalum, zirconium and hafnium. Superplastic materials. MEMS and materials used in it. Materials for nuclear power generation. High entropy materials and alloys (HEM).</p> <p>LABORATORY: Weldable increased and high strength steels. High alloying corrosion resistant steels. Materials for high temperature applications. Composites.</p>														
Prerequisites and co-requisites															
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="453 486 790 517">Subject passing criteria</th> <th data-bbox="794 486 1141 517">Passing threshold</th> <th data-bbox="1145 486 1493 517">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="453 524 790 555">questions and answers</td> <td data-bbox="794 524 1141 555">50.0%</td> <td data-bbox="1145 524 1493 555">30.0%</td> </tr> <tr> <td data-bbox="453 562 790 593">answer for questions</td> <td data-bbox="794 562 1141 593">50.0%</td> <td data-bbox="1145 562 1493 593">35.0%</td> </tr> <tr> <td data-bbox="453 600 790 631">content and formal criteria</td> <td data-bbox="794 600 1141 631">50.0%</td> <td data-bbox="1145 600 1493 631">35.0%</td> </tr> </tbody> </table>	Subject passing criteria	Passing threshold	Percentage of the final grade	questions and answers	50.0%	30.0%	answer for questions	50.0%	35.0%	content and formal criteria	50.0%	35.0%		
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answer for questions	50.0%	35.0%													
content and formal criteria	50.0%	35.0%													
Recommended reading	<p>Basic literature</p>	<p>1. Adamczyk J., Szkaradek K.: Materiały metalowe dla energetyki jądrowej. Wyd. Politechniki Śląskiej, Gliwice 1992. 2. Ashby M., Jones D.: Materiały inżynierskie. Tom I właściwości i zastosowanie. WNT, W-wa 1995. 3. Ashby M., Jones D.: Materiały inżynierskie. Tom II Kształtowanie struktury i właściwości, dobór materiałów. WNT, W-wa 1996. 4. Baczkowska A. i in.: Kompozyty. Oficyna Wydawnicza Politechniki Warszawskiej, W-wa 2000. 5. Blicharski M.: Wstęp do inżynierii materiałowej. WNT, Warszawa 2003. 6. Blicharski M.: Inżynieria materiałowa. Stal. WNT, Warszawa 2004. 7. Chodorowski J., Ciszewski A., Radomski T.: Materiałoznawstwo lotnicze. Oficyna Wydawnicza Politechniki Warszawskiej, W-wa 1996. 8. Ciszewski B., Przetakiewicz W.: Nowoczesne materiały w technice. Wyd. Bellona, W-wa 1993. 9. Cantor B., Assender H., Grant P.: Aerospace Materials. IoP, Bristol and Philadelphia 2001</p>													
	<p>Supplementary literature</p>	<p>Oczoł K.: Kształtowanie ceramicznych materiałów technicznych. Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów 1995. 3. Pampuch R.: Siedem wykładów o ceramice. Wyd. Akademii Górniczo-Hutniczej, Kraków 2001. 4. Śledziona J.: Podstawy technologii kompozytów. Wyd. Politechniki Śląskiej, Gliwice 1998.</p>													
	<p>eResources addresses</p>	<p>Adresy na platformie eNauca:</p> <p>Advanced Engineering Materials, L, IDE+EMSS, sem.1, letni, 2023/24 - Moodle ID: 36885  <a href="https://enauca.pg.edu.pl/moodle/course/view.php?id=36885">https://enauca.pg.edu.pl/moodle/course/view.php?id=36885</a></p> <p>Advanced Engineering Materials, L, IDE+EMSS, sem.1, letni, 2023/24 - Moodle ID: 36885  <a href="https://enauca.pg.edu.pl/moodle/course/view.php?id=36885">https://enauca.pg.edu.pl/moodle/course/view.php?id=36885</a></p>													
Example issues/ example questions/ tasks being completed	<p>1. Aerospace materials  2. Materials for power generation  3. MEMS</p>														
Work placement	<p>Not applicable</p>														