



Subject card

Subject name and code	, PG_00065833						
Field of study	Materials Engineering						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2024/2025		
Education level	second-cycle studies	Subject group			Specialty subject group 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			Polish none		
Semester of study	2	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Division of Ceramics -> Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Tadeusz Miruszewski					
	Teachers	dr inż. Sebastian Wachowski dr inż. Tadeusz Miruszewski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	0.0	0.0	0.0	30
	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	30	3.0		17.0	50	
Subject objectives	Acquiring knowledge about the phenomena, technologies and applications of electroceramics.						
Learning outcomes	Course outcome	Subject outcome		Method of verification			
	[K7_W01] Has extended knowledge of the fields of science and scientific disciplines relevant to materials engineering, and their historical development and importance for the progress of exact and natural sciences, knowledge of the world and evolution of humanity.	Understands the need to update knowledge regarding materials		[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge			
	[K7_W03] Has extended and enhanced knowledge of mathematics, physics, chemistry and other fields, useful when formulating and solving problems within the scope of materials science.	The student has extended and in-depth knowledge of the physicochemical phenomena occurring in electroceramics.		[SW1] Assessment of factual knowledge			
[K7_U06] Can evaluate usefulness and feasibility of using new achievements (techniques and technologies) within the scope of materials science.	The student has knowledge of the design and research of new ceramic materials.		[SU4] Assessment of ability to use methods and tools				
Subject contents	1. Introduction, definition of electroceramics, historical outline, selected technological issues of ceramic production; differences between ceramics and electroceramics.2. Methods of producing ceramic powders; methods of densifying ceramics, methods of producing porous ceramics; methods of forming ceramic elements;3. Ionic conducting electroceramics: point defects, Kroger-Vink notation; ionic diffusion and conductivity; doped ZrO ₂ and other oxygen ion conductors; proton conductors; materials with mixed electronic-ionic conductivity;4. Methods of testing the electrical properties of electroceramics;5. Applications of electroceramics: gas sensors, membranes and electrochemical cells.						
Prerequisites and co-requisites	Knowledge of solid state physics and electrochemistry.						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Excercises	50.0%	40.0%
	Lecture	50.0%	60.0%
Recommended reading	Basic literature	scientific literature and A. J. Moulson, J. M. Herbert, Electroceramics: Materials, Properties, Applications, Copyright © 2003 John Wiley & Sons, Ltd	
	Supplementary literature	none	
	eResources addresses	Podstawowe https://enauzanie.pg.edu.pl/moodle/course/view.php?id=44886 - eLearning course Adresy na platformie eNauzanie:	
Example issues/ example questions/ tasks being completed	-defects in ionic crystals-diffusion mechanisms-Kroger-Vink notation-types of fuel cells-defect equilibrium diagrams		
Work placement	Not applicable		

Document generated electronically. Does not require a seal or signature.