



Subject card

Subject name and code	, PG_00058707						
Field of study	Materials Engineering, Materials Engineering						
Date of commencement of studies	February 2024	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group			Optional 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		
Semester of study	1	ECTS credits			5.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Zakład ceramiki -> Instytut Nanotechnologii i Inżynierii Materiałowej -> 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	30.0	15.0	0.0	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	10.0		70.0	125	
Subject objectives	Learning about the phenomena, technologies and applications of electroceramics.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K7_K01		Understands the need to update materials knowledge		[SK2] Assessment of progress of work		
	K7_U06		The student has knowledge of the design and testing of new ceramic materials.		[SU4] Assessment of ability to use methods and tools		
	K7_W03		it is extended and deepened knowledge of electroceramics		[SW1] Assessment of factual knowledge		
Subject contents	<p>Preliminary news Technological issues of production electroceramics: Methods of producing ceramic powders; Ceramic densification methods (or vice versa, methods production of porous ceramics); Methods of forming ceramic elements; Ion conductive electroceramics: Point defects, Kroger-Vink notation; Diffusion and ionic conductivity; Methods of testing electrical properties (e.g. impedance measurements); Doped ZrO₂ and other oxygen ion conductors; Proton conductors; Materials with mixed electron-ion conductivity; Applications of electroceramics: gas sensors, accumulators, batteries and cells Electro-conductive electroceramics: Electron transport in ceramics; Test methods for electroceramics: Structural research; Electrochemical research; Examples of interesting materials electroceramic: Perovskites and perovskite derivatives; Fluorite ceramics;</p>						
Prerequisites and co-requisites							

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture	50.0%	60.0%
	Excercises	50.0%	40.0%
Recommended reading	Basic literature	scientific publications	
	Supplementary literature	jw	
	eResources addresses	Adresy na platformie eNauzanie:	
Example issues/ example questions/ tasks being completed	defects in ionic crystals diffusion mechanisms Kroger Vink notation SOFC		
Work placement	Not applicable		