



Subject card

Subject name and code	Superconductivity and Superconducting Devices, PG_00069715						
Field of study	Nadprzewodnictwo i urządzenia nadprzewodnikowe						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2026/2027		
Education level	first-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	3		Language of instruction		Polish		
Semester of study	6		ECTS credits		1.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Michał Winiarski				
	Teachers		dr inż. Michał Winiarski				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	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	15		2.0		8.0	25
Subject objectives	The aim of the course is to familiarize students with the phenomenon of superconductivity, superconducting materials and their application in technology, especially in energy.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_U06] can accurately present technological and scientific problems, related to the production and application of nanostructures, to specialists in related fields, and initiate and coordinate interdisciplinary cooperation.		The student is able to describe the purposes of using superconducting materials in electronic and electrical systems.		[SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu		
	[K6_W01] has knowledge of materials science and understands its key role in the progress of civilization		The student knows the basic characteristics of the superconducting and metallic state and is able to name the most commonly used superconductors in technology.		[SW1] Ocena wiedzy faktograficznej		

Subject contents	Course content – lecture		
	Introduction:		
	The Metallic State,		
	Interelectron Interactions,		
	Emergent States		
	History of the Discovery of Superconductors		
	Experimental Description of Superconductivity		
	Overview of Superconducting Materials: Metals and Alloys Intermetallic Compounds Copper Superconductors Magnesium Diboride and Other Covalent Superconductors Iron Superconductors Exotic Superconductors		
	Applications of Superconductors		
	On the Micro and Nano Scale		
On the Macro Scale			
Applications of Machine Learning and Artificial Intelligence in the Search for Superconductors			
Summary			
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Final test	50.0%	100.0%
Recommended reading	Basic literature	1. Ch Poole i et al., Handbook of Superconductivity. Academic Press, 2000.	
	Supplementary literature	1. D.I. Khomskii, Basic Aspects of the Quantum Theory of Solids. Cambridge Univ. Press, 2010	
	eResources addresses	Basic https://www.ascg.msm.cam.ac.uk/lectures/ - Lectures on Superconductivity	
Example issues/ example questions/ tasks being completed	List the applications of superconducting materials in energy generation, transmission, and storage technologies. What characterizes the crystal structure of copper superconductors (cuproates)?		
Practical activites within the subject	Not applicable		