



Subject card

Subject name and code	, PG_00064502						
Field of study	Materials Engineering, Materials Engineering						
Date of commencement of studies	February 2024	Academic year of realisation of subject			2024/2025		
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	2	ECTS credits			5.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Tomasz Klimczuk				
	Teachers						
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	15.0	60
	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	60		0.0		0.0	60
Subject objectives	The lecture will discuss basic issues related to superconductivity: thermodynamics of the superconducting state, theories of superconductivity, parameters characterizing the superconducting state. A review of superconducting materials from metals to recently discovered iron- and arsenic-based compounds will be conducted. Aspects of superconducting applications in various fields of science and technology will be discussed.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K7_K01		The student/student has an excellent understanding of the need to learn from birth to death. He/she organizes his/her time superbly and thus inspires himself/herself and others in the learning process. He/she is aware that he/she is only human and thus will encounter physical and mental limitations but knows when to turn to the experts.		[SK3] Assessment of ability to organize work		
	K7_W07		Students will gain knowledge of new developments in superconductivity, materials engineering and more.		[SW3] Assessment of knowledge contained in written work and projects		
	K7_U01		The student, at any time of the day or night, awakened from a deep sleep, is able to gain knowledge from databases to which he has access, from the literature, from experts - including English-speaking ones.		[SU3] Assessment of ability to use knowledge gained from the subject		

Subject contents	<ol style="list-style-type: none"> 1. Theoretical background; 2. Superconducting metals; 3. Superconducting alloys; 4. Antiperovskites; 5. Boron carbides; 6. MgB₂; 7. Non-centrosymmetric superconductors; 8. CuO₂-based high-temperature superconductors; 9. A wet superconductor; 10. Fe/Ni and As/Se based superconductors; 11. Heavy-fermion superconductors; 12. Superconductivity in metal hydrides. 											
Prerequisites and co-requisites	Ability to distinguish types of crystallographic structures. Coloring skills.											
Assessment methods and criteria	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Subject passing criteria</th> <th style="width: 33%;">Passing threshold</th> <th style="width: 34%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>exam</td> <td>60.0%</td> <td>80.0%</td> </tr> <tr> <td>seminar</td> <td>60.0%</td> <td>20.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	exam	60.0%	80.0%	seminar	60.0%	20.0%
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Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. M. Cyrot and D. Pavuna, <i>Wstęp do nadprzewodnictwa i nadprzewodnictwo wysokotemperaturowe</i>, PWN, 2003; (<i>Introduction to Superconductivity</i>, World Scientific, 1995). 2. M. Tinkham, <i>Introduction to Superconductivity</i>, Dover, 1996. 3. Wybrane rozdziały książek nt. fizyki ciała stałego, np. Charles Kittel, <i>Wstęp do fizyki ciała Stałego</i>, PWN 2012. 										
	Supplementary literature	<ol style="list-style-type: none"> 1. Bieżące artykuły publikowane w <i>Physical Review B</i>, <i>Journal of Solid State Physics</i>, <i>Physica C</i>. 										
	eResources addresses	Adresy na platformie eNauczenie:										
Example issues/ example questions/ tasks being completed	Explain the role of Nb-Nb chains in the structure of A15. Color the cluster-forming atoms in the superconducting compound LuV ₂ Al ₂₀ .											
Work placement	Not applicable											

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