GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Superconducting materials, PG_00072584		
Field of study	Materials Engineering		
Date of commencement of studies	October 2023	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	4	Language of instruction	Polish
Semester of study	7	ECTS credits	2.0
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	prof. dr hab. inż. Tomasz Klimczuk	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	0.0	15.0	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

The aim of the course is to familiarize students with the basic concepts of superconductivity and then to provide a thorough discussion of the most important superconducting compounds and families.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U03] Can critically analyze and evaluate the functioning – particularly in the context of materials engineering –existing technical solutions, particularly equipment, objects, systems, processes.	The student is able to evaluate technical solutions related to the application of superconductivity.	[SU2] Assessment of ability to analyse information
[K6_W08] Has fundamental knowledge of the development trends in the fields of science and scientific disciplines relevant to materials engineering.	The student is highly skilled at gathering all available information on trends in materials engineering	[SW2] Assessment of knowledge contained in presentation
[K6_W07] Has detailed knowledge of selected problems of materials science.	The student has knowledge of materials science, particularly inorganic materials, including superconductivity.	[SW1] Assessment of factual knowledge
[K6_U06] Can integrate obtained information, interpret it and draw conclusions, as well as formulate and justify opinions.	The student has no trouble connecting the information they already know with newly acquired knowledge, analyzes the gathered data, and then formulates only well-founded opinions, which they are able to justify exceptionally well.	[SU2] Assessment of ability to analyse information
[K6_K01] Understands the need to improve professional and personal competencies; is conscious of own limitations and knows when to turn to experts, properly establishes priorities helping to accomplish tasks defined by oneself or others.	The student is a mature young adult who is aware of market demands and the associated need to enhance their professional and personal skills. They are open to establishing contacts with experts in the field of superconductivity, including Nobel Prize laureates.	[SK4] Assessment of communication skills, including language correctness

<table>
<tr><td>Subject contents</td><td>Course content – lecture
1. Introduction to superconductivity; 2. Superconducting metals; 3. Superconducting alloys; 4. Antiperovskites; 5. Boron carbides; 6. MgB2; 7. CuO2-based high-temperature superconductors; 8. Wet superconductor; 9. Iron-based superconductors; 10. Exotic superconductors.

Most topics will be discussed using the case-study method.

Course content – seminar
The seminar sessions will take place at the end of the semester, as students need to be introduced to the subject matter. Students will receive a selected scientific publication describing a newly discovered superconductor, the subject of which they will present during the seminar. Two mandatory consultation sessions are scheduled, aimed at: (1) discussing the publications subject matter, (2) assessing the readiness of the presentations and answering any questions.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Knowledge of element symbols. Knowledge of the basics of chemistry and the physics of solids.</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td></td><td>60.0%</td><td>75.0%</td></tr>
<tr><td></td><td>60.0%</td><td>25.0%</td></tr>
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<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. A.V. Narlikar, Frontiers in superconducting materials; 2. A.V. Narlikar, Superconductors;</td></tr>
<tr><td>Supplementary literature</td><td>1. A.C. Rose-Innes, E.H.Rhoderick: Superconductivity;</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>Describe the family of copper oxide-based superconductors. What is the maximum critical temperature for the A15 family of compounds.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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