GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Electrical Properties of Materials and Nanomaterials, PG_00069699		
Field of study	Nanotechnology		
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 none
Semester of study	5	ECTS credits	3.0
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 -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Tadeusz Miruszewski	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	0.0	0.0	30

E-learning hours included: 0.0

eNauczanie source address: https://enauczanie.pg.edu.pl/2025/my/

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	42.0	75

Subject objectives

The aim of the course is to familiarize students with the properties of charge transport in nanocrystalline materials and with the research methodology for these properties.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U02] can analyze and solve simple scientific and technical problems based on possessed knowledge, applying analytical, numerical, simulation and experimental methods.	The student is able to interpret measurement data of charge transport properties in nanomaterials and ceramic materials.	[SU2] Assessment of ability to analyse information
[K6_W09] Has knowledge of the structure and operation of scientific instruments, measuring and test equipment and in the field of planning and conducting a physical experiment and critical analysis of its results.	The student is able to perform measurements of charge transport properties in nanomaterials and ceramic materials.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K6_W07] has systematic knowledge of the physical and chemical principles of nanotechnology (methods of obtaining nanostructures, types of nanostructures, their properties, basic research methods).	The student has knowledge of the electrical properties of nanomaterials and ceramics.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge

Subject contents

1. Electrical conductivity of solids.
2. Changes in the transport properties of materials when moving from the micro to the nanoscale.
3. Diffusion phenomena in solids.
4. Methods for measuring the electrical properties of solids.
5. Analysis of sample test results and their interpretation.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">Physical basis of current flow in solids.</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Report</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>Exam</td><td>50.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. Singh J. CHARGE TRANSPORT IN MATERIALS. In: Smart Electronic Materials: Fundamentals and Applications. Cambridge University Press; 2005:148-201.

2. P.J. Gellings, The CRC Handbook of Solid State Electrochemistry, CRC Press, 1997</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">none</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">1. List the methods for measuring electrical conductivity in ceramics.
2. State the assumptions of the four-point resistance measurement method.</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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