GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00070389		
Field of study	Materials Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2025/2026
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	Division of Electrochemistry and Surface Physical Chemistry -> 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 hab. inż. Natalia Wójcik	
	Teachers	dr hab. inż. Natalia Wójcik	

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

eNauczanie source addresses:

Moodle ID: 4455 Materiały dielektryczne
https://enauczanie.pg.edu.pl/2025/course/view.php?id=4455

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

Learning about the modern dielectric materials and technological issues associated with their use.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U06] Can integrate obtained information, interpret it and draw conclusions, as well as formulate and justify opinions.	The student is able to integrate knowledge of the electrical properties of dielectrics, interpret measurement results (including impedance spectroscopy), and formulate and justify conclusions regarding polarization mechanisms, electrical conductivity, and practical applications of dielectric materials.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
[K6_W07] Has detailed knowledge of selected problems of materials science.	The student has detailed knowledge of the electrical properties of dielectrics, including polarization and conduction mechanisms, material response in alternating electric fields, and measurement methods, in particular impedance spectroscopy.	[SW1] Assessment of factual knowledge
[K6_W03] Has knowledge of materials science and can relate the properties of materials with their structure and composition, knows the theoretical description of phenomena occurring in materials subjected to external factors.	The student has knowledge enabling them to relate the electrical properties of dielectric materials to their structure and chemical composition, and understands the theoretical description of phenomena occurring in materials subjected to external electric fields.	[SW1] Assessment of factual knowledge
[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 recognizes the need to develop their competences in the field of materials science and is able to responsibly plan and carry out tasks related to the analysis of the electrical properties of materials.	[SK3] Assessment of ability to organize work [SK2] Assessment of progress of work

Subject contents

Course content – lecture

- Electrical properties of dielectrics - basic concepts. Macroscopic properties of dielectrics.
- Electrical properties of dielectrics - dielectric polarization mechanisms
- Electrical conduction mechanisms in dielectrics
- Dielectric in the alternating electric field - the description in the frequency domain.
- Dielectric in the alternating electric field - a time domain.
- Measurements of electrical parameters of dielectrics
- Impedance spectroscopy
- Dielectrics with special properties
- Basic applications dielectrics.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Colloquium	50.0%	100.0%

Recommended reading

Basic literature	• *Fizyka dielektryków*, *A. Chełkowski; PWN, 1972, 1993.* • *Elektrolity Stałe*, *Władysław Bogusz, Franciszek Krok; WNT, 1995.*
Supplementary literature	None
eResources addresses	

Example issues/ example questions/ tasks being completed

Explain the four mechanisms of dielectric polarization.

Draw a Nyquist plot and describe it.

Describe what impedance spectroscopy consists of and what information can be obtained by studying materials using this technique.

Practical activites within the subject

Not applicable