GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00058940		
Field of study	Nanotechnology		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study 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	2	Language of instruction	Polish
Semester of study	4	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
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. Maria Gazda	
	Teachers	dr inż. Sebastian Wachowski Joanna Pośpiech prof. dr hab. inż. Maria Gazda	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	30.0	0.0	0.0	45

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	45	5.0	50.0	100

Subject objectives

Gaining knowledge of selected nanomaterials and functional nanostructures, their properties and applications.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_U06	Is able to present problems related to the applications of functional nanostructures and nanomaterials.	[SU5] Assessment of ability to present the results of task
K6_W06	Has basic knowledge of nanomaterials science and knows how size affects selected properties.	[SW1] Assessment of factual knowledge
K6_U09	can produce selected nanomaterials	[SU1] Assessment of task fulfilment
K6_U10	Can predict the risks associated with the use of functional nanomaterials	[SU2] Assessment of ability to analyse information
K6_W07	Has systematic knowledge of the physical and chemical properties of functional nanomaterials	[SW1] Assessment of factual knowledge

Subject contents

LectureIntroduction: nanomaterials, nanostructures;Nanomaterials and nanostructures with specific functions resulting from the properties:Electrical (conductors, superconductors, electrides, Coulomb blockade, ballistic conductivity, ionic conductors, dielectrics, ferroelectrics, etc.);Optical (effect of size on optical properties);magnetic (ferro-, antiferro-, dia-, paramagnetics, superparamagnetism);other;Nanomaterials in information recording and energy conversion. **Laboratory**: The laboratory includes exercises: production and testing of a ceramic superconductor, production and testing of nanoparticles (ZnO, CeO2, etc.), preparation and testing of a nanocrystalline photoelectrochemical cell, testing of hydrophilic and hydrophobic materials. Exercises will be performed in groups of 2-3 people.

Prerequisites and co-requisites

no

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	written assesment: open questions	52.0%	50.0%
	lab assesment	52.0%	50.0%
Recommended reading	Basic literature	Nanomaterials, D. Vollath	
	Supplementary literature	scientific literature	
	eResources addresses	Adresy na platformie eNauczanie: Nanomateriały funkcjonalne - Moodle ID: 27780 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=27780	
Example issues/ example questions/ tasks being completed	1. How does size affect the elastic properties (e.g. Young's modulus), melting point and heat capacity of materials (with a brief explanation)?2. Write and briefly explain why the electrical conductivity will change (increase or decrease) (Note: this is about conductivity):a. Copper as a result of heating it to a higher temperatureb. Copper as a result of its strong plastic deformationc. Undoped silicon as a result of heating it to a higher temperatured. Doped silicon as a result of heating it to a higher temperature3. What properties should the superconductor have, from which the winding of an electromagnet generating a magnetic field of B = 9 T is made?4. Can a mirror be made in a way other than applying a layer of metal to glass? If so, describe such a mirror.5. List non-magnetic ways of recording information. Describe two of them.		
Work placement	Not applicable		

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