GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Basics of Nanotechnology, PG_00049373		
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2023/2024
Education level	second-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Solid State Physics -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marta Prześniak-Welenc	
	Teachers	dr inż. Marta Prześniak-Welenc	

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	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	3.0	27.0	75

Subject objectives

The aim of the course is to gain knowledge of the basics of nanotechnology.

Learning outcomes

Course outcome	Subject outcome	Method of verification

Subject contents

What is nanotechnology. Elements of solid state physics: crystalline structure of solids, bonds, phonons, band structure. Physical phenomena in nanostructures, quantum wells. Methots of nanosized materials preparations:thin films, nanorods, quantum dots, nanopowdwes. Electrica, amgnetic, aptical and mechanical properties of nanosized materials. Photonic structures. Methods of nano-materials examonation (AFM, STM and nanoindentation). Physical properties of nanotunes and graphen, Nanotechnology applications.

qantum Hall effect, tunneling effect, balistic charge transport, absorption and emission of radiation, lasers, Coulomb blocade, photonic structures, nanomagnetism. 5. Physical properties of nanotubes. 6. Elements of nanoelectronics

Prerequisites and co-requisites

Knowledge of basics of classical and contemporary physics.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Written exam	50.0%	66.6%
Paricipation in lessons, doing reports	50.0%	33.4%

Recommended reading

Basic literature	1. Nanotechnologie. Red. Nauk. R.W.Kelsall i in. PWN 2008. 2. Wstęp do fizyki ciała stałego. C. Kittel, PWN, 1999
Supplementary literature	1. Introduction to nanotechnology. Ch.P.Poole Jr, F.J.Owens. Wiley 2003
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	1. General concepts related to nanotechnology, production methods and methods of research on nanostructures.2. Physico-chemistry of surfaces.3. Elements of solid state physics: crystal structure of a solid, bonds, models of electrons in a crystal,electron state density, band structure.4. Quantum wells.5. Physical phenomena in nanostructures: ballistic transport of carriers, quantum Hall effect,tunneling, Coulomb blockade, the Aharonov-Bohm effect, absorption and emission of radiation, lasers.6. Specific heat in a crystal, thermal properties of nanostructures.7. Photonic structures and their application.8. Nanomagnetism: magnetic properties of materials, spin-orbit coupling, GMR, TMR, valvesspin, Hall spin effect, Kondo effect.9. Physical properties of nanotubes and graphene.
Work placement	Not applicable