COURSE DESCRIPTION CARD - SYLLABUS

Course name
Introduction to Nanotechnology

Course

Field of study
Education in Technology and Informatics

Year/Semester
2/4

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
26

Laboratory classes

Other (e.g. online)

Tutorials
15

Projects/seminars
15

Number of credit points

5

Lecturers

Responsible for the course/lecturer:
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Faculty of Materials Engineering and Technical Physics

Piotrowo street 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge of experimental physics and mathematical analysis in the field of program content implemented in semesters 1-4 during the 1st degree of education in the field of Technical and Information Education. The ability to solve simple physical problems based on knowledge of experimental physics, and the ability to obtain information from the indicated sources. Understanding the need to expand their competences, willingness to cooperate within the team.

Course objective

1. Providing students with basic knowledge of physics, to the extent determined by the curriculum content specific to the field of study, in particular the capabilities and specificities of nanometric

technologies, including in particular the basic measurement methods and techniques used in nanoscience and nanotechnology, common technologies for the manufacture of nanostructures, the specific characteristics of nanoobjects and their use in science, industry and medicine.

2. Developing the skills of selection of modern materials for applications in electronics and optoelectronics. Ability to find applications and develop technologies for the manufacture of innovative devices.

3. Shaping students' teamwork skills.

Course-related learning outcomes

Knowledge

1. Knows and understands the mathematical apparatus necessary for the description and analysis of the basic issues of nanometric materials engineering, mechanics and computer science [K1_W01], [K1_W16].

2. Is familiar with the state of the art in nanoscience and nanotechnology, functional materials and is aware of the latest trends in this topic [K1_W02], [K1_W17].

3. Is familiar with the current state of industry applications and is familiar with the latest measurement techniques for surface and nanostructure characterization and in the latest applications of nanotechnology products [K1_W05, K1_W12].

Skills

Students gain ability how to:

1. apply basic laws of physics and simplified models to solve problems in the programme content of the subject [K1_U04], [K1_U20].

2. make use of the knowledge from indicated literature sources (list of basic literature) and acquire knowledge from other sources [K1_U01, K1_U02]

3. prepare well-documented studies/or presentations on the latest developments in nanoscience and nanotechnology and applications of nanotechnology products. [K1_U01, K1_U02, K1_U03, K1_U05].

Social competences

1. Understands the need and knows the possibilities for continuous further training and improvement of professional, personal and social competences [K1_K03].

2. she/he will be able to transmit information related to technology and information technology in a commonly understood manner (K1_K05, K1_K06]

3. understands the importance of the non-technical aspects and effects of nanotechnology engineering activities [K1_K09]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Effect	Form of assessment	Assessment criteria
W01-W03	written/oral exam	3 - 50.1%-70.0%;
		4 - 70.1%-90.0%;
		5 - od 90.1%
U01-U04	test	3 - 50.1%-70.0%;
		4 - 70.1%-90.0%;
		5 - od 90.1%
K01-K02	written/oral exam	3 - 50.1%-70.0%;
		4 - 70.1%-90.0%;
		5 - od 90.1%

Programme content

1. Properties of solids on a nanometer scale: • structural, • mechanical, • thermal, • electron, • magnetic.

2. Basic groups of measurement methods and techniques used in nanoscale research: • scanning tunnel microscopy, • atomic force microscopy, • electron microscopy, • near field scanning microscopy.

3. Nanostructure manufacturing technologies: • "top-down", • "bottom-up".

4. Basic types of nanostructures, their characteristics and applications: • semiconductor nanostructures (wells, wires and quantum dots), • magnetic nanomaterials, • carbon nanotubes, • others.

5. Molecular nanotechnology and bionanotechnology.

Teaching methods

lecture

Bibliography

Basic

1. Nanotechnologies (org. Nanoscale Science and Technology), Editors: R. W. Kelsall, I. W. Hamley, M. Geoghegan, PWN, Warsaw, 2008

2.STM/AFM scanning probe microscopes (org. A practical guide to scanning probe microscopy), R. Howland, L. Benatar, Park Scientific Instruments, Polish edition, Warsaw, 2002

3.Electron microscopy, red. A. Barbacki, Poznań University of Technology Publishing House, Poznań, 2007

4.Solid State Spectroscopy, ed. M. Drozdowski, Poznań University of Technology Publishing House, Poznań, 2001

5. Own materials of the lecturer or/and classes presentations in the form of a .pdf collection

Additional

1. "Nanotechnology – Global strategies, Industry Trends and Applications", Editor: J. Schulte, John Wiley&Sons Ltd. 2005.

2. J. Szuber, Surface Research Methods in Semiconductor Nanotechnology, Silesian University of Technology Publishing, Gliwice, 2002

Breakdown of average student's workload

	Hours	ECTS
Total workload	120	5,0
Classes requiring direct contact with the teacher	70	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	60	2,0

[1] delete or add other activities as appropriate