

COURSE DESCRIPTION CARD

Course name	Nanomaterials in engineering applications				
Course type	optional	Course code	SDPB0035	ECTS credits	1
Forms and number of hours	lecture: 10 h	Scientific discipline	mechanical engineering		
Course objectives	The aim of the course is to provide PhD students with knowledge about modern and advanced engineering materials, which are undoubtedly nanomaterials. During the course, students will learn about the definition of these materials and the concepts that appear in their context. Students will acquire the ability to navigate among various methods of their characterization and to combine their internal structure with appropriate properties. Students will be able to make a comprehensive systematics of nanomaterials together with an indication of the basic engineering applications of individual distinguished groups. The content provided during the classes will also allow them to assess the potential application of the pointed group, together with an indication of the risks and limitations.				
Course content	1. Definition and basic concepts relating to nanomaterials 2. Classification of nanomaterials for engineering applications 3. Structure of nanomaterials in relation to classical engineering materials 4. Specific properties of nanomaterials 5. Methods for the characterization of nanomaterials 6. Nanometals and their applications 7. Nanopolymers and their applications 8. Nanoceramics and their applications 9. Nanocomposites and their applications 10. Nanocomposites in structural applications 11. Nanomaterials taken from the nature 12. Potential threats and development prospects for nanomaterials				
Teaching methods	The standard form of classes in the form of a lecture will be enriched with discussions with the audience. The course will use modern media in the form of multimedia materials (presentations, films).				
Assessment method	Lecture: credit				
Symbol of learning outcome	Learning outcomes		Reference to the learning outcomes for the field of study for the 8 th level of Polish Qualification Framework (PRK)	Methods of assessing the learning outcomes	
LO1	Knows and understands the definition and basic concepts related to engineering nanomaterials		SD_W1	Credit	
LO2	Knows and understands the structure and linked specific properties of nanomaterials		SD_W1, SD_W2	Credit	
LO3	He can indicate methods of nanomaterials characterization depending on the expected research results		SD_W1, SD_W2	Credit	

L04	He can arrange nanomaterials into groups resulting from their structure and indicate possible areas of their application	SD_W1	Credit
L04	Is able to discuss the possibilities of development of engineered nanomaterials with an indication of both the advantages and risks of this	SD_W4	Credit

Student workload (in hours)	
Lecture	10
Consultations	1
The unassisted student work	10
Implementation of project tasks and preparation for and participation in exams/tests	5
Total	26
ECTS credits	1

Basic references	1. Krzysztof Kurzydłowski ; Małgorzata Lewandowska. Nanomateriały Inżynierskie Konstrukcyjne i Funkcjonalne. 1st ed. Warszawa: Wydawnictwo Naukowe PWN, 2010. 2. Trzaska, Maria. Nanomateriały w Architekturze i Budownictwie. 1st ed. 2019.
Supplementary references	1. Linkov, Igor, and Jeffery Steevens. Nanomaterials. Risks and Benefits. Springer Netherlands, 2009. 2. Kanchi, Suvardhan, Shakeel Ahmed, Chaudhery Mustansar Hussain, and Myalowenkosi Sabela. Nanomaterials. Wiley-Scrivener, 2018.
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