



COURSE DESCRIPTION CARD - SYLLABUS

Course name

NANOTECHNOLOGY IN TRANSPORT ENGINEERING

Course

Proposed by Discipline

Civil engineering and transport

Type of studies

Doctoral School

Form of study

full-time

Year/Semester

II/4, III/6

Course offered in

English

Requirements

elective

Number of hours

Lecture

4

Tutorials

Projects/seminars

Number of credit points

1

Lecturers

Responsible for the course/lecturer:

dr hab. inż. Jarosław Kałużny, prof. PUT

email: jaroslaw.kaluzny@put.poznan.pl

phone: +48 61 665 2049

Faculty of Civil and Transport Engineering

Poznan University of Technology

ul. Piotrowo 3, 60-965 Poznan, Poland

Responsible for the course/lecturer:

Prerequisites

Knowledge: basic knowledge in material engineering, physics, mathematics and subjects related to the mechanical engineering.

Skills: ability to define and test hypothesis related to research problems.

Social competencies: ability to think and act in a creative way.

Course objective

Interdisciplinary thinking for creative engineering solutions.



Course-related learning outcomes

Knowledge

A PhD student who graduated from doctoral school knows and understands:

- 1) key developmental trends of science disciplines in which education takes place at the doctoral school, [P8S_WG/SzD_W02]
- 2) basic conditions of knowledge transfer to the economic and social sphere as well as commercialization of the results of scientific activities and know-how related to these results. [P8S_WK/SzD_W07]

Skills

A PhD student who graduated from doctoral school can:

- 1) use the knowledge from different branches of science to creatively identify, formulate and to innovatively solve complex problems or to execute research tasks in particular:
 - define the aim and subject of scientific research, form a research hypothesis,
 - develop research methods, techniques and tools and use them creatively,
 - draw conclusions on the basis of research results, [P8S_UW/SzD_U01]
- 2) plan and implement individual and team research projects, also in the international community. [P8S_UO/SzD_U09]

Social competences

A PhD student who graduated from doctoral school is ready to:

- 1) acknowledge the importance of knowledge in solving cognitive and practical problems, [P8S_KK/SzD_K03]
- 2) fulfilling the social obligations of researchers and creators. [P8S_KO/SzD_K04]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

PQF code	Methods for verification of learning outcomes	Assessment criteria
W02, W07	Written report describing the self study on a given innovative project	originality of the approach, depth of the analyses, presented cross-disciplinary knowledge and practical approach
U01, U09	Written report describing the self study on a given innovative project	originality of the approach, depth of the analyses, presented cross-disciplinary knowledge and practical approach



K03, K04	Written report describing the self study on a given innovative project	originality of the approach, depth of the analyses, presented cross-disciplinary knowledge and practical approach
----------	--	---

Programme content

1. Basics (Nanotechnology: definitions, reasons to be, history; comparison of a bee and an aircraft and the advantages of hierarchical structures in nature, General physics principles related to nanotechnology; review, Carbon nanomaterials and their unique properties, Nanomaterials characterization, case studies (electron microscopy, spectroscopy, etc.)).
2. Applications (Nanomaterials in lubrication, Nanocomposites).
3. Environment (Nanotechnology in nature and bionics, Nanomaterials characterization, case studies (electron microscopy, spectroscopy, etc.)).
4. Brainstorm (Your application of nanomaterials for a revolutionary device, technology, etc.).

Teaching methods

Lecture: multimedia presentation including illustrations and examples.

Bibliography

Basic

1. Bhushan B. Springer Handbook of Nanotechnology.

Additional

1. Nouailhat A. An Introduction to Nanoscience and Nanotechnology; free pdf available at: http://elibrary.bsu.az/books_250/N_229.pdf.
2. Any other free downloadable books found in google under “nanotechnology books”.

Breakdown of average student's workload

	Hours	ECTS
Total workload	14	1.0
Classes requiring direct contact with the teacher	8	0.5
Student's own work (literature studies, preparation for tutorials, project preparation) ¹	6	0.5

¹ delete or add other activities as appropriate