



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Nanomaterials in engine design

Course

Field of study

Mechanical and Automotive Engineering

Area of study (specialization)

Hybrid powertrain systems

Level of study

Form of study

Year/Semester

2/3

Profile of study

Course offered in

polish

Requirements

Number of hours

Lecture

9

Laboratory classes

0

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

1

Lecturers

Responsible for the course/lecturer:

Responsible for the course/lecturer:

dr hab. inż. Jarosław Kałużny

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Wydział Inżynierii Lądowej i Transportu

ul. Piotrowo 3, 60-965 Poznań

Prerequisites

Knowledge: Base knowledge in physics, according to the course for the faculty of mechanics; base knowledge in chemistry, according to the course for the faculty of mechanics

Competences: Ability to conduct self studies in literature; ability for creative usage of knowledge in various fields of physics, chemistry and engineering sciences

Social competences: Understanding of continuous personal development; understanding of the impact of engineering products on the human environment.



Course objective

Analysis of the process of piston-cylinder friction. Hydrodynamic theory of lubrication.

Course-related learning outcomes

Knowledge

Has extended knowledge of physics in the field of contemporary physical problems conditioning the progress in technical sciences: solid state physics nonlinear optics, nuclear physics and new research methods used in physics.

Has extended knowledge of modern construction materials such as carbon plastics, composites, ceramics, in terms of their construction, processing technology and applications.

Has extended knowledge of material strength in the field of nonlinear models, fracture and fatigue strength, calculations of statically indeterminate structures, structure stability.

Skills

Can formulate and test hypotheses related to simple research problems.

Can plan and carry out experimental research of specific processes taking place in machines and routine tests of a working machine or a vehicle from a selected group of machines.

He can design the technology of exploitation of a selected machine with a high degree of complexity.

Social competences

It is ready to fulfill social obligations, inspire and organize activities for the benefit of the social environment.

It is ready to initiate actions for the public interest.

Is willing to think and act in an entrepreneurial manner.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Discussion during the lesson

Mutual or written exam

Programme content

- Definition of nanomaterials, types of nanomaterials
- Application of nanomaterials in mechanical and electronics design
- Carbon allotropes
- Growth of carbon nanomaterials
- Carbon nanomaterials for friction reduction



- Results of the tests targeting application of carbon nanotubes in combustion engines, discussion
- Electron microscopy, types of microscopes, principles of imaging process
- EDX spectroscopy
- Raman Spectroscopy

Teaching methods

various

Bibliography

Basic

1. ACS Nano
2. Nano Today

Additional

1. Nature
2. Science

Breakdown of average student's workload

	Hours	ECTS
Total workload	15	1,0
Classes requiring direct contact with the teacher	9	0,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	6	0,5

¹ delete or add other activities as appropriate