COURSE DESCRIPTION CARD - SYLLABUS

Course name

TOWARDS GREEN TRIBOLOGY: DEVELOPMENT OF NEW LUBRICANTS AND MATERIALS FOR SUSTAINABLE ENGINEERING

Course

Proposed by Discipline

Civil Engineering,
Geodesy and Transport

Type of studies

Doctoral School

Form of study

full-time

Year/Semester

II/3, III/5

Course offered in

English

Requirements

elective

Number of hours

Lecture	Tutorials	Projects/seminars
4		

Number of credit points

1

Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

Prerequisites

Knowledge: PhD student has basic knowledge about the phenomenon of friction and its role in nature and technology. Has basic knowledge of solid state mechanics and materials used in modern friction pairs. Understands the need to counteract the negative effects of friction related to wear and energy loss.

Skills: PhD student understands and is able to interpret the most important physicochemical parameters related to friction and surface engineering: friction force and friction coefficient, surface topographic characteristics, wettability, etc.

Social competitions: PhD student has the ability to work in a team, allowing him to lead discussions and draw conclusions on the topics discussed.

Course objective

As a result of this course, PhD students should know the operational and economic consequences of friction and wear for modern machines and devices. The knowledge they gain allows them to recognize the most important friction mechanisms that destroy parts and how to counteract them. The course presents current trends in science related to friction and wear, including the concept of so-called "green tribology", which includes lubricants that radically reduce the coefficient of friction and construction materials using waste as an ingredient

Course-related learning outcomes

Knowledge

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

1) global achievements, covering theoretical foundations as well as general and selected specific issues that are relevant to tribology and surface engineering, to the extent that enables revision of existing paradigms, [P8S_WG/SzD_W01],
2) key developmental trends of tribology and surface engineering, [P8S_WG/SzD_W02],
3) scientific research methodology in tribology and sciences related to solid mechanics and surface physiochemistry, [P8S_WG/SzD_W03],
4) fundamental dilemmas of the contemporary civilization concerning climate protection and counteracting the greenhouse effect resulting from energy losses generated by friction, [P8S_WK/SzD_W05],
5) economic, legal, ethical and other vital conditions related to scientific activity,, [P8S_WK/SzD_W06],
6) basic principles of knowledge transfer to the economic and social sphere as well as those of commercialization of 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 knowledge from different branches of science to creatively identify, formulate and innovatively solve complex problems or perform research tasks in tribology and surface engineering, [P8S_UW/SzD_U01],
2) critically analyse and assess scientific research results, work of experts and other creative activities together with their contribution to knowledge development, [P8S_UW/SzD_U02],

3) transfer the results of scientific activity to the economic and social sphere in the context of counteracting the negative effects of friction, [P8S_UW/SzD_U03],
4) communicate on specialist issues on the level that allows active participation in the international scientific community, [P8S_UK/SzD_U04],
5) share results of scientific activity also in a popular form, [P8S_UK/SzD_U05],
6) initiate debates, [P8S_UK/SzD_U06],
7) take part in scientific discourse, [P8S_UK/SzD_U07],
8) plan and implement individual and team research projects, also in the international community – in this case in the sciences related to friction, wear and lubrication, [P8S_UK/SzD_U09].

Social competencies

A PhD student who graduated from doctoral school is ready to:
1) critically assess achievements within a given scientific discipline, [P8S_KK/SzD_K01],
2) critically evaluate their own contribution to development of a given scientific discipline, P8S_KK/SzD_K02],
3) acknowledge the importance of knowledge in solving cognitive and practical problems, [P8S_KK/SzD_K03].

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
W01, W02, W03, W05, W06, W07	Final test, discussion during classes	Number of points (test + discussion)
U01, U02, U03, U04, U05, U06, U07, U09	Final test, discussion during classes	Number of points (test + discussion)
K01, K02, K03	Final test, discussion during classes	Number of points (test + discussion)

Programme content

Basic information on friction, wear and lubrication. Trends in modern tribology (based on research conducted at the Poznań University of Technology).

Course topics

Lecture 1 - Basics: friction classification, wear mechanisms, types of lubrication.
Lecture 2 - Green Tribology: Superlubricity, bio-composites, examples of anti-wear strategies.

Teaching methods

Lectures (multimedia presentation), discussion.

Bibliography

G.W. Stachowiak, A. W. Batchelor, Engineering tribology, 4th ed., Elsevier, 2014.
I. Hutchings, P. Shipway, Tribology, 2nd ed., Elsevier, 2017.

Additional

Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1,0
Classes requiring direct contact with the teacher	4	0
Doctoral student's own work (literature studies, preparation for tutorials, project preparation) [1]	21	1,0

[1] delete or add other activities as appropriate