



## KARTA OPISU PRZEDMIOTU - SYLABUS

Subject name

Tribology of mechatronics devices

Subject

Field of study

Mechatronics

Studies in the field of (specialty)

Study level

First-cycle studies

Form of study

full-time

Year / Semester

3/5

Profile of studies

general academic

Language of the course

English

Requirements

### Number of hours

Lecture

15

Laboratories

15

Others (e.g., online)

0

Exercises

0

Projects/seminaries

0

### Number of ECTS points

2

### Lecturers

Responsible for the subject/lecturer:

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ul. Piotrowo 3 60-965 Poznań

Responsible for the subject / lecturer:

### Prerequisites

A student has a basic knowledge of physics, mathematics, mechanics, materials science.

### The objective of the Subject

Increasing competence in the field of preventing and controlling consumption processes, human and environmental impact on technical objects in existence subsequent stages, constructing of kinematic nodes in the context of wear processes, selection of lubricants.

### Subject learning effects

Knowledge

1. Characteristics of the phases of the existence of technical objects - [K2\_W10]



2. Definition of terminology in the field of machine operation - [K2\_W04]
3. Definition of basic concepts in the field of machine reliability - [K2\_W04]
4. Characteristics of phenomena on the surface of solids in mutual contact - [K\_W10]
5. The basis of the processes of wear of machine parts and assemblies - [K2\_W10]
6. Sources of damage in the technical objects life cycle, including the human factor - [K2\_W08]

#### Skills

1. Know the sources of information about operational problems - [K2\_U19]
2. Assess the impact of a complex structure on its reliability - [K2\_U19]
3. Know the essence of machine parts wear processes, can apply appropriate construction materials - [K2\_U03]
4. Know the impact of phenomena occurring during the contact of solids on the operation of kinematic nodes - [K\_U19]
5. Understand the role of man in the formation of damage and failure states of technical systems - [K2\_U22]
6. Identify the causes of wear of machine parts and assemblies based on the symptoms and intensity of wear - [K2\_U22]

#### Social competence

1. Is aware of the effects of engineering activities in the technical and non-technical areas. Is aware of the impact of decisions and responsibility for decisions - [K2\_K02]
2. Is aware of the social role of a technical university graduate, understands the need for formulation and transfer to the public, in particular through the mass media, information and opinions on the achievements of technology and other aspects of engineering activities; makes efforts to provide information and ideas in a commonly understandable way for different points of view - [K2\_K07]

#### **Methods for verifying learning effects and evaluation criteria**

The learning effects presented above are verified as follows:

Lecture: an evaluation based on control work and verbal discussion. Positive evaluation if a minimum of 3 points is obtained. Laboratory: an evaluation based on a report made during laboratory classes, under the supervision of the lecturer.

#### **Program content**

Operating strategies. The physical phenomena occurring in the contact zone between solid bodies. Friction processes for metals and non-metals. Friction in extreme conditions. Common types of lubrication of kinematic nodes. Tribological and tribo - chemical wear processes - nature and symptoms. Types, occurrence, and prevention methods of corrosion. Properties and characteristics of solid, liquid,



and gas lubricants. Classification, selection methods, and application of lubricants. The relationship between lubrication and efficiency. Degradation and aging of consumer products (e.g., laptop, passenger car, household appliances). Causes and sources of damage in subsequent stages of the technical object's existence. Human participation in the chain of events leading to mechanical failure and disasters. Basic concepts of reliability. Materials resistance to wear. Laboratory studies: experimental tests of friction, wear and lubrication with devices in the following systems: pin-on-disk, block-on-ring, rolling friction with slip, oscillating linear motion, empirical testing of selected lubricants, prevailing conditions modeling in the contact zone of cooperating solids.

### Didactic methods

Lecture: multimedia presentation, presentation illustrated with examples, discussion, and analysis of problems.

### Literature

Basic

1. G.Stachowiak, A.W.Batchelor: Engineering Tribology, Butterworth-Heineman, 2013
2. I. Hutchings, P.Shipway: Friction and wear of engineering materials, Butterworth-Heineman,2017
3. G.Stachowiak, A.W.Batchelor: Experimental methods in Tribology, Elsevier, 2004
4. M. Hebda, A Wachal: Trybologia, WNT, 1999 .
5. H. Czichos, Tribology, Elsevier, 1978.

Supplementary

1. W. Neville, P.Sachs: Practical Plant Failure Analysis, CRC Press, Boca Raton 2007.
2. H. Bloch, F. Geitner: Practical Machinery Management for Process Plants Vol.1,2,3, Gulf Professional Publishing, Houston 19993. H. Bloch, F. Geitner: Practical Machinery Management for Process Plants Vol.1,2,3, Gulf Professional Publishing, Houston 1999
3. A. Podniadło: Paliwa, oleje i smary w ekologicznej eksploatacji, WNT,2002

### Balance of workload of an average student

	Hours	ECTS
Total workload	50	2,0
Classes requiring personal contact with the teacher	35	1,5
Student's work (literature studies, preparation for laboratory classes/exercises, preparing for tests/exam, preparing of the project) <sup>1</sup>	15	0,5

<sup>1</sup> niepotrzebne skreślić lub dopisać inne czynności