



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Exploitation of consumer goods

### Course

Field of study

Management and Production Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

part-time

Year/Semester

4 / 8

Profile of study

general academic

Course offered in

polish

Requirements

elective

### Number of hours

Lecture

10

Laboratory classes

8

Other (e.g. online)

Tutorials

Projects/seminars

### Number of credit points

3

### Lecturers

Responsible for the course/lecturer:

PhD Rafał Talar

Responsible for the course/lecturer:

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Faculty of Mechanical Engineering

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### Prerequisites

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

### Course objective

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.

### Course-related learning outcomes

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 competences

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 outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: an evaluation based on a colloquium consisting of 5 questions evaluated 0, 0.5 point, 1 point. 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.

#### Programme 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.

### Teaching methods

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

### Bibliography

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.

Additional

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

### Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	35	1,5
Student's own work (literature studies, preparation for laboratory classes, preparation for tests, report preparation) <sup>1</sup>	40	1,5

<sup>1</sup> delete or add other activities as appropriate