



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Problems of hydrodynamic lubrication

### Course

Field of study

Mechanical and Automotive Engineering

Area of study (specialization)

Hybrid powertrain systems

Level of study

Form of study

Year/Semester

1/2

Profile of study

Course offered in

polish

Requirements

### Number of hours

Lecture

30

Laboratory classes

0

Other (e.g. online)

0

Tutorials

15

Projects/seminars

0

### Number of credit points

3

### Lecturers

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

Responsible for the course/lecturer:

### Prerequisites

Knowledge: Base knowledge in design and function of combustion engines; base knowledge in mechanics of fluids

Competences: Ability to read and understand diagrams, technical sketches etc.

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 thermodynamics and fluid mechanics to the extent necessary to understand the principle of operation and calculations of thermodynamic and flow processes occurring in working machines such as heating, cooling, drying, thermal and pressure agglomeration, etc., pneumatic transport, energy conversion, etc.

Has extensive knowledge of the processes taking place in the surface layer of machine structural elements and surface engineering methods.

Has general knowledge of standardization, EU recommendations and directives, national, industry and international standards systems, and industrial standards.

#### 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.

Is able to carry out basic measurements of mechanical quantities on the tested working machine with the use of modern measuring systems.

#### Social competences

He is ready to critically assess his knowledge and received content.

It is ready to initiate actions for the public interest.

Is ready to fulfill professional roles responsibly, taking into account the changing social needs, including.

### 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

- Parts of the piston-cylinder group: materials, design and function
- Methods for oil film parameter calculation
- Navier-Stokes equation in the application to the cylinder liner and journal bearings
- Nanomaterials in friction and lubrication

### Teaching methods



various

## Bibliography

Basic

1. Iskra A., Dynamika mechanizmów tłokowych silników spalinowych. Wydawnictwo Politechniki Poznańskiej, Poznań 1995
2. Zima S., Kurbeltriebe. Vieweg GmbH. Braunschweig, Wiesbaden 1999

Additional

Köhler E., Verbrennungsmotoren ? Motormechanik, Vieweg ? ATZ-MTZ-Fachbuch, Braunschweig/Wiesbaden 2002

## Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	45	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	30	1,0

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