COURSE DESCRIPTION CARD - SYLLABUS

Course name
Problems of hydrodynamic lubrication [S2MiBP1-HSN>PHSiŁ]

Course

Field of study
Mechanical and Automotive Engineering

Year/Semester
1/2

Area of study (specialization)
Hybrid Powertrain Systems

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

3,00

Coordinators

dr hab. inż. Jarosław Kałużny prof. PP
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Lecturers

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 scetches etc. Social competences: Understanding of continuous personal developement; 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:

Learning outcomes presented above are verified as follows:
Discussion during the lesson
Mutual or written exam

Programme content

Design of the friction components in the internal combustion engine.
Hydrodynamic theory of lubrication.
Nanotechnology for lubricants.

Course topics

- Components of the piston-ring-cylinder group, their design, functions and materials.
- Methods foe oil film parameter calculations.
- Navier-Stocks equations, solutions for piston skirt and journal bearing.
- Nanomaterials in friction and lubrication.
- Design of the crankshaft.
- Design of friction related components of the internal combustion engine.
- Friction losses in the internal combustion engine.
- Hydridynamic theory of lubrication.
- Calculations of friction losses according to the hydrodynamic theory of 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	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00