

## Tárgytematika / Course Description

### Tribology + Failure analysis

AJNM\_BMTA032

**Tárgyfelelős neve /**

**Teacher's name:** dr. Knaup Jan Christopher

**Félév / Semester:** 2022/23/2

**Beszámolási forma /**

**Assesment:** Vizsga

**Tárgy heti óraszám /**

**Teaching hours(week):** 2/0/2

**Tárgy féléves óraszám /**

**Teaching hours(sem.):** 0/0/0

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### OKTATÁS CÉLJA / AIM OF THE COURSE

#### Aim of the course:

During the semester, the students have to learn the basics of the tribology, and its importance in the field of the internal combustion engine development phases. The students have to know after the course the friction and wear mechanism, the importance of the lubrication, the content and their dependence of the lubricants. In this course the several tribological (friction, wear and lubrication) measurement methods have to be also known.

In the second half of the semester, the students have to learn the basics and importance of the failure analysis of the machine parts. They also have to learn the investigation methods of these failures.

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### TANTÁRGY TARTALMA / DESCRIPTION

#### Agenda of the subject:

- Week 1: Introduction in the science tribology, tribological basics, tribological system, technical surfaces
- Week 2: Basics of the friction, friction states, friction mechanismen
- Week 3: Basics of the wear, wear mechanismen, wear reduction possibilities in the engines
- Week 4: Lubrication system, lubricants, additives
- Week 5: Tribological investigation methods, in case of the friction and lubrication
- Week 6: Tribological investigation methods, in case of the wear
- Week 7: Tribological analysis of the engine parts
- Week 8: Written test
- Week 9: Introduction in the failure analysis of the machine parts
- Week 10: Investigation methods, Hypotheses and their confirmation

- Week 11: Cracks, tough cracks, frigid cracks and their signs on the broken surface
  - Week 12: Fatigue break, thermic break, cavitation breaks
  - Week 13: Analyse of a broken engine part in the microscope laboratory
  - Week 14: Analyse of a broken engine part in the microscope laboratory
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## **SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE / ASSESMENT'S METHOD**

### **Testing and evaluating:**

- The students have to write one written test at the half of the semester to earn the signature (at least 50% necessary).
  - The students have to make a literature research from a chosen topic, and they have to write a summary about the results of their research. It is also obligatory for the signature.
  - The students have to pass the exam at the exam period of the semester. This exam is written and oral.
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## **KÖTELEZŐ IRODALOM / OBLIGATORY MATERIAL**

### **Obligatory literature:**

- Gál, Péter, Auer, János: Tribológia 5. – Járműtribológia. Budapest, Tribotechnik Kft. 2003.
- P. L. Mendez, M. Nosonovsky, M. R. Lovell, S. P. Ingole, S. V. Kailas: Tribology for Scientists and Engineers, New York.
- Horst, Czichos & Karl-Heinz Habig., Tribologie – Handbuch, Deuschlang, 2010, Vieweg+Teubner Verlag, ISBN 383-48-0017-1.