

## Tárgytematika / Course Description

### Tribology of Internal Combustion Engines

AJNB\_BMTA014

Tárgyfelelős neve /

Teacher's name: dr. Hanula Barna

Félév / Semester: 2021/22/1

Beszámolási forma /

Assesment: Vizsga

Tárgy heti óraszám /

Teaching hours(week): 3/0/1

Tárgy féléves óraszám /

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

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### OKTATÁS CÉLJA / AIM OF THE COURSE

During the semester the students will learn the scientific field of tribology, its engineering use and the different development possibilities of the internal combustion engines in tribological aspect. The students have to learn the existing friction and wear mechanisms, the importance and content of lubricants as well. The course highlights also the different measurement methods for the purpose of developments.

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### TANTÁRGY TARTALMA / DESCRIPTION

- Week 1: Introduction of the scientific field tribology
- Week 2: Basics of tribology, tribological system
- Week 3: Technical surfaces, surface roughness values, tribological effects of surface structures
- Week 4: Basics of friction, friction types, mechanisms, and states. The Stribeck-curve
- Week 5: Basics of wear, wear velocity, wear mechanisms
- Week 6: Possibilities to reduce the wear: material, surface structure, heat treatment, coatings, lubricants
- Week 7: 1st test of the semester
- Week 8: Lubricants, content of lubricants: base oil and additives, viscosity and performance levels and classifications of lubricants
- Week 9: Tribological investigation methods, measurement of frictional losses
- Week 10: Tribological investigation methods, measurement of wear losses, RNT
- Week 11: Tribological evaluation of engine and vehicle subsystems: brake pad – brake disc, tyres, valvetrain
- Week 12: Tribological evaluation of engines and vehicle subsystems: crankshaft, pistons, cylinder liners, plain bearings
- Week 13: 2nd test of the semester
- Week 14: replacement tests

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### SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE / ASSESSMENT'S METHOD

- The students have to pass 2 separated tests during the semester
- Requirement of the signature: Minimum 50% from the 2 tests
- The students have to abolve an exam at the end of the semester. The type of exam is written and oral.

The evaluation of the exams:

- 0-50%: Note 1 (fail)
  - 51-65%: Note 2
  - 66-80%: Note 3
  - 81-90%: Note 4
  - 91-100%: Note 5
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### **KÖTELEZŐ IRODALOM / OBLIGATORY MATERIAL**

- 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, Deutschland, 2010, Vieweg+Teubner Verlag, ISBN 383-48-0017-1.