Tárgytematika / Course Description
Internal Combustion Engines I.

AJNM_BMTA019

Tárgyfelelős neve / Teacher's name: dr. Hanula Barna Gábor
Félév / Semester: 2026/27/1
Beszámolási forma / Assesment: Vizsga
Tárgy heti óraszáma / Teaching hours(week): 3/0/0
Tárgy féléves óraszáma / Teaching hours(sem.):

OKTATÁS CÉLJA / AIM OF THE COURSE

The goal of the subject is to create a link between fluid and thermal dynamics and real technical devices. During the semester students can deepen their technical thinking and understand the engine related thermal, flow, energetical and chemical processes. We are continously focussing on the aspects of environment and efficiency. IC engines offer an excellent opportunity to analize and to solve complex problems with a system oriented approach. In order to this the subject crosses significant formal solutions and explains the new state of the art solutions. The approach is always the logical thinking in a multi-dymension space.

TANTÁRGY TARTALMA / DESCRIPTION

- 1. week:Overview and definition of IC-engines and their parameters. Analysis of the thermodynamic cycle. Analysis of the specific fuel consumption map. Energetic approach of alternative vehicle drivetrains.

- 2. week:Gas exchange process. Bernoulli equation with losses. Flow coefficients of intake and exhaust ports. Secondary charge motion. Volumetric efficiency. Forced induction.

- 3. week:Supercharging and turbocharging. Devices and limitations of charging. Matching of engine and turbocharger.

- 4. week:State of the art supercharging systems and their archtecture.

- 5. week:Analysis of theoreticel and real thermal cycles. Definition of the ideal engine. Partition of losses.

- 6. week:Combustion and heat transfer. Fuels for Otto and Diesel engines. Ignition and flame propogation. Thermal load and stress. LCF.

- 7. week:Irregular combustion processes. Engine knock, pre-ignition. Measures to reduce irregular combustion. Possible damage pathes.

- 8. week:Written test

- 9. week:Analysis of the combustion process. Formation of pollutants, internal measures for emission reduction.

- 10. week:Exhaust gas aftertreatment. One-way, threeway catalyst, deNOx- catalyst, DPF, OPF, SCR technology

- 11. week:Mixture preparation of gasoline engines. The use of different energy sources for mixture formation.

- 12. week:Mixture preparation of Diesel engines. The use of different energy sources for mixture formation.

- 13. week:Latest trends in IC-engine development. Smart hybrid conception. LCA approach of the environmental impact of vehicles.

SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE / ASSESMENT'S METHOD

- Written test in the mid-semester (no prereqiusite of the exam)
- At the end of semester oral examination in the exam period

KÖTELEZŐ IRODALOM / OBLIGATORY MATERIAL

Obligatory literature:

- John B. Heywood: Internal Combustion Engine Fundamentals /McGraw-Hill, 1988/

AJÁNLOTT IRODALOM / RECOMMENDED MATERIAL