MF2048 Internal Combustion Engines 2 9.0 credits

Förbränningsmotorteknik 2

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for MF2048 valid from Spring 2012

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Mechanical Engineering

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After completing the course students must be able to:

•On a clear and simple way present their findings orally and in writing

•Identify the most common exhaust emissions from internal combustion engines and their impact on health and environment

After completing the course students must be able to describe:

•The combustion and emission formation in the spark ignited engine

•A turbo-supercharging systems from a performance perspective

•The combustion and emission formation in the diesel engine

•Different methods to reduce exhaust emissions from diesel engines, both in combustion and aftertreatment

•Mass forces and vibration of a single cylinder engine

•How the two-stroke engine works

•How pulses in inlet and exhaust systems affect cylinder filling

•Thoughts and reasoning in current engine development

After completing the course students must be able to demonstrate an understanding of:

•Challenges related to industrial application

• Possibilities and limitations of using a simulation program for engine performance

Course contents

The course covers combustion, exhaust emission formation and control of exhaust emissions of spark ignition and diesel engines. It covers inertia forces and two-stroke engines. Training in oral and written presentation are included. The course builds on the content of the ICE 1 and is a continuation of this.

Disposition

Combustion and formation of emissions in diesel, SI-engines and alternative combustion schemes are treated in lectures. This is followed up by laboratory exercise with combustion analyses. Laboratory exercises with measurements similar to certification illustrate the emission problem. Control systems are important for optimisation of performance and emissions. This is illustrated in lecture and laboratory exercise.

Aftertreatment systems including catalysts, SCR and particulate filters are discussed.

Ship engines are treated in lectures.

Crank mechanism kinetics is deduced directed towards 1st and 2nd order vibrations. Vibrations including torsional vibrations are treated with related mathematical problems trained.

Thermodynamic cycle calculations are performed with world leading commercial software. The computer exercises are done during scheduled time with support from instructors. The computer exercises have objectives to learn how gas exchange gas dynamics and turbocharging can be optimized for a performance target. The pulsative nature of the gas dynamics is highligted.

Engine design, material choice and production methods are treated.

Industry tours are made to study product development and engine production.

Each student chooses a subject to be presented for about 20 minutes during a randomly chosen lecture time. A lecture in presentation technique is included.

Specific prerequisites

KTH-student: Minimum 120 credits and SG1220/5C1220, MF2047/MF2015/(4F1430) or other similar knowledge.

Master Student: Bachelor in Machine Design or Chemical Sience with knowledge in Fluid Mechanics and MF2047 or similar

Other Students: Bachelor in Machine Design or Chemical Sience with knowledge in Fluid Mechanics similar to course SG1220 (6 credits) .

Documented proficiency in English B

Course literature

Bosch Automotive Handbook

Heywood Internal Combustion Engine Fundamental, McGraw-Hill

Additional literature made available during the course

Examination

- INL1 - Hand in task, 5.0 credits, grading scale: A, B, C, D, E, FX, F
- PRO1 - Project Work, 2.0 credits, grading scale: A, B, C, D, E, FX, F
- PRO2 - Project Work, 2.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Other students: To be able to follow the course you must have knowledge similar to the basic course MF2047/MF2015

Other requirements for final grade

Course final grade is a weighted average of the various parts' grades

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.