MF2016 Combustion Engines, Advanced Course 9.0 credits

Förbränningsmotorteknik, fortsättningskurs

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

Establishment

Course syllabus for MF2016 valid from Autumn 2007

Grading scale

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

Education cycle

Second cycle

Main field of study

Mechanical Engineering

Specific prerequisites

Combustion Engines MF2015 (4F1430) or corresponding.

Language of instruction

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

Intended learning outcomes

The aim of the course is to gain

- general knowledge of performance, combustion and emissions from diesel- and from SI-engines, supported by own laboratory measurements
- understanding how engine emissions can be reduced
- knowledge about electronic control systems, illustrated by a laboratory exercise on a modern engine
- knowledge about vibrations from reciprocating movements and from torque pulses, supported by own laboratory exercise
- knowledge about design and specific improvements for selected vehicle engines
- experiences in using modern simulation software to analyse and optimise engine performance
- knowledge about current and future fuels
- experience in report writing with word processor and integrating graphs from computer calculations and from measurements

experience in oral presentations within the subject.

Course contents

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 laboratory exercise.

The fuel issue is treated in lecture and in a laboratory exercise, the effect from changing to an alternative fuel is studied.

Both engine vibrations, unevenness and torsion vibrations are measured and analysed in laboratory exercise.

Thermodynamic cycle calculations are performed with world leading commercial software. The computer exercises are done during scheduled time with support from instructors. The exercises shall be documented by written reports. The computer exercises have three different objectives.

Combustion calculation on a one-cylinder model, 2-stroke engine with optimisation of exhaust system to optimise pressure waves and a turbocharged charge air cooled diesel, where the whole system including the turbo charger is simulated.

An industry tour is 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 offered in co-operation with another course

Course literature

Heywood. Internal Combustion Engine Fundamentals. McGraw-Hill and recent articles within the field of combustion and emission treating both diesel and SI-engines is the basis for the lectures.

Examination

- LAB2 - Laboratory Work, 3.0 credits, grading scale: P, F
- TENA - Examination, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Work, 3.0 credits, grading scale: P, 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.

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

Other requirements for final grade

Two Lab reports plus one lecture (LAB1; 3cr; period II), (LAB2; 3cr; period III). Written exam (TEN1; 3cr).

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.