MF2048 Internal Combustion Engines 2 9.0 credits

Förbränningsmotorteknik 2

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

Establishment

Course syllabus for MF2048 valid from Spring 2011

Grading scale

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

Education cycle

Second cycle

Main field of study

Mechanical Engineering

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 Heat transfer and MF2047 or similar

Other Students: Bachelor in Machine Design or Chemical Sience with knowledge in Fluid Mechanics similar to course SG1220 (6 credits) and MF2047. Documented proficiency in English B

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 fundamental knowledge for the design and analysis of engines for vehicle and power use, including:

• general knowledge of performance, combustion and emissions from diesel- and from SI-engines, supported by own laboratory measurements

• knowledge about ship engines and their specific development challenges

• understanding how engine emissions can be reduced including aftertreatment

• knowledge about electronic control systems

• knowledge about vibrations from reciprocating kinetics and from torque pulses

• knowledge about gas exchange process and pulsating flow including turbocharges

• experiences in using modern simulation software to analyse and optimise engine performance

• knowledge about engine lubrication and cooling and the fluid specification

• experience in report writing and with data presentation

• 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 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 turbocharg-

ing 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.

Course literature

To be decided later.

Examination

- LAB2 - Laboratory Work, 3.0 credits, grading scale: P, F
- TEN1 - Written Exam, 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.

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.