MJ2241 Jet Propulsion Engines, General Course 6.0 credits

Flygmotorteknik, allmän kurs

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 MJ2241 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

B.Sc. in Engineering with prerequisite in MJ1112 Thermodynamics 9 ECTS, MJ1401 Heat Transfer 6 ECTS and SG1220 Fluid Mechanics 6 ECTS or a combination of these subjects of at least 15 ECTS.

Documented proficiency in english B or equivalent.

Language of instruction

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

Intended learning outcomes

The course aims at giving students an overview of airbreathing propulsion engines with the main focus put on jet propulsion. Having finished the course the student shall

· Understand various types of airbreathing propulsion concepts

· Understand how thrust and shaft power are interrelated in various types of propulsion engines

· Understand and be able to explain the main components of jet engines (fan, compressor, turbine)

· Be able to perform basic thermodynamic and aerodynamic analyses of these components

· Know the mechanical design of typical jet engines

Course contents

Airbreathing propulsion is largely relying on turbomachines independent of propulsion concepts (propeller, ducted fan, future unducted fans). Especially for jet propulsion engines, turbomachines play a vital role. The reason is to be found in the unprecedented power density as well as reliability of these machines. In other words, modern air transport would not be possible without having turbomachine-powered propulsion devices in place. The present course gives an introduction into airbreathing propulsion concepts and has a clear focus on jet propulsion and turbomachinery. The aero- and thermodynamic terminology and equations relevant for these machines are discussed extensively. The essential fundamental theory is explained in an interactive and animated way. Additionally, today's and tomorrow's need for turbomachines is discussed and the future development and research needs are also elucidated. The principles of various propulsion concepts and their impact on energy usage and consequently the environmental impact are treated. Calculations and laboratory exercises are performed with the aim to understand the physical relationship between the aero- and thermodynamics of the machine as a whole a well as specific components.

The course is conceived such that the students build up a solid basic knowledge that allows them performing simple analyses on these types of machines themselves as well as that serves as foundation for further studies in this field.

Course literature

Vogt, D., 2009, "Lecture Notes in Airbreathing Propulsion and Turbomachinery", Collection of short pdf documents, KTH, Heat and Power Technology

Fransson, T. H. et. al. 2001, CompEduHPT: Computerized Educational Heat&Power Technology Program. HPT/KTH Stockholm, Sweden

Selected papers

Complementary reading (not compulsory):

Dixon, S.L., 1998

"Fluid Mechanics and Thermodynamics of Turbomachinery" Fourth edition, Butterworth-Heinemann, Woburn, MA, USA, 1998 ISBN 0-7506-7059-2

Examination

- LAB1 - Laboratory Work, - credits, grading scale: P, F
- TEN1 - Written exam, 6.0 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 requirements for final grade

Written exam (covering lectures and tutorials) (TEN1; 6cr) and approved tutorial work is required.

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.