MJ2241 Jet Propulsion Engines, General Course 6.0 credits

Flygmotorteknik, allmän kurs

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

Establishment

On 22/04/2022, the Dean of the ITM School has decided to establish this official course syllabus to apply from autumn term 2022 (registration number M-2022-0599).

Grading scale

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

Education cycle

Second cycle

Main field of study

Mechanical Engineering

Specific prerequisites

MJ1112 Applied Thermodynamics, 9 credits or the equivalent + MJ1401 Heat transfer, 6 credits or the equivalent + Fluid dynamics, 6 credits or the equivalent, or a combination of these of at least 15 credits

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 with a passing grade the student should be able to:

1. Explain and describe main principles of jet engine propulsion and describe which role turbomachines have in jet engines
2. Explain and describe work principles for typical compressible turbo machinery (turbines, compressors), as well as explain limitations for safe operation of compressors
3. Decide velocity triangles and solve problems for turbo machinery stages working in design or off-design mode, based on medium section analysis
4. Carry out design of a turbine or compressor stage to given pressure and temperature conditions, and determine design parameters
5. Carry out cycle analysis for turbojet and turbo fan engines from a given design point

Course contents

The course intends to give an overview of aircraft engines with main focus on jet engine technology and its turbomachine components. Modern aircraft engines use turbomachines to a large extent, irrespective of the propulsion principle (propeller, ”turboprop”, jet engine etc). The reason is that these types of machines mean a very favourable thrust/weight relation as well as a high grade of reliability. The course gives an overview of propulsion principles, subsequently leading into jet engines and turbomachines as their main component. The relevant aerodynamic and thermodynamic concepts are introduced and discussed, as well as applied in simple design analyses. The need for aircraft engines today and tomorrow, as well as future trends and research focuses are discussed. The different propulsion principles are analysed in view of their environmental impact both from a noise and en emission perspective. Calculation exercises and a laboratory exercise are carried out to clarify the physical relation between the aerodynamics and the thermodynamics of the machine.

Examination

- TEN1 - Written exam, 6.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Work, 0.0 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.

Quizzes (non-mandatory) are given weekly and a minimum of 75% right answers give bonus point to TEN1 if the grade awarded is E or higher.

Obsolete examination items will be assessed using supplementary tasks or complementary assignments during three years of time after the last course offering. Thereafter, the examination items according to the current official course syllabus must be carried out.

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.