

SYLLABUS

Thermal Turbomachines and Steam Boilers 7.5 credits F7014T

Termiska turbomaskiner och ångpannor

Course syllabus admitted: Autumn 2023 Sp 1 - Present

**DECISION DATE
2022-02-14**

Thermal Turbomachines and Steam Boilers 7.5 credits F7014T

Termiska turbomaskiner och ångpannor

Second cycle, F7014T

Education level	Grade scale	Subject	Subject group (SCB)
Second cycle	G U 3 4 5	Energiteknik	Energy Technology

Main field of study

Mechanical Engineering

Entry requirements

Basic mechanics (e.g. F0004T, Physics 1), basic principles on flows (e.g. F0031T, Hydromechanics), thermodynamic principles (e.g. F0032T, Thermodynamics and heat transfer). Good knowledge in English, equivalent to English 6.

Selection

The selection is based on 30-285 credits

Course Aim

After completing the course, students should:

1. Knowledge and understanding

- be able to illustrate design configurations of gas turbines, jet engines and steam boilers
- be able to identify the thermodynamic phenomena occurring in jet engines and steam boilers

2. Skills and abilities

- be able to calculate energy balances for gas and steam turbines
- be able to perform one-dimensional calculations about compressible flows
- be able to solve engineering problems about the flow in single stages of compressors and turbines
- be able to calculate energy balances and steam/water circulation in steam boilers

3. Evaluation and attitude

- be able to evaluate the influence of different design parameters on jet engine and steam boiler performance
- be able to briefly discuss the energy conversion issues in jet engines and steam boilers

Contents

One-dimensional compressible flow in nozzles and channels with and without friction and heat transfer. Elementary cascade and stage theory. Radial balance. Flow losses in cascades. Applications in radial and axial compressors, gas expanders and steam turbines. Heat balance calculations for boilers. Sizing of heat transfer surfaces. Two-phase flow theory. Application to circulation rate calculations for steam boilers. Two projects: 1) Prediction of thrust in an aircraft jet engine. 2) Design calculations for a steam boiler.

Realization

Each course occasion's language and form is stated and appear on the course page on Luleå University of Technology's website.

Teaching consists of lectures with theory review and problem solving. Submission of bonus assignments. Two project assignments in groups of 2-3 students.

Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided.

Item 1: individual written exam (there can be alternative examination methods) with differentiated grades in the scale G U 3 4 5. Item 2: review of project reports. Both items are required for the final grade in the course.

Unauthorized aids during exams and assessments

If a student, by using unauthorized aids, tries to mislead during an exam or when a study performance is to be assessed, disciplinary measures may be taken. The term "unauthorized aids" refers to aids that the teacher has not previously specified as permissible aids and that may assist in solving the examination task. This means that all aids not specified as permissible are prohibited. The Swedish version has interpretative precedence in the event of a conflict.

Overlap

The course F7014T is equal to MTM143

Course offered by

Department of Engineering Sciences and Mathematics

Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0002	Project	U G#	3	Mandatory	A07	
0003	Written exam	G U 3 4 5	4.5	Mandatory	A21	

Study guidance

Study guidance for the course is to be found in our learning platform Canvas before the course starts. Students applying for single subject courses get more information in the Welcome letter. You will find the learning platform via My LTU.

Last revised

by Niklas Lehto, Programme Director 2022-02-14

Syllabus established

The syllabus was established by the Department of Applied Physics and Mechanical Engineering 2007-02-28, and remains valid from autumn 2007.