



# MJ2425 Cooling of Electronics

## 6.0 credits

### Elektronikkyllning

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 MJ2425 valid from Autumn 2011

### Grading scale

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

### Education cycle

Second cycle

### Main field of study

Mechanical Engineering

### Specific prerequisites

MJ1401 Heat transfer and SG1220 Fluid mechanics for engineers or SG1217 Fluid Mechanics Basic Course, or equivalent courses

### 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 give knowledge concerning cooling problems in electric and electronic systems, as well as knowledge about methods for thermal design of such systems.

After this course the student should be able to:

- describe, and assess cooling problems in electric and electronic systems
- perform thermal design work using methods such as:
  - compact models of electronic components
  - the air efficiency method for selection of fans
  - the thermal territory method
- design heat sinks, and assess the impact of flow bypass
- describe and apply different compact models for characterization of components
- describe different liquid cooling techniques and assess their capability and applicability
- assess the capability and applicability of different commercial calculation tools.

## Course contents

A brief repetition of the basics of refrigeration. Characterization of electronic components. The cooling efficiency concept, the air efficiency method for choice of fans. The thermal territory method for placing of components on circuit boards. Optimization of fin distances. Design of heat sinks in open geometries. Approximation of contact resistances. Liquid cooling in one-phase and two-phase. Orientation about commercial calculation tools (FEM- and CFD-programmes).

## Course literature

Mälhammar, Å.: Thermal design for Electronics, 2003  
Palm, B.: Short notes on heat transfer

Handouts

## Examination

- LAB1 - Laboratory Work, - credits, grading scale: P, F
- PRO1 - Project, 1.5 credits, grading scale: P, F
- TEN1 - Examination, 4.5 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 (TEN1; 4,5 cr)  
Student project (SEM1; 1,5 cr)  
Lab work (LAB; 0 cr)

## 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.