

SYLLABUS

Electricity and thermodynamics 7.5 credits F0061T

Ellära och termodynamik

Course syllabus admitted: Autumn 2023 Sp 1 - Present

**DECISION DATE
2022-02-14**

Electricity and thermodynamics 7.5 credits F0061T

Ellära och termodynamik

First cycle, F0061T

Education level	Grade scale	Subject	Subject group (SCB)
First cycle	G U 3 4 5	Fysik	Physics

Entry requirements

In order to meet the general entry requirements for first cycle studies you must have successfully completed upper secondary education and documented skills in English language and Documented skills in English language. Additionally you should have knowledge corresponding the course Mechanics and experimental methods (F0060T) and Differential Equations and Transform Theory (M0052M) or equivalent

Selection

The selection is based on 1-165 credits.

Course Aim

After a successfully completed course, the student should:

1. Knowledge and understanding

Thermodynamics:

- define, explain and use fundamental concepts and relationships in classical thermodynamics: with focus on the first and second law of thermodynamics
- describe some of the important technological applications in relation to sustainable energy development
- explain the physical principles of heat transfer (for conduction, radiation and convection)

Electricity:

- explain the origin and the effect of electrostatic and magnetostatic fields, including their interaction
- describe electrical components and explain their function in circuits
- explain the principles of alternating (AC) and direct (DC) current

2. Competence and skills

Thermodynamics:

- apply the laws of thermodynamics for calculations on liquids and ideal gases in closed and open systems
- calculate the efficiency of thermodynamic cycles with applications on steam machines and heat pumps
- apply the physical principles of heat transfer (for conduction, radiation and convection) to calculate heat transport in various applications

Electricity

- analyze and measure circuits with resistors, capacitances and inductances
- analyze DC circuits, voltage drop and power calculations
- analyze simple AC circuits

3. Judgement and approach

- have the ability to estimate the plausibility of the obtained result
- describe in a general way, some applications for the phenomena discussed during the course
- Be able to argue from a scientific point of view and be able to discuss technological applications

Contents

Thermodynamics

Classical thermodynamics, state equations and properties of the ideal gas and real substances
The first and second law of thermodynamics
State changes and ideal thermodynamic cycles such as the Carnot, Otto, Diesel and Stirling cycle
Heat pumps, refrigerators and steam engines
Heat transfer

Electricity

Electrostatics and DC current
Magnetic forces and fields
Basic methods for analysis of linear electrical circuits.
Circuits with resistors and capacitors
Kirchhoff's laws, passive components
Digitization and electric measurements
Basic AC power
Analysis of L-R-C circuits
Examples of applications

Realization

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

The theoretical part of the course will be taught in form of lessons, including demonstrations and problem solving. In order to reach the aim of the course, the student is encouraged to attend the lessons, read the course literature and solve the recommended exercises.

The student will have the opportunity to develop their ability to work in groups during the two compulsory practical sessions. During these two sessions in the laboratory, the students will be able to improve their ability to plan, structure and execute the experiment, while further developing their computer skills by using software such as Excel for data analysis. A written report containing the results obtained during the practical sessions is required.

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.

Written exam at the end of the course and compulsory midterm exam. Also, compulsory laboratory work with written reports summarizing the results from the practical sessions.

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.

Remarks

This course can not be included in any degree in combination with F0004T Completion course Thermodynamics or W0012T

Overlap

The course F0061T is equal to F0004T, W0012T, F0064T

Course offered by

Department of Engineering Sciences and Mathematics

Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0004	Practical sessions and written reports	U G#	1.5	Mandatory	A21	
0005	Midterm exam	G U 3 4 5	1.5	Mandatory	A21	
0006	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

by Niklas Lehto 2019-02-15