Thermal physics

Värmelära
4 credits

Programme course

TFYI04

Valid from: 2024 Spring semester

Determined by	**Main field of study**	
Board of Studies for Electrical Engineering, Physics and Mathematics	Applied Physics	
Date determined	**Course level**	**Progressive specialisation**
2023-08-31	First cycle	G1X
Revised by	**Disciplinary domain**	
	Technology	
Revision date	**Subject group**	
	Physics	
Offered first time	**Offered for the last time**	
Spring semester 2023		
Department	**Replaced by**	
Institutionen för fysik, kemi och biologi		

Course offered for

- Bachelor of Science in Applied Physics

Prerequisites

Calculus in one variable. Basic physics.

Intended learning outcomes

The purpose of the course develop the student´s knowledge in thermal physics. After completing the course, the student should be able to:

- solve problems in thermal physics by using fundmental concepts and relations
- determine thermal properties of matter and analyze thermodynamics processes
- explain phenomena and relate the theory to applications
- carry out experiments in thermal physics and analyze the results.

Course content

- Fundamental concept: Temperature, heat, work, internal energy. The Kelvin scale. Thermal equilibrium. The fundental laws of thermodynamics. Entropy (both macroscopic and microscopic perspectives).
- Thermal properties of matter: Thermal expansion. Kinetic theory of gases. Ideal-gas equation. Degrees of freedom and equipartition of energy. Heat capacities. Phase transformation. Heat conduction. Heat radiation, the Stefan-Bolzmann law, and emissivity.
- Thermodynamic processes (isothermal, adibatic, etc.)
- Heat engines, refrigirators, and heat pumps. The Carnot cycle. Working cycles and technical implemantation of real heat engines and refrigirators. Calculation of the coefficient of performance.
- Models for earths energy balance and the global green house effect is discussed in connection to heat radiation.

Teaching and working methods

Lectures, problem solving sessions, and laboratory work.

Examination

TEN1	Written Examination	3 credits	U, 3, 4, 5
LAB1	Laboratory Work	1 credits	U, G
KTR1	Optional Assignment	0 credits	U, G

Grades for examination modules are decided in accordance with the assessment criteria presented at the start of the course.

Grades

Four-grade scale, LiU, U, 3, 4, 5

Other information

About teaching and examination language

The teaching language is presented in the Overview tab for each course. The examination language relates to the teaching language as follows:

- If teaching language is “Swedish”, the course as a whole could be given in Swedish, or partly in English. Examination language is Swedish, but parts of the examination can be in English.
- If teaching language is “English”, the course as a whole is taught in English. Examination language is English.
- If teaching language is “Swedish/English”, the course as a whole will be taught in English if students without prior knowledge of the Swedish language participate. Examination language is Swedish or English depending on teaching language.

Other

The course is conducted in such a way that there are equal opportunities with regard to sex, transgender identity or expression, ethnicity, religion or other belief, disability, sexual orientation and age.

The planning and implementation of a course should correspond to the course syllabus. The course evaluation should therefore be conducted with the course syllabus as a starting point.

The course is campus-based at the location specified for the course, unless otherwise stated under “Teaching and working methods”. Please note, in a campus-based course occasional remote sessions could be included.