IF1601 Physics part 1, Thermodynamics and Wave Physics 6.0 credits

Fysik del 1, termodynamik och vågrörelselära

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

Establishment

Course syllabus for IF1601 valid from Autumn 2009

Grading scale

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

Education cycle

First cycle

Main field of study

Physics, Technology

Specific prerequisites

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 the students basic knowledge and know-how in wave physics and thermodynamics so that they can apply this on realistic problems.

After the course, the students should be able to

- identify a wave equation and know its solutions

- relate a real harmonic or spherical wave to its mathematical description

- apply basic concepts such as interference, beats, diffraction, Doppler effect, standing waves and polarisation

- apply idealised thermodynamic processes (isobaric, isovolumetric, isothermal and adiabatic process) both individually and when combined for describing an engine

- maitrise the first and second law of thermodynamics and being able to use this for calculations of energies and entropies

- relate the energy flow in a thermodynamic process to the thermal efficiency for engines and to the coefficient of performance for heat and cooling machines to allow for calculations

- make calculations on heat transfer problems (radiation, convection, heat conduction)

- describe statistical distributions of particles and being able to use them for simple calculations

- apply all above in order to create calculable models of realistic, real problems

- for higher grades, the student should in addtion be able to apply all above in various areas of wave physics and thermodynamics including applications not discussed in the course

- perform and criticially analyse the results of some physics experiments and report the results in a well written and concise report

Course contents

Wave equation, harmonic and spherical waves, wave propagation. Mechanical waves, intensity, reflection, standing waves. Electomagnetic waves, polarisation, interferens, diffraction, lasers, fiber optics, geometrical optics. Gas laws, kinetci gas theory. The first and second law of thermodynamics, energy and entropy. Thermodynamic processes, Carnot process, thermal efficiency, coefficient of performance. Heat transfer (radiation, convection, heat conduction). Introduction to statistical physics, Bose-Einstein, Fermi-Dirac and Maxwell-Boltzmann distributions

Course literature

O. Beckman, G. Grimvall, B. Kjöllerström och T. Sundström, Energilära, Liber AB (2005), ISBN 91-47-05218-X

G. Jönsson och E. Nilsson, Våglära och optik, Teach Support (2008), Lund, ISBN 978-91-972499-6-3
Lab instructions supplied by the course coordinator.

Examination

- TEN1 - Examination, 4.5 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Work, 1.5 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.

Other requirements for final grade

Written exam (TEN1, 4.5 hp), grade A/B/C/D/E/Fx/F
Laboratory work (LAB1, 1.5 hp), grade Pass/Fail
Additional points on the exam from home excercises are only valid until the next years course starts.

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.