

SYLLABUS

Statistical Physics and Thermodynamics 7.5 credits F7035T

Statistisk fysik och termodynamik

Course syllabus admitted: Spring 2024 Sp 3 - Present

**DECISION DATE
2023-06-15**

Statistical Physics and Thermodynamics 7.5 credits F7035T

Statistisk fysik och termodynamik

Second cycle, F7035T

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

Entry requirements

Quantum physics (F0047T) or equivalent, as well as basic programming skills. Good knowledge in English, equivalent to English 6.

Selection

The selection is based on 30-285 credits

Course Aim

After a successfully completed course, the student should be able to:

1. Knowledge and understanding

- Define the basic assumptions of statistical physics.
- Explain the implications of the microcanonical, canonical and grand canonical ensembles.
- Discuss the macroscopic and the microscopic description of temperature, entropy and free energy.
- Describe Bose-Einstein and Fermi-Dirac distribution functions and the classical limit.
- Define and properly use concepts such as Helmholtz free energy, Gibbs free energy and entropy.

2. Competence and skills

- Use the basic concepts in statistical physics
- Apply the Bose-Einstein and Fermi-Dirac distribution functions
- Perform basic meanfield calculations
- Plan and write a basic Monte-Carlo program
- Solve practical problems within the course's relevant areas.

3. Judgement and approach:

- Analyze, present and discuss the results from Monte Carlo simulations.
- In scientific terms, give feedback and discuss your own and your colleagues' projects.

Contents

States, ergodic assumption, partition function, entropy, micro canonical, canonical and grand canonical ensemble, temperature, reversibility, ideal gas, Maxwell-Boltzmann distribution, Gibbs distribution, Fermi and Bose statistics, free energy, mean field theory, critical exponents, scaling theory, diffusion, Brownian motion.

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, including problem solving, will be taught in form of lessons. The course includes a couple of programming exercises which give the student the opportunity to improve their programming skills. The student has to present the results of one of these exercises in a written report and as a poster. Attendance to the poster presentation is compulsory.

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.

Compulsory oral poster presentation and written report on the programming exercise: 'Monte Carlo project' (2.5 credits).

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 F7035T is equal to F0018T

The course F7035T is equal to MTF115.

Course offered by

Department of Engineering Sciences and Mathematics

Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0001	Written exam	G U 3 4 5	5	Mandatory	S12	
0003	Project and oral presentation	U G#	2.5	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.

See also

<http://staff.www.ltu.se/~weber/kurs/statmek/kursprog.html>

Last revised

by Mats Näsström, acting Head of Undergraduate Education 2023-06-15

Syllabus established

by Department of Engineering Sciences and Mathematics 2011-02-07