

Statistical Mechanics WS 2021/22

<https://www.physik.uni-kl.de/eggert/statmech/>

Lectures: Tue 12:00-13:30 and Thu 12:00-13:30 in 46-270
Sebastian Eggert Office 46-551, Tel.: 205-2375, e-mail: eggert@physik

Exercise group lecturers:

Mathis Giesen Office 46-554, Tel.: 205-2299, e-mail: jmgiesen@rhrk
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Christopher Mink Office 46-574, Tel.: 205-3158, e-mail: cmink@rhrk

Literature: Recommended text book: Schwabl: Statistische Mechnik (Springer)
Other books: R.K. Pathria: Statistical Mechanics (Pergamon Press)
Landau-Lifschitz: Statistische Physik (Akademie-Verlag)
Baierlein: Thermal Physics (Cambridge University Press)
Reichl: A Modern Course in Statistical Physics (Wiley)

Certificates:

Pass/fail certificate for exercises or graded certificate for exam are possible. Please find out what is required for your course of study.

1) Excercises 1-3 homework exercises per week. „*He who can do nothing understands nothing.*“ (Paracelsus). Pass certificate requires 50% of all points.

2) Exam on **Feb 10th, 2022.** Required for graded certificate. Admission requirement: pass of exercise part 1).

Corona Rules:

- Lectures will take place in person in room 46/270. Zoom participation will only be available as an exception or if the situation changes.
- For seat arrangement in a checker board pattern a mask is no longer mandatory. However, if you have an immediate neighbor (front/back/side) please keep your mask on.
- Contact tracing takes place via Intake. QR Code can be obtained on the following web site: <https://kontaktverfolgung.uni-kl.de/> and should be kept on smart phone or as a print out. Please link your vaccination status or testing status with this code, since you are required to be tested or vaccinated, which may be checked occasionally.
- All exercises and class materials can be found at this web site: <https://www.physik.uni-kl.de/eggert/statmech/>
- The organization of exercise groups and hand-ins (electronically or in paper) will be discussed by your group lecturer. Each participant must provide his/her own solution. Partner work is encouraged, but must be handed in separately.

Contents:

- 1) Recapitulation of Thermodynamics
laws of thermodynamics, equations of state, thermodynamic cycles, thermodynamic potentials, Maxwell's relations
- 2) Foundations of Statistical Mechanics
Mikrocanonical und canonical ensembles. Entropy.
- 3) Non-interacting Models
Real gases, black body radiation, polymers, specific heat of phonons.
- 4) Quantum statistics und quantum gases
Bose-Einstein and Fermi-Dirac Statistics, photons, electrons
- 5) Phase Transitions
Clausius Clapeyron, Van der Waals gas, critical phenomena, Ising-Model