Statistical Mechanics (Physics 219), Spring 2018

Date and time: Mondays and Wednesdays, 5:20–6:55pm

Webpage: https://syzranov.physics.ucsc.edu/teaching/Course219spring2018/StatMech.html

Instructor: Sergey Syzranov, syzranov@ucsc.edu, ISB 218

Location: ISB 235

Office hours: Tuesday, 2:00-3:00pm or by appointment

Syllabus

- Statistical distributions. Entropy. Laws of Thermodynamics.
- Macroscopic parameters (pressure, temperature, magnetisation).
  Free energy and thermodynamic potentials.
- Classical ideal gas. Maxwell distribution.
- Fermi and Bose distributions.
  Ideal quantum gases. Bose condensation.
- Magnetism of ideal quantum gases. Landau diamagnetism. Pauli paramagnetism.
- Systems with variable numbers of particles. Canonical and grand-canonical ensembles.
- Non-ideal gases. Virial expansion. Van der Waals' equation.
- Landau theory of phase transitions. Mean-field theories. Critical indices.
- Solids. Heat capacitance of crystals at high and low temperatures. Phonons.
- Fluctuations. Small fluctuations in ideal gases. Fluctuation-dissipation theorem.

Mark: 60% Exam + 40% Midterm

Recommended literature

- L.D. Landau and E.M. Lifshitz, v.5 "Statistical Physics"
- K. Huang, "Statistical Mechanics"
- M. Kardar, "Statistical Physics of Particles"