

The Hebrew University of Jerusalem

Syllabus

Statistical Mechanics 1 - 77802

Last update 25-03-2025

HU Credits: 4

Degree/Cycle: 2nd degree (Master)

Responsible Department: Physics

<u>Academic year:</u> 0

Semester: 2nd Semester

Teaching Languages: English and Hebrew

<u>Campus:</u> E. Safra

Course/Module Coordinator: Dr. Ofri Telem

Coordinator Email: ofri.telem@mail.huji.ac.il

Coordinator Office Hours: Sunday 15-16

Teaching Staff:

Mr. khalaf Majed, Dr. Ofri Telem

<u>Course/Module description:</u> A graduate course in Statistical Mechanics

<u>Course/Module aims:</u>

 Solid acquaintance with equilibrium Statistical Mechanics, from Thermodynamics to interacting particles.
Foundations of statistical mechanics out of equilibrium: The Boltzmann equation, the Langevin and Fokker-Planck equations, and the Master equation.

Learning outcomes - On successful completion of this module, students should be able to:

Knowledge and advanced tools in statistical physics

Attendance requirements(%):

75

Teaching arrangement and method of instruction: Lectures and recitations

Course/Module Content:

- 1. Thermodynamics and classical Statistical Mechanics.
- 2. Systems in non trivial potentials.
- 3. Interacting magnetic systems -exact results and mean-field theory.
- 4. Interacting particles the cluster expansion, dense liquids.
- 5. Langevin and Fokker-Planck equations.
- 6. The Master equation.

<u>Required Reading:</u> None

Additional Reading Material:

While there are many textbooks in the field there isn't a single one that covers in a satisfactory way and with the right focus all the subjects taught in class. Some useful general texts are:

1. M. Kardar, Statistical Physics of Particles (CUP, 2007).

2. R.K. Pathria and P.D. Beale, Statistical Mechanics 3rd ed. (AP, 2011).

3. K. Huang, Statistical Mechanics 2nd Ed. (Wiley, 1987).

4. R. Livi & P. Politi, Nonequilibrium Statistical Physics - A Modern Perspective (CUP, 2017).

5. Krapivsky, S. Redner and E. Ben-Naim - A Kinetic View of Statistical Physics (CUP, 2010).

Grading Scheme:

Written / Oral / Practical Exam 80 % Submission assignments during the semester: Exercises / Essays / Audits / Reports / Forum / Simulation / others 20 %

Additional information: