

## Statistical Physics 2 schedule, 2026-27 / Fall

| Column1 | Column3               | Column4                                                                                                                                                                                                        | Column2            | Column32                                                                                                                                                                       |
|---------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| hét     | Wednesday 16:15-17:45 | Wednesday 16:15-17:45                                                                                                                                                                                          | Fri 8:15-10:45     | Friday 10:15-11:45                                                                                                                                                             |
| 1       | September 9, 2026     | <b>Part 1: Phase transitions</b><br>L1: Ferromagnetic transition (revision); conditional free energy, Ginzburg-Landau theory                                                                                   | September 11, 2026 | Tutorial: Mean field (from free energy)                                                                                                                                        |
| 2       | September 16, 2026    | L2: Scaling exponents, correlations, and connection between critical exponents.                                                                                                                                | September 18, 2026 | T: Ginzburg-Landau theory                                                                                                                                                      |
| 3       | September 23, 2026    | L3: Scaling and renormalization group                                                                                                                                                                          | September 25, 2026 |                                                                                                                                                                                |
| 4       | September 30, 2026    | L4: Superfluidity I: basic phenomena, Tisza theory, Gross-Pitaevskii theory, healing length, vortices                                                                                                          | October 2, 2026    | Supplemental lecture (L5) ?<br>on superfluids: rotons, explanation of superfluidity, time dependent Gross-Pitaevskii equation<br><b>OR</b> tutorial covering related subjects. |
| 5       | October 7, 2026       | <b>Part2: Q-statistical physics: Density operator</b><br>L6: Density operator: coupled spins, density operators, mixed and pure states                                                                         | October 9, 2026    | Test 1: Theory + Exercises<br>(Phase transitions)                                                                                                                              |
| 6       | October 14, 2026      | L7: General structure of density matrix<br>Neumann equation (spin in external field: in tutorial)<br>Time averages and equilibrium structure of DM.                                                            | October 16, 2026   | T: Density operator, mutual information, Neumann equation, Lindblad equation                                                                                                   |
| 7       | October 21, 2026      | L8: Dissipative spin dynamics, spin relaxation, Neumann entropy, and the principle of maximal entropy                                                                                                          | October 23, 2026   | <b>National holyday</b>                                                                                                                                                        |
| 8       | October 28, 2026      | <b>Part3: Q-statistical physics: Classical and quantum noise</b><br>L9: Properties of enalized dynamical susceptibility, Linear response theory, Kubo formula.                                                 | October 30, 2026   | T: Using the principle of maximal entropy                                                                                                                                      |
| 9       | November 4, 2026      | L10: Noise: Classical noise, quantum noise, and the FDT                                                                                                                                                        | November 6, 2026   | Test 2 (theory + exercises):<br>(Density operators and principles of maximal entropy)                                                                                          |
| 10      | November 11, 2026     | L11: Classical limit of FDT: Onsager's regression hypothesis, Johnson noise of resistive circuits.                                                                                                             | November 13, 2026  |                                                                                                                                                                                |
| 11      | November 18, 2026     | <b>TDK</b>                                                                                                                                                                                                     | November 20, 2026  | <b>Test 3</b> (45 minutes, theory only) + handouts for simulation homework<br>+ <b>Short lecture:</b> Markov-process, Master equation, H-theorem                               |
| 12      | November 25, 2026     | <b>Part4: Intro to non-equilibrium statistical physics</b><br>L12: H-theorem and relaxation to equilibrium<br>Monte Carlo simulations: Detailed balance, MC sampling, Metropolis algorithm, umbrella sampling. | November 27, 2026  | <b>NYÍLT NAP</b>                                                                                                                                                               |
| 13      | December 2, 2026      | L13: Brownian motion, diffusion and Langevin equation.                                                                                                                                                         | December 4, 2026   | Tutorial?: Monte-Carlo simulation                                                                                                                                              |
| 14      | December 9, 2026      | L14: Fokker-Planck equation, velocity relaxation and generalized diffusion equation.                                                                                                                           | December 11, 2026  | Tutorial: diffusion equation                                                                                                                                                   |
| 15      |                       | <b>Make-up week</b>                                                                                                                                                                                            | December 18, 2026  | <b>Test 4</b>                                                                                                                                                                  |