

## Statistical Physics 2 schedule, Fall 2019-20

| Column1 | Column2             | Column3            | Column32   | Column4   |
|---------|---------------------|--------------------|--|---|
| hét     | Tuesdys 10:15-11:45 | Fridays, 8-10      | Tuesdys 10:15-11:45  | Fridays, 8:30-10:00, F3M1?  |
| 1       |                     | September 13, 2019 |  | <b>Part 1: Phase transitions</b><br>L1: Ferromagnetic transition (revision); conditional free energy, Ginzburg-Landau theory                        |
| 2       | September 17, 2019  | September 20, 2019 | Tutorial: Mean field (from free energy)  | L2: Scaling exponents and connection between critical exponents.  |
| 3       | September 24, 2019  | September 27, 2019 | T: Ginzburg-Landau theory  | L3: Scaling and renormalization group (Kormos Marci)  |
| 4       | October 1, 2019     | October 4, 2019    |  | L4: Superfluidity I: basic phenomena, Tisza theory, Gross-Pitaevskii theory, healing length, vortices   |
| 5       | October 8, 2019     | October 11, 2019   | Test 1: Theory + Exercises (Phase transitions)   | <b>Part2: Q-statistical physics:</b><br><b>L6: Density operator</b><br>coupled spins, density operators, mixed and pure states                      |
| 6       | October 15, 2019    | October 18, 2019   |  | L7: General structure of density matrix<br>Neumann equation (spin in external field: in tutorial)<br>Time averages and equilibrium structure of DM. |
| 7       | October 22, 2019    | October 25, 2019   | T: Density operator, mutual information, Neumann equation, Lindblad equation   | L8: Dissipative spin dynamics, spin relaxation, Neumann entropy, and the principle of maximal entropy   |
| 8       | October 29, 2019    | November 1, 2019   | T: Principle of maximal entropy  | MINDENSZENTEK   |
| 9       | November 5, 2019    | November 8, 2019   | Test 2 (theory + exercises):<br>(Density operators and principles of maximal entropy)  | L9: Properties of eneralized dynamical susceptibility, Linear response theory, Kubo formula.  |
| 10      | November 12, 2019   | November 15, 2019  | TDK  | L10: Noise: Classical noise, quantum noise, and the FDT   |
| 11      | November 19, 2019   | November 22, 2019  |  | L11: Classical limit of FDT: Onsager's regression hypothesis, Johnson noise of resistive circuits.  |
| 12      | November 26, 2019   | November 29, 2019  | <b>Test 3</b> (45 minutes, theory only) + handouts for simulation homework<br>+ <b>Short lecture:</b> Markov-process, Master equation, H-theorem | Egyetemi nyílt nap  |
| 13      | December 3, 2019    | December 6, 2019   | L12: Brownian motion, diffusion and Langevin equation.   | L13: H-theorem and relaxation to equilibrium<br>Monte Carlo simulations: Detailed balance, MC sampling, Metropolis algorithm, umbrella sampling.    |
| 14      | December 10, 2019   | December 13, 2019  | L14: Fokker-Planck equation, velocity relaxation and generalized diffusion equation.   | Tutorial: diffusion equation  |
| 15      | December 17, 2019   |                    | <b>Test 4</b><br><b>+ Supplemental lecture on superfluids (L5)</b>   |   |