
WS2018/2019: Many-Body Theory in Condensed Matter

Website: https://tu-dresden.de/mn/physik/itp/ket/studium/lehre/mbt_ws18

Lectures/Tutorials: Tuesday 13:00-14:30 at SE2/102/U
Wednesday 16:40-18:10 at BZW/A120/P

Lecturer: Hong-Hao Tu (hong-hao.tu@tu-dresden.de)

Teaching assistant: Wei Zhu (wei.zhu1@tu-dresden.de)

Topics: Many-particle quantum mechanics (second quantization, path integral methods and Green's functions), interacting bosons (symmetry breaking and phase transition), interacting fermions (Fermi liquid, superconductivity, Hubbard model and strong correlations), physics in one dimension (Luttinger liquid, Haldane conjecture and several important exactly solvable models), role of topology (integer and fractional quantum Hall systems, topological phases and anyons)

Office hours: Appointment via email.

Tutorials: The solutions to the exercises will be discussed during the tutorials.

Final exam: There is no written exam. The student who needs a certificate (Schein) should correctly finish at least 60% of the exercises.

Literature:

1. N. Nagaosa, *Quantum Field Theory in Condensed Matter Physics*, Springer (1999).
2. N. Nagaosa, *Quantum Field Theory in Strongly Correlated Electronic Systems*, Springer (1999).
3. A. Altland and B. Simons, *Condensed Matter Field Theory*, Cambridge University Press (2010).
4. C. Mudry, *Lecture Notes on Field Theory in Condensed Matter Physics*, World Scientific (2014).
5. P. Coleman, *Introduction to Many-Body Physics*, Cambridge University Press (2015).
6. X.-G. Wen, *Quantum Field Theory of Many-Body Systems*, Oxford University Press (2004).
7. T.-K. Ng, *Introduction to Classical and Quantum Field Theory*, Wiley-VCH (2009).
8. E. Fradkin, *Field Theories of Condensed Matter Physics*, Cambridge University Press (2013).
9. G. D. Mahan, *Many-Particle Physics*, Plenum Press (1990).