Announcements

Brief description of the course
The course is offered to the phd, integrated phd and 4th and 5th year undergraduate students. It aims to introduce the students to the advanced topics in condensed matter physics, e.g. physics of interacting electronic systems.

Prerequisites
Quantum mechanics, basics statistical physics and condensed matter physics I (or equivalent solid state physics course).

Syllabus
renormalization, effective interaction between electrons, polarons. Transport phenomena, Boltzmann equation, electrical and thermal conductivities, thermo-electric effects.

Superconductivity—phenomenology, Cooper instability, BCS theory, Ginzburg-Landau theory.

Course outcomes
The student will learn the basics techniques to deal with interacting quantum systems, e.g. mean field theory, second quantized operators. Also transport and linear response theories that connect between theory and experimental observations are taught. It introduces theoretical framework such as BCS theory of superconductivity.

Grading policy
40% assignments, 15% mid-term, 20% project (term paper) and 25% final exam.

Assignments

Resources
4. Giuliani and Vignale, Quantum theory of the electron liquid.
5. P. Fazekas, Lecture notes on electron correlation and magnetism.
6. A. Altland and B. Simons, Condensed matter field theory.
7. P. W. Anderson, Basic notions of condensed matter physics