summer term: mandatory (physics)

Quantum Theory of Materials

- structure and bonding in materials
- modeling interactions between atoms: force-fields
- mean-field theory: Thomas-Fermi and Hartree-Fock
- ab-initio modeling: density-functional theory
- basis sets and linearized methods
- ab-initio molecular dynamics
- computing solids

summer term: mandatory (physics)

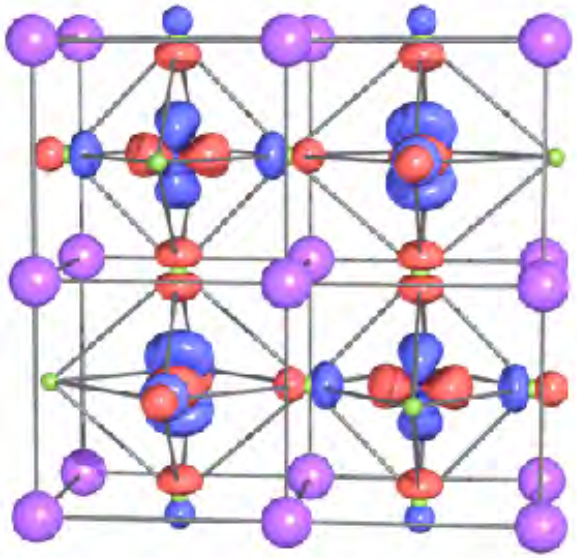
Computational Many-Body Physics

- Solid state physics as many-body problem
- Second quantization
- Fermions and Bosons
- Electron gas
- Hubbard model and *t*-*J* model
- Anderson and Kondo model
- Two-site Hubbard model, two-site Anderson model
- Matsubara formalism and many-body perturbation theory
- Green function and self-energy
- Mean-field approches
- Hartree-Fock method
- Fermi-liquid theory
- Dynamical mean field theory (DMFT)
- Mott transition
- Kondo effect

http://iffwww.iff.kfa-juelich.de/~pavarini/SS16/lecture.html

summer term: elective

Correlated Electrons



- Many-electrons in atoms, ions, and molecules
  - direct exchange and Hund's rules
  - kinetic exchange and antiferromagnetism
- crystal-field theory
  - Symmetries in solids
  - JahnTeller effect
- Mott transition and the Hubbard model
  - second quantization and configuration representation
  - limiting cases of the Hubbard model
- Mott insulators
  - t-J model and orbital ordering

www.cond-mat.de/teaching/correl/

http://www.cond-mat.de/events/correl.html

Autumn School on Correlated Electrons

The Physics of Correlated Insulators, Metals, and Superconductors

25-29 Sept 2017, Forschungszentrum Jülich

Previous Schools: 2016, 2015, 2014, 2013, 2012, and 2011