Physics 551, Syllabus

**Basic concepts about solids and surfaces:**
Bonding, crystals, liquid crystals, soft matter (polymers, biological building blocks);
Description of electrons, phonons, quasiparticles in solids and at surfaces, energy band dispersions.

**Measurement techniques (including lab visit):**
Scanning tunneling microscopy, photoelectron spectroscopy, x-ray absorption spectroscopy, X-ray diffraction, SQUID magnetometry.

**Magnetism:**
Exchange interaction, magnetic phases, magnetoresistance, magnetic data storage.

**Superconductors:**
Electron pairing, high-temperature superconductors, vortices / flux quanta.

**Semiconductors:**
Basic device structures, such as CMOS, CCD, LED, quantum well laser, solar cell.

**Low-dimensional Physics:**
Two- and one-dimensional electrons, quantum Hall effect, surfaces, nanostructures.