1. (09. + 11.10.2012, RJ) Tensors - strain and stress
   - basics of tensor algebra, transformations, invariants.
   - strain tensor: definition; shear, tensile, plane strain.
   - definition of stress tensor, sign convention.
   - principal stresses, linear and plane stress, pure shear, hydrostatic pressure.
   - Mohr-circle?

2. (16. + 18.10.2012, AL) Assessment of mechanical properties
   - Presentation of the different mechanical properties
   - linking them to physical origins (lessons 3-7)
   - exercise: tensile test in laboratory

3. (23. + 25.10.2012, RJ) Elasticity
   - Hooke’s law.
   - tensor of elastic constants, Voigt notation, crystal symmetry.
   - Lamé constants, Young’s modulus, rigidity modulus, Poisson’s ratio.

4. (30.10.2012, RJ) Stress-strain diagrams and yield surfaces
   - tensile tests, stress-strain diagrams for different materials.
   - yield surfaces, von Mises criterion, Tresca criterion.

5. (06. + 08.11.2012, RJ) Defects in solids
   - overview over 0D - 2D defects.
   - influence on mechanical and functional properties in different materials.

6. (13. + 15.11.2012, RJ) Plasticity
   - dislocation glide and climb.
   - Peierl’s stress, forces on dislocations.
   - dislocation interaction and multiplication, dislocation sources.

7. (20. + 22.11.2012, RJ) Solid-solid interfaces
   - structure models of grain and phase boundaries.
   - influence on mechanical properties.
   - influence on functional properties.

8. (27. + 29.11.2012, RJ) Assessment of materials properties by simulation

9. (04. + 06.12.2012, AL) Phases & Phase Diagrams
   - Heterogeneous Equilibrium, binary phase diagrams
   - Calphad (?)
   - Example: Fe-C diagram
   - exercise: lever-rule, labeling one- and two-phase regions

    - generation & detection of x-rays, instrumentation
    - stress analysis
    - phase analysis
    - exercise: peak identification, Bragg-condition

    - Imaging, SEM vs. TEM
    - EDX
    - EBSD

12. (08. + 10.01.2013, AL) Electric & Magnetic Properties
    - conductivity, 4-point measurements
    - metals, semiconductors, isolators, superconductors
    - remanence, coercivity
    - Hall-effect

13. (15. + 17.01.2013, AL) Thermal & Optic Properties
    - thermal expansion
    - heat conductivity
    - optical absorption
    - optical transmissivity

14. (22. + 24.01.2013, AL) Multifunctional Properties

15. (29. + 31.01.2013, RL, AL) additional dates