Jan 15  Organization of the course.  Organization of atoms, bonding, energy levels and density of states, lattices and crystal structures.

Jan 20  MLK day


Feb 24: Diffusion under very high pressure. Diffusion induced stresses. Anelasticity and internal friction. Snoek peaks. Torsion pendulum of Ke. The damping of iron due to carbon motion in the octahedral holes. Skip chapter 8 Start Chapter 9 PLASTIC deformation via dislocation motions. We already know generally about tensile tests, hardness, impact test, creep tests and fatigue tests from the mechanics of how they are done….this chapter looks at why we get the responses. We will start with the expressions for necking in tensile bars. Elastic deformation—the atomic springs approach with cross bracing. Isotropic material Moduli relations. Definitions of displacement fields, strain fields. Strain at a point and stress at a point. Hooke’s law for cubic crystals. Independent elastic constants. Some comments on the lower symmetry systems. Mention of Nye. Anisotropy of metal crystals. Plastic macro deformation criteria: Tresca and von Mises. The effective stress and strain. Micro plastic deformation


March 19: General effects of Annealing and the three stages of Annealing. Plot the strength as a measure of degree of annealing and look for peaks. RECOVERY: RECRYSTALLIZATION. Boundary mobility. Nucleation and growth as the controlling physics of recrystallization. Factors that influence recrystallization. Grain growth.....only starts after the system has completed primary recrystallization. Duplex temperatures to promote abnormal grain growth. Straight sides on grains and parallel grain boundaries are the signature of annealing twins in FCC. Textures can develop during recrystallization....new grains have orientation relationship with old ones so textures can accumulate.


April 9: We will treat very briefly plain carbon steels, alloy steels, and stainless steels and HSLA steels since they are well covered in the prerequisite course. We will discuss maraging steels and dual phase steels. We will talk about mechanically alloyed steels. We will examine


April 16: In class closed book midterm exam. There will be no homework after the exam; instead, work on your project paper.


April 30: Coatings and modification of surfaces. Chemical and physical vapor deposition. Particle bombardment and ion implantation. Diamond like films. Laser processing of surfaces. Project paper due this day during class.