ME 582/MATS 582 Rate Processes

Catalog Description: Diffusion in solids, including vacancy and interstitial and short-circuit diffusion. Phase transformations including classic nucleation and growth theory. Applications to materials development. Laboratory will emphasize microstructural evaluation and quantitative metallography.

Contact: William Warnes, 541.737.7016, Dearborn 303E

Prerequisites: Required or Elective No. of Credits Terms offered:
ME/MATS 581 Elective 4 Winter term

*It is suggested, but not required, that students have a basic understanding of the thermodynamics of solids (e.g. ME/MATS 581 Thermodynamics)

Class/Lab Schedule: 4 hours of lecture per week

Textbook or other required course materials:
R.W. Balluffi, S.M. Allen, W.C. Carter, KINETICS OF MATERIALS.

Student Learning Outcomes and mapping to Program Outcomes
At the completion of the course, students will be able to…
1. Explain the principles of nucleation theory and growth kinetics to solid state phenomena
2. Describe the principles of diffusion in crystalline solids as they apply to metal, metal oxide, and organic systems
3. Apply proper metallographic techniques to classify relevant microstructural features

Topics Covered:

- Force/Flux Couples
- Driving Forces and Fluxes
- Diffusion Equation
- Atomic Models and Crystal Diffusion
- Phase Transformations
- Nucleation
- Nucleation and Growth
- Two-Phase Microstructures
- Solidification
- Precipitation

GRADING:

Four Homework Assignments 20% total
Two Midterms 40% total
Short Lab Reports 20% total
Final Lab Project Report 20%
The grading will be based on two midterms (20% each), four homework assignments (5% each), two lab reports (10% each), and a final project paper (20%). See the schedule below for due dates of the exams and assignments. The schedule is provisional only in that the materials covered each lecture may change. Dates for homework, lab reports and exams will not change from that listed.

Statement Regarding Students with Disabilities:
"Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 737-4098."

Academic Dishonesty:
Acts of academic dishonesty (i.e. cheating, plagiarism, etc.) will not be tolerated and will be handled according to the policies of Oregon State University:

http://oregonstate.edu/admin/stucon/achon.htm

Prepared By: William Warnes
Revision Date: May 12, 2010