

UNIVERSITY OF CALIFORNIA, DAVIS
Department of Chemical Engineering and Materials Science

EMS 264: Transport Phenomena in Materials Processes

COURSE OUTLINE – Fall 2015

Instructor : Professor Sabyasachi Sen

Email : sbsen@ucdavis.edu

Lectures: MW 10:00 am-11:50pm at 1132 Bainer

Office Hours: T 2:00pm-3:00pm at 2017 Kemper

Description: A graduate course in kinetics. The objective is to address the phenomenology and the atomistic mechanisms of various transport processes in materials and how they control a wide range of phenomena encountered during synthesis and processing of materials.

Grading: Homework 50% + Midterm 25% + Final Exam 25%

Main Textbook: Kinetic Processes: Crystal Growth, Diffusion and Phase Transitions in Materials, by Kenneth A. Jackson (Wiley, 2004) [preview at <http://www.docin.com/p-33539828.html>].

References:

Physical ceramics : principles for ceramic science and engineering / Yet-ming Chiang, Dunbar P. Birnie III, W. David Kingery

Sintering: Densification, Grain Growth and Microstructure/ S. L. Kang

Fundamentals of Solidification/ W. Kurz, D.J. Fisher

Phase Transformations in Metals and Alloys/ D.A. Porter, K.E. Easterling

Kinetics of materials /Robert W. Balluffi, Samuel M. Allen, W. Craig Carter

Journal papers and lecture notes as well as homeworks etc. will be posted on the smartsite

All communications will be made via SmartSite.

Tentative Schedule:

Sept 28,30, Oct 5,7

Thermodynamics vs. Kinetics; Diffusion – basic concepts,
phenomenological treatment, atomistic mechanisms

Oct 12,14,19

Nucleation, Growth, Coarsening, Ripening

Oct 21, 26,28

Sintering phenomena

Nov 2,4,9

Solidification phenomena

Nov 9

MIDTERM

Nov 11,16

Phase Separation

Nov 18, 23

Vapor Deposition

Nov 30; Dec 2

Surface and Interface instabilities, Chemical reaction rate
theory

Week of Dec7

FINAL EXAM