Department of Materials Science and Engineering
University of Maryland, College Park, Maryland

1. **ENMA 471 – Kinetics, Diffusion and Phase Transformations**

2. **Credits and contact hours – 3 credits.** The University of Maryland follows the Maryland Higher Education Commission's policies on "contact hours;" specifically, one semester hour of credit will be awarded for a minimum of 15 hours, of 50 minutes each of actual class time, exclusive of registration, study days, and holidays.

   Schedule: meets two 75 minute periods (lecture)

3. **Instructor's or course coordinator's name: Profs. Ray Phaneuf and Manfred Wuttig**

4. **Text book, title, author and year:** D.A. Porter and K.E. Easterling, Phase Transformations in Metals and Alloys, CRC Press.
   a. **Optional supplementary materials:**
      Shape Memory Materials, K. Otsuka and C.M. Wayman, eds. Cambridge University Press 1998/2002

5. **Specific course information**
   a. **Brief description of the content of the course (catalog description):**
      Fundamentals of diffusion, the kinetics of reactions including nucleation and growth and phase transformations in materials.
   b. **Pre-requisites or co-requisites:** Must have completed or be concurrently enrolled in ENMA461. Restriction: Junior standing or higher; or permission of ENGR-Materials Science & Engineering department.
   c. **Indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program:** ENMA 471 is a required course for Materials Science and Engineering majors.
6. **Specific goals for the course:**
   a. **Specific outcomes of instruction**: The outcomes of the course are as follows:
      1. Student learns about thermal activation and the relationship to kinetics
      2. Student learns to solve diffusion problems, both steady state and transient
      3. Student learns about coarsening and grain growth.
      4. Student learns about the role of interfaces on transformations.

b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed in this course.

ABET A: Ability to apply mathematics, science and engineering principles.
ABET E: Ability to identify, formulate and solve engineering problems

7. **Brief list of topics to be covered**.
   1. Intro & Review of Equilibrium & Phase Digrams
   2. Diffusion
   3. Interfaces
   4. Solidification -Through Heterogeneous Nucleation
   5. Solidification -Through Front Velocities
   6. Solidification
   7. Solidification-Atomistic Description
   8. Growth Instabilities
   9. Growth
   10. Diffusional Transformations