

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

1. **ENMA 461 – Thermodynamics of Materials**
  
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: Prof. Yifei Mo**
  
4. **Text book, title, author and year:** Thermodynamics in Materials Science, 2nd edition, Robert DeHoff (Taylor & Francis, New York, 2006)
  
5. **Specific course information**
  - a. **Brief description of the content of the course (catalog description):**  
Thermodynamic aspects of materials; basic concepts and their application in design and processing of materials and systems. Topics include: energy, entropy, adiabatic and isothermal processes, internal and free energy, heat capacity, phase equilibria and surfaces and interfaces.
  - b. **Pre-requisites or co-requisites:** ENMA 300. Restriction: Junior standing or higher.
  - c. **Indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program:** ENMA 461 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 the conditions for thermodynamic equilibrium
    2. Student learns about thermal activation
    3. Student learns about the energetics of interfaces
  
  - 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

ABET K: Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

**7. Brief list of topics to be covered.**

1. What is Thermodynamics and what is it for?
2. The laws of thermodynamics
3. Variables and relations
4. Equilibrium
5. Statistical mechanics
6. Phase stability: Unary, Heterogeneous
7. Phase stability: Multicomponent, Homogeneous
8. Phase stability: Multicomponent, Heterogeneous
9. Phase stability: Diagram Thermodynamics
11. Phase stability: Reacting systems
12. Defects in crystals
13. Extra topics – Interfacial Energy and Electrochemistry