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

1. **ENMA 362 – Mechanical Properties**

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) and one hour lab a week

3. **Instructor's or course coordinator's name: Prof. Rama Ankem**

4. **Text book, title, author and year:** Courtney, Thomas. Mechanical Behavior of Materials. 2nd edition, 2005, Waveland Press, ISBN: 978-1577664253.

5. **Specific course information**
   a. **Brief description of the content of the course (catalog description):** Overview of Mechanical Behavior, Elastic Behavior, Dislocations, Plastic Deformation, Strengthening of Crystalline Materials, Composite Materials, High Temperature Deformation of Crystalline Materials, Permanent Deformation of Noncrystalline Materials, Tensile Fracture at Low Temperatures, Engineering Aspects of Fracture, High Temperature Fracture, Fatigue, and Experimental determination of Mechanical Properties including Hardness of Metals and Strength of Metals, Polymers, Ceramics and Composites.
   b. **Pre-requisites or co-requisites:** ENMA 300. Restriction: Junior standing or higher; and permission of the department.
   c. **Indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program:** ENMA 362 is a required course for Materials Science and Engineering majors.

6. **Specific goals for the course:**
   a. **Specific outcomes of instruction**:
   The main objective of this course is to teach how various factors such as chemical composition and microstructure effect mechanical properties of various engineering materials including metals, ceramics, polymers, and composite materials, as well as the experimental methods used to determine various mechanical properties of these engineering materials. Satisfactory completion of this course should demonstrate ability to:

1. Understand how the chemical composition and microstructure effect mechanical properties of various engineering materials,
2. Understand the ways to alter the microstructure,
3. Learn how various factors such as temperature and strain rate effect mechanical properties,
4. Learn how to experimentally determine the mechanical properties, and
5. Analyze and interpret the test data.

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 B: Ability to design and conduct experiments, analyze and interpret data.
ABET E: Ability to identify, formulate and solve engineering problems
ABET G: Ability to communicate effectively.
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. Introduction
2. Overview Of Mechanical Behavior
3. Elastic Behavior
4. Dislocations (Chapter 3)
5. Plastic Deformation In Single And Polycrystalline Materials (Chapter 4)
6. Strengthening Of Crystalline Materials (Chapter 5)
7. High Temperature Deformation Of Crystalline Materials (Chapter 7)
8. Deformation Of Noncrystalline Materials (Chapter 8)
9. Fracture Mechanics (Chapter 9)
10. Fatigue Of Engineering Materials (Chapter 12)
11. Special Topics(Handouts)