

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

1. **ENMA 470 – Materials Selection for Engineering Design**
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:** **Dr. Timothy Foecke**
4. **Text book, title, author and year:** Materials Selection in Mechanical Design, 4th edition, Ashby.
 - a. **Optional supplementary materials:** Case Studies All Along the Way; CES EduPack
5. **Specific course information**
 - a. **Brief description of the content of the course (catalog description):** Students will learn about materials classes, properties, limitations and applications and the methodology of materials selection in engineering design.
 - b. **Pre-requisites or co-requisites:** ENMA 300 and permission of the Department.
 - c. **Indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program:** ENMA 470 is a required course for Materials Science and Engineering majors.
6. **Specific goals for the course:**
 - a. **Specific outcomes of instruction:** The outcome of the course is as follows:
 1. Increase instinctive familiarity of students with materials classes, types, performance, limitations and applications

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

ABET C: Ability to design a system, component, or process to meet desired needs
ABET E: Ability to identify, formulate and solve engineering problems
ABE T H: The broad education necessary to understand the impact of engineering solutions in a global and societal context.

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 to the CES materials selection software
2. Materials Intuition 101 Typical materials---related design parameters: Easy to Hard
3. Design Considerations when using specific materials classes
4. Processing Intuition 101: Materials issues
5. Review of important "material properties": Strength, Toughness, Fatigue, Corrosion, etc.
6. The Materials Selection Process -- How to do it step by step
7. Basic design cases: yield before break, leak before yield, buckling, etc. Review of Area Moment of Inertia.
8. Cost---based decisions: strength/weight * cost, etc
9. Non---mechanical selection: Thermal, electronic, optical, etc
10. Multi---criteria
11. Conflicting criteria
12. Design for recycling/carbon footprint/energy cost / "green---ness"