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

   
   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"