

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

1. **ENMA 464 – Environmental Effects on Engineering 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 per week

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

4. **Text book, title, author and year:** Denny A. Jones, "Principles and Prevention of Corrosion, 2nd ed." Prentice Hall, 1996.

5. Specific course information

- a. **Brief description of the content of the course (catalog description):**
Introduction to the phenomena associated with the resistance of materials to damage under severe environmental conditions. Oxidation, corrosion, stress corrosion, corrosion fatigue and radiation damage are examined from the point of view of mechanism and influence on the properties of materials. Methods of corrosion protection and criteria for selection of materials for use in radiation environments.
 - b. **Pre-requisites or co-requisites:** ENMA300. Or permission of ENGR-Materials Science & Engineering department; and permission of instructor.
 - c. **Indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program:** ENMA 464 is an elective 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 fundamentals of environmental effects on materials as related to oxidation, corrosion, and radiation effects. Satisfactory completion of the course should demonstrate the ability to:
 1. Understand the basic principles of environmental effects.
 2. Identify various damage mechanisms.
 3. Suggest ways to reduce or eliminate damage due to environmental effects.

 - 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 to design

ABET C: Ability to design a system, component, or process to meet desired needs

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. Introduction To Environmental Effects
2. Technology And Evaluation Of Corrosion (Chapter 1)
3. Electrochemical Thermodynamics And Electrode Potential (Chapter 2)
4. Electro-Chemical Kinetics Of Corrosion (Chapter 3)
5. Passivity (Chapter 4)
6. Environmentally Induced Cracking (Chapter 8)
7. Atmospheric Corrosion And Elevated Temperature Oxidation (Chapter 12)
8. Cathodic Protection (Chapter 13)
9. Coatings And Inhibitors (Chapter 14)
10. Radiation Effects (Special Topic)
11. Special Topics