**ENMA 464/ENMA664 – FALL 2020**

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

**ENVIRONMENTAL EFFECTS ON ENGINEERING MATERIALS**

**COURSE 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 related environments.

**PREREQUISITES**: ENMA300/ENME382 or permission of both department and instructor.

**TEXTBOOK:** Denny A. Jones, “Principles and Prevention of Corrosion, 2nd ed.” Prentice Hall, 1996.

**COURSE OBJECTIVE:** 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.

# TOPICS 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

# CLASS SCHEDULE

**Lecture:** M,W,F 2;00 – 2:50 PM, Online

# POLICIES

**Quizzes**: Quizzes will be randomly given at anytime during the class. If a student misses the quiz due to lateness or unexcused absence, a zero will be issued to that student for that quiz.

**Attendance**: Online attendance is mandatory for the lectures. Students are required to make every reasonable effort to inform the instructor by email before the start of class if they will be absent, as well as the reason for absence. In addition, if a quiz is given on that day, the student should submit a self-signed letter explaining the reason for their absence. The letter from the student is subject to the rules of the Student Honor Code of the University of Maryland.

If a student is absent more than one time during the semester, the student is required to submit documentation signed by a health care professional justifying the absence.

# If a student is absent for Midterm Exams or Scheduled Final Term Paper Presentations and Term Paper Submissions (Major Grading Events), he or she must provide documentation of illness from a health care professional, and make every reasonable effort to notify the instructor in advance.

If a student does not follow the above instructions, the student will receive ZERO CREDIT for any grading events missed while absent. Make-up of any grading event is subject to the discretion and convenience of the instructor.

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| **Academic Integrity**: See <http://www.president.umd.edu/policies/iii100a.html> |  |

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| **GRADING** |  |
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| Quizzes | 15% |
| Homework | 15% |
| Preliminary Term Paper Presentations, September 21, 2020 | 5% |
| Midterm Exam 1, October 9, 2020 | 20% |
| Midterm Exam 2, November 20, 2020  | 20% |
| Final Term Paper Presentations: November 23rd, November 30th, December 2nd, December 4th, December 7th, December 9th, December 11th, and December 14th | 10% |
| Submission of Final Term Paper, On or Before December 19, 2020  | 15% |

Note: Final Term Paper Presentation and submission of the Term Paper Constitute the Final Exam |  |
| **Instructor: Prof. *S. Ankem*** |  |
| Bldg. 090, Room 1105 |  |
| Tel: (301) 405-5219 |  |
| E-Mail: ankem@umd.edu |  |
| **Office Hours: M, W, F: 1:00 PM- 2:00 PM ( Through email )** |  |