Syllabus for MSE 580 – Materials Forensics and Degradation  Spring 2016

Instructor: Professor Carl C. Koch  Class Hours: MW 1:30 – 2:45 pm
Office: EBI, room 3006  Office Hours: TBA
Phone: 919-515-7340  Class location: EB I, room 1011
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Course Prerequisites: MSE 370, MSE 380 or consent of the instructor

Learning Outcomes: Upon satisfactory completion of this course, students should: know the mechanisms responsible for degradation of a variety of materials classes (metals, ceramics, polymers, electronic materials); be able to design strategies to eliminate or minimize materials degradation; know the general approaches taken to analyze material failures; demonstrate the ability to correct material failures.


Course Overview: Materials forensics will describe the principles and prevention of the degradation of materials. The topics will include electrochemical corrosion of metallic materials, oxidation of metals, degradation of polymers, biodeterioration of materials, failure analysis of materials including mechanical failures and failures of electrical devices. The general practice of failure analysis will be applied to a variety of case studies to illustrate important failure mechanisms.

Tentative Schedule of Lectures.

Jan 6  Overview of course, economics of materials degradation, examples of catastrophic Materials failures.
Jan 11  Electrochemical corrosion – electrochemistry, thermodynamics
Jan 13  Thermodynamics of electrochemical corrosion, Pourbaix diagrams
Jan 20  Kinetics of electrochemical corrosion
Jan 25  Passivity
Jan 27  Specific types of corrosion – uniform attack, galvanic corrosion, crevice corrosion, etc.  Homework Set #1 due.
Course Grading:  

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Test #1</td>
<td>25%</td>
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<td>Test #2</td>
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<td>Final Exam</td>
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<tr>
<td>Homework</td>
<td>10%</td>
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<tr>
<td>Term Paper</td>
<td>15%</td>
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Grading Scale:  
Grading will follow the guidelines given below:

- 96 and above: A+  
- 92-95.9: A  
- 88-91.9: A-  
- 84-87.9: B+  
- 80-83.9: B  
- 76-79.9: B-  
- 72-75.9: C+  
- 68-71.9: C  
- 56-59.9: D  
- 52-55.9: D-  
- 51.9 and below: F
University policies that should be adhered to. The following are lists of University policies on attendance, code of behavior, and accommodations for students with disabilities that will be followed in this course.

- NCSU POL11.35.1 - Code of Student Conduct Policy
- NCSU REG02.20.3 - Attendance Regulation
- NCSU REG02.20.1 - Academic Accommodations for Students with Disabilities

Disability Services Office

For students with disabilities: Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at 1900 Student Health Center, Campus Box 7509, 515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation (REG02.20.1)

Regarding academic integrity, the Honor Pledge will be used as follows. The Honor Pledge: "I have neither given nor received unauthorized aid on this test or assignment." It is the understanding and expectation of faculty that the student's signature on any test or assignment means that the student neither gave nor received unauthorized aid.