MATL 7240: Corrosion – 3 hrs. – Current Syllabus

Course Description: Fundamentals of the chemical degradation of materials. Types and methods for prevention or minimization of corrosion.

Prerequisite: MATL 6100 or departmental approval.

I. Course Content/Objectives

1. Objectives
   Provide the student with a basic understanding of how corrosion occurs and how to apply this understanding to the prevention and control of corrosion.

2. Tentative Schedule and Outline (indicate weeks/lectures for each topic)
   Introduction ...........................................................................1 class
   Principles
   Thermodynamics ................................................................. 7 classes
      Electrode Potentials
      Pourbaix Diagrams
   Kinetics ........................................................................... 7 classes
      Exchange Current Density
      Polarization
      Mixed Potential Theory
   Passivation ................................................................. 3 classes
   Types of Corrosion
   Uniform ................................................................. 2 classes
   Localized ................................................................. 4 classes
      Galvanic/Concentration,
      Pitting/Crevise
   Synergistic ................................................................. 2 classes
      Stress
      Erosion
   Microstructure Related ........................................... 2 classes
      Intergranular
      Weld
   High Temperature ................................................... 6 classes
      Hot Corrosion
      Oxidation
   Evaluation/Experimental Methods ........................................... 2 classes
   Prevention ................................................................. 5 classes
      Cathodic Protection
      Coatings/Inhibition
   Presentations ................................................................. 2 classes
   Poster Session ................................................................. 1 class
   Exam ................................................................. 1 class
3. **Textbook**  

II. **Grading and Evaluation**

1. **Course requirements (papers, exams...)**  
   - Homework assignments
   - One exam during regular class
   - One written paper
   - One oral presentation
   - One poster presentation
   - Final exam

2. **Grading system**  
   - Homework .......................................................... 5%
   - Written paper.......................................................... 25%
   - Oral presentation ......................................................... 10%
   - Poster presentation ................................................. 10%
   - Hourly exam .......................................................... 20%
   - Final exam .................................................................. 30%

III. **Statement related to policies on unannounced quizzes and class attendance**

   Policy regarding class attendance and unannounced quizzes will be set by the individual instructor. The detailed policy and any implication on grade evaluation will be announced to the students on the first day of class.

IV. **Statement regarding students with disabilities**

   If any student needs special accommodations he/she should see the instructor to discuss the situation. The student should bring the memo from the Program for Students with Disabilities (PSD) office. If the student does not have such a memo, he/she should make an appointment at the PSD office in 1232 Haley Center (844-2096) to discuss the situation.

**JUSTIFICATION for offering MATL 6600 for Graduate Credit**

The analysis of corrosion involves thermodynamic and kinetic models and analysis which are appropriate for a graduate course. The course is also appropriate for advanced undergraduate students with a particular interest in corrosion. The course will not be required of all undergraduate students, but rather will be offered as part of a specialization series with courses in chemistry or chemical engineering.

**Syllabus Prepared by J.W. Fergus**
MATL 6600/6606: Corrosion – 3 hrs. – New Syllabus

Course Description: Fundamentals of the chemical degradation of materials. Types and methods for prevention or minimization of corrosion.

Prerequisite: CHEM 1040

I. Course Content/Objectives

1. Objectives
   Provide the student with a basic understanding of how corrosion occurs and how to apply this understanding to the prevention and control of corrosion.

2. Tentative Schedule and Outline (indicate weeks/lectures for each topic)
   Introduction ...........................................................................1 class
   Principles
   Thermodynamics .................................................................................................................. 10 classes
   Equilibrium Potentials
   Electrode Potentials
   Pourbaix Diagrams
   Kinetics ......................................................................................... 9 classes
   Diffusion
   Exchange Current Density
   Polarization
   Mixed Potential Theory
   Passivation .................................................................................. 3 classes
   Types of Corrosion
   Uniform .................................................................................. 2 classes
   Localized ...................................................................................... 4 classes
   Galvanic/Concentration,
   Pitting/Crevice
   Synergistic .................................................................................. 2 classes
   Stress
   Erosion
   Microstructure Related ..................................................................... 2 classes
   Intergranular
   Weld
   High Temperature ........................................................................ 4 classes
   Hot Corrosion
   Oxidation
   Evaluation/Experimental Methods .................................................. 2 classes
   Prevention .................................................................................. 3 classes
   Cathodic Protection
   Coatings/Inhibition
   Poster Session ...........................................................................1 class
   Exams ......................................................................................... 2 classes
3. **Textbook**

II. **Grading and Evaluation**

1. **Course requirements (papers, exams...)**
   
   Homework assignments
   
   Two exams during regular class
   
   One written paper
   
   One poster presentation
   
   Final exam

2. **Grading system**

   Homework ....................................................................................................................... 10%
   
   Poster ........................................................................................................................ .5%
   
   Term Paper ....................................................................................................................... 15%
   
   Exam 1 ....................................................................................................................... 20%
   
   Exam 2 ....................................................................................................................... 20%
   
   Final exam .................................................................................................................... 30%

3. **Grading Scale**

   \[ 90\% \leq \text{score} \leq 100\% \] .................................................................................. A
   
   \[ 80\% \leq \text{score} < 90\% \] ....................................................................................... B
   
   \[ 70\% \leq \text{score} < 80\% \] ....................................................................................... C
   
   \[ 60\% \leq \text{score} < 70\% \] ....................................................................................... D
   
   Score < 60% ................................................................................................................... F

III. **Statement related to policies on unannounced quizzes and class attendance**

   Policy regarding class attendance and unannounced quizzes will be set by the individual instructor. The detailed policy and any implication on grade evaluation will be announced to the students on the first day of class.

IV. **Academic Honesty**

   All portions of the **Auburn University Student Academic Honesty Code**, as found in the *Tiger Cub* and defined in the SGA Code of Laws, Title XII, will apply in this class.

V. **Statement regarding students with disabilities**

   If any student needs special accommodations he/she should see the instructor to discuss the situation. The student should bring the memo from the Program for Students with Disabilities (PSD) office. If the student does not have such a memo, he/she should make an appointment at the PSD office in 1232 Haley Center (844-2096) to discuss the situation.
VI. Distance Learning

The distance learning sections of this course are administered through the COE Graduate Outreach Program. The lectures are video-taped, transferred to DVD and mailed to the off-campus students. Homework assignments and handouts are accessible to both on-campus and off-campus student through WebCT. Off-campus students are allowed additional time to complete assignments to account for the time required for mailing of the DVDs of the lectures. Students contact faculty for assistance by telephone and/or e-mail. The Graduate Outreach Office arranges for a proctor to administer examinations to off-campus students, who are generally required to take examinations within a week of the time the exams are administered to the on-campus students. The used of recorded lectures is an appropriate method for dissemination of the course material, so that the course objectives can be achieved for off-campus students.

JUSTIFICATION for offering MATL 6606 for Graduate Credit

This course will be co-listed in with MATL 5600, but graduate students in MATL 6600/6606 will have additional requirements. One will be a term paper in which each student will present in in-depth discussion of a corrosion topic. In addition, some of the homework assignments and examination questions for students in MATL 6600/6606 will be more rigorous than those for students in MATL 5600. The analyses of corrosion in this paper and these more rigorous questions involve thermodynamic and kinetic models and analysis which are appropriate for a graduate course.

Syllabus Prepared by J.W. Fergus