

**MSE 112  
Corrosion  
Spring 2015**

Instructor: Professor Thomas M. Devine  
Office: Room 224, Hearst Mining Building  
Email: [devine@berkeley.edu](mailto:devine@berkeley.edu)

Lectures: Tu and Thurs 11:00am-12:30pm  
Office Hrs: TBD

GSI: Brian Patrick  
Email: [Brian.n.patrick@gmail.com](mailto:Brian.n.patrick@gmail.com)  
Office Hrs: TBD  
Discussion: TBD

<b>Topic</b>	<b>Reading Assignment</b>
1. Electronic Structure of Atoms and Metals	Chapter 1
2. Electronic Structure of H <sub>2</sub> O and Aqueous Solutions	Chapter 2
3. Structure of Interface between Metal and Aqueous Solution	Chapter 2
4. Measurement of Interface Potential Difference	Chapter 2
5. Reference Electrodes	Chapter 2
6. Kinetics of Red-ox Reactions	Chapter 3
7. Reduction Reactions that Accompany the Oxidation of Metals in Aqueous Solutions	Chapter 3
8. Measurement of Anodic and Cathodic Polarization Curves	Chapter 3
9. Determination of Corrosion Potential and Corrosion Rate	Chapter 3
10. Use of Polarization Curves to Analyze Corrosion Phenomena; Influence of pH and P(O <sub>2</sub> )	Chapter 4
11. Galvanic Corrosion	Chapter 4
12. Cathodic Protection	Chapter 4
13. Formation of Solid Corrosion Products	Chapter 5
14. Pourbaix Diagrams	Chapter 5
15. Corrosion Inhibitors	ZZhang at al.
16. Passivity	Chapter 6 (Mott and Cabrerra)
17. Identity of Iron's Passive Film	Chapter 6 Nagayama/CohenI
18. Properties of Iron's Passive Film Ionic and Electronic Conductivities	Nagayama/CohenI Nagayama/CohenII
19. Passive Film of Chromium	Bjornkvist et al. Okuyama et al
20. Stainless Steels	Newman et al.
21. Localized Corrosion – Crevice Corrosion	Chapter 7
22. Localized Corrosion – Pitting Corrosion	Chapter 7

23.	Localized Corrosion – Intergranular Corrosion	Chapter 7
24.	Environmentally Assisted Cracking – Stress Corrosion Cracking	Chapter 8
25.	Fracture Mechanics and Stress Corrosion Cracking	Chapter 8
26.	Environmentally Assisted Cracking – Hydrogen Assisted Cracking	Chapter 8
27.	Environmentally Assisted Cracking – Corrosion Fatigue	Chapter 8
28.	Electrochemical Aspects of Batteries	Handout

**Reading** All reading assignments will be posted on b-space. Most of the reading assignments come from a set of notes prepared by TMD.

**Homeworks** – There will be one problem set per week covering Topic Nos. 1-14. For Topic Nos. 15-28 there will be approximately one problem set every two weeks.

**Exams** There will be a Mid-term exam covering Topics 1-14 on Tuesday, March 17.

The Final Exam is scheduled on Thursday, May 14, 2014, 8:00am-11:00am

**The mid-term exam and final exam must be taken on the scheduled times and dates.** If dire circumstances (e.g., severe illness) prevent you from taking the Final Exam at the scheduled time/date you will receive an Incomplete for the course and will need to take the Final Exam that will be offered May 2016.

**Grading** The grade for the course will consist of the Final Exam (50%), the Mid-term Exam (35%) and Homework (15%).