Fall 2015
MSE 531 Corrosion (class# 14997)

Course Description: Corrosion is the destructive result of chemical reaction between a material and its environment. Corrosion engineering and science is the study the chemical and metallurgical processes that occur during corrosion. Corrosion engineering is the design and application of methods to prevent corrosion. Both aqueous and gaseous corrosion will be discussed. Students will conduct internet search to collect data, analyze data, and interpret the data. The results of their works will be presented in written report and oral presentations in class. The **learning objectives** are: To understand the principles of materials corrosion behaviors in applications of materials and design. To learn to find information in literature and other available sources. To learn to use information systems (computer, internet, and other available sources) in engineering practice. To understand the application of standards for testing and evaluation of corrosion of materials, and finally to learn the importance of safety considerations in design and material selection for corrosive environments.
Methods of Students evaluation: Class examinations, reports, and a final examination. Design problems and homework (weekly assignments), oral presentations, and written reports on the design projects.

Dr. B. Bavarian
Time: T 7:00-9:50 PM, JD 1552
Office Hour: T 6:00-7:00 PM
Office: JD3513, x3917

Textbook: 1. D. A. Jones, Principles and Prevention of Corrosion, Macmillan, 1992.
2. ASM Metals Handbook, volume 13, 1987. (Optional)

Date	**Seminar topic**	**Homeworks**
Aug. 25	Introduction	1-5, 1-9
Sept. 1	Thermodynamics of Corrosion pH-Potential diagrams (Pourbaix Diagrams)	2-5, 2-8
Sept. 8	Corrosion tests, Lab	
Sept. 15	Corrosion forms	
Sept. 22	Kinetics of Corrosion (Evans Diagrams)	3-3, 3-8, 3-10
Sept. 29	Passivity of metals & Its Breakdown	4-2, 4-9
Oct. 6	Galvanic corrosion	6-3, 6-9
Oct. 13	Pitting & Crevice corrosion	7-4, 7-8
Oct. 20	**Mid-term Exam**	
Oct. 27	Environmentally Induced Cracking	8-2, 8-4, 8-7
Nov. 3	Hydrogen Assisted Cracking	
Nov. 10	Corrosion in selected Corrosive Environments	11-4, 11-7
Nov. 17	High Temp. Corrosion, Mechanisms & Kinetics	12-5, 12-7
Nov. 24	Effects of Metallurgy on Corrosion	9-2, 9-4, 9-6
Dec. 1	Corrosion Protection/Coating	13-1, 13-4
Dec 8	Inhibitors	

Dec. 15 Final Exam, 8:00-10:00pm

Grading:

Homework	5%
Presentation	10%
Term paper (due Dec 8)	10%
Mid-Term Exam	35%
Final Exam	40%

Last day to drop: Friday, Sept. 11, 2015

References:

1. ASM Metals Handbook, volume 13, 1987.
2. H. Kaesche, Metallic Corrosion, NACE 1985.
3. M. Pourbaix, Atlas of Electrochemical Equilibrium in Aqueous Solution, NACE 1974.
4. G. Wranglen, An Introduction to Corrosion and Protection of metals, Chapman and hall, NY 1985.
5. J.C. Scully, The Fundamentals of corrosion, 2nd ed. Pergamon Press, Oxford, 1975.
6. R.W. Staehle, et al, Localized corrosion, NACE 1974.
7. B. F. Brown, Stress corrosion cracking Control Measures, NACE 1981.
8. R. A. Rapp, High Temp. Corrosion, NACE 1983.
9. F. Mansfeld/Bertocci, Electrochemical Corrosion Testing, ASTM, STP 727, 1981
10. R. Baboian and G.S. Haynes, Laboratory Corrosion Tests and Standards, ASTM, STP 866, 1985.
11. M. G. Fontana, Corrosion Engineering, McGraw-Hill, 1986.
12. L. L. Shreir, etal, Corrosion, 3rd ed, Butterworth-Heinemann, 1994.
13. "Uhlig's Corrosion Handbook", edited by R. Winston Revie, 2nd ed, J. Wiley, 2000.
14. C. Leygraft and T. E. Graedel, Atmospheric Corrosion, J. Wiley, 2000