ChE 432 Materials Engineering and Corrosion

Date: 20-2-2006

Instructor: Farag A. AbdelAleem **Total credits**: 4 Lecture Cr: 3 Lab Cr: 0 Recitation Cr: 1

Pre Req(s): Chem 331 **Co Req(s):**

Contribution to professional component: Math and Basic science Cr: 1 Engineering Cr: 2 General Education Cr: 0

Catalog Data:

This course combines the principles of Extractive Metallurgy, electrochemical engineering and corrosion as described by the covered topics.

Textbook:

M.E. El-Dahshan, "fundamentals of Extractive Metallurgy" king Saud university Press, 1993

Brett, M.A. and Brett A.O., "electrochemistry, principles, Methods and Applications", Oxford Press, 1993

Denny A. Jones, "Principles and Prevention of corrosion", Prentice Hall, 1996.

Topics covered

1. Extractive Metallurgy (5 weeks): Basic concepts with emphasis on thermodynamics, extractive processes such as Pyrometallurgy, Hydrometallurgy and Electrometallurgy. Extraction of Iron, Aluminum and Copper.
2. Electrochemical engineering (4 weeks): electrochemical cells and its reaction. Thermodynamics of electrochemical systems. Kinetics of electrochemical reactions. Electrolytic hydrogen production, Fuel cells and Aluminum production.
3. Corrosion and its control (5 weeks): Basic concepts and principles. Thermodynamic of corrosion. Kinetics of Corrosion. Corrosion measurements. Corrosion protection and control.

Objectives	a	b	c	d	e	f	g	h	i	j	k		L	M
1. Able to apply chemical engineering principles; material and energy balances in extractive metallurgy processes.	3		2								1			
2. Understanding how to apply thermodynamics in material engineering.	3				2						2			
3. Able to select the suitable process flow sheet for metal extraction.	3				3						1			
4. Understanding the environmental aspects of extraction processes and how to control it.					1	2		3			2			
5. Ability to understand and analyze electrochemical reactions of the cells.	3				1						1			
6. Understanding the electrochemical kinetics and its application in corrosion.	3	2			1						1			
7. Recognition of the potential practical importance of corrosion and how to tackle it.	1			1							2			
8. Understanding the electrochemical nature of corrosion and how to utilize it.	3			1	1						2			
9. Ability to monitor and to measure the rates of corrosion and its utilization in the equipment design.	3	2	3								2			

10. Able to identify the corrosive environments of chemical processes and how to deal with it.			3		3	1					2			

a. Ability to apply knowledge of math, engineering, and science.
b. Ability to design and construct experiments.
c. Ability to design a system, component, or process.
d. Ability to function on multi-disciplinary teams.
e. Ability to identify, formulate, and solve engineering problems.
f. Understanding of professional and ethical responsibility.
g. Ability to communicate effectively.
h. …broad education … to understand the impact of eng. solutions in a global and societal context.
i. Recognition of the need for and ability to engage in life-long learning.
j. Knowledge of contemporary issues.
k. Ability to use techniques, skills, and modern engineering tools necessary for engineering practice.
L. Quickly contribute in their focus area.
M. Team contributors.

Key: 3: strong 2: moderate 1: weak