1. EM456 Corrosion and Corrosion Control

2. Credit Hours (3)/Contact Hours (4)

3. Course Director – Michelle Gaudett Koul

4. Principles and Prevention of Corrosion, Denny A. Jones, Second Edition

5. Specific course information
    a. Elective course that emphasizes both the fundamentals of corrosion science, as well as the engineering involved in preventing corrosion. An introduction to the principles of electrochemistry will be presented in order to understand the mechanisms associated with the various forms of corrosion. Select corrosion mitigation techniques will also be presented, with emphasis on the marine environment. Common experimental techniques for corrosion evaluation and materials selection will be presented and demonstrated
    b. Prerequisites: EA222 or EM313 or ER313 or EN380 or EM452

6. Educational objectives for the course
    a. Understand how the thermodynamic driving forces for corrosion are related to electrochemical potential.
    b. Utilize a Pourbaix diagram to determine the stability of a material as a function of potential and pH.
    c. Understand how the kinetics of a corrosion process is measured and how it relates to actual material loss.
    d. Describe the appearance of the various forms of corrosion and the mechanism(s) involved in initiation and propagation.
    e. List and describe corrosion mitigation techniques particular to the marine environment.
    f. List and describe standard experimental techniques used to evaluate corrosion susceptibility and corrosion mitigation methods.
    g. Select materials and design structures to avoid catastrophic failures or high life cycle costs associated with corrosion.

7. Specific program outcomes addressed by this course

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Reinforced		X	X	X			
Mastered	X					X	

8. Brief list of topics to be covered
    a. Thermodynamics of Corrosion
        i. Nernst Equation
        ii. Replacement Reactions
        iii. Pourbaix Diagrams
        iv. “Gas” reactions
    b. Kinetics of Corrosion
        i. Faraday’s Law
        ii. BV Equation,
        iii. Exchange Current Density
        iv. Evans Diagrams,
        v. Adding an Oxidizer
        vi. Measuring Mixed Potentials
        vii. Mass Transport Control, Mixed Control
    c. Experimental Polarization
    d. Passivity
    e. Pitting and Crevice Corrosion: Mechanism, Evaluation
    f. Galvanic and Concentration Cell Corrosion
    g. Environmentally Induced Cracking
    h. Metallurgical Effects on Corrosion
    i. Cathodic Protection