SYLLABUS

A. Course Description

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Private study*	*Pre-requisites*	*Course Level*	*Language*
CHM	**343**	**Electrochemistry & Corrosion**	**4**	**2**	**3**	**1**	**8**	**CHM 242**	**5**	**English**

This course describes fundamentals of electrochemistry, cells, batteries and their standard potentials, Nernst equation, potentiometry and voltammetry methods, electrolytic conductance, corrosion. The course covers essential topics in electrochemistry where concepts of oxidation, reduction, electrochemical cells for producing energy and consuming energy, electrochemical processes such as cyclic voltammetry, polarography, corrosion causes and methods of measurement and prevention. The practical part consists of a set of experiments that reinforce the module concepts. At the end of this course the student will be able to

- Understand the basics of electrochemical processes under standard and non-standard conditions.
- Know principles of some electrochemical techniques.
- Introduce corrosion and wear occurring to metals under different conditions and technologies used to prevent or minimize it.
- Solve mathematical problems to calculate cells potentials, amounts of metal deposited in electrolysis, conductivity, resistivity and current values.
- Carry out experiments, collect data and derive relations and conclusions.

B. References: Required Textbook & Internal Website

I shall use

Analytical Electrochemistry, ***Joseph Wang,*** (3rd Ed.), John Wiley & Sons, New Jersy, 2006, ISBN: 978-0-471-67879-3.

Students are required to purchase the textbook/materials (it is an obligation). The book contains the lecture notes as well as activities for the students to take part in; the book serves as a workbook.Other references:

- ***Electrochemical Methods: Fundamentals and Applications***, A. J. Bard and L. R. Faulkner, (2nd Ed.), John Wiley & Sons, New York, 2001, ISBN: 0-471-04372-9.

Google Classroom Webpage:http://www.imamm.org/

C. Topics Outline

Disclaimer: this is a very fast-paced course. There will be little time—if any—for review. What follows is an approximate outline of the pace of the course. We may go faster or slower, contingent on the class response. The tentative list of topics to cover:

a. ***Theory:***

Introduction / Fundamental Concepts: Electrochemistry and Redox, Redox Balancing Redox Reactions, Types of cells, Common Components, Electrolytic cells, Voltaic (Galvanic) Cells, Cell Potential. STANDARD POTENTIALS, Standard Reduction Potentials, E0cell and ΔG0, Calculating E0 cell, Nernst equation, Concentration Cells. Batteries, Fuel Cells, Electrolysis, Stoichiometry, Faraday constant (F). Thermodynamics and Potentials. Ion-selective electrodes (ISE), glass electrodes, liquid membrane electrodes, solid-state electrodes, applications of ISEs. Steps in simple reactions, steps in complex reactions, electrode reaction pathway, reactions controlled by mass transport. Potentiometry: Potential step experiments, potential sweep experiments. Cyclic voltammetry, Reversible Systems, Irreversible Systems, Quasi-reversible Systems, Applications, spectroelectrochemistry, electrochemiluminescence (ecl), scanning probe microscopy. Conductivity of electrolytes. Controlled potential techniques: Controlled potential, chronoamperometry, chronocoulometry, polarography, the ilkovic equation, pulse voltammetry, ac voltammetry, stripping analysis, flow analysis. Chemical Corrosion: Electrochemical Corrosion, the Electrode Potential in Electrochemical Cells. Types of Electrochemical Corrosion, Protection against Electrochemical Corrosion

b. ***Practical:***

Electrolysis of Water - Electrochemical Studies on Different Galvanic Cells - Electrochemical Studies on Concentration Cells – Calculation of the equilibrium constant - Electrochemical Determination of ΔG, ΔH, and ΔS - Determination of Cell Constant - Determination of Equivalent Conductance of A Strong Electrolyte - Dissociation Constant of Weak Acid – Electroplating - Corrosion rate (weight loss) - Corrosion rate (corrosion current) - Potentiometric Titration of a Bromide-Iodide Mixture.

D. Exams & Grading System

The semi-official dates of the exams for this course, with all the caveats, that the word "semi-official" entails, can be found here:

- **Midterm 1:** 6th or 7th week &**Midterm 2:**11th or 12th week
- **Quizzes & Homeworks: During the semester**

Your course grade will be based on Final Exam, Midterms, Homework, Quizzes, Participation, Attendance and Project.

Midterm 1: 10 %	**Midterm 2:** 10 %	**Final Exam:** 40 %
Laboratory: 30 %	**Quizzes; Homework & Attendance & Participation:** 10 %	

Grading distribution:

A^+: [95, 100], A:[90, 95), B^+: [85, 90) , B: [80, 85), C^+: [75, 80), C: [70, 75), D^+: [65, 70), D: [60, 65), F: [0, 60).

E. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. ("Immediate family" is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Examsgoo.gl/ykm7t3

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