Chemistry 793

Special Topics: Electrochemistry

Lecture Times: T, TH 5:30 – 6:45 PM

Course Content – Electrochemistry and electrochemical processes are concerned with relationships between electrical and chemical effects. In most cases the techniques probe the relationships between an applied potential and the passage of charge or current. The scope of electrochemical studies is broad, encompassing many scientific fields including surface chemistry (corrosion, electrochemical surface modification, adsorption), biochemistry (electrophoresis) and industries such as mining electronics, fuel cells, and electrolysis. This course will examine the processes that occur at electrochemical interfaces to obtain chemical, electrical, kinetic and thermodynamic understanding of the fundamental principals governing electrochemical reactions at electrodes. To accomplish the course objectives this course will provide an understanding of the fundamental principals governing electrochemical reactions at electrodes. This course is specifically designed to provide an introduction and understanding of physical processes and analytical techniques associated with electrochemical processes at a variety of electrode interfaces. The goal is to understand the relationship between the physical processes and useful analytical information of the system.

Leaning outcomes: Upon completion of the course, students will be able to:

- Define and explain fundamental concepts associated with oxidation/reduction reactions.
- Apply electrochemical reaction kinetics to electrochemical systems.
- Apply electrochemical models in the study of reversible, irreversible, and quasirversible electrochemical oxidation/reduction reactions.
- Evaluate and distinguish voltammetry associated with surface and solution electrochemical processes.
- Understand and apply potential-step, constant potential, and variable potential electrochemical processes.

Assessment of learning objectives will be based on the following:

Exams and grading – The course grade will be based on performance on two regular exams, problem sets, and a final exam as follows:

2 Exams	(300, 150 points each)
3 Problem Sets	(150, 50 points each)
Directed Reading	(150 points)
Final Exam	(200 points)

A scientific calculator is suggested for the course but not required. **Failure to turn in assigned work (exams or problem sets) at the scheduled time will result in a grade of zero.** Exceptions will be allowed only in the most extraordinary circumstances. However, **a student must supply adequate proof that an emergency has befallen her/him and contact the instructor prior to the date and time the assignment is due**. The instructor has final discretion in all matters concerning late assignments.

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The final grade in the course will be based on the total number of points at the end of the semester. The final grade is based on an 800-point scale. The following cut offs will be used:

A	100 – 88%
B	87 – 75%
C	74 – 62%
D	61 – 59%
F	> 59%

Problem sets will be provided to assist the student in mastering the material covered. These sets will be graded. Students are strongly urged to visit the instructor during office hours or make an appointment o see the instructor if help is needed in performing the more difficult problems. **Late problem sets will not be accepted**.

The following should be noted:

Academic Misconduct—Academic integrity is a legitimate concern for every member of the campus community; all share in upholding the fundamental values of honesty, trust, respect, fairness, responsibility and professionalism. By choosing to join the UNLV community, students accept the expectations of the Student Academic Misconduct Policy and are encouraged when faced with choices to always take the ethical path. Students enrolling in UNLV assume the obligation to conduct themselves in a manner compatible with UNLV's function as an educational institution. An example of academic misconduct is plagiarism. Plagiarism is using the words or ideas of another, from the Internet or any source, without proper citation of the sources. See the *Student Academic Misconduct Policy* (approved December 9, 2005) located at: https://www.unlv.edu/studentconduct/student-conduct.

Students Responsibility in the classroom—Students have a responsibility to conduct themselves in class and in the libraries in ways, which do not interfere with the right of other students to learn or of instructors to teach.

Copyright—The University requires all members of the University Community to familiarize themselves **with** and to follow copyright and fair use requirements. **You are individually and solely responsible for violations of copyright and fair use laws. The university will neither protect nor defend you nor assume any responsibility for employee or student violations of fair use laws.** Violations of copyright laws could subject you to federal and state civil penalties and criminal liability, as well as disciplinary action under University policies. Additional information can be found at: http://www.unlv.edu/provost/copyright.

Disability Resource Center (DRC)—The UNLV Disability Resource Center (SSC-A 143, http://drc.unlv.edu/, 702-895-0866) provides resources for students with disabilities. If you feel that you have a disability, please make an appointment with a Disabilities Specialist at the DRC to discuss what options may be available to you. If you are registered with the UNLV Disability Resource Center, bring your Academic Accommodation Plan from the DRC to the instructor during office hours so that you may work together to develop strategies for implementing the accommodations to meet both your needs and the

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requirements of the course. Any information you provide is private and will be treated as such. To maintain the confidentiality of your request, please do not approach the instructor in front of others to discuss your accommodation needs.

Religious Holidays Policy—Any student missing class quizzes, examinations, or any other class or lab work because of observance of religious holidays shall be given an opportunity during that semester to make up missed work. The make-up will apply to the religious holiday absence only. It shall be the responsibility of the student to notify the instructor **within** the first 14 calendar days of the course for fall and spring courses (excepting modular courses), or **within** the first 7 calendar days of the course for summer and modular courses**,** of his or her intention to participate in religious holidays which do not fall on state holidays or periods of class recess. For additional information, please visit: http://catalog.unlv.edu/content.php?catoid=6&navoid=531.

Transparency in Learning and Teaching—The University encourages application of the transparency method of constructing assignments for student success. Please see these two links for further information:

https://www.unlv.edu/provost/teachingandlearning
https://www.unlv.edu/provost/transparency

Incomplete Grades—The grade of I—Incomplete—can be granted when a student has satisfactorily completed three-fourths of course work for that semester/session but for reason(s) beyond the student's control, and acceptable to the instructor, cannot complete the last part of the course, and the instructor believes that the student can finish the course without repeating it. The incomplete work must be made up before the end of the following regular semester for undergraduate courses. Graduate students receiving "I" grades in 500-, 600-, or 700-level courses have up to one calendar year to complete the work, at the discretion of the instructor. If course requirements are not completed within the time indicated, a grade of F will be recorded and the GPA will be adjusted accordingly. Students who are fulfilling an Incomplete do not register for the course but make individual arrangements with the instructor who assigned the I grade.

Tutoring and Coaching—The Academic Success Center (ASC) provides tutoring, academic success coaching and other academic assistance for all UNLV undergraduate students. For information regarding tutoring subjects, tutoring times, and other ASC programs and services, visit http://www.unlv.edu/asc or call 702-895-3177. The ASC building is located across from the Student Services Complex (SSC). Academic success coaching is located on the second floor of the SSC (ASC Coaching Spot). Drop-in tutoring is located on the second floor of the Lied Library and College of Engineering TEB second floor.

UNLV Writing Center—One-on-one or small group assistance with writing is available free of charge to UNLV students at the Writing Center, located in CDC-3-301. Although walk-in consultations are sometimes available, students with appointments will receive priority assistance. Appointments may be made in person or by calling 702-895-3908. The

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student's Rebel ID Card, a copy of the assignment (if possible), and two copies of any writing to be reviewed are requested for the consultation. More information can be found at: http://writingcenter.unlv.edu/.

Rebelmail—By policy, faculty and staff should e-mail students' Rebelmail accounts only. Rebelmail is UNLV's official e-mail system for students. It is one of the primary ways students receive official university communication such as information about deadlines, major campus events, and announcements. All UNLV students receive a Rebelmail account after they have been admitted to the university. Students' e-mail prefixes are listed on class rosters. The suffix is always @unlv.nevada.edu. **Emailing within WebCampus is acceptable.**

Library Resources—Students may consult with a librarian on research needs. For this class, the subject librarian is https://www.library.unlv.edu/contact/librarians_by_subject. UNLV Libraries provides resources to support students' access to information. Discovery, access, and use of information are vital skills for academic work and for successful post-college life. Access library resources and ask questions at https://www.library.unlv.edu/.

Final Examinations—The University requires that final exams given at the end of a course occur at the time and on the day specified in the final exam schedule. See the schedule at: http://www.unlv.edu/registrar/calendars.

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TENTATIVE COURSE OUTLINE

The following rough outline is provided to assist your preparation for lectures. Due to the volume of material it is impossible to lecture on every topic. Therefore, it is imperative that you read the text thoroughly to obtain an understanding of material not covered. This is a tentative schedule that will change, as needed, based on time constraints within the semester.

Text (Required):

Joseph Wang
Analtyical Electrochemistry
Wiley-VCH, New Jersey, 3rd Edition, 2006.

Other useful Text (Not required):

Allen J. Bard and Larry R. Faulkner
Electrochemical Methods: Fundamentals and Applications
John Wiley and Sons, New York, 2nd Edition, 2000.

Date	Topic	Reading Assignment

Exam Schedule

Exam I	To be announced
Exam II	To be announced

Tentative Lecture/Reading Schedule

Week of August 28th

Read Chapter 1 immediately

8/29 – 9/22 Fundamental Concepts of electrochemistry

Read Chapter 4 by 9/22

9/25 – 10/10 Practical Considerations

Read Chapter 2 by 10/12

10/12 – 11/7 Electrode Reactions and Interfacial Properties.

Read Chapter 3,5 by 11/7

11/9– 12/9 Controlled Potential/Potentiometry

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