CHEMISTRY 7730 – ELECTROCHEMISTRY

FALL SEMESTER (A), AUG 19TH - OCT 4TH, 2019

Instructor: Henry S. White
Thatcher b423, ph: 585-6256
white@chem.utah.edu

Lectures: MWF 9:35 - 10:40 a.m. in Life Sciences 102 (see map)
(The U is closed on Labor Day, September 2)

Credit Hours: 2

Course Description: This course will provide an overview of the fundamental concepts of electrochemical science, focusing on the basic principles underlying chemical reactions at the electrode/electrolyte interface.

Course Overview: Chem 7730 provides an introduction to modern electrochemical theory, concepts, and methods. Approximately two thirds of the course are devoted to the fundamental principles underlying reactions at the electrode/electrolyte interface; the remainder will emphasize methods, instrumentation, and electrocatalytic reactions. This course does not focus on specific electrochemical technologies, but the principles and methods taught are applicable to electrocatalysis, electrochemical synthesis, electrical energy storage and generation, chemical sensors, etc.

Course Outcomes: This course will provide each student with a working knowledge of:
• thermodynamics and kinetics of electrochemical reactions,
• the structure of the electric double layer,
• transport phenomena underlying electrochemical measurements,
• electrochemical methods for investigating electron-transfer reactions.

Text: Electrochemical Methods: Fundamentals and Applications, A. J. Bard and L. R. Faulkner, 2nd Edition, 2001, Wiley. Reading assignments will be posted on Canvas and discussed in class. You are not required to purchase you own copy of the textbook, but you must have access to it.

Course topics: (18 lectures)
• Overview of Electrode Processes
• Thermodynamics of Cells
• Kinetics of Electrode Reactions
• Double-layer Structure
• Mass Transfer
• Microelectrode Voltammetry
• Transient i-t Measurements
• Electrochemical Instrumentation
• Cyclic Voltammetry Basic Theory
• Coupled Electron-Transfer and Homogeneous Reactions
• Marcus Theory
• Inner-sphere Reactions and Electrocatalysis
Office Hours
Tuesdays at 4-5 pm, TBBC b423
Fridays 11 am – 1 pm, TBBC b423.

Communication with the instructor: The instructor will promptly respond to e-mail requests, including evenings and weekends; feel free to send questions about the course material, or to schedule meetings outside of the regular course office hours.

Last day to withdraw: Sept. 13, 2019

Course Evaluations Methods: The final grade is based on homework, one mid-term exam, and the final exam, with the following weights given to each.

- Homework: 100 points
- Midterm exam: 100
- Final exam: 150
Total points: 350 points

Accumulation of at least 75% of the total points is expected for a grade of B or above.

*Homework:* Problems will be assigned from the textbook and from questions developed during lecture. All homework assigned during the week should be turned in on Fridays at the beginning of class. Students are encouraged to work together on all homework. However, each student must turn in his/her own homework.

*Exams:*
- Midterm exam: Monday, Sept 9, during regular class period.
- Final exam: Friday, Oct. 5, 2 hours, *time to be determined.*

The midterm and final exams are closed book, closed note exams. You may bring a calculator and pencil or pen. Exam problems are taken directly from homework problems and lectures notes. Example exams from prior years will be posted on Canvas.

Class Attendance: Strongly encouraged. Lecture slides will be posted the night before each lecture. Note that some homework problems will be assigned based on discussions during class. If you miss a class, it is important to look at Canvas to identify any problems assigned during that class period.

Teaching and Learning Methods
Outcomes are achieved through lectures, discussions, assigned readings, and problem-based learning. Students are encouraged to work together on homework.

Responsibility of Instructor and Students: The instructor’s responsibility is to enthusiastically engage in instruction, including but not limited to: preparing effective lectures and course materials that provide students with useful outcomes; respecting the learning needs of all students; being responsive to requests for consultation; and providing fair evaluation of student efforts. The students’ responsibility is to enthusiastically engage in learning, including but not limited to: attending lectures and participating in class discussion; reading assigned chapters prior to lectures; working homework problems; using office hours for consultation on course concepts; and preparing for exams.

Diversity Statement: It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students’ learning needs be addressed both in and out of class, and that the
diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups. In addition, if any of our class meetings conflict with your religious events, please let me know so that we can make arrangements for you.

**University Policies**

*The Americans with Disabilities Act.* The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.

*University Safety Statement.* The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu.

*Addressing Sexual Misconduct.* Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran’s status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677 (COPS).

*Undocumented Student Support Statement.* Immigration is a complex phenomenon with broad impact—those who are directly affected by it, as well as those who are indirectly affected by their relationships with family members, friends, and loved ones. If your immigration status presents obstacles to engaging in specific activities or fulfilling specific course criteria, confidential arrangements may be requested from the Dream Center. Arrangements with the Dream Center will not jeopardize your student status, your financial aid, or any other part of your residence. The Dream Center offers a wide range of resources to support undocumented students (with and without DACA) as well as students from mixed-status families. To learn more, please contact the Dream Center at 801.213.3697 or visit dream.utah.edu.

*Wellness Statement.* Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a student’s ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness at www.wellness.utah.edu or 801-581-7776.

*Veterans Center.* If you are a student veteran, the U of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Hours: M-F 8-5pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources: http://veteranscenter.utah.edu/. Please also let me know if you need any additional support in this class for
any reason.

**Learners of English as an Additional/Second Language.** If you are an English language learner, please be aware of several resources on campus that will support you with your language and writing development. These resources include: the Writing Center (http://writingcenter.utah.edu/); the Writing Program (http://writingprogram.utah.edu/); the English Language Institute (http://continue.utah.edu/eli/). Please let me know if there is any additional support you would like to discuss for this class.

*Note: This syllabus is meant to serve as an outline and guide for our course. Please note that I may modify it with reasonable notice to you. Any changes will be announced in class and posted on Canvas under Announcements.*