

Chem 7530 Syllabus (Fall 2016)
Electrochemistry and Electrochemical Systems

Instructor: Tianbiao Liu (Office, Maeser 361)
Email: leo.liu@usu.edu
Office Hours: By appointment
Class Time: Thursday 10:30 am –12:00 pm except Thanksgiving week (Tuesday);
Class Location: WIDT 333

Required textbooks: No specific textbooks are needed. All related materials would be available as printouts or via Canvas. Canvas handouts will be updated by each weekend.

Reference books:

1. A.J. Bard and L. R. Faulkner, *Electrochemical Methods: Fundamentals and Applications*, John Wiley and Sons., 2nd ed. 2001.
2. John Newman, Karen E. Thomas-Alyea “*Electrochemical Systems*”, 3th Edition, Wiley, 2004.

Class Schedule (subjected to change)

Date	Topic	Literature Discussion
09/01/Th	Course Introduction	<i>No</i>
09/08/Th	History and Basic Concepts of Electrochemistry	Cam
09/15/Th	Nernst Equation and Electrode Double Layer	Bo
09/22/Th	Voltammetry I: LSV and CV	Jared
09/29/Th	Voltammetry II: CV, NPV, and DPV	Kevin
10/06/Th	Electrochemical kinetics	Xuan
10/13/Th	Mass transport	Guanqun
10/20/Th	Potential Controlled Methods: CA and CC (BE)	<i>Course review Q&A</i>
10/27/Th	Electrocatalysis I	Cam
11/03/Th	Electrocatalysis II	Bo
11/10/Th	Fuel cells	Jared
11/17/Th	Batteries	Kevin
11/22/Tu	Capacitors	Xuan
12/01/Th	Impedance I	Guanqun
12/09/Th	Impedance II	<i>Course review Q&A</i>
12/15/Th	Final exam	

Course Content: The purpose of this course is to provide fundamental knowledge and practical applications of electrochemistry in electrocatalysis, fuel cells, and batteries. The course involves a small amount of electrochemical theories and emphasizes practical uses of electrochemical techniques such as CV, EIS, Galvanostatic methods, rotation disk electrode, etc.

Typically, the first 2/3 of each class period will be the introduction of key principles delivered by the instructor, followed by a literature discussion led by a student. Each of you will be asked to select one recent publication on electrochemical applications such as batteries, fuel cells, and sensors etc. The discussion leader needs to inform the entire class which paper he/she chooses to discuss at least one week prior to the discussion. It is mandatory for everyone to be highly involved in the literature discussions. Detailed criteria for how the discussions will be graded are presented on the next page.

Grading*:	Literature presentation and discussion (2*30 + 10*4 points)	100
	Two problem sets	200
	Final exam in class	100
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		Overall: 400

*Note: Answers of problem sets must be turned in at the beginning of the next class. The deadline to turn in exam answers will be announced in the class when exams are distributed.

Tentative Grading Scale:

A-/A	90-100%
B-/B/B+	80-89%
C-/C/C+	70-79%
D/D+	60-69%

Literature Discussion Guidelines

- 1) Each student will lead a total of 4 literature discussions.
- 2) Preparation for literature discussions:
The schedule of the literature discussion will be available on Canvas. Everyone is expected to have carefully read the paper(s) that will be discussed prior to coming to class.
- 3) Expectation for the discussion leader:

Provide a concise description of the following:

- a) Rationale for the research: background and motivations
- b) Experiments that were performed
- c) Interpretation of all figures/schemes
- d) Outcomes
- e) Answer questions from other students; instructor

It may be beneficial to prepare a short handout for the class, especially if items are not clearly described in the paper (e.g. key background information, synthetic equations, and molecule structures). For some particularly long papers, the instructor and students will decide on which aspects of the research are most pertinent to the class and this portion will be discussed. Don't ignore the supporting information (SI) for a paper. Because of page limitations, authors in many cases put a significant number of figures/schemes in the SI.

- 4) Expectation for discussion participants:
Each student is expected to actively participate in the literature discussions.
- 5) Grading:
Each student will be graded on your ability to effectively describe the contents of the paper and answer questions. You will lead a total of 4 literature discussions, with each being worth 10 points ($4 \times 10 = 40$ total points). You will also engage in 20 literature discussions as a participant, with your performance being evaluated to earn up to 3 points: $20 \times 3 = 60$ points. Total literature discussion points: 100.

Withdrawal Policy and "I" Grade Policy

The administration of Chem 6500 will adhere strictly to the academic regulations stipulated in the most recent Schedule of Classes and the USU General Catalog. Withdrawal from the course will follow official USU procedures. Students are required to complete all courses for which they are registered by the end of the semester. In some cases, a student may be unable to complete all of the coursework because of extenuating circumstances, but not due to poor performance or to retain financial aid. The term "extenuating circumstances" includes: (1) incapacitating illness which prevents a student from attending classes for minimum period of two weeks, (2) a death in the immediate family, (3) financial responsibilities requiring a student to alter a work schedule to secure employment, (4) change in work schedule as required by an employer, or (5) other emergencies deemed appropriate by the instructor.

Plagiarism:

Plagiarism includes knowingly "representing, by paraphrase or direct quotation, the published or unpublished work of another person as one's own in any academic exercise or activity without full and

clear acknowledgment. It also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials.” The penalties for plagiarism are severe. They included warning or reprimand, grade adjustment, probation, suspension, withholding of transcripts, denial or revocation of degrees, and referral to psychological counseling.

University Standards of Academic Integrity – “the Honor System”

Each student has the right and duty to pursue his or her academic experience free of dishonesty. The Honor System is designed to establish the higher level of conduct expected and required of all Utah State University students.

The Honor Pledge:

To enhance the learning environment at Utah State University and to develop student academic integrity, each student agrees to the following Honor Pledge: “I pledge, on my honor, to conduct myself with the foremost level of academic integrity.” A student who lives by the Honor Pledge is a student who does more than not cheat, falsify, or plagiarize. A student who lives by the Honor Pledge espouses academic integrity as an underlying and essential principle of the Utah State University community; understands that each act of academic dishonesty devalues every degree that is awarded by this institution; and is a welcomed and valued member of Utah State University.

Students with Disabilities:

The American with Disabilities Act states: “Reasonable accommodation will be provided for all persons with disabilities in order to ensure equal participation within the program.” If a student has a disability that will likely require some accommodation by the instructor, the student must contact the instructor and document the disability through the Disability Resource Center (797-2444), preferably during the first week of the course. Any request for special consideration relating to attendance, pedagogy, taking of examinations, etc., must be discussed with and approved by the instructor. In cooperation with the Disability Resource Center, course materials can be provided in alternative format, large print, audio, diskette, or Braille.