

Iowa State University
Department of Chemistry
Fall 2022
Chem 512 – Electrochemical Methods of Analysis (Credits: 3)
9:55 a.m. MWF, Gilman 1051

Instructor:

Asst. Prof. Robbyn K. Anand

Office: Hach Hall 2101C

Student hours: Fridays 11 a.m. – 1 p.m. (in person, can be virtual by advance request)

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Prerequisites: Suggested (but not required) that students complete Instrumental Analysis (Chem 316) before taking this course.

Course Goals: This course is useful for both those doing electrochemical research *per se* and those in fields tangential to electrochemistry such as sensor design, alternative energy, anti-corrosion, materials, catalysis, and species transport (e.g., capillary electrophoresis).

Note: This course may be taken to clear the Analytical Diagnostic.

Learning Objectives: My goal is for you to develop a broad working knowledge of electroanalytical chemistry within a classical theoretical framework. Here are some learning outcomes that we aim to achieve:

1. Working knowledge of the governing equations of electrochemical processes. *How the properties of chemical species and materials lead to signals in current, potential, and time.*
2. An understanding of the major directions of contemporary electrochemical research and the ability to explain these topics to a broad audience. *Communicate electrochemical concepts effectively.*
3. The ability to critique a recent journal article on an electrochemistry-related topic. *Think critically about electrochemistry.*
4. Basic knowledge of electrochemical instrumentation, electrode materials, and experimental parameters. *How to do electrochemistry.*

Textbook: Electrochemical Methods: Fundamentals and Applications – Allen J. Bard, Larry R. Faulkner, 2nd Ed.

Course Format: In this course, we will use a mixture of lecture, group work sessions, and student presentations.

Assignments (Grade %):

1. Electrochemical simulation. **15%**
2. Homework. **25%**
3. Three exams, including a final. **45%**
4. Individual presentations. **15%**

Course Policies:

Attendance – Having more than two unexcused absences will impact your final grade.

Tardiness – Out of respect for your fellow students and myself, please come on time.

Plagiarism – Copying material from any source (online, other students, etc.) without citing the source is considered plagiarism and will result in a failing grade.

Last Drop Date – Listed on the ISU Fall 2022 schedule as **August 26, 2022**.

Course Calendar:

August			19	W	Potential Step (H5)
22*	M	No class	21	F	<i>Literature Discussion 1</i>
24*	W	No class	24	M	Potential Sweep
26	F	Electrode Processes	26	W	Potential Sweep
29	M	Electrode Processes	28*	F	Exam 2
31	W	Electrode Processes	31	M	Potential Sweep/Simulation
September			November		
2	F	Electrode Processes	2	W	Hydrodynamic Methods
5	M	University Holiday	4	F	Hydrodyn. Meth. (Sim. Due)
7	W	Electrode Processes (H1)	7	M	Controlled Current
9	F	Electrode Processes	9	W	Impedance and AC Methods
12	M	Potential/Thermo.	11	F	<i>Literature Discussion 2</i>
14*	W	<i>Help session (H2)</i>	14	M	Double Layer Structure
16	F	Potential/Thermo.	16	W	Modified Electrodes
19	M	Potential/Thermo.	18	F	<i>Literature Discussion 3</i>
21	W	Potential/Thermo. (H3)	21	M	Fall Break
23	F	Kinetics	23	W	Fall Break
26	M	Kinetics	25	F	Fall Break
28	W	Kinetics (H4)	28	M	<i>Student Presentations</i>
30	F	Kinetics	30	W	<i>Student Presentations</i>
October			December		
3*	M	<i>Optional Review</i>	2	F	<i>Student Presentations</i>
5*	W	Exam 1	5	M	<i>Student Presentations</i>
7	F	Mass Transfer	7	W	<i>Student Presentations</i>
10	M	Mass Transfer	9	F	<i>Student Presentations</i>
12	W	Mass Transfer (No HW)	14	W	Final exam (7:30-9:30 a.m.)
14	F	Potential Step			
17	M	Potential Step			*Prof. Anand traveling

Students with Disabilities

Iowa State University is committed to assuring that all educational activities are free from discrimination and harassment based on disability status. All students requesting accommodations are required to meet with staff in Student Disability Resources (SDR) to establish eligibility. A Student Academic Accommodation Request (SAAR) form will be provided to eligible students. The provision of reasonable accommodations in this course will be arranged after timely delivery of the SAAR form to the instructor. Students are encouraged to deliver completed SAAR forms as early in the semester as possible. SDR, a unit in the Dean of Students Office, is located in room 1076, Student Services Building or online at www.dso.iastate.edu/dr/. Contact SDR by e-mail at disabilityresources@iastate.edu or by phone at 515-294-7220 for additional information.