

Iowa State University
Department of Chemistry
Fall 2023
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. (virtual, can be in person 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. **30%**
3. Two exams, including the final. **40%**
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 2023 schedule as **October 27, 2023**.

Course Calendar:

August			18	W	Potential Step (H5)	
	21	M	Electrode Processes	20	F	Literature Discussion 2
	23	W	Electrode Processes	23	M	Potential Sweep
	25	F	Electrode Processes	25	W	Potential Sweep
	28*	M	No class	27	F	Literature Discussion 3
	30*	W	No class	30	M	Potential Sweep/Simulation
September				November		
	1*	F	Literature Discussion 1	1	W	Hydrodynamic Methods
	4	M	University Holiday	3	F	Hydrodynamic Methods
	6	W	Electrode Processes (H1)	6	M	Controlled Current
	8	F	Electrode Processes	8	W	Impedance and AC Methods
	11	M	Potential/Thermo.	10	F	Periodic Techniques (Sim. Due)
	13	W	Potential/Thermo. (H2)	13	M	Double Layer Structure
	15	F	Potential/Thermo.	15	W	Modified Electrodes
	18	M	Potential/Thermo.	17	F	Literature Discussion 4
	20	W	Potential/Thermo. (H3)	20	M	Fall Break
	22	F	Kinetics	22	W	Fall Break
	25	M	Kinetics	24	F	Fall Break
	27	W	Kinetics (H4)	27	M	Student Presentations
	29	F	Kinetics	29	W	Student Presentations
October				December		
	2	M	Mass Transfer	1	F	Student Presentations
	4	W	Mass Transfer (No HW)	4	M	Student Presentations
	6	F	Mass Transfer	6	W	Student Presentations
	9*	M	Optional Review	8	F	Student Presentations
	11*	W	Exam 1	13	W	Final exam (7:30-9:30 a.m.)
	13	F	Potential Step			
	16	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.