Instructor   Professor Shane Ardo (ardo@uci.edu)
Office Hours: Mon. @ 8 – 9 am, *and* 5 – 6 pm *(via Zoom; no sessions on M11/13, M12/4)*

Meeting Times
Lecture: T/Th @ 8 – 9:20 am **in PSCB 240** *(no class on T11/14, Th11/23 (holiday); Zoom link should be used when feeling ill; video-recorded lectures available)*
Final Exam Period is Tues. 12/12 @ 8 – 10 am *(Presentations occur during this time)*

"*Discussion*" (8):   Mon. @ 1 – 2:50 pm *or* 3 – 4:50 pm **in RH 453** *(no class on M11/13; Zoom on M12/4)*

Presentations: Last *three* meeting periods *(T12/5, Th12/7, T12/12)*

Course Objectives
- To understand and explain the theory behind fundamental electrochemical processes
- To be able to design, perform, troubleshoot, and analyze electroanalytical experiments and data
- To quantitatively and qualitatively assess problems, and empirical data from the peer-reviewed literature
- To summarize and explain seminal and recent electrochemical peer-reviewed literature and technologies

Required Resources
Electrochemical Methods: Fundamentals and Applications (2nd edition) by A. J. Bard and L. R. Faulkner
ISBN: 978-0-471-04372-0; Chapters Covered: **A:** 1, 15, 4, 5; **B:** 2, 13, 3, 6; ***Extra:*** 12, 9, 10, 16, 17, 18
Peer-Reviewed Journal Articles and Additional Problems (http://www.chem.uci.edu/~ardo/echem.html)
Bio-Logic Potentiostat Software for PC (https://www.biologic.net/support-software/ec-lab-software/)

Topics Covered *(tentative)*
$A_{1,15}$ Review+ (Nomenclature, Balancing equations, Electrodes, Potentiostats, Diagrams)
$A_{4,5}$ Mass Transfer (Nernst–Planck equation (migration, diffusion, convection), Fick's laws of diffusion, Cottrell equation, Anson plot, Ultramicroelectrode (UME))
B_2 Thermodynamics (Electrochemical potential, Nernst equation, Underpotential deposition (UPD), Liquid-junction potential, Donnan potential, pH probe, Ion-selective electrodes (ISEs))
B_{13} Charged Interfaces (Ionic activity, Diffuse double layer and models, Boundary layer)
$B_{3,6}$ Electron Transfer Kinetics (Marcus–Gerischer theory, Butler–Volmer equation, Tafel equation, Catalysis and volcano plots, Cyclic voltammograms, Randles–Sevcik equation, Corrosion)
Extra   Methods (Potential/Current step/sweep/pulse, Hydrodynamic RDE, Impedance spectroscopy, Scanning probe electrochemistry, Spectro-/Photo-electrochemistry)

Grading *(10% of lowest score will be dropped, leaving 90% for course grade determination)*
50%   *Asynchronous Assignments* (*8*): "Lab activity" write-up and several related problems due one week after odd-numbered activities (**Mondays @ noon**: **10/9**, **10/23**, **11/6**, **11/27**, *and* **Tues. 12/12 @ 8 a**)
20%   *Asynchronous Exam A* (*24 hours*; available **Mon. 11/6 @ 5 pm** *through* **Mon. 11/13 @ 11 am**)
20%   *Asynchronous Exam B* (*24 hours*; available **Mon. 11/27 @ 5 pm** *through* **Mon. 12/4 @ 11 am**)
10%   *Synchronous Presentation* (~15 min per student; occurs during the last week of classes (**Tues. 12/5** *and* **Thurs. 12/7**), *and* during the final exam period (**Tues. 12/12 @ 8 – 10 am**))

Course Policies
Late assignments and make-up exams are not accepted, although *I will regrade exams upon specific request*.
Add/Drop Info (use WebReg): https://www.reg.uci.edu/calendars/quarterly/2023-2024/quarterly23-24.html
UCI Chemistry Enrollment-Related Questions: https://www.chem.uci.edu/studentaffairs/, or chemistry@uci.edu
UCI Laptop Requirements for Students: https://www.oit.uci.edu/undergrads/laptop-requirements-students/
UCI Policy on Academic Integrity and Honesty: https://aisc.uci.edu/policies/academic-integrity/
UCI Human Resources Working Well Student Resources: https://hr.uci.edu/partnership/workingwell/