Department of Chemistry, UC Irvine, Fall 2020  
Version Date: 20.10.01

Instructor  
Professor Shane Ardo (ardo@uci.edu)  
Office Hours: T @ 2 – 3 pm and F @ noon – 1 pm (use Shane Zoom link)

Teaching Assistant  
Leanna Schulte (lschulte@uci.edu)  
Office Hours: TBD (use Leanna Zoom link)

Meeting Times (use Shane Zoom link for items under Lecture & Leanna Zoom link for items under Discussion)  
Lecture: MWF @ 11 – 11:50am + 10 min* (encouraged to attend; video-recorded lectures available*)  
Final Exam Period is Fri. 12/18 @ 8 – 10 am (e-Presentations occur during this time)  
No Class on Wed. 11/11 (holiday) and Fri. 11/27 (holiday)

"Discussion" e-Lab: Mon. @ 1 – 2:50 pm or 3 – 4:50 pm (highly encouraged to attend the 2nd hour*)  
Watch e-Lab videos on your own during the first hour of each e-Lab session (8)  
Last two meeting periods: 11/30 (Final Exam Review*) and 12/7 (e-Presentations)

Course Objectives
- To understand and explain the theory behind fundamental electrochemical processes
- To be able to design, perform, troubleshoot, and analyze electroanalytical experiments
- 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
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 (http://www.bio-logic.net/support-software/ec-lab-software/)

Topics Covered
A1,15 Review+ (Nomenclature, Balancing equations, Electrodes, Potentiostats, Diagrams)  
A4,5 Mass Transfer (Nernst–Planck equation (migration, diffusion, convection), Fick’s laws of diffusion, Cottrell equation, Anson plot, Ultramicroelectrode (UME))  
B2 Thermodynamics (Electrochemical potential, Nernst equation, Underpotential deposition (UPD), Liquid-junction potential, Donnan potential, pH probe, Ion-selective electrodes (ISEs))  
B13 Charged Interfaces ( Ionic activity, Diffuse double layer and models, Boundary layer)  
B3,6 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*)
- 50%* Asynchronous Assignments (8): e-Lab activity write-up and several related problems due one week after odd-numbered activities (Mondays @ 1 pm: 10/12, 10/26, 11/9, 11/23, and Fri. 12/18 @ 8 am)
- 20% Asynchronous Exam A (24 hours; available Mon. 11/9 @ 5 pm through Mon. 11/16 @ 11 am)
- 20% Asynchronous Exam B (24 hours; available Mon. 11/30 @ 5 pm through Mon. 12/7 @ 11 am)
- 10%* Synchronous e-Presentation (~15 min per student; occurs during the last week of classes (Mon. 12/7, Wed. 12/9, and Fri. 12/11), and during the final exam period (Fri. 12/18 @ 8 – 10 am))

Course Policies
Late assignments and make-up exams are not accepted, although I will regrade exams.
UCI Laptop Requirements for Remote Learning: https://techprep.oit.uci.edu/laptop-requirements-students/  
UCI Policy on Academic Integrity and Honesty: http://senate.uci.edu/academic-integrity/  
COVID-19 Student Resources from the UCI School of Physical Sciences: https://ps.uci.edu/students/*

* implemented to provide flexibility due to the challenges we are all facing