Course Outline

Proposed course name: Dynamics of Interfacial Charge Transfer Processes
Course number and suffix: 9505A
Term: Fall

Instructor: Jungsook Clara Wren
Email & tel: jcwren@uwo.ca
Schedule: Tuesdays and Wednesdays from 4:30 pm to 6:00 pm.
Web: https://www.rampsgroup.org/

Target audience: Graduate students in electrochemical and corrosion science areas

Pre-requisites: Enrolled in MSc or PhD program in the chemistry or physics program at Western.

Topics:

- Interfacial electron transfer - electrochemical process on an inert electrode.
- Polarization analyses (cyclic voltammetry, potentiodynamic versus potentiostatic, linear polarization, electrochemical impedance spectroscopy).
- Equilibrium potential, Open circuit potential, Butler-Volmer equation and its derivatives (Tafel, Wagner-Traud, Stern-Geary equations).
- Transport of solution redox species. Cottrell equation, Levich equation, Contribution of mass transport to the overall redox rate. Linear dynamics of an overall electrochemical process (combination of 1st order kinetics of redox reaction at the interface and 1st order rate of transport from the interface to the bulk solution). Koutecky-Levich equation.
- Interfacial electron and atom transfer – corrosion.
- Corrosion rate analyses – when do the conventional polarization analyses fail.
- Corrosion path, multiple oxidation steps, more than one steady state,
- Non-adiabatic system, systemic feedback,
- Chemical waves, Oscillation reactions, Liesegang phenomena

Special:

Material: Lecture notes

Practical requirements: Some background on electrochemistry, chemical kinetics and flux equations.

Helpful reference material: Electrochemical Methods: Fundamentals and Applications by Bard and Faulkner; Any physical chemistry textbooks.

Evaluation:

50%: a series of short problem-solving assignments
50%: a final report/presentation.
The fine print - University guidelines on various issues:
The UWO Senate Academic Handbook has specified that the following points should be added to all course outlines:

A. Prerequisites: Enrolled in MSc or PhD program in the chemistry or physics program at Western.

B. Medical/Compassionate Excuses: Students missing work for valid medical or other reasons are governed by the regulations https://studentservices.uwo.ca/secure/index.cfm

C. Student Accessibility Services (SAS): Western is committed to achieving barrier-free accessibility for all its members, including graduate students. As part of this commitment, Western provides a variety of services devoted to promoting, advocating, and accommodating persons with disabilities in their respective graduate program. Graduate students with disabilities (for example, chronic illnesses, mental health conditions, mobility impairments) are encouraged to register with Student Accessibility Services, a confidential service designed to support graduate and undergraduate students through their academic program. With the appropriate documentation, the student will work with both SAS and their graduate programs (normally their Graduate Chair and/or Course instructor) to ensure that appropriate academic accommodations to program requirements are arranged. These accommodations include individual counselling, alternative formatted literature, accessible campus transportation, learning strategy instruction, writing exams and assistive technology instruction. For more information, see http://www.sdc.uwo.ca/ssl/

E. Academic Offences: Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: http://www.uwo.ca/univsec/handbook/appeals/scholastic discipline undergrad.pdf

F. Plagiarism: All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com ( http://www.turnitin.com ).

G. Support Services: Support is available from the Registrar: http://www.registrar.uwo.ca, via the university students council (http://westernusc.ca/services/) and at Student Development Services (http://www.sdc.uwo.ca/).

H. Mental or Emotional Health: Students who are in emotional/mental distress should refer to Mental Health@Western http://www.uwo.ca/uwocom/mentalhealth/ for a complete list of options about how to obtain help.